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Recent Advances and Applications in Partial Least Squares Structural Equation Modeling (PLS-SEM)

Edited by
María del Carmen Valls Martínez, José-María Montero
and Pedro Antonio Martín Cervantes

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Preface

Partial Least Squares Structural Equation Modeling (PLS-SEM) is an innovative approach to statistical data analysis that has gained rapid popularity in academic circles, despite its recent origin. This method has captured the attention of scholars across various disciplines and continues to dynamically evolve.

In the contemporary landscape, decision makers in businesses, public sectors, academics and researchers have access to copious amounts of data for analysis and discovery. Therefore, this necessitates a robust theoretical framework and the application of disciplines such as mathematics and statistics, as well as practical experience and intuition. PLS-SEM stands out as a multivariate analysis technique that combines regression and linear analysis methodologies, offering advantages (such as not mandating normality) and yielding dependable results even with small sample sizes. This technique is extensively used in social sciences, particularly for handling unobservable or latent variables. PLS-SEM facilitates the simultaneous examination of relationships between observable and latent variables (assessing the measurement model) as well as relationships among latent variables (evaluating the structural model). Moreover, it is widely embraced in management due to its capacity to scrutinize intricate models with numerous indicators for each latent variable and multiple relationships among them.

This book encompasses 23 research articles and 1 review selected for publication from a total of 56 manuscripts submitted to the MDPI Special Issue, entitled “Recent Advances and Applications in Partial Least Squares Structural Equation Modeling (PLS-SEM).” These 24 papers, previously published in the journals *Economies* (7 papers), *Mathematics* (6 papers), *Sustainability* (10 papers) and *Data* (1 paper), explore diverse themes related to the theory and practical application of PLS-SEM methodology. These topics include the prediction of stock market investment intentions, the nexus between institutional quality and international competitiveness, governance paradigms, information and communication technologies in the supply chain, impacts of environmental information absorption and proactivity on company outcomes, quality management, corporate social responsibility’s effects on financial performance, healthcare system enhancement through resource management, self-awareness in online shopping behavior, status quo as a predictor of brand loyalty and innovation propensity, utilization of maximum entropy bootstrapping for time series, etc.

This book is considered a valuable resource for professionals in PLS-SEM, spanning various domains such as economics, finance, marketing, education, etc. It covers applications involving higher-order constructs, mediating variables, multigroup analysis and the latest advancements in applied methodology.

As Guest Editors of this Special Issue, we extend our gratitude to the contributing authors for their high-quality submissions, the reviewers for their invaluable feedback that enhanced the manuscripts and the administrative team at MDPI for their support of this project. Special gratitude is owed to Dr. Syna Mu, the Managing Editor of this Special Issue, for his professionalism, interpersonal skills, outstanding collaboration and valuable assistance.

María del Carmen Valls Martínez, José-María Montero, and Pedro Antonio Martín Cervantes

Editors

Article

Consumer Ethnocentrism and Country of Origin: Effects on Online Consumer Purchase Behavior in Times of a Pandemic

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Abstract: Electronic commerce has shown exponential growth over the past decade, but the impact of COVID-19 has exceeded all expectations. Based on the theory of planned behavior, this paper aims to investigate the relationship between consumer ethnocentrism and internet purchase behavior in times of pandemics. Data was collected from 294 online purchasers, and the analysis was conducted utilizing a Partial Least Squares Structural Equation Modeling approach. The results indicate no significant impact on the relationship between the planned online purchase behavior and the country of origin when consumers face a health crisis. Additionally, the outcomes show that attitude toward online shopping positively affects online purchase behavior.

Keywords: ethnocentrism; country of origin; internet purchasing behavior; PLS-SEM; COVID-19

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1. Introduction

For decades, marketing scholars and practitioners have investigated the influence of globalization on consumer behavior across countries, particularly in connection with issues of worldwide marketing standardization–adaptation [1,2]. According to [3], market convergence has encouraged sociologists, psychologists, and marketers to examine the interaction of global and local influences on consumer behavior in the context of globalization. As Ref. [4] defined, global consumer acculturation is the effect of culture on consumer behavior. Therefore, it is vital to research the impact of individual cultural features on consumers' behavior, even if the study concentrates on single cultural characteristics and does not include studies of how the complex total influences purchasing and consumer behavior (p. 785).

Due to advancements in communication technology, information has spread far and wide, giving businesses and goods a global audience. As the Internet has been more widely accepted and used, customers from across the globe have access to more goods and services through safe online purchasing [5]. New transportation technologies have offered customers more accessible access to other countries, where they may immediately interact with foreign goods and advertising. These exposures have impacted customer expectations and product selections across many attributes [6]. E-commerce has grown in popularity because of improved Internet technology. Consumers now have quick access to the product information on the Internet and may use shopping channels to make online purchases [7].

The development of the Internet has established a tight relationship with producers and consumers, locally and internationally. All these participants have become important and conscious contributors to sustainable consumption [8]. Although there is no agreement about the sustainable consumption definition, one of the most accepted, presented in 1994, defines it as “the use of goods and services that respond to basic needs and bring a better quality of life, while minimizing the use of natural resources, toxic materials and

emissions of waste and pollutants over the life cycle, so as not to jeopardize the needs of future generations” [9]. In that sense, the expansion of e-commerce has influenced those changes and emerged along with sustainable development. Therefore, its significance has been considered to have an extraordinary impact on the modern world [10]. Sustainable development establishes the paradigm of economic growth by integrating it with environmental protection criteria [11], considering current and future generations’ needs, and acknowledging the connection of its three dimensions: Environmental, Social, and Economic [12].

Evidence suggests that consumers in emerging nations are less ethnocentric [13]. They highly prefer imported goods from developed countries [14]. One significant factor contributing to this occurrence is prestige. Consumers often utilize the Country of Origin (COO) as a quick indicator when deciding whether or not to buy goods and brands made in the target nation [15]. Hence, many studies on the COO’s impact on customer behavior have developed in international marketing and business literature [16].

Corporations working based on online retail and e-commerce implement strategies to attract consumers to their brands and product lines, facilitating online shopping and bidirectional communication with their customers. Undoubtedly, corporations should consider, in all senses, the importance of e-commerce sustainability and sustainable regulations when creating offers, processes, and marketing strategies [17].

Previous statements are important due to the fact that e-commerce may assist in achieving a sustainable competitive advantage, which contributes to the long-term stability of the ecological system. According to [18], there is a link between perceived sustainability and customer engagement in e-commerce, and by reducing the number of visits to the store, e-commerce shopping may help to encourage environmentally-friendly lifestyles [19].

Consumer ethnocentrism (CE) has become progressively essential to researchers in consumer behavior and international marketing because it directly influences consumers’ attitudes and buying preferences. An example of ethnocentrism is when a person desires to explore their identity and belong to a group/community [20]. Purchasing foreign goods is considered harmful because it is detrimental to the home economy, unpatriotic, and has a damaging influence on domestic jobs [21]. CE has a moral basis that extends beyond economic and functional concerns. Some customers think buying foreign goods is disloyal and immoral since it harms the native economy and destroys employment. Highly ethnocentric customers often make erroneous judgments and overvalue local items relative to imported goods [22]. Thus, understanding customer behavior in various settings is critical for international marketing. As markets grow borderless and completely interconnected, it is crucial to determine if customers are concerned about the COO of goods and to what degree countries and cultures favor local goods over international ones.

Even though many researchers have investigated CE in various countries and have concentrated on CE results, little is known regarding the proportional relevance of its effects on the COO and Theory of Planned Behavior (TPB). What is more, there is a lack of explicitly evaluating consumer behavior through internet purchases during a pandemic in this framework. Nevertheless, there is mounting evidence that COO and CE are significant determinants of product assessments and purchasing choices [23,24]. Consequently, this research emphasized the roles of COO and CE in understanding consumer purchasing behavior. Thus, the current study attempts to expand the TPB model by incorporating key online purchasing variables, such as COO and CE, and improving our capacity to forecast intention and explain online consumers’ choices. As a result, this research develops and examines a theoretical framework based on the TPB model to examine the connection between variables and explain online consumer behavior during pandemics.

The present study adds to the body of knowledge in a variety of ways. First, it may fill a knowledge gap in COO and CE research by examining online consumer responses during pandemics. Second, we create an experimentally tested model that explains the links between COO and CE and predicts online local and international brand purchase decisions using the TPB. Finally, we conduct an experimental evaluation of the model

using data from a representative sample of a developing country to see if the indicated relationships hold.

Partial least squares structural equation modeling (PLS-SEM) is now well-established as a method for analyzing complex causal relationships among latent variables [25]. Moreover, this analysis method has been used extensively in many contexts, particularly in international marketing [26]. In this study, this approach is used to validate the theoretical framework.

The remaining document is organized as follows. The subsequent section sets out the conceptual framework and hypothesis. Afterward, measurements and procedures are discussed. Next, the empirical results are examined. Finally, we discuss the implications for theory and practice, highlight limitations, and provide suggestions for further study.

2. Conceptual Framework and Research Model

2.1. Consumer Ethnocentrism

Ethnocentrism, or more broadly, in-group prejudice, is a prevalent empirical phenomenon in human cultures. For example, Ref. [27] refers to CE as the beliefs held by consumers about the appropriateness, indeed morality, of purchasing foreign-made products. Highly ethnocentric consumers refuse to buy imported products and may even chastise others for doing so [28]. The impact of ethnocentrism extends not only to businesses or governments but also to the consumer level, on which most of the academic study has concentrated.

CE refers to preferences for home over international goods in marketing research [27]. The idea is helpful in forecasting customer receptivity to foreign brands [3]. For consumers and strategic decision-makers in the global economy, assessing CE levels is critical since doing so may indicate where standardization is feasible and specialized services are required [29] (p. 58). Aspects such as global positioning [30], market entry mode decisions [31], and the materialization of COO effects [32] are also influenced by CE [33]. CE's impact has often been theorized in terms of social identity theory, in which customers are seen as actors motivated to adhere to and align themselves with the standards and values of their in-groups in the hopes that doing so will provide them with a good social image [34].

Despite its many theoretical and practical uses and repeated requests for conceptual revision, the CE construct has remained unchanged since 1987. According to [35], it has been suggested by many scholars that CE must be conceptually reexamined, along with its quantification. The rise in calls is due to empirical data contradicting the original conception of CE as a unidimensional phenomenon [36]. The Consumer Ethnocentrism Tendencies Scale (CETSCALE) is utilized to operationalize the concept, which raises questions regarding the measurement's relevance and generalizability [27]. On the other hand, Ref. [37] indicated that many researchers linked the CETSCALE to social desirability bias, response style bias, and the dimensionality issues raised in previous research.

Shimp and Sharma [27] coined CE as American consumers' views about the propriety, even morality, of purchasing foreign-made goods. According to these authors, from the ethnocentric consumer's viewpoint, buying imported goods is terrible since it harms the home economy, results in job losses, and is unpatriotic. CE was quantified using the CETSCALE, created by these researchers. All the scale's items indicate a preference for US-made goods over foreign-made goods and a rejection of purchasing or importing foreign goods. As a result, it has been utilized successfully throughout the globe (e.g., [38], with acceptable reliability and validity.

Ethnocentrism is a broad concept that encompasses all aspects of ethnicity. Ethnicity is a prehistoric human social identity. For example, Ref. [39] specifies that it is still one of people's most significant social identities, since it fulfills fundamental psychological requirements and has an evolutionary foundation because it is concerned with family groupings and genetic similarities. According to [27], CE derives from Sumner's [39] broad notion of ethnocentrism. In other words, CE seems to be a narrow application and adaptation of ethnocentrism to the purchase of imported consumer goods. Therefore, CE originated from the broader notion of ethnocentrism [37] (p. 382). However, the two

concepts are different, and CE is best understood considering generic ethnocentrism. On the other hand, Ref. [40] suggested that CE may mean many other things, such as beliefs, dispositions, or characteristics. Hence, it is best understood as an attitude and social-psychological construct. CE may fulfill the requirements of ethnocentrism by strengthening ethnic group strength by purchasing goods from the nation where their ethnic group resides. However, it is probable that CE may not flow directly from ethnocentrism, but that multiple categories mediate the connections.

On the other hand, non-ethnocentric customers compare the quality and performance of international and local goods and select the best one [27]. According to [41]'s research on ethnocentric sentiments in consumer behavior, there is a general dislike of imported goods, making it difficult for them to succeed in foreign marketplaces. In today's more globalized society, cosmopolitan attitudes are believed to decrease ethnocentric sentiments. However, Ref. [27] found that CE promotes patriotism and stresses cultural and ethnic identity, affecting the global economic environment, particularly in times of crisis. Consistent with the study of [42], the desire to help local businesses typically rises during economic crises in many nations.

Subsequent ethnocentrism research has concentrated on the willingness to pay for foreign goods and the intention to buy and attitudes about foreign products [43]. In the same vein, Ref. [44] said that CE is associated with a negative attitude toward foreign goods, and, at the same time, the desire to buy domestically is positively impacted. In the opinion of [45], the explanation for this conclusion is that consumers' cultural values significantly influence consumer behavior. On the other hand, Ref. [46] stated that customers choose imports from nations with similar cultural backgrounds to their own. Thus, CE significantly impacts purchasing habits for domestic and foreign products, with particular attention to market segmentation, communications processes, and methods, defining the correct target markets, and creating a unique selling proposition that can be decoded by consumers nationally. Therefore, we hypothesized:

Hypothesis 1 (H1). *High consumer ethnocentrism will produce lower online consumer purchase behavior.*

Hypothesis 2 (H2). *Consumer ethnocentrism positively influences country of origin.*

2.2. Country of Origin

The COO effect is generated from customer views of a country's identity, which means that goods and companies benefit from and face criticism based on preconceived notions. Examples are high or low quality, newly attractive or old fashion and lousy design, simply by being recognized worldwide as typical for that country [24,47,48]. As per [49], it has been recognized that this is due to that nation's culture, tradition, and history. In other words, the COO theory is rooted in history. According to several sources, the COO may be described as either where a product is produced, manufactured [50] or where the company's headquarters are situated [51]. A study conducted by [52] defines the COO as an intangible barrier, based on consumer prejudice, which benefits well-known companies and harms newcomers to the market. Nevertheless, many academics are interested in COO, as shown by the wide range of definitions [5]. According to [32] evidence supports the presence of the COO effect even when the perceived brand origin is incorrect, calling into question the idea that the impact of COO on customer attitudes and behaviors is exaggerated (e.g., [53]. In addition, a meta-analysis conducted by [54] found that customer perception of quality and purchase intent are influenced by COO, which aids their decision-making process.

Based on their research, Ref. [55] highlight COO and its impact on customer assessments of items as being one of the most extensively researched topics in marketing, with hundreds of journal papers dedicated to it. Additionally, Ref. [54] demonstrated that the COO effect is more than a cognitive signal. It also has symbolic and emotional implications. Indeed, the origin of goods transmits a set of associations and symbols associated with the nation of origin [56]. Therefore, the COO effect demonstrates how customers have varying opinions about goods from different nations, indicating that they utilize provenance as

a criterion for product quality, either alone or with other criteria [57]. When consumers interconnect the perceived quality with COO, they are more likely to pay attention to how much they value a product and how confident they are in their purchase, which reduces the chance of making a mistake or cognitive dissonance [58].

Many research studies show that COO significantly impacts purchase decisions [59,60], although others have shown that the origin does not affect consumer preferences or is a minor factor [61]. Nonetheless, it is necessary to emphasize that these findings are linked to the relative significance given to those characteristics compared to the attribute origin. According to [62], customers are interested in direct quality indicators, and in [63]'s findings, consumers are focused on pricing. In a similar way, Ref. [64] stated that when local products are perceived as low quality, there is evidence of rejecting them and preferring imports. In other words, the COO impact is observed in a limited number of goods and at varying degrees of strength, making it difficult to generalize for any product or nation [65]. According to [66], customers' ethnocentric emotions are exacerbated by the COO effect. Consumers' perceptions of imported foods are influenced by the economic growth of the nation of origin, with goods from developed countries often receiving better ratings than those from developing ones [67].

The COO effect has been linked to various marketing variables that influence customer behavior, including familiarity [68], and consumers form opinions about countries based on their acquaintance with foreign goods. Understanding may have a significant role in comprehending the proclivity for using COO data and its impact on other factors [69]. For example, consumers may decide not to purchase a foreign product that they have never heard of since they are concerned about its quality [70]. According to [49], customers acquainted with a particular product class are less likely to use COO as a signal in product assessment. Furthermore, these authors discovered that familiarity with a specific product from a foreign country influences assessments but does not always result in more positive views.

Hypothesis 3 (H3). *A higher-country-of-origin effect will produce higher online consumer purchase behavior.*

2.3. Theory of Planned Behavior

According to the TPB, a person's desire to engage in a particular activity determines whether that individual gets involved in that conduct. To some extent, the intent is shaped by attitudes toward the action, subjective standards about participating in it, and assessments of whether the person would be successful. Ajzen [71] defined the last three constructs as follows. Attitude is the degree to which a person has a positive or negative evaluation of the conduct at issue. In general, the more positive an individual's attitude toward the action, the greater their intention to do it. Subjective norms perceive societal pressure on a person to perform or not perform a behavior. It is believed that perceived behavioral control reflects both prior experience and expected obstacles and repercussions [72]. Finally, Ajzen connects perceived behavioral control with Bandura's concept of perceived self-efficacy [73]. Thus, the TPB establishes a relationship between perceived behavioral control and behavioral achievement

According to [71], in the TPB, individual behavior is determined by behavior intentions. Intention plays a critical role in mediating behavior and other variables, such as attitude, subjective norm, and perceived behavioral control. Attitude is the degree to which a person has a positive or negative evaluation of the conduct at issue. In general, the more positive an individual's attitude toward the action, the greater their intention to do it. Subjective norms perceive societal pressure on a person to perform or not perform a behavior. It is believed that perceived behavioral control reflects both prior experience and expected obstacles and repercussions. In addition, and based on the findings of [74], people's conduct is heavily influenced by their belief in their abilities. When activities are regarded as difficult, or performance obstacles exist, perceived behavioral control becomes essential. Furthermore,

Ref. [75] found that brand awareness is the first stage in creating good connections and positive attitudes between consumers and products.

The TPB has been used in online purchases and information technology studies [76,77]. According to [78], consumers' desire to use information technology goods is influenced by attitude, subjective norms, and perceived behavioral control. Other researchers have found that TPB effects, subjective norms, and perceived behavioral control were direct antecedents of the desire to embrace mobile commerce [79]. In an empirical study conducted by [77], which focused on internet purchasing, attitude and perceived behavioral control were predictors of internet purchasing; consumer's internet purchasing behavior did not significantly influence subjective norm. In addition, the study demonstrated that the normative structure impacts subjective norms, and internet trustworthiness influenced attitudes regarding online buying. A positive effect of self-efficacy on perceived behavioral control was verified. Therefore, we hypothesized:

Hypothesis 4 (H4). *Perceived behavioral control will positively influence online consumer purchase behavior.*

Hypothesis 5 (H5). *Attitude toward online purchases will positively influence online consumer purchase behavior.*

Hypothesis 6 (H6). *Subjective norms will positively influence online consumer purchase behavior.*

2.4. Research Model

Figure 1 shows the research model of the study. In the model, Attitude Toward Online Purchase (ATOP), Subjective Norms (SN), Perceived Behavioral Control (PBC), Consumer Ethnocentrism (CE), and Country of Origin (COO) determine online consumer purchase behavior (OPB). Additionally, CE determines COO.

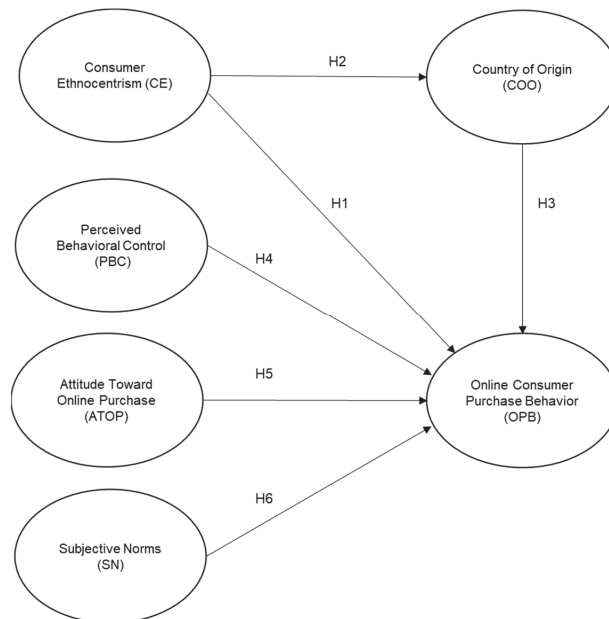


Figure 1. Research model.

3. Materials and Methods

Colombian consumers aged 18 and above from three major cities, Bogotá, Medellín, and Bucaramanga, participated in this research. The survey was distributed through email blasting and using Survey Monkey services. The email outlined the study's goals and

invited recipients to participate in an online poll in which they would remain anonymous. Every other week, we sent out email notifications to all the prospective participants. The data-collecting period lasted 20 weeks. The researchers received 398 questionnaires. However, 104 had to be discarded since they lacked crucial data for this investigation. Two hundred and ninety-four questionnaires were approved, yielding a response rate of 73.9 percent.

Regarding age, 23.1 percent of the participants identified as 18–24 years old, while 17.6 percent identified as 45–54 years old. In terms of gender, 51.7 percent of the participants were female, and 48.3 percent were male. Regarding educational attainment, 30.2 percent reported some college studies, 25.9 percent a bachelor’s degrees, 9.2 percent some graduate studies but no degree, and 29.9 percent a graduate degree, respectively (see Table 1).

Table 1. Demographic Characteristics.

Demographic Variable	Frequency	Percent
Gender		
Female	164	51.7
Male	153	48.3
Age		
18–24	92	31.3
25–34	49	16.7
35–44	54	18.4
45–54	70	23.8
55–64	26	8.8
65+	3	1.0
Education		
High School Degree or equivalent	14	4.8
Some college but no degree	89	30.2
Bachelor’s Degree	76	25.9
Some Graduate Study but no degree	27	9.2
Graduate	88	29.9

The questionnaire was created using scales that had been established in earlier research. The questionnaire included questions that were scored on a seven-point Likert scale. CETSCALE was proposed by [27], and it was used to develop the CE scale. The COO was determined using the scale of [51]. The TPB was determined using the model for the Internet buying environment proposed by [77]. Four latent variables were included, adapted from the TPB. Four items evaluated attitudes toward online purchases. In addition, two items assessed subjective norms, and two items evaluated perceived behavioral control. To verify semantic equivalence in the translation of the scales from English to Spanish, a pilot study with 50 participants was performed. A single question assessed online consumer purchase behavior: How much would you say you spend on Internet purchases each month? The questionnaire is exhibited in Table A1.

4. Analysis and Results

Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to analyze the data. The selection of the technique is due to the exploratory nature of the hypothesized relationships in this study. The PLS analysis consists of two phases, examining the validity of the measurement model and evaluating the structural model. The results of each stage will then be reported.

4.1. Measurement Model

The guidelines for the evaluation of the model were applied in accordance with the procedures described in the literature. Table 2 shows the measurement models, outer loadings exceeding 0.707 met technical recommendations, with the only exception being

SN1 with a value of 0.676. Furthermore, composite reliability and average variance extracted (AVE) exceeded 0.83 and 0.59, respectively. Therefore, the convergent validity has been proven.

Table 2. Cronbach's Alpha, Composite Reliability, AVE, and Factor Loadings.

Latent Variables	Value
Attitude Toward Online Purchase (ATOP)	
Cronbach's Alpha	0.907
Composite Reliability	0.935
AVE	0.782
ATOP1	0.907
ATOP2	0.856
ATOP3	0.898
ATOP4	0.877
Subjective Norms (SN)	
Cronbach's Alpha	0.754
Composite Reliability	0.835
AVE	0.724
SN1	0.676
SN2	0.996
Perceived Behavioral Control (PBC)	
Cronbach's Alpha	0.723
Composite Reliability	0.870
AVE	0.771
PBC1	0.806
PBC2	0.944
Consumer Ethnocentrism (CE)	
Cronbach's Alpha	0.933
Composite Reliability	0.942
AVE	0.599
CE1	0.743
CE2	0.754
CE3	0.744
CE4	0.730
CE5	0.807
CE6	0.851
CE7	0.738
CE8	0.829
CE9	0.754
CE10	0.725
CE11	0.825
Country of Origin (COO)	
Cronbach's Alpha	0.862
Composite Reliability	0.900
AVE	0.644
COO1	0.785
COO2	0.838
COO3	0.747
COO4	0.831
COO5	0.808

Discriminant validity was assessed based on the Fornell–Larcker criterion and the Heterotrait–Monotrait Ratio (HTMT) approach. Table 3 indicates these results, the square roots of the AVEs for the latent variables being higher than the correlations between them. Furthermore, HTMT values were all below 0.50, offering full support for discriminant validity.

Table 3. Discriminant validity analysis.

Latent Variable	ATOP	PBC	CE	COO	SN	OPB
Fornell–Larcker criterion						
ATOP	0.884					
PBC	0.365	0.878				
CE	−0.080	−0.178	0.774			
COO	−0.047	−0.020	0.423	0.802		
SN	0.268	0.143	−0.023	−0.005	0.851	
OPB	0.378	0.263	−0.116	0.047	0.159	
Heterotrait–Monotrait Ratio (HTMT)						
PBC	0.452					
CE	0.092	0.217				
COO	0.057	0.062	0.456			
SN	0.287	0.224	0.082	0.070		
OPB	0.393	0.289	0.133	0.063	0.122	

4.2. Structural Model

Table 4 and Figure 2 present the analysis of the structural model. The assessment of the structural models started with the evaluation of the Standardized Root Mean Square Residual (SRMR) for the estimated models. As a result, the model has an SRMR of 0.058, an appropriate fit based on the cut-off value of 0.08. Overall, both OPB R^2 and COO R^2 indicate lower effects. Similarly, the Q^2 predict values show the lower predictive accuracy for the model.

Table 4. Path coefficients and indexes of structural models.

Relationships/Indexes	Global
H1: CE → OPB	−0.116 ns
H2: CE → COO	0.423 ***
H3: COO → OPB	0.114 ns
H4: PBC → OPB	0.122 *
H5: ATOP → OPB	0.314 ***
H6: SN → OPB	0.055 ns
R^2 of OPB	0.178
R^2 Adjusted of OPB	0.164
Q^2 Predict of OPB	0.142
R^2 of COO	0.179
R^2 Adjusted of COO	0.176
Q^2 Predict of COO	0.168
SRMR	0.058

Notes: *** p -value < 0.001, * p -value < 0.05, ns non-significant.

Next, we examined the hypothesized relationships. For the research model, beta coefficients are positive and significant for the relationships between CE and COO, PBC and OPB, and ATOP and OPB but not for the other relations. The analysis supports the beta coefficients being significantly different from zero between the independent variables PBC, ATOP, and the variable OPB, and, in the same way, between the independent variable CE and the dependent variable COO. This same analysis cannot support beta coefficients being significantly different from zero between the independent variables CE, SN, and COO and the dependent variable OPB. This result indicates that with an increase/decrease in the PBC, ATOP variables' values implies an increase/decrease in the OPB variable. These effects follow the theory of planned behavior. On the other hand, it is not supported that the variation of the SN values impacts OPB. One explanation is that subjective norms are perceived as the same for these consumers, and in a pandemic context, and there is not enough variation for the model to detect it. In the case of the relationship between CE and COO, an increase/decrease in the values of the CE variable implies an increase/decrease in the COO variable, a situation following the idea of social identity in the context of consumer

behavior. Finally, the COO variation does not affect the OPB variation. A possible reason is that most products bought online for the consumers surveyed in a pandemic context do not include the country of origin as an essential attribute. Consequently, hypotheses H2, H4, and H5 are supported for the model.

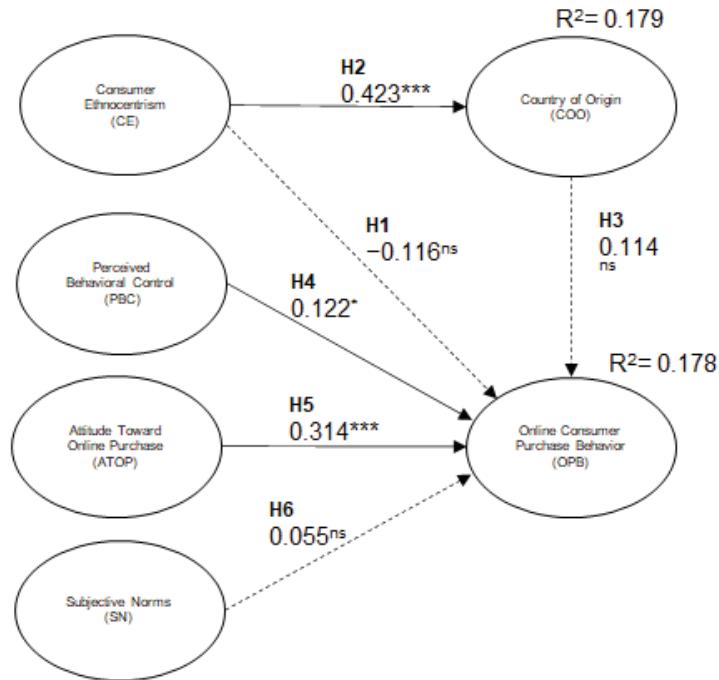


Figure 2. PLS results. Notes: *** p -value < 0.001, * p -value < 0.05, ns non-significant.

5. Discussion

This study reviewed the effects of CE and COO on OPB in times of pandemics utilizing the TPB in a developing country. It is essential to point out that the study results align with the TPB and confirm the theory's strength within the e-commerce environment. Although CE, COO, and TPB have been studied before, this study addresses two critical issues in international business and marketing: evaluating the three in the e-commerce environment and their significance in times of health, economic, and social crisis.

5.1. Theoretical Implications

This study makes the following contributions to the literature. First, it finds that PBC has a mild effect on OPB when consumers are facing the impact of a pandemic. This result is in the same line as [77,78], whose findings indicate that PBC influences OPB positively. This first finding shows that consumers' intentions toward Internet purchases are significantly affected by the consumers' perceived behavioral control. In other words, the ease in purchasing partially determined the online purchase. In marketing and international business, specifically in e-commerce, this information is relevant because consumers understand that they control the decision-making process in their purchases. Therefore, the entire virtual environment must be designed to stimulate and promote that perception. Nevertheless, a cross-country review shows that PBC is not always an antecedent to purchasing [80]. In the case of online consumers in Colombia, the results of our study indicate this effect, which is remarkable. In marketing and international business, specifically in e-commerce, this information is relevant because consumers understand that they control the decision-making process in their purchases. Therefore, the entire virtual environment must be designed to

stimulate and promote that perception. In this vein, and from a broader view, a complete and cheaper access to the Internet in developing countries, in addition to other essential benefits, can promote online purchases.

Second, in alignment with other studies' previous results related to e-commerce and the TPB [76–79], this study finds that ATOP has a large effect on OPB. The favorability of consumers in times of pandemic for online purchases was demonstrated with this result. Undoubtedly, e-commerce plays a unique role when the population faces the waves of a crisis such as COVID-19. This preference and positive attitude toward online purchasing is essential for international business and marketing strategy decision-makers. These results are linked to [27] and [29] when they stated the perceptual relationship between sustainability and e-commerce customer engagement and, being more specific, how this practice could promote environmentally-friendly lifestyles.

Moreover, it is indispensable to adequate product and distribution platforms to satisfy this “in-crescendo” market reality. It is necessary to highlight that our findings related to SN are similar to those of [77] but in contradiction with the research outcomes of [78]. Hassan et al. [80] suggested that cultural differences affect the relationship between SN and consumer intention and that power distance is a necessary and sufficient cultural dimension to explain the cross-country variation found. In this way, the effect of SN on the purchase will be stronger in countries high in power distance than in countries low in power distance. Previous COVID-19 pandemic studies back this suggestion in countries high in power distance [81,82]. Our results do not support that the variation of the SN values impacts OPB. One explanation is that subjective norms are perceived as the same for Colombian consumers and in a pandemic context, and there is not enough variation for the model to detect it. This means that in times of a global pandemic, where physical contact has decreased to an unprecedented maximum, the perception of the Colombian consumer that everyone whom they consider important thinks that they should take care of themselves and not be exposed to the COVID-19 disease, preferring shopping online, is the same for everyone.

Third, this research suggests that CE exhibits a negative and not significant effect on OPB. Our findings contradict the results stated by [27,41,42], at least in times of a pandemic. These results are crucial when potential markets evaluate the quality and performance of international and local goods and select the best one. E-commerce offers an essential array of possibilities to consumers. Purchasing habits for domestic and foreign products might not be the main criteria to motivate the decision-making process. Accessibility, delivery process, truthfulness, and product assortment could be the fundamental variables consumers consider in times of a pandemic.

Fourth, the COO's results demonstrate that the relationship with OPB is not significant. These findings are in the same line as those of [61] and the results presented by [62] that indicated customers are interested in direct quality indicators.

5.2. Managerial Implications

This study has implications for both international brand managers and native brand managers regarding e-commerce.

Considering the study results, we want to highlight three specific aspects of the online buying behavior of Colombian consumers during the pandemic, and that may or may not vary after the pandemic. First, the ethnocentrism of the consumer appears as a non-determinant of online shopping in a pandemic scenario in Colombia. However, recent results in European consumers indicate the opposite [82]. An explanation could lie in the differentiated quality of local production between developed and developing countries. In this sense, in a post-pandemic scenario, Colombian online consumption behavior should not change concerning this determinant unless local production increases its quality. Second, social norms do not have an effect in explaining online shopping. Given that Colombia is a country high in the cultural dimension distance to power, it is expected that in ordinary times this effect can be detected in models based on the TPB [80].

Third, the global health crisis triggered the use of information technologies by people and organizations and the access to banking services to the population around the world. These two drivers have placed various countries, including Colombia, in a flourishing stage for electronic commerce. The Diffusion of Innovation Theory [83] suggests that this exponential advance should be followed by a period of moderate advancement in adopting online shopping in Colombia. We believe that in this future period, the effect of PBC will be moderated by variables such as age, gender, and experience on digital platforms [84].

Based on these results, marketers in developing countries should assimilate that the ATOP supports OPB in times of a pandemic, which means the clear preference consumers exhibit to buy products and services through business virtual platforms. International and local marketing managers should evaluate the strategies to keep consumers motivated toward their brands and products, considering that CE and COO are not fundamental variables of decision in times of a social crisis. Due to the economic crisis that COVID-19 has imposed, perceived high-quality benefits and the price could be essential variables consumers adopt to solve their needs.

On a more general note, our findings point to several ways that marketing and international managers could react to times of pandemics. Still, the lesson learned is to be prepared and design and build a solid structure to be ready. Beyond this, businesses should add specific benefits to their products and services that consumers can decode as unique, increasing the overall country perception. Additionally, in terms of selecting international markets to trade products and services, based on an in-depth analysis, the first should be those countries characterized as having low CE levels.

5.3. Limitations and Future Research

The present study has four limitations, which create opportunities for future studies. First, this study's research context is in Colombia. Future studies should examine consumers in other countries and regions. Second, limitations imposed by the Colombian Government related to social distancing and sanitary prohibitions did not reach a very significant sample population for this study. Research should apply and test the study's model with more representative samples. Third, future research can examine and compare different countries to evaluate the effects of CE, COO, and OPB considering diverse society, cultural, political, and economic facts. Last but not least, forthcoming studies should consider other theories and constructs to explore e-commerce to explain consumer perception, attitude, and behavior to deepen our understanding of the online/Internet shopping phenomenon in regular times and pandemics.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Questionnaire.

Latent Variable/Item	Scale
Attitude Toward Online Purchase (ATOP)	
Buying things online is a.	Very bad idea—Very good idea
Buying things online is a.	Very silly idea—Very intelligent idea
Buying things online is an idea that I.	Dislike a lot—I like too much
Using the Internet to buy things would be.	Very unpleasant—Very pleasant
Subjective Norms (SN)	
People who influence my behavior would think I should buy things online.	Strongly disagree—Strongly agree
People who are important to me would think I should buy things online.	Strongly disagree—Strongly agree
Perceived behavioral control (PBC)	
I'm able to buy things online.	Strongly disagree—Strongly agree
Buying things online is completely under my control.	Strongly disagree—Strongly agree
I have the resources, the knowledge and the ability to buy things online.	Strongly disagree—Strongly agree
Online shopping behavior (OPB)	
How much would I say you spend on online shopping each month?	Nothing to 250 dollars
Consumer Ethnocentrism (CE)	
We should always buy local products instead of imports.	Strongly disagree—Strongly agree
Only products that are not available in our country should be imported.	Strongly disagree—Strongly agree
Buying our domestic products keeps our people working.	Strongly disagree—Strongly agree
Local products, from the first to the last, are always the most important.	Strongly disagree—Strongly agree
Buying foreign products is anti-Colombian.	Strongly disagree—Strongly agree
It is not right to buy foreign products.	Strongly disagree—Strongly agree
An authentic Colombian should buy products made in Colombia.	Strongly disagree—Strongly agree
We should buy products manufactured in Colombia instead of making other countries rich at our expense.	Strongly disagree—Strongly agree
It is always better to buy Colombian products.	Strongly disagree—Strongly agree
There should be little marketing of products from other countries unless it is a necessity.	Strongly disagree—Strongly agree
Colombians should not buy foreign products because they damage Colombian businesses and cause unemployment.	Strongly disagree—Strongly agree
Restrictions should be placed on all imports.	Strongly disagree—Strongly agree
It could cost me more in the long run, but I prefer to support Colombian products.	Strongly disagree—Strongly agree
Foreigners should not be allowed to place their products in our markets.	Strongly disagree—Strongly agree
Foreign products should be taxed highly to reduce their entry into Colombia.	Strongly disagree—Strongly agree
We should buy foreign products only if these products cannot be obtained within our country.	Strongly disagree—Strongly agree
Colombian consumers who buy imported products are responsible for putting their compatriots out of work.	Strongly disagree—Strongly agree
Country of Origin (COO)	
When buying imported products, the country of origin is the information I take into consideration.	Strongly disagree—Strongly agree
I look for the information of the country of origin to select the best imported product available in the market.	Strongly disagree—Strongly agree
I understand that the country of origin determines the quality of the imported products.	Strongly disagree—Strongly agree
When I buy expensive imported products, I always look for which country it was manufactured in.	Strongly disagree—Strongly agree
If I have little experience in the type of imported product, I look for the information of the country of origin to help me make a better decision.	Strongly disagree—Strongly agree

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Article

Consumers' Perspectives and Behaviors towards Corporate Social Responsibility—A Cross-Cultural Study

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Abstract: This study measured consumers' perspectives and behaviors with respect to corporate social responsibility (CSR). Specifically, we explored the components of CSR, including CSR aimed towards the environment, society, customers, employees, suppliers, and shareholders. We also examined the impact of CSR practices on brand attitude and purchase intention. The study surveyed 616 consumers across three locations, with detailed questionnaires in four languages. A total of 564 samples (186 from Vietnam, 189 from Indonesia, and 189 from Taiwan) qualified for data analysis. Additionally, statistics software including LISREL 8.8, STATISTICA 10, and MINITAB 19 were utilized to evaluate our hypotheses and construct a structural model. The results indicated that the consumers across the three areas were not concerned about CSR aimed towards shareholders, while all consumers considered CSR aimed towards themselves. Vietnamese customers prioritized a company's care for its employees, while both Indonesian and Taiwanese consumers concentrated on the environment and society. In addition, suppliers' benefits and rights attracted Indonesians' attention. Furthermore, CSR had a positive significant impact on brand reputation in all three cultures. However, while CSR had a positive influence on customer purchase intention in Indonesia and Taiwan, it did not in Vietnam.

Keywords: corporate social responsibility; brand attitude; purchase intention; linear structure relation model; regression model

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1. Introduction

1.1. Research Background

These days, many companies are attempting to humanize themselves. Specifically, they are endeavoring to behave like humans in order to win customers' hearts. For example, Howard Schultz—the founder of Starbucks—was inspired by his father's adversity. Schultz's father struggled to make ends meet and was underestimated by his employers; moreover, he was seriously injured in the workplace. The hard times experienced by his father prompted Schultz's motivation to genuinely care about his employees' lives and implement corporate social responsibility (CSR). He established a "Transformation Agenda" targeting the firms' employees [1]. Specifically, Starbucks not only remunerates its employees equally but also offers insurance and other benefits to all part time and full time staff. Additionally, Starbucks has implemented numerous initiatives focused on the environment and the community. Regarding the community, Starbucks operates community stores in collaboration with local nonprofit organizations. Through these endeavors, Starbucks has undertaken a host of activities to help the communities in which they are located. With respect to environmental responsibility, Starbucks has tried to reduce its waste by recycling and conserving water and energy. Furthermore, its CSR performance has earned a great deal of support from its customers and, as a result, has contributed to increased profits. After implementing these strategies, Starbucks bounced back financially, and by 2013 had even exceeded its previous revenue.

Recently, CSR has received attention due to its importance to customers, employees, shareholders, suppliers, the environment, and society as a whole. The practice of CSR is one of the effective ways by which an enterprise can enhance its reputation [2] and sharpen its competitive edge, which is subsequently reflected in a firm's profitability [3]. These days, in particular, with competition becoming increasingly tougher, CSR should be taken into consideration. Therefore, extensive studies have been conducted to better understand the components of CSR, as well as the correlations between their roles and consumer perspectives with respect to brand and purchase intention. More specifically, CSR practices can enhance consumers' perspectives on a particular brand or company with respect to trust, engagement, contentment, and attachment [4]. In addition, CSR practices have a significant influence on the target audience's attitude towards the company and their purchase intention [5].

In Taiwan, CSR has entered the mainstream, shifting from its use mainly in NGOs and companies in the public sectors to finding utility in private companies. In September 2014, the government imposed compulsory CSR on all companies with capital above TWD 10 billion, as well as food, chemical, and finance enterprises listed on TWSE/TPEX [6]. In 2015, 77% of Taiwan's top companies published CSR reports, compared to an average of 73% of top firms doing the same around the world. Moreover, to ensure that these reports were reliable, many companies hired one of the big four accounting companies to confirm and verify them. Approximately 50% of the CSR reports were verified independently by certification, testing companies, or accounting firms. To date, many Taiwanese companies have committed to addressing CSR, including the Taiwan Business Bank (TBB), BASF, and Taiwan FamilyMart Co., Ltd. CSR strategies do indeed enhance the competitiveness and corporate reputation of a firm. This can be explained by the fact that consumers in this area are aware of CSR and are more likely to support companies that take on social responsibility, even if the price or quality of the products or services provided by these companies do not exceed those of products or services provided by their counterparts. Indonesia was the first country to adopt a compulsory approach to CSR. According to Article 15 of Law 25 2007, all companies must implement CSR [7]. In reality, the lack of clarity on definitions has resulted in the government finding it difficult to enforce CSR. Companies have, nevertheless, deemed the implementation of CSR to be capable of increasing their competitiveness. Therefore, many domestic and multinational companies, such as Unilever Indonesia, Nestle, Coca-Cola, Exxon Mobil, Conoco Phillips, Pertamina, Chevron, Indosat Ooredoo, etc., have voluntarily adopted CSR. In Vietnam, in the 2000s, CSR was introduced by multinational firms [8,9]. These days, many companies, including BIDV, Bitis, and Vinamilk, have voluntarily adopted CSR, and VinGroup has been a rising star. VinGroup donated a large portion of its budget to help alleviate the damage caused by the COVID-19 pandemic. In emerging markets such as Vietnam and Indonesia, CSR is not generally taken seriously. In particular, there are no official regulations or accounting standards in accordance with which enterprises are to disclose CSR activities in either country [10,11]. At the same time, sufficient support for issuing global CSR certificates is not provided [11]. In cases where businesses communicate CSR activities, they are likely to announce them in their yearly report or, rarely, in a CSR report or sustainable report; however, the report indicators and methods are inconsistent [12]. Most companies take on CSR superficially and spontaneously due to their altruistic motives and do not put much effort into fulfilling their social responsibility. In other words, these types of enterprises do not engage actively in sustainable growth due to profit motives [13]. On the one hand, the cost of CSR activities is quite high, which outweighs the benefit that they could derive. On the other hand, consumers who operate in the markets pay more attention to the core value of products rather than CSR.

On 11 March 2020, the World Health Organization (WHO) declared COVID-19 a pandemic, which has since then led to a serious economic crisis [14] with more than 276 million cases and 3.3 million deaths (<https://www.worldometers.info/coronavirus/>, accessed on 22 December 2021). In Taiwan, the COVID-19 pandemic has been controlled

well [15] due to the experience of SARS in 2003 [16,17]. At the beginning of the pandemic, on 27 April 2020, Taiwan had only 429 cases and 6 deaths [15]. As of 26 December 2020, just 783 cases were confirmed on this island due to its efficient quarantine policies [18]. Although Taiwan encountered a severe wave of infections in May 2021 with about 15,000 cases by 15 July 2021 [19], the number of daily cases decreased to approximately 30 in July 2021 [15]. Updated in 22 December 2021, Taiwan recorded only 16,840 total cases, 850 total deaths, 705 total cases per million people, compared to 35,501 total cases per million people globally, 36 deaths per million people compared to 691 deaths per million people globally. In contrast, in Indonesia and Vietnam, the situation is much worse. Indonesia, a country with the fourth highest population, is likely to be severely affected by the pandemic [20]. In November 2020, the death rate from COVID-19 in Indonesia was the highest in Asia (8% in 2020) [21]. On 22 December 2021, Indonesia recorded 4,261,000 total cases, 144,034 total deaths, and 15,340 total cases per million people, 519 total deaths/million of the population (<https://www.worldometers.info/coronavirus/>, accessed on 22 December 2021). The explanation for this serious situation is that vaccination programs were rolled out slowly and most Indonesian people follow Islam which limits the consumption of goods—including vaccines—to only those that meet halal certification. Regarding Vietnam, the government controlled the COVID-19 pandemic well during 2020 due to effective quarantine policies [22]. Since April 2021, the most serious COVID-19 outbreak in Vietnam saw 1,588,000 total cases, 30,250 total deaths, and 16,105 total cases per million people, and 307 total deaths per million people, as updated on 22 December 2021 (<https://www.worldometers.info/coronavirus/>, accessed on 22 December 2021). Many enterprises have been struggling, and some have entered bankruptcy [23]. Obviously, a pandemic—such as COVID-19—is an unexpected event and can magnify the cost of CSR activities [24] and also amplify the sensitivity of customers. In this situation, from a company's perspective, whether it should take on its social responsibility or focus on profit has always been a widely debated issue. In addition, to what extent consumers would support companies that perform CSR remains unknown. According to prior research [25], culture affects CSR disclosures. Particularly, in Western countries, where individualism is embraced and the power gap is not high, CSR reports are prevalent. However, in Asian countries, which are comparatively conservative, the CSR disclosure rate is lower.

1.2. Research Purpose

Based on previous studies [26–28], this research aims to examine the components and their associated weights in different cultures. Although the concept of CSR components has existed for over a decade, they are still worth researching in the current COVID-19 pandemic—a sensitive time. Furthermore, this research proposes and examines how consumers perceive CSR as well as the influence of CSR on their attitude toward brand and consumer intention. We also collected demographic information for statistical analysis to increase the precision of data in this research. To carry out this study, we collected samples from consumers in Taiwan—a developed economy—as well as two developing economies—Indonesia and Vietnam—during the COVID-19 pandemic. The results analyze CSR components and customers' perception towards CSR, as well as gauge how CSR influences brand attitude and purchase intention. In the research, we make comparisons in three areas. Lastly, this research also makes theoretical and practical contributions.

1.3. Research Structure

Section 1 introduces CSR generally and particularly in Taiwan, Indonesia, and Vietnam. It also briefly mentions the purpose of this research and the study structure. Section 2 is the literature review—it defines CSR components, namely, CSR towards the environment, society, customers, employees, suppliers, and shareholders. It also investigates CSR's effects on customers' attitudes toward brands and their purchase intention. In this section, a model including nine hypotheses is also described. In Section 3, the sampling technique and the research methodology are demonstrated. Specifically, we show the way to distribute, collect,

and analyze data. Section 4 presents the hypotheses testing results extracted from analyzing the data collected. Moreover, the results of the statistical analyses show the similarities and differences in the three locations. Section 5 includes the conclusion, discussion, limitations, and further studies.

2. Literature Review

2.1. CSR

The concept of CSR dates back to a long time ago. Especially, after World War II, CSR was adopted and gradually became prevalent [29]. Nowadays, CSR has received a great deal of attention from the public. Many companies issue CSR reports as a means of communicating their CSR performance. Public and company awareness leads to the growth of CSR initiatives [30]. There are many standards used as social reporting frameworks. Global Reporting Initiative (GRI) has become commonly used for reporting sustainability [31] since GRI reports are used to judge improvement year by year, and also facilitates making comparisons with their rivals [32]. It provides three standards, including economic, environmental, and social metrics [33]. The ESG metrics are based on three aspects (environmental, social, and governance); ESG disclosures can also help companies become more reliable and transparent and, then, improve their reputation [34]. Furthermore, ISO 26,000 is not certifiable but offers guidance on socially responsible practices to organizations as well as the public sector [35]. One of the most valuable frameworks is the United Nations Global Compact (UNGC), which correlates firms' strategies and activities with human rights, labor, environment, and anticorruption principles [30]. Regarding employees, Social Accountability International's SA8000 standard and FLA Workplace Code guide on maintaining social practices in the workplace [36].

Although many previous theories and models have studied CSR, to date, there is a scarcity of research models that examine how CSR affects brand attitude and purchase intention. In addition, previous research was conducted on just one specific area and did not examine the interrelations in areas that have different legal, economic, cultural, and social conditions. Moreover, previous research was carried out in normal situations. However, this study is conducted in a crisis, the COVID-19 pandemic, in which the cost of CSR activities [24] and the sensitivity of customers are prone to be high. Therefore, this study proposed the influence of CSR on purchase intention in Vietnam and Indonesia—emerging economies—and Taiwan—a developed economy.

Since the 1950s, there have been many definitions of CSR. In the study, CSR is defined as a set of principles that a company adopts voluntarily beyond legal requirements to be accountable toward the environment, society, customers, employees, suppliers, and shareholders [26,27]. Therefore, it improves quality of life and also contributes to sustainable development. According to [28], CSR is a seven-dimensional construct, which includes the environment, society, community, customers, employees, suppliers, and shareholders. However, we realize that there are some overlaps between the two domains—community and society—and we integrate the two domains into one. Therefore, in this study, CSR includes six subdomains.

2.1.1. CSR towards the Environment

Environmental sustainability and green business management have received a great deal of attention. The environment domain plays a crucially important role in CSR and environmental conservation is a duty of corporations and can be a strategic instruction for how enterprises achieve sustainable development [34]. CSR towards the environment is the combination of the awareness of environmental management and the philosophy of corporate operation to alleviate the effect of manufacturing on the environment [37]. CSR towards the environment has been mentioned widely but lacks quantitative data to evaluate the outcomes, while many frameworks, such as ESG, involve environmental criteria to gauge how well a company serves the environment. CSR towards the environment can be considered as enterprises minimizing energy consumption, using ecofriendly and

sustainable materials, and having proper waste management. Moreover, these companies engage in constant efforts to preserve the environment, as well as invest in research and development related to environment protection [28,38,39]. This study assumes the existence of the positive relationship of CSR towards the environment and overall CSR. As a result, the following first hypothesis is developed:

Hypothesis 1 (H1). *CSR towards the environment has a positive impact on overall CSR.*

2.1.2. CSR towards Society

Apart from environmental issues, recently, social issues have emerged. Society is described as the surroundings in which an enterprise deploys its CSR practices and activities. In general, society often expects the returns from a company to afford that company acceptance and legitimacy [40]. Instead of avoiding social issues, enterprises nowadays have taken on CSR to address those problems [41]. CSR towards society can be considered as an enterprise's contributions to community development related to job creation, especially for disabled people, economic development, as well as contributing to enhancing the life quality of the community [28,42]. An assumption is that there is a positive correlation between CSR towards society and overall CSR. Therefore, the hypothesis is developed:

Hypothesis 2 (H2). *CSR towards society has a positive impact on overall CSR.*

2.1.3. CSR towards Customers

Customers are a substantial source of the value of a company [43]. If a company does not take responsibility for its customers, it will be unable to attract customers and generate revenue or profits. In the case that customers are unsatisfied with a company's products or behaviors, they can stop supporting or even boycott the company's products or services. The worst case could be that company is likely to lose profits or go bankrupt. Consequently, CSR towards customers is key in CSR strategy. CSR towards customers can be considered as an enterprise making honest claims to customers through advertising or marketing, providing safe products with high quality, fair prices [28,38,39]. This study speculates the positive link between CSR towards customers and overall CSR. Therefore, the following hypothesis is developed:

Hypothesis 3 (H3). *CSR towards customers has a positive impact on overall CSR.*

2.1.4. CSR towards Employees

Employees are a vital resource of a company [44]. Employees' competence is necessary and can be considered a core value of an enterprise. In cases where employees are not satisfied with their jobs, work performance is affected. The quality and quantity of products and services are prone to be reduced. Taking on CSR towards employees is necessary for a company to maintain its business and improve its outcomes [45]. The foundations of CSR should focus on employees' wellbeing [46]. There are many frameworks, such as Social Accountability International's SA8000 standard, FLA Workplace Code, etc., which provide guidance on maintaining social practices in the workplace [36]. CSR towards employees can be considered as an enterprise paying adequate salaries to their employees [47], creating safe, decent working conditions, and providing professional development and promotion opportunities to their employees [48]. It is also worth mentioning that companies must treat their employees fairly (without region or gender discrimination or abuse) as well as offer their employees adequate medical insurance [28,38,39]. The following hypothesis is assumed:

Hypothesis 4 (H4). *CSR towards employees has a positive impact on overall CSR.*

2.1.5. CSR towards Suppliers

There is an important link between suppliers and a company in a distribution chain and that connection is key in a company's business. The reason for this is that suppliers provide a company with materials with reasonable prices and quality. If a company does not fulfill its duties towards suppliers, the materials' quality may be unreliable. Consequently, its products and services can be affected. Therefore, embracing CSR towards suppliers is of importance for a company to run its business [49]. CSR towards suppliers can be considered as an enterprise providing fair terms and conditions for all suppliers. Furthermore, enterprises must communicate openly, honestly, and confidentially, as well as comply with contractual payment terms [28]. The following hypothesis is assumed:

Hypothesis 5 (H5). *CSR towards suppliers has a positive impact on overall CSR.*

2.1.6. CSR towards Shareholders

Shareholders are individuals who own a company's shares. By investing in a company, shareholders gain benefits from improving the company's financial situation with a high share dividend in return. Besides investing in a company, shareholders can engage in the company's activities, such as consulting and other assistance related tasks. Without shareholders' engagement, a company cannot operate well. In fact, CSR towards shareholders is vital in a business—if a company does not take on the responsibility, it may struggle with financial issues [50]. CSR towards shareholders can be considered as an enterprise investing the capital of shareholders properly. Moreover, companies must respect their shareholders by communicating openly and honestly with them. Finally, companies have to guarantee sustainable development and long term success to the shareholders [28,38,47]. The following hypothesis is developed:

Hypothesis 6 (H6). *CSR towards shareholders has a positive impact on overall CSR.*

The utility formulation can be conceptualized as:

$$CSR = a_0 + a_1 Evn + a_2 Soc + a_3 Cus + a_4 Emp + a_5 Splr + a_6 Sh + \varepsilon_1 \quad (1)$$

CSR: Consumers' perspectives on CSR

Evn: CSR towards the environment

Soc: CSR towards society

Cus: CSR towards customers

Emp: CSR towards employees

Splr: CSR towards suppliers

Sh: CSR towards shareholders

2.2. Brand Attitude

Brand attitude is considered as the consumers' willingness to show a favorable or unfavorable reaction toward a certain brand [51]. An individual's attitude toward any brand is based on the information or knowledge he or she has gained through particular sources, such as their family, friends, networking, cultural, and global aspects [52]. On the other hand, together with engagement, those attitudes are founded through consumers' experiences [53]. Gradually, consumers form their attitude toward the brand: they may trust, like, or be loyal to the brand [54]. In this study, brand attitude refers to consumers' attitudes towards brands that are socially responsible. Based on firms' CSR engagement, customers may have a positive view of companies or brands [55–57]. According to previous research [58], CSR can be important for improving brand attitude. The following hypothesis is developed:

Hypothesis 7 (H7). *CSR has a positive influence on brand attitude.*

2.3. Purchase Intention

Purchase intention is the inclination of consumers towards products or services. Specifically, after making a certain evaluation, consumers have an intention to buy products or use services [59]. Many factors influence consumers' intentions [60]. The final decision relies on consumers' preferences as well as external aspects [61]. In this study, purchase intentions refer to consumers' intentions to purchase products from companies taking on social responsibility [62]. Based on the theory of reasoned actions [63], personal attitudes and behaviors have a relationship. According to [64], in the Italian banking industry, CSR practices related to the environment, society, and ecosustainable projects are important; at the same time, customers believe that there is a link between CSR practices and their choice of banks. In the hospitality industry, during the COVID-19 pandemic, CSR practices encouraged customers to prepay services [65]. In the wine industry, CSR towards the environment receives a great deal of attention [66]. Therefore, we assume that purchase intention is influenced by CSR and brand attitude. Thus, we form the final two hypotheses:

Hypothesis 8 (H8). *CSR positively influences purchase intention.*

Hypothesis 9 (H9). *Brand attitude has positively impact on purchase intention.*

The utility formulation can be conceptualized as:

$$BR = b_0 + b_1 CSR + \varepsilon_2 \quad (2)$$

$$PI = c_0 + c_1 CSR + c_2 BR + \varepsilon_3 \quad (3)$$

BR: brand attitude

PI: purchase intention

The conceptual model related to CSR, Brand attitude, and Purchase intention is demonstrated in Figure 1.

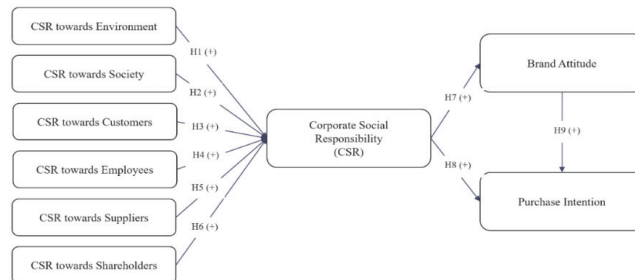


Figure 1. Conceptual model.

3. Research Methodology

3.1. Collect Data and Questionnaire

A survey research method was conducted to obtain insights into CSR and its influence on brand attitude and purchase intention as well as test the proposed conceptual model. All question items of the questionnaire were composed to attain the most precise data to accept or reject the hypotheses in the proposed model. Multidimensional analysis results are needed; consequently, demographic information is collected. The research is exempt from the regulations of the Institutional Review Board (IRB) regarding the involvement of human subjects according to the Helsinki declaration. The reason is the research posed almost no risks to human subjects. Ethical principles were abided by including privacy and confidentiality, etc. [67]. The questionnaires contain information about the reason for conducting the survey, instructions on answering, and a statement on assuring their

privacy and confidentiality. There are two parts to the questionnaires. The first part contains 40 questions that asks consumers about their perspective on CSR towards the environment, society, customers, employees, and suppliers, and overall CSR of a hypothetical company, as well as their brand attitude and purchase intention. The second part contains 10 questions about personal information. A 5-point Likert scale (totally disagree = 1 to totally agree = 5) is used to evaluate the variables [68]. The questionnaire was first composed in English and then translated into three languages, including Chinese, Indonesian, and Vietnamese. Therefore, respondents across three areas (Taiwan, Indonesia, and Vietnam) can understand the questionnaire holistically without any confusion during the answering process.

The questionnaires were distributed mainly via Google Forms to alleviate the accumulation of defective data that might otherwise impact the analysis results. Through the qualitative research results, as the preliminary survey, the observed variables have been adjusted and supplemented to match the research. To collect the data, a nonprobability convenience sampling was accepted with the purpose of theory testing [69]. The eligibility criteria are consumers over 16 years old residing in the three target countries with acceptable reading comprehension. Initially, 616 participants took part in the survey, however, 11 respondents were not from the three target areas, 9 samples were under 16 years old, and 32 samples were disqualified because survey takers missed some questions or answered questions carelessly (all answers are the same, etc.). After eliminating improper samples, the number of qualified samples was 564, including 186 respondents from Vietnam, 189 from Indonesia, and 189 from Taiwan. The reliability of research constructs can be assessed by using Cronbach's alpha values [70] in each dataset and the pooled data.

3.2. Data Analysis

3.2.1. Descriptive Statistics

Descriptive statistics are used to demonstrate the basic traits of data gathered from empirical research in numerous ways [71]. It is considered an indicator for depicting quantitative information in a brief structure. This technique is remarkably useful for helping us to understand and demonstrate features or characteristics of a certain dataset by briefly summarizing the samples and their parameters. The most commonly used types are concentrated trend parameters, including mean, median, and weak, which are used in most—if not all—levels of mathematics and statistics. There are two basic types of measurement: centralized trend measurement and volatility or dispersion measurement. The former describes the center of a dataset whereas the latter demonstrates the dispersion of data. The demographic statistic is usually applied in qualitative and demographic variables [72]. In this study, STATISTICA 10 is applied since it offers a variety of integrated statistical information such as age, occupation, income, etc. [73].

3.2.2. Regression Analysis

The most primitive form of regression analysis is the method of least squares, which was first used scientifically in 1885 [74]. Moreover, the method was developed as the method of least squares procedures [75]. Regression analysis is defined as an analytical method to understand the relationship between a dependent variable and independent variables [76]. In addition, it can be used to estimate and predict the expected value of a dependent variable in a conceptual model. After performing regression analysis with the Minitab 19 software, we obtain results including the beta coefficient (β), p -value, t -value, and R^2 . Next, we can use these to evaluate whether or not the hypotheses should be accepted or rejected. Adjusted R^2 indicates how independent variables influence the dependent variable. In theory, if it is good (over 50%), the study is well justified [77]. In addition, p -value is the probability that the null hypothesis is supported. At large, a variable with a p -value not over 0.05 shows that the variable, within the model, is significant; while a p -value exceeding 0.05 implies that the variable should be removed [77]. Regarding the beta coefficient (β), which independent factor has the largest beta coefficient also has the greatest influence on the change in the dependent variable.

3.2.3. Linear Structural Relations (LISREL)

LISREL is a statistics software for modeling structural equations [78] and was used as a research tool in 1972 [79]. For this research, LISREL 8.8 software was used. The reason for applying it is that we can test the hypotheses in the proposed model easily and flexibly. Moreover, we can use this software in various fields thanks to the ability of this software to easily adapt according to the situation, especially in constructing models for estimating relationships between independent and dependent variables. The third reason is providing crucial indicators such as χ^2/df , P, RMSEA, AGFI, PGFI, GFI, NFI, CFI, IFI, and SRMR, LISREL also helps us determine the goodness of fit test [80]. Importantly, the results from running LISREL 8.8 also show the model's structural validity, and the *t*-test helps determine any significant relationship between the two variables. In theory, NFI should be over 0.9 [81], GFI and CFI higher than 0.9 [82].

4. Results

4.1. Demographic Statistics

Questionnaires were distributed over two months from 3 September 2021, to 19 November 2021, via an online survey—Google Forms in Vietnamese, Indonesian, Chinese, and English. According to previous research, monetary incentives are beneficial to enhance the response rate and completion rate [83]. Therefore, the authors used a lottery-style approach, which means we provided a USD 25 gift to the luckiest respondent by a random draw. Overall, we attained 616 responses. However, 52 participants were not qualified and 564 complied with the requirements of the survey. Table 1 depicts the demographic profile of the collected data. There are 186 Vietnamese, 189 Indonesian, and 189 Taiwanese respondents, which accounts for about 33% of each region. According to previous studies, urban vs rural differences are prone to obscure sophisticated influences [84]; measure of urban vs rural characteristics is considered in the research. The percentage of urban participants (78.01%; 440 samples) is four times higher than that for rural counterparts—21.99%; 124 samples. Moreover, 60.82% of the total participants are females while 39.18% are males. Only 11.88% are high school students, the rest completed higher education. Maritalwise, the number of single participants is dominant, with 436 samples (77.30%), while married individuals occupy 22.16% (125 samples). Regarding age, the proportion of individuals from 18 to 35 years old constitutes 82.62% (466 samples). The data show that respondents with the lowest income (less than USD 250 per month) take up the highest rate (37.23%; 210 samples), while those making the highest income (over USD 5000 per month) make up the smallest proportion (0.89%; 5 samples).

Table 1. Demographic statistics ($n = 564$).

Characteristics	Freq.	(%)	Characteristics	Freq.	(%)
Location	564	100.00%	Age	564	100.00%
Vietnam	186	32.98%	Under 18	2	0.35%
Indonesia	189	33.51%	18–25	281	49.82%
Taiwan	189	33.51%	26–35	185	32.80%
Area	564	100.00%	36–45	40	7.09%
Countryside	124	21.99%	46–55	33	5.85%
City	440	78.01%	Over 55	23	4.08%
Gender	564	100.00%	Occupation	564	100.00%
Female	343	60.82%	Student	270	47.87%
Male	221	39.18%	Com. employee	178	31.56%
Education	564	100.00%	Civil servant	20	3.55%
Highschool grad	67	11.88%	Self employed	81	14.36%
VoTech program	25	4.43%	Homemaker	13	2.30%
Bachelor's degree	377	66.84%	Retired	2	0.35%
Master's degree	93	16.49%	Monthly income	564	100.00%
Doctoral degree	2	0.35%	Less than USD 250	210	37.23%

Table 1. Cont.

Characteristics	Freq.	(%)	Characteristics	Freq.	(%)
Marital status	564	100.00%	USD 251–500	138	24.47%
Single	436	77.30%	USD 501–1000	119	21.10%
Married	125	22.16%	USD 1001–2500	78	13.83%
Divorced	1	0.18%	USD 2501–5000	14	2.48%
Widow	2	0.35%	>USD 5000	5	0.89%

Based on the database collected, Cronbach's alpha values were utilized to test the reliability of research constructs. Table 2 shows that all Cronbach's alpha indicators of the pooled data and each dataset surpass the generally agreed threshold of 0.8 [85]. Therefore, the research is reliable for each location and the cross locations.

Table 2. Construct reliability (Cronbach's alpha).

Constructs	Pooled	Vietnam	Indonesia	Taiwan
Evn	0.91	0.88	0.92	0.93
Soc	0.5	0.94	0.95	0.95
Cus	0.8	0.87	0.89	0.87
Emp	0.96	0.94	0.97	0.97
Splr	0.92	0.94	0.93	0.90
Sh	0.96	0.95	0.97	0.97
CSR	0.87	0.86	0.85	0.90
BR	0.89	0.85	0.87	0.95
PI	0.83	0.84	0.82	0.82

4.2. Regression Analysis and LISREL Testing

4.2.1. Regression Analysis

Based on the database collected, regression analysis was carried out via Minitab 19 software. According to the proposed models, we performed a regression analysis based on Equations (1)–(3) with four datasets. The results demonstrated in Table 3 show that, in three regression models for Equations (1)–(3) with four datasets, R^2 and adjusted R^2 , are over 0.05, which means all models are well justified. Moreover, we observed that indexes such as R^2 and the adjusted R^2 of model 1 are higher than those of models 2 and 3 in the four datasets. Therefore, model 1 is more justified than models 2 and 3.

Table 3. Regression model.

	Pooled	Vietnam	Indonesia	Taiwan
Equation (1)	Regression summary for dependent variable CSR			
R^2	0.72	0.64	0.74	0.78
Adjusted R^2	0.71	0.63	0.74	0.77
p -value	0.00	0.00	0.00	0.00
	Coefficients			
	β (t-value)	β (t-value)	β (t-value)	β (t-value)
(Constant)	0.09 (0.87)	0.34 (1.48)	0.12 (0.72)	−0.07 (−0.40)
Evn	0.18 (3.43) *	0.04 (0.39)	0.31 (3.55) *	0.18 (2.16) *
Soc	0.22 (3.48) *	0.10 (0.65)	0.18 (1.98) *	0.25 (2.40) *
Cus	0.33 (7.39) *	0.29 (3.35) *	0.35 (4.85) *	0.31 (4.19) *
Emp	0.20 (2.67) *	0.62 (3.86) *	−0.00 (−0.03)	−0.03 (−0.23)
Splr	0.16 (2.68) *	0.23 (1.76)	0.23 (2.42) *	0.11 (1.17)
Sh	−0.13 (−1.97) *	−0.38 (−3.00) *	−0.12 (−1.14)	0.19 (1.67)

Table 3. Cont.

	Pooled	Vietnam	Indonesia	Taiwan
Equation (2)	Regression summary for dependent variable BR			
R ²	0.60	0.52	0.67	0.60
Adjusted R ²	0.60	0.52	0.67	0.60
p-value	0.00	0.00	0.00	0.00
	Coefficients			
	β (t-value)	β (t-value)	β (t-value)	β (t-value)
(Constant)	0.93 (8.57) *	1.15 (5.45) *	0.82 (5.06) *	0.85 (4.30) *
CSR	0.77 (28.91) *	0.70 (14.11) *	0.80 (19.33) *	0.82 (16.77) *
Equation (3)	Regression summary for dependent variable PI			
R ²	0.54	0.57	0.53	0.55
Adjusted R ²	0.54	0.56	0.52	0.55
p-value	0.00	0.00	0.00	0.00
	Coefficients			
	β (t-value)	β (t-value)	β (t-value)	β (t-value)
(Constant)	0.57 (4.74) *	0.41 (1.78) *	0.48 (2.31) *	0.82 (4.31) *
CSR	0.24 (5.50) *	0.06 (0.79)	0.35 (4.04) *	0.29 (4.15) *
BR	0.51 (11.66) *	0.75 (10.15) *	0.41 (4.72) *	0.04 (5.94) *

Note: * indicates p-value ≤ 0.05 .

Model 1 relating to Equation (1) is built as follows:

For the pooled data				
CSR=	0.09 (0.87) (0.38)	+0.18 × Evn (3.43) (0.00)	+0.22 × Soc (3.48) (0.00)	+0.33 × Cus (7.39) (0.00)
		+0.20 × Emp (2.67) (0.01)	+0.16 × Splr (2.68) (0.01)	−0.13 × Sh (−1.97) (0.05)
For Vietnamese data				
CSR _V =	0.34 (1.48) (0.14)	+0.04 × Evn _V (0.39) (0.70)	+0.10 × Soc _V (0.65) (0.51)	+0.29 × Cus _V (3.35) (0.00)
		+0.62 × Emp _V (3.86) (0.00)	+0.23 × Splr _V (1.76) (0.08)	−0.38 × Sh _V (−3.00) (0.00)
For Indonesian data				
CSR _I =	0.12 (0.72) (0.48)	+0.31 × Evn _I (3.55) (0.00)	+0.18 × Soc _I (1.98) (0.05)	+0.35 × Cus _I (4.85) (0.00)
		−0.00 × Emp _I (−0.03) (0.98)	+0.23 × Splr _I (2.42) (0.02)	−0.12 × Sh _I (−1.14) (0.26)
For Taiwanese data				
CSR _T =	−0.07 (−0.40) (0.69)	+0.18 × Evn _T (2.16) (0.03)	+0.25 × Soc _T (2.40) (0.02)	+0.31 × Cus _T (4.19) (0.00)
		−0.03 × Emp _T (−0.23) (0.82)	+0.101 × Splr _T (1.17) (0.24)	+0.19 × Sh _T (1.67) (0.10)

Model 2 relating to Equation (2) is built as follows:

For the pooled data			
BR=	0.93 (8.57) (0.00)		+0.77 × CSR (28.91) (0.00)
For Vietnamese data			
BR _V =	1.15 (5.45) (0.00)		+0.70 × CSR _V (14.11) (0.00)
For Indonesian data			
BR _I =	0.82 (5.06) (0.00)		+0.80 CSR _I (19.33) (0.00)
For Taiwanese data			
BR _T =	0.85 (4.30) (0.00)		+0.82 × CSR _T (16.77) (0.00)

Model 3 relating to Equation (3) is constructed as follows:

For the pooled data			
PI=	0.57 (4.74) (0.00)	+0.24 × CSR (5.50) (0.00)	+0.51 × BR (11.66) (0.00)
For Vietnamese data			
PI _V =	0.41 (1.78) (0.08)	+0.06 × CSR _V (0.79) (0.43)	+0.75 × BR _V (10.15) (0.00)
For Indonesian data			
PI _I =	0.48 (2.31) (0.02)	+0.35 × CSR _I (4.04) (0.00)	+0.41 × BR _I (4.72) (0.00)
For Taiwanese data			
PI _T =	0.82 (4.31) (0.00)	+0.29 × CSR _T (4.15) (0.00)	+0.40 × BR _T (5.94) (0.00)

Table 4 shows the results of hypotheses testing. For the pooled data, all hypotheses are supported except H6 ($\beta = -0.13 < 0$). For each regional data, we find that H3, H7, and H9 are supported, while H6 is rejected in all three areas. Both Indonesian and Taiwanese data support H1, H2, and H8 while those hypotheses are rejected in Vietnam. However, regarding H4, Vietnamese data supports it ($\beta = 0.62 > 0$ and $p\text{-value} \leq 0.05$) whereas both Indonesian and Taiwanese information rejected it. In contrast, H5 is supported with Indonesian data ($\beta = 0.23 > 0$ and $p\text{-value} \leq 0.05$), while it is rejected in both Vietnam and Taiwan.

Table 4. Hypotheses testing—regression.

Hypotheses	Supported (β)			
	Pooled	Vietnam	Indonesia	Taiwan
H1: Evn → CSR	Yes 0.18 *	No 0.04	Yes 0.31 *	Yes 0.18 *
H2: Soc → CSR	Yes 0.22 *	No 0.10	Yes 0.18 *	Yes 0.25 *
H3: Cus → CSR	Yes 0.33 *	Yes 0.29 *	Yes 0.35 *	Yes 0.31 *
H4: Emp → CSR	Yes 0.20 *	Yes 0.62 *	No 0.00	No −0.03
H5: Splr → CSR	Yes 0.16 *	No 0.23	Yes 0.23 *	No 0.11
H6: Sh → CSR	No −0.13 *	No −0.38 *	No −0.12	No 0.19

Table 4. Cont.

Hypotheses	Pooled	Supported (β)		
		Vietnam	Indonesia	Taiwan
H7: CSR \rightarrow BR	Yes 0.77 *	Yes 0.70 *	Yes 0.80 *	Yes 0.82 *
H8: CSR \rightarrow PI	Yes 0.24 *	No 0.06	Yes 0.35 *	Yes 0.29 *
H9: BR \rightarrow PI	Yes 0.51 *	Yes 0.75 *	Yes 0.41 *	Yes 0.40 *

Note: * indicates p -value ≤ 0.05 . Supported: yes ($\beta > 0$ and p -value ≤ 0.05).

4.2.2. LISREL Testing

- Covariance matrix

The covariance matrix depicting the linear relationship between constructs is demonstrated in Table 5 for the pooled Vietnamese, Indonesian, and Taiwanese data. It can be seen that all values in the matrix are positive, showing an increasing linear relationship between the constructs.

Table 5. Covariance matrix of the measure variables.

Pooled	CSR	BR	PI	Evn	Soc	Cus	Emp	Splr	Sh
CSR	1.04								
BR	0.80	1.04							
PI	0.66	0.72	0.97						
Evn	0.75	0.72	0.56	0.89					
Soc	0.85	0.83	0.59	0.81	1.12				
Cus	0.69	0.61	0.54	0.67	0.68	0.79			
Emp	0.85	0.83	0.58	0.82	1.02	0.69	1.10		
Splr	0.85	0.80	0.57	0.82	1.03	0.68	1.02	1.15	
Sh	0.85	0.85	0.57	0.86	1.04	0.71	1.08	1.05	1.20
Vietnam	CSR	BR	PI	Evn	Soc	Cus	Emp	Splr	Sh
CSR	0.87								
BR	0.61	0.82							
PI	0.51	0.66	0.92						
Evn	0.52	0.48	0.42	0.68					
Soc	0.62	0.57	0.50	0.60	0.82				
Cus	0.55	0.49	0.46	0.56	0.56	0.72			
Emp	0.63	0.56	0.50	0.60	0.74	0.58	0.77		
Splr	0.62	0.58	0.47	0.60	0.77	0.54	0.73	0.84	
Sh	0.57	0.55	0.48	0.61	0.74	0.57	0.73	0.74	0.82
Indonesia	CSR	BR	PI	Evn	Soc	Cus	Emp	Splr	Sh
CSR	1.10								
BR	0.88	1.05							
PI	0.75	0.74	1.07						
Evn	0.88	0.84	0.63	1.06					
Soc	0.91	0.87	0.58	0.94	1.25				
Cus	0.76	0.70	0.59	0.77	0.72	0.86			
Emp	0.90	0.86	0.54	0.98	1.12	0.77	1.26		
Splr	0.97	0.87	0.58	1.00	1.18	0.78	1.20	1.38	
Sh	0.92	0.92	0.53	1.03	1.16	0.78	1.25	1.25	1.42
Taiwan	CSR	BR	PI	Evn	Soc	Cus	Emp	Splr	Sh
CSR	1.09								
BR	0.89	1.21							
PI	0.67	0.74	0.89						
Evn	0.79	0.83	0.61	0.87					
Soc	0.96	1.02	0.65	0.83	1.22				
Cus	0.68	0.61	0.53	0.62	0.66	0.70			
Emp	0.96	1.04	0.67	0.85	1.15	0.68	1.24		
Splr	0.90	0.94	0.60	0.79	1.05	0.64	1.08	1.13	
Sh	1.00	1.07	0.68	0.89	1.16	0.71	1.21	1.09	1.30

- Goodness of fit testing

In the study, goodness of fit testing was used to evaluate the covariance between the variables. Indexes are demonstrated in Table 6. The χ^2/df of the pooled database and that of each region are significant. The explanation for this is that the data are collected from respondents from all walks of life in three locations (different areas, ages, educational background, marital status, jobs, and monthly income). This index is high and $p < 0.000$, which means that the one-factor model does not fit the data. However, it cannot negate the proposed models, since χ^2 is sensitive to the size and diversity of the samples [86]. Furthermore, the index is nonparametric statistics [87] and the possibility of finding differences is less than the parameter tests [88]. Consequently, the χ^2 test is not as suited as a general independent test [89]. Indices such as RMSEA, AGFI, and PGFI were not fit. However, indices, namely, GFI, NFI, CFI, and IFI are over 0.9, and SRMR is less than 0.08. Therefore, the model can be considered as accepted.

Table 6. Measurement of goodness of fit statistics.

Fit Measures	Pooled	Vietnam	Indonesia	Taiwan	Statistics Target
χ^2/df	14.17	3.28	5.65	8.89	
P	0.00	0.00	0.00	0.00	
RMSEA	0.15	0.11	0.16	0.21	Lower than 0.08
AGFI	0.76	0.83	0.72	0.59	Higher than 0.9
PGFI	0.25	0.25	0.25	0.24	Higher than 0.5
GFI	0.94	0.95	0.93	0.90	Higher than 0.9
NFI	0.98	0.99	0.98	0.97	Higher than 0.9
CFI	0.98	0.99	0.98	0.97	Higher than 0.9
IFI	0.98	0.99	0.98	0.97	Higher than 0.9
SRMR	0.06	0.08	0.049	0.074	Lower than 0.08

- Hypotheses testing

Table 7 shows hypotheses testing. With the pooled data, apart from H6, all hypotheses are supported. For each regional data, H3, H7, and H9 are accepted while H6 is rejected in all three areas. Moreover, Indonesian and Taiwanese data support H1, H2, and H8 whereas those hypotheses are refused in Vietnam. Regarding H4, Vietnamese data support it (Est. = 0.20 > 0 and |t-value| \geq 1.96) while both Indonesian and Taiwanese information rejects it. Nonetheless, H5 is accepted with Indonesian data while it is rejected with both Vietnamese and Taiwanese data.

Table 7. Hypotheses testing—LISREL.

Hypotheses	Pooled	Supported (Est.)		
		Vietnam	Indonesia	Taiwan
H1: Evn → CSR	Yes 0.18 *	No 0.04	Yes 0.31 *	Yes 0.18 *
H2: Soc → CSR	Yes 0.22 *	No 0.10	Yes 0.18 *	Yes 0.25 *
H3: Cus → CSR	Yes 0.33 *	Yes 0.29 *	Yes 0.35 *	Yes 0.31 *
H4: Emp → CSR	Yes 0.20 *	Yes 0.62 *	No −0.00	No −0.03
H5: Splr → CSR	Yes 0.16 *	No 0.23	Yes 0.23 *	No 0.11
H6: Sh → CSR	No 0.13 *	No 0.38 *	No −0.12	No 0.19

Table 7. Cont.

Hypotheses	Pooled	Supported (Est.)		
		Vietnam	Indonesia	Taiwan
H7: CSR → BR	Yes 0.77 *	Yes 0.70 *	Yes 0.80 *	Yes 0.82 *
H8: CSR → PI	Yes 0.24 *	No 0.06	Yes 0.35 *	Yes 0.29 *
H9: BR → PI	Yes 0.51 *	Yes 0.75 *	Yes 0.41 *	Yes 0.40 *

Note: * indicates |t-value| ≥ 1.96; supported: Yes (Est. > 0 and |t-value| ≥ 1.96).

The result of LISREL for the pooled data, Vietnamese data, Indonesian data, and Vietnamese data are depicted in Figures 2–5 respectively.

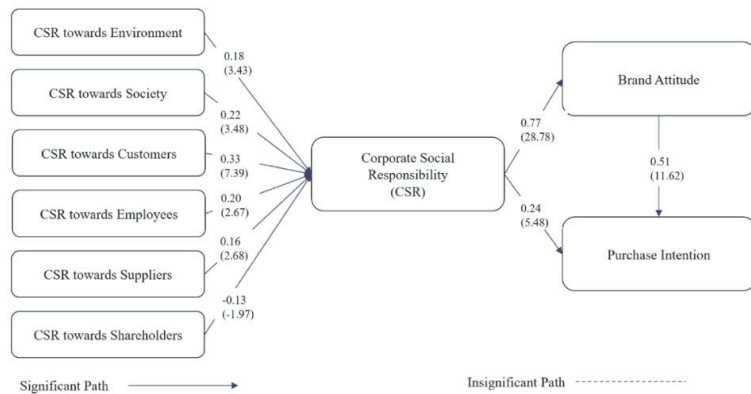


Figure 2. Result of LISREL for the pooled data.

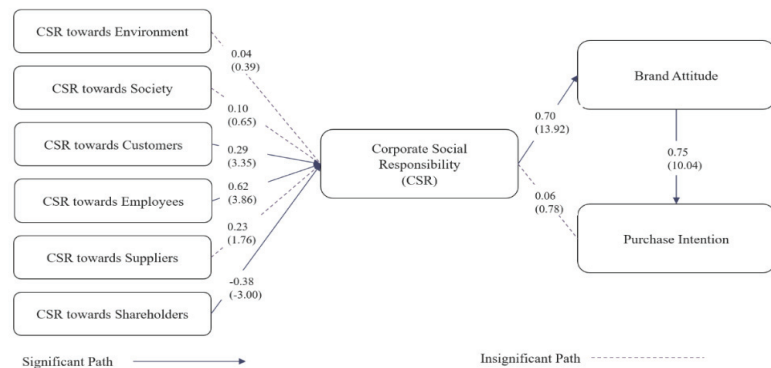


Figure 3. Result of LISREL for Vietnamese data.

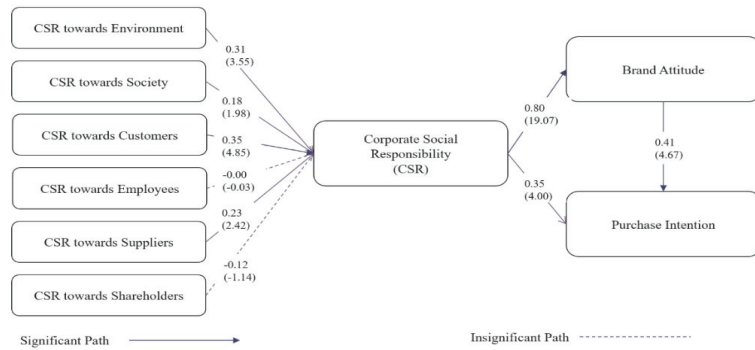


Figure 4. Result of LISREL for Indonesian data.

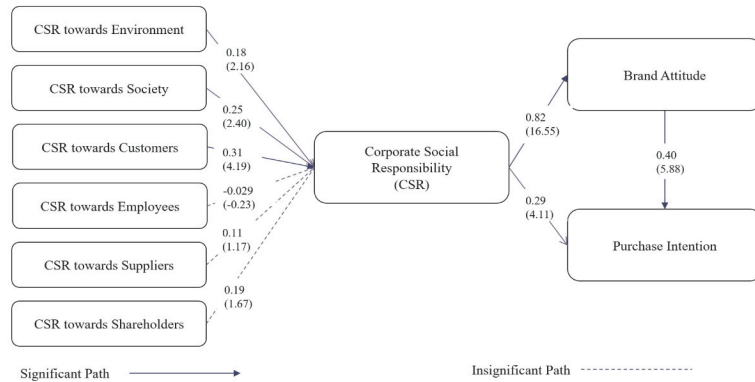


Figure 5. Result of LISREL for Taiwanese data.

4.2.3. Comparison of the Regression Analysis and LISREL Model

Regression analysis is a reliable and powerful tool that can solve the relationship between independent and dependent variables as linear models. In regression models, R^2 and adjusted R^2 demonstrate structural validity. In this research, all indices of the pooled database or each area are over 0.5, particularly, some indices are over 0.7. Therefore, we can consider the model as reaching the fit. Regarding LISREL, the advantage is that it is highly flexible for concluding the relationship of variables. In this study, some indices are fitted, however, others, such as RMSEA, AGFI, and PGFI, are not suitable (RMSEA is much higher than the cut-off value = 0.05 and AGFI and PGFI are way lower than the requirement). Therefore, we could not claim that the model is fully fitted.

Comparing the two methods, we found that the regression model is better than the LISREL model due to its validity. However, both methods showed similarities in supporting or rejecting the hypotheses. Especially for the pooled data, we rejected H6 and accepted the rest. We also rejected two hypotheses with Indonesian data and rejected three with Taiwanese data. However, in Vietnam, four hypotheses were accepted while five hypotheses were rejected.

5. Discussion and Conclusions

5.1. Summary of Results

Overall, for pooled data, CSR towards shareholders can be ignored while CSR towards other issues positively influences CSR. In particular, CSR towards customers is the most important factor. Furthermore, CSR significantly affects brand attitude and purchase

intention. Moreover, the influence of CSR on brand attitude is higher than it is on purchase intention. Brand attitude significantly positively influences purchase intention.

Observing the Vietnamese data, CSR towards employees is the most important factor, followed by CSR towards customers, while other issues can be ignored. The result shows that CSR significantly influences brand attitude but does not affect purchase intention. Brand attitude still has a significant positive impact on purchase intention.

Regarding the Indonesian data, CSR towards customers is the most important factor, followed by the environment and society, while other factors can be neglected. CSR also has a positive impact on brand attitude and purchase intention (the impact of CSR on the former is much higher than on the latter). Furthermore, purchase intention is still influenced by brand attitude and the influence is higher than CSR's influence on purchase intention).

For the Taiwanese data, CSR towards customers is the most significant influence on CSR, followed by CSR towards society and the environment, whereas other aspects related to employees, suppliers, or shareholders can be ignored. Moreover, CSR has a significant impact on brand attitude. The influence of brand attitude is higher than the effect of CSR on purchase intention.

5.1.1. The Correlation across All Areas

Regarding the pooled data across all three areas, the results showed that some aspects—namely, the environment, society, customers, employees, and suppliers—have a positive impact on CSR. The explanation lies in the fact that, since the COVID-19 pandemic, customer perspectives have changed significantly. Specifically, for societal issues, employees are given a great deal of consideration. Additionally, together with the increasing awareness of the environment, issues such as environmental deterioration or natural disasters are becoming, in general, a pressing concern across the world [90]—particularly in Vietnam, Indonesia, and Taiwan. However, from the customers' standpoint, the conflict between shareholders' benefits and customers still exists [91]. Implementing CSR leads to an increase in company costs and risks, together with a decrease in shareholders' benefits [92]. In this regard, taking on responsibility towards shareholders has no impact on CSR; this is in contrast to prior research. In terms of brand attitude, CSR has a significantly positive impact on it. In other words, customers are likely to exhibit favorable feelings towards brands that engage in social responsibility. Additionally, the results depict that there is a positive correlation between brand attitude and purchase intent.

5.1.2. The Correlation per Area

The effect of the environment on CSR varies across the three locations. Indonesian customers perceive the environment positively influences CSR, and its effect is higher than in Taiwan. However, it has no positive effect on CSR in Vietnam. In the Quran—the equivalent of the Christian Bible—Earth is mentioned over 400 times and Muslims are called to save it [93]. According to Islamic beliefs, environmental issues are seriously considered [94]. In Indonesia—an Islamic country—in the 1960s, the Suharto regime concentrated on economic growth together with environmental efforts [95]. Therefore, Indonesian people are likely to have a much higher awareness of the environment. Previous research shows that the concept of environmental sustainability bears resemblance to Taoist (Daoist) principles [96]. In Taiwan, many people are Taoists [97]; issues relating to the environment, therefore, are pervasive throughout the culture. Since 1992, Taiwan has progressed positively towards environmental sustainability [98]. As a result, Taiwanese people are paying much attention to the environment. Nonetheless, in Vietnam, consumers' awareness of environmental and social issues is still limited [99]. As mentioned in previous studies [100,101], these days, economic activities are in opposition to the socialist ideology declared by the party state, which has failed the environment and society [8]. In contrast, in Taiwan and Indonesia, social issues have caught the public's attention.

From the customer's perspective, their rights and benefits are crucially important. Consequently, fulfilling duties towards customers positively influence CSR in three areas.

A new point of this research that is different from previous CSR research is that CSR towards shareholders does not impact CSR. This is because customers tend to believe that there is a conflict between shareholders' values and customers' benefits [91]. Regarding employees' benefits, in Vietnam, employees are positively affected by CSR while they are not in the other two areas. On the one hand, Vietnamese culture has been affected by Buddhism, Confucianism, and Taoism (Daoism), therefore, the centrality of *nhan* (humanity, humanness) plays an important role in moral values [8]. On the other hand, in Taiwan, nowadays, the COVID-19 pandemic has been severe, leading to job losses, and many employees continue to struggle from the pandemic's fallout. Therefore, employee related issues are taken into citizens' consideration. Regarding Indonesia, its economy is the largest in Southeast Asia and the country is an emerging global economy. Over the past decade, the Indonesian economy has developed rapidly and, by 2030, is likely to become the seventh largest economy in the world [102]. It is reasonable to postulate that, in Indonesia, issues related to the economy or supply chain are worth considering. CSR towards suppliers, therefore, has a positive impact on CSR.

Regarding the relationship between CSR and brand attitude, in three areas, CSR has a positive influence on brand attitude. In particular, the impact of CSR in Taiwan is the greatest, followed by Indonesia, and Vietnam. This means that Taiwanese consumers display their affinity towards CSR brands more than Indonesian and Vietnamese consumers. Moreover, when it comes to purchase intention, CSR takes effect in Indonesia and Taiwan. Specifically, Indonesian consumers are influenced by CSR more than their Taiwanese counterparts. Nevertheless, Vietnamese customers are not affected. Regarding the link between brand attitude and purchase intention, three areas experience positive relations.

5.2. Theoretical Contribution

The academic contributions of this research are as follows. Firstly, based on stakeholder theory, this research assessed customers' perspectives on overall CSR and in each domain. In addition, this work analyzed CSR components and ascertained the influences of the components, including the environment, society, customers, employees, and suppliers, on CSR. Moreover, the study showed that, in the three areas during the COVID-19 pandemic, taking on responsibility towards shareholders does not influence CSR—an obvious departure from prior studies. This could be explained by the fact that, during the COVID-19 pandemic, customers focused more on their benefits and other issues instead of shareholders' interest. Secondly, regarding the applied theory of reasoned actions [63], this study constructed a model of purchase intention based on CSR and brand attitude. The results showed that, with the pooled data, CSR positively influences brand attitude and purchase intention; additionally, brand attitude also affects customers' purchasing intent. Thirdly, the survey was conducted across three different locations with different cultures and economic statuses. This provides a comprehensive picture of customers' perspectives on CSR to brand attitude and purchase intent during the COVID-19 pandemic. In particular, Vietnamese people focus more on human issues, such as CSR towards customers and employees. Furthermore, in Vietnam—a communist country—CSR does not have a positive effect on purchase intention. However, apart from CSR towards customers, Taiwanese and Indonesian citizens pay attention to environmental and social issues.

5.3. Managerial Implications

Evaluating customers' perceptions of CSR allows companies to measure customers' awareness level of their CSR practices [28], and the effect of CSR on brand attitude and purchase intention. This research can be applied to launch improved strategies for businesses. Regarding the importance of CSR, in general, companies should pay more attention to CSR practices to enhance brand attitude and purchase intention in crises such as the current COVID-19 pandemic. However, in Vietnam, the COVID-19 pandemic is likely to amplify customers' perspectives on prices, therefore, companies should weigh the costs and benefits associated with taking on CSR practices. Focusing on each area, it can be

seen that Vietnamese citizens are less concerned with human related issues. Therefore, businesses should allocate their budgets towards CSR to address these problems in order to enhance their public image. However, in Taiwan and Indonesia, companies should focus on protecting the environment and improving society. These days, the concept of sustainable cities has received a great deal of attention from the public. Sustainable cities were mentioned in The United Nations' 2030 Agenda [103]. Companies can fulfill their responsibility in developing the environment and society via their CSR practices. Therefore, companies can collaborate with governments to establish a CSR scheme contributing to the development of urban infrastructure and sustainable cities [104]

5.4. Limitations and Further Research

This study has several limitations. Firstly, the research did not consider industry characteristics. CSR practices vary, depending on the industry to which a company belongs. Therefore, further research should be conducted according to different sectors. Secondly, the sample size for the pooled data ($n = 564$) is acceptable [105]. However, the research was conducted across three countries, therefore, the validation of the sample size of each region should be considered. It can be seen that the sample size of each location (about 188) was quite small and should be increased. Moreover, the study used cross-cultural data, however, only investigated individuals in three areas across Asia. Moreover, the sample size in each area is quite small and is therefore not representative. As a result, the results may not be used across other cultures, areas, and/or continents. Further research should be carried in different areas on different continents considering different cultural, economic, and legal settings. Furthermore, most respondents were rather young. In the future, sampling procedures should be considered in a strict manner. Third, the investigation took place in a short period during the pandemic, the results cannot be applied in another context (pre- and postpandemic). The difference in different methodology can be used to make comparisons over time [106]. Further research could apply this method to examine the variation in customers' perspectives towards CSR and its effect on brand attitude and purchase intent before, during, and after crises. Finally, when analyzing the effect of CSR on purchase intention, this research did not incorporate other factors related to customers and products. In the future, those factors should be integrated into the model.

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Article

European Citizens' Happiness: Key Factors and the Mediating Effect of Quality of Life, a PLS Approach

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Abstract: Happiness is a very important aspect in the life and well-being of all citizens; as such, it has become a key factor in personal preferences. For these reasons, it is relevant to study what factors principally affect the happiness of the population. However, the difficulties involved in measuring this concept mean that there are no clear criteria as to which aspects should be promoted in order for citizens to achieve greater happiness. This paper uses variance-based structural equation modelling (SEM)—partial least squares path modelling (PLS)—to analyse the direct and indirect effects of European citizens' assessment of different aspects of their city related to safety, environmental quality and urban planning on their happiness. The source of information used in this study is the Flash Eurobarometer 419 prepared by Eurostat in 2015, with a total of 9799 observations. The results show how quality of life, safety, the environment and city planning have a positive and significant influence on European citizens' happiness, especially safety. In addition, quality of life acts as a mediating variable, primarily increasing the influence of urban planning on happiness. The findings of the study point to the relevant policies that governments should undertake to ensure the happiness of their citizens.

Keywords: happiness; quality of life; safety; environmental quality; urban planning; European cities; mediating effect; PLS-SEM

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1. Introduction

Happiness and life satisfaction are currently central themes of research in social sciences, psychology, philosophy and economics [1]. Much of the work has been based on determining more objective methods of research on happiness, well-being and quality of life, supported by socioeconomic and geographical attributes, with a special interest in the impact of inequalities, such as social justice, social and spatial [2]. Equally, however, numerous studies have emerged that consider more subjective characteristics through the use of social surveys [3], where citizens rate their health, well-being, life satisfaction, as well as their happiness in general [4].

The measurement and analysis of happiness is becoming increasingly important in the social sciences [5], where there have been numerous attempts to define, measure and analyse subjective measures of happiness from the perspective of different academic disciplines, from neuroscience and psychology to philosophy and economics [6]. Thus, happiness has been shown to be one of the key factors in subjective well-being and overall life satisfaction [7–12], and it is very related if you take into account the place where a person lives, especially in the cultural context [13]. Thus, the current vision of urban, economic and social policy in cities is taking on particular importance [14], with the aim of

understanding the happiness of their residents [15,16]. The place where one lives affects all aspects of everyday life and, therefore, affects one's happiness [15,17,18]. In this regard, authors such as [19] have examined whether the happiness of citizens depends on the amount of services available in a city. Their results reveal that they must have a good quality of services, for example: surveillance, schools, beauty, easy access to health, as well as transportation services and cultural and recreational opportunities. In this sense, this is what really determines whether cities will succeed or fail when residents are presented with opportunities to have a good quality of life. In view of the above, this study uses a subjective approach for measuring happiness in order to analyse how it is influenced by both personal elements and external factors simultaneously [20].

The purpose of this research is to gain a better understanding of how some key factors influence the happiness of European citizens since people normally tend to choose where to live based on job opportunities, as well as the services and public goods offered [15]. To that end, a factor analysis using the Flash Eurobarometer 419 from 2015 [21] produced by Eurostat has allowed us to identify some key aspects of cities for citizens, according to their degree of satisfaction with them. The factors identified measure citizens' satisfaction with safety, environmental actions and urban planning. Thus, we first conduct a literature review to observe how the literature approaches these factors before analysing the effects they have on happiness, considering both the direct effect of each factor and the indirect effect, mediated by quality of life. Specifically, the Flash Eurobarometer 419 compiles European citizens' assessments of different items relating to various aspects of their personal situation, their city and the neighbourhood where they live. It should be noted that this information has been filtered, taking into account some of the specifics of this study, allowing us to identify the three key factors mentioned above.

Thus, in Section 2, we conduct a literature review that allows us to confirm the use of quality of life as a mediating variable, as well as the theoretical justification for each of the hypotheses established in the article. Section 3 details the methodology applied in this research, the database used, the definition of each of the factors considered and the procedure used to fit the corresponding model. The results and discussion are presented in Section 4 where the measurement of the model and the validation of the hypotheses proposed in this study are shown. The method chosen has been through structural equations (SEM), using the technique of partial least squares (PLS). This technique has become a standard tool for analysing complex interrelationships between variables [22,23] and is used in many disciplines [24]. Section 5 outlines the main conclusions reached, together with the new lines of research opened up.

2. Background on Happiness and the Mediating Effect of Quality of Life

Regarding the measurement of happiness, Veenhoven [25] and Diener and Seligman [26] hold that happiness reveals an individual's assessment of the general aspects of their life and conditions, and how much an individual likes the life that he/she lives. Therefore, the central concept of happiness is the subjective assessment of one's life or satisfaction with life [7,27]; they thus claim that happiness can be measured through "Satisfaction with life in this city". This way of measuring happiness is supported by the works of Diener [28], Diener and Inglehart [29], Veenhoven [30] and Bernini, Emili and Galli [31]. In addition, Moeinaddini et al. [32] consider that happiness is synonymous with satisfaction of the experience, and this satisfaction can come from everything around you. Therefore, the place where one lives affects happiness [33]. In this study, we follow this subjective approach, establishing that the way to measure residents' happiness with their city is through the answer to the question "I am satisfied to live in ...".

The literature review has allowed us to observe how the terms happiness and quality of life are intertwined, given the links between them. While there are studies that clearly differentiate between quality of life and happiness by measuring quality of life through aspects, such as income [34], income and employment [35] or the built environment, education, leisure and recreation, mental and physical health, social belonging and safety

and crime. [16,36]. Other studies support that quality of life is synonymous with more abstract issues, such as freedom, human rights and happiness. [37], which complicates the task of differentiating between quality of life and happiness. In this respect, we consider quality of life as a mediating variable that can contribute to happiness. Accordingly, we approach quality of life as a multidimensional concept, accounting for different aspects that allow us to measure citizens' quality of life. It is worth highlighting the work of [14,38], which have served as a starting point for our study.

Weziak-Białowolska [14], using the Flash Eurobarometer 366 [39] proposes measuring quality of life in relation to citizen's satisfaction with aspects, such as availability of services, the environment and social aspects in cities and characteristics of the city, such as size, location, safety, economic development, the labour market and the quality of institutions. Thus, the results indicate that satisfaction with life in a city is very different, both within cities and across Europe. In the same vein, Nevado-Peña et al. [38], based on the Flash Eurobarometer 419, proposes four dimensions for the measurement of the quality of life of European citizens: Life Satisfaction (Trust and Safety), Mobility (Culture and Sports), Integration (Sustainability) and Public Services.

This way of measuring quality of life allows the researcher, on the one hand, to analyse its direct influence on happiness and, on the other, to consider it as a mediating variable of the effects on happiness. This allows more in-depth research on what aspects to promote in order to ultimately achieve greater happiness in European citizens. In this regard, it is necessary to establish different hypotheses to be tested in this study.

2.1. European Citizens' Happiness: Hypotheses Development

From the literature review, we draw our first hypothesis on the relationship between quality of life and happiness. Senasu and Singhapakdi [40] analyse the influence of quality of life on the happiness of Thai citizens in family, community and work settings. Li [41] uses objective, subjective and social quality indicators for three Chinese cities, analysing the relationship between respondents' happiness and quality of life characteristics (objective and subjective) and social quality. Finally, several analyses have found that, among the three abovementioned sets of factors, the ones that most influence happiness are subjective indicators [31,42]. Thus, we propose the following hypothesis to determine whether happiness in European cities can be influenced by people's subjective assessment of their quality of life:

Hypothesis 1 (H1). *Quality of life in European cities has a positive and significant influence on happiness.*

Analysing the influence of different types of factors on happiness and quality of life requires the use of a multidimensional approach. This allows us to include a wide range of factors, considering both the direct effect of each factor on happiness and the indirect effect mediated by quality of life. In this respect, there are a number of studies that explore the influence of different economic/labour-related factors on happiness; notable examples focus on income [2,3,15,36,41,43–47], or employment status and access to housing [15,44]. However, other studies account for aspects related to the city of residence, such as population density or travel times on public transport [15] or the size of the city [48,49]. For example, accessibility and transportation play an important role in obtaining a good quality of life [49]. However, according to our background, there are no studies that focus on citizens' subjective assessment of the particular features of their city. In this regard, we consider assessments of urban planning, the environment and safety, and the extent to which quality of life acts as a mediating variable on their influence.

2.1.1. Urban Planning

Life satisfaction tends to be higher in regions with intermediate levels of urbanisation [50]. The constant growth of cities' populations has prompted rapid planned urban-

isation in many of them, which has helped to improve the quality of life of millions of people [51]. Thus, the type of urbanisation of a city has proven to be important in predicting happiness [20,52]. In addition, urban parks, considered green spaces, are associated with obtaining a good quality of life translated into good health and well-being of people [53].

The progress that is taking place between the standard of living and the urbanisation of the place of residence are increasingly related. This leads some studies to conclude that we are happier in cities. [54]. However, those that have lost population may be due to the fact that they present lower quality of life standards, which leads to a general negative conception of these cities [49]. In this sense, people tend to choose where to live according to the job opportunities, public goods and services the location provides [15]. Conversely, Maricchiolo et al. [18] show that urban development, in the sense of whether someone lives in a rural or urban area, does not directly affect happiness.

This rapid urbanisation has meant that urban planning can have an influence on happiness since most cities would be chaotic without such planning. Papachristou and Rosas-Casals [17] and Zhang and Wang [16] have shown that proper urban planning is vital in order to ensure residents' quality of life [55–57] and, consequently, their happiness [16,32].

Indeed, research has shown that the distance of commutes, as determined by urban planning, is closely related to residents' happiness [15,45,51,58,59]. Duarte et al. [60] find that respondents who use the subway to go to work are happier than those who travel by car, while Abou-Zeid and Ben-Akiva [61] report that commuters in non-motorised vehicles are happier than those who commute by car and public transport. In light of the above, we consider two further hypotheses for analysis: whether the urban planning factor influences European citizens' happiness and whether their quality of life has a mediating effect on said relationship.

Hypothesis 2 (H2). *Planning in European cities has a positive and significant influence on happiness.*

Hypothesis 2M (H2M). *The influence of planning on happiness is positively mediated by quality of life.*

2.1.2. Safety

Papachristou and Rosas-Casals [17] argue that the subjective happiness of citizens consists of the satisfaction they obtain through three factors: comfort and security in the place of residence, having satisfactory social relationships and feeling that there is an increase in vital possibilities. Similarly, Veenhoven [62] argues that quality of life can refer to society and, in other cases, to the happiness of its citizens. For shrinking cities, Delken [48] shows that this is not because residents are unaware of the situation in their city, since they seem to be more concerned about job opportunities and crime [48]. Therefore, measures taken to improve safety and lifestyle will unquestionably improve quality of life and happiness [16,63]. Authors such as Amado et al. [49] reveal that safety in smaller cities helps to develop a friendly environment.

The review focusing on public safety reveals that this factor has been the least studied in terms of its influence on citizens' happiness. This finding underlies the idea of proposing two further hypotheses regarding whether safety in European cities directly or indirectly affects the happiness of their citizens, considering both the direct effect and the effect mediated by quality of life.

Hypothesis 3 (H3). *Safety in European cities has a positive and significant influence on happiness.*

Hypothesis 3M (H3M). *The influence of safety on happiness is positively mediated by quality of life.*

2.1.3. Environment

The relationships between environmental and well-being factors are causing great interest in research, specifically in the field of economics, psychology, health and conservation [64]. However, the lack of attention paid to the city environment justifies the lack of research that exists to understand how the characteristics of the environment influence happiness throughout life [19]. In this regard, there are at least reasons to believe that the natural environment is positively related to well-being, health and happiness. Similarly, awareness of a local environmental problem and its adverse effects on the health of people and the ecosystem can have a negative influence on levels of happiness. This is, therefore, because natural environments tend to increase happiness as they facilitate and encourage behaviours that are physically and mentally enhancing, including physical exercise, recreation and social interaction [64].

In this respect, citizens' perceptions of air pollution can influence their happiness [65]. Thus, studies, such as MacKerron and Mourato [64], show how citizens are significantly happier when they live in places that have more green or natural spaces, unlike those who live in urban environments. This relationship between the environment and subjective well-being is sometimes mediated by variables that help explain these causal effects, such as satisfaction with personal relationships, health, satisfaction from leisure and the emotional response to the neighbourhood [57]. In the same sense, ref. [66] posit that the "rhythm of life" indicator is an important mediator between perceived quality of life and people's relationship with the environment. Together with the type of urbanisation of a city (considering buildings, streets, etc.), this has been indicated to be relevant to achieving the happiness of the citizens [52]. Thus, we try to analyse the influence of the city's environment on the happiness of its inhabitants and whether the quality of life they enjoy in their place of residence can mediate the influence on said happiness. To that end, two further hypotheses are proposed.

Hypothesis 4 (H4). *The environment in European cities has a positive and significant influence on happiness.*

Hypothesis 4M (H4M). *The influence of the environment on happiness is positively mediated by quality of life.*

3. Material and Methodology

The source of information used in this study is the Flash Eurobarometer 419 produced by Eurostat in 2015, as this is the most up-to-date information available. The information it compiles consists of a Likert-scale assessment of citizens' degree of satisfaction with certain aspects of their city. It has been produced for a total of 79 cities and 4 "greater cities" in the EU, as well as Turkey, Iceland, Norway and Switzerland [21], and includes a total of 40,798 observations. In this study, we filtered the information in three ways: first, we removed information related to the greater cities, as it was thought it could distort the results; second, we removed observations that answered "don't know" to some of the questions, thus leaving complete information in the database, and such that the different items are measured on a 4-point Likert scale (very satisfied; rather satisfied; rather unsatisfied; not at all satisfied); and finally, we removed cities that did not have a representative number of observations and those that do not belong to the European Union (the United Kingdom is included). This filtering of the information yielded a total of 9799 observations, the distribution of which by country and city can be seen in Appendix A.

Based on this information, we first carried out a factor analysis to identify the key factors in citizens' satisfaction and the items corresponding to each one. In the first place, for the evaluation of a PLS-SEM model, it is required to specify the model measure and later to evaluate the structural model where the hypotheses are tested. We started with a reflective model and used the partial least squares (PLS) technique [67]. This methodology allows being more flexible in the specification of the relationship between elements and

constructions. It also works well in any setting and field of study [23] and has been more studied than CB-SEM (based on covariance) [68]. SEM is a good method to address the problem of measuring unobservable latent variables [69]. Table 1 shows the latent factors and items extracted for the sample together with the value of Cronbach’s alpha (α), which allows us to verify the validity of these latent variables, and the Kaiser–Meyer–Olkin (KMO) measure to determine the adequacy of the data for factor analysis.

Table 1. Latent factors and items.

Factor	Item	Denomination	KMO	Cronbach’s α
Quality of life [5,15,16,47]	q2_2	It is easy to find a job in . . .	0.732	0.708
	q3_1	Your personal job situation		
	q3_2	The financial situation of your household		
	q3_3	The life you lead		
Urban Planning [17,20,53,60]	q1_1	Public transport, for example the bus, tram or metro	0.832	0.724
	q1_2	Health care services, doctors and hospitals		
	q1_3	Sports facilities such as sport fields and indoor sport halls		
	q1_4	Cultural facilities such as concert halls, theatres, museums and libraries		
	q1_6	Public spaces such as markets, squares, pedestrian areas		
	q1_8	Availability of retail shops		
	q1_9	Schools and other educational facilities		
Safety [16,17,63]	q2_1	I am satisfied to live in . . .	0.806	0.780
	q2_3	The presence of foreigners is good for . . .		
	q2_4	Foreigners who live in . . . are well integrated		
	q2_7	I feel safe in . . .		
	q2_8	I feel safe in my neighborhood		
	q2_10	Generally speaking, most people in . . . can be trusted		
	q2_11	Generally speaking, most people in my neighborhood can be trusted		
Environment [19,52,64,65]	q1_5	The state of the streets and buildings in your neighborhood	0.775	0.730
	q1_7	Green spaces such as parks and gardens		
	q1_10	The quality of the air		
	q1_11	The noise level		
	q1_12	Cleanliness		

The results in Table 1 confirm the validity of the factor analysis carried out, as shown by the high KMO values. In addition, the validity of the constructs is confirmed by the Cronbach’s Alpha values above 0.7 [70]. Therefore, the quality of life of European citizens can be measured through their subjective responses regarding their degree of satisfaction with four items in their economic/financial and labour sphere. The urban planning factor is determined according to their degree of satisfaction with the public and private services offered, access, mobility and transport infrastructure, assessed through seven items. To

measure safety, we again used seven satisfaction items from the survey relating to the surroundings in the neighbourhood of residence, the integration of foreigners and trust in other residents of the neighbourhood. The environmental factor is determined based on European citizens’ responses indicating their satisfaction with five items relating to pollution and green policies. Finally, as discussed above, citizens’ happiness is measured by the answer given to the direct question aimed at assessing citizens’ satisfaction with the place where they live.

To fully test the proposed hypotheses, a reflective-type conceptual model is formulated [71–73], currently called mode A [23]. This type of model is used in many fields [69,74,75]. We contribute two innovative elements to the scientific analysis of happiness: different aspects related to the city of residence are assessed from a subjective point of view, and we also include the mediating effect of quality of life on the relationship between these aspects and the happiness of European citizens. We measure all the constructs used, and on the other, we test the hypotheses raised.

The reflective model (model A), shown in Figure 1, is estimated with the PLS technique using the SmartPLS 3.3.2 software package. This software has a good platform that allows sharing and exchanging knowledge between researchers. This measure is determined by (Equation (1)):

$$\text{Reflective (mode A)} \quad X_{kj,n} = \tilde{w}_{kj}\tilde{\xi}_{j,n} + e_{kj,n} \quad (1)$$

x_{ki} = the manifest variable k of the latent variable i , $k = 1, \dots, K$

\tilde{w}_{kj} = the estimated external weight of the indicator x_{ki}

$\tilde{\xi}_{j,n}$ = the latent variable, $j = 1, \dots, J$

$e_{kj,n}$ = the error term from a bivariate regression [76]. The main results are analysed in the next section.

n = the specific observation, $n = 1, \dots, N$

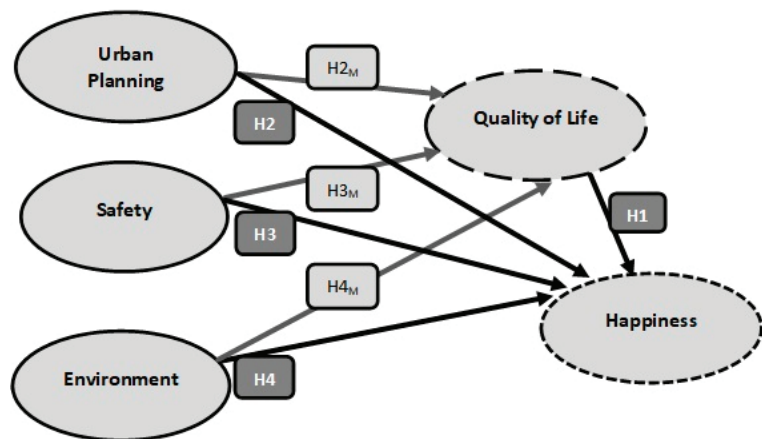


Figure 1. Conceptual model.

4. Main Results and Discussion

First, the measurement model is evaluated with PLS and, subsequently, the hypotheses proposed are contrasted.

4.1. Evaluation of the Measurement Model: Validity and Reliability

For the measurement of reflective models, it involves evaluating the reliability of the measures (the reliability of the indicator and the internal consistency reliability) and the validity (convergent and discriminant validity) [24]. The individual reliability of the indicators was calculated; the simple correlations of the indicators with their constructs

were analysed, confirming those items with loadings greater than or equal to 0.707 [77]. Some of the observed variables show a standardised loading slightly lower than this value (Figure 2); however, the t-values were greater than 1.96. In this case, Chin [78] suggests that there is some flexibility in the 0.707 standardised loading rule, especially when indicators can contribute to content validity.

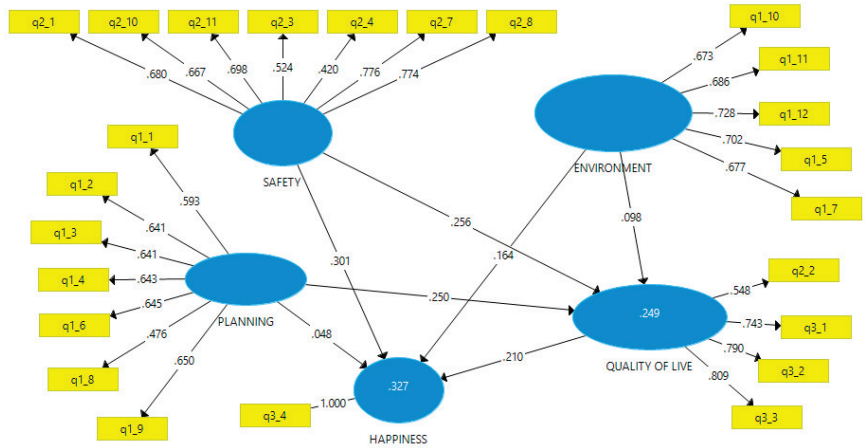


Figure 2. Estimated model. (Source: Own elaboration).

To calculate the reliability of the internal consistency of the reflective construct, the composite reliability is calculated (Equation (2)), which should range between 0.7 and 0.95 [76]:

$$\rho_c = \frac{(\sum_{k=1}^K lk)^2}{(\sum_{k=1}^K lk)^2 + \sum_{k=1}^K var(e_k)} \tag{2}$$

lk = the outer loading of the manifest variable k corresponding to a latent variable measured with K indicators

ek = is the measurement error of k

$var(ek)$ = the measurement error variance and it is calculated as $1 - l_k^2$

Cronbach’s alpha (Equation (3)), which is the upper limit of the reliability of internal consistency, is also calculated:

$$Cronbachs\ a = \frac{K \bar{r}}{1 + (K - 1)\bar{r}} \tag{3}$$

\bar{r} = the mean of the correlation matrix

With respect to the reliability of the model, it can be confirmed that Cronbach’s Alpha and composite reliability exceed 0.7 for all constructs (Table 2). Thus, the indicators satisfactorily measure the construct to which they are assigned.

Regarding the validation of the measurement model, the acceptable values of the Average Variance Extracted (AVE) (Equation (4)) and Rho_A (Equation (5)) for each of the constructs indicate their reliability (Table 2) [79,80]. These measurements are determined by:

$$AVE = \frac{\sum_{k=1}^k l_k^2}{k} \tag{4}$$

$$\rho_A = (\hat{w}\hat{w})^2 \frac{\hat{w}(S - diag(S))\hat{w}}{\hat{w}(\hat{w}\hat{w}.. - diag(\hat{w}\hat{w}))\hat{w}} \tag{5}$$

Table 2. Composite reliability and Converging validity.

Factor	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	Rho_A
Quality of life	0.701	0.817	0.533	0.730
Happiness	1.000	1.000	1.000	1.000
Environment	0.730	0.822	0.481	0.731
Urban Planning	0.725	0.809	0.379	0.732
Safety	0.781	0.839	0.435	0.811

On the other hand, to calculate the discriminant validity, the Fornell–Larcker [79] criterion is taken into account: if the correlations between the constructs are lower than the square root of the AVE, which is shown on the diagonal of said matrix, it indicates that each construct is different from the others. The results obtained in the matrix of correlations between the constructs of the model (Table 3) confirm the discriminant validity of the measurement model [81]. In addition, the values of the Heterotrait–Monotrait Ratio of Correlations (HTMT) in all cases indicate discriminant validity in the PLS-SEM model [82]; where it has been calculated as (Equation (6)):

$$HTMT = \frac{\frac{1}{K_i K_j} \sum_{g=1}^{K_i} \sum_{h=1}^{K_j} r_{ig,jh}}{\frac{2}{K_i(K_i-1)} \sum_{g=1}^{K_i-1} \sum_{h=g+1}^{K_i} r_{ig,jh}} \quad (6)$$

Table 3. Discriminating validity: Fornell–Larcker Criterion.

	Quality of Life	Happiness	Environment	Planning	Safety
Quality of life	<u>0.730</u>	0.488	0.522	0.586	0.542
Happiness	0.419	<u>1.000</u>	0.503	0.425	0.528
Environment	0.377	0.432	<u>0.693</u>	0.771	0.679
Urban Planning	0.420	0.365	0.568	<u>0.616</u>	0.569
Safety	0.420	0.499	0.533	0.447	<u>0.660</u>

Note: The data underlined in the diagonal is the square root of the AVE. The data at the bottom of the diagonal are the correlations between the constructs, and the data at the top of the diagonal are the HTMT values.

4.2. Evaluation of the Structural Model

Having validated the model, we use the nonparametric resampling technique, PLS bootstrapping [83], to evaluate the relevance of the trajectory coefficients (β), detail the relationships between constructs, as well as the significance of the relationships proposed [68]. Table 4 shows the results of this structural analysis.

Table 4. Structural analysis of the hypothesis contrast.

Hypothesis	Structural Relationship	Path (β) Standardised	* t Value Bootstrap	Contrast
H1	Quality of life -> Happiness	0.210	19.289 *	ACCEPTED
H2	Urban Planning -> Happiness	0.048	4.330 *	ACCEPTED
H3	Safety -> Happiness	0.301	26.004 *	ACCEPTED
H4	Environment -> Happiness	0.164	14.537 *	ACCEPTED

Note: * $p < 0.001$.

In light of these results (Table 4), we accept the first hypothesis, meaning that quality of life has a positive and significant influence on the happiness of European citizens. Their happiness is, therefore, significantly conditioned by their financial and labour sphere and the enabling structural environment; that is, their neighbourhood, district and city. In this sense, the results are in line with studies, such as Senasu and Singhapakdi [40], who first distinguished between the two before testing the influences of quality of life on happiness.

Furthermore, hypotheses 2, 3 and 4 are also accepted, and it is shown that of the variables proposed, the one that has the greatest direct effect on citizens' happiness is safety in cities, followed by the environment, and to a lesser extent, urban planning. We have, thus, been able to clearly specify the factors that determine Europeans' personal satisfaction and also rank them. In this regard, safe surroundings in the place of residence and the way that foreigners are integrated in the city are fundamental. Although this has been less investigated, the H3 results are consistent with Janjani [63] and Zhang and Wang [16]. These elements are followed by the environmental conditions (H4), where they coincide with the works of MacKerron and Mourato [64] and Wang et al. [84], the green policy of local governments in all their spheres and, finally, the value added of life in the city considering structural aspects and access to public and private services through infrastructure and spatial-temporal planning. These H2 data are adjusted to the studies, such as Yin et al. [20] and Clark, Yi and Huang [52], where they suggest that the type of urbanisation of a city is relevant to predict happiness.

It should be stressed that these measured effects on European citizens' happiness are direct, i.e., they condition the choice to live in the city in question rather than another, and the satisfaction with that choice. Variations in these situations should then be assessed to see if this determination is mediated or influenced through the social and labour conditions related to the quality of life variable.

The most relevant prerequisite for the evaluation of the structural model is the evaluation of the quality of the model [85]. For the R^2 values have also been taken into account: good results in terms of predictive power are obtained for quality of life (0.249) and for happiness (0.327) [86].

Lastly, as a measure of the fit of the model, the Standardised Root Mean Square Residual (SRMR) is calculated, which compares the difference between observed and predicted correlations. The range lies between 0 and 1, and the lower the value is, the better the model fit [68]. The proposed model shows an appropriate fit with a value of 0.061 [87].

Furthermore, we now test for the existence of a mediating effect of quality of life. To do so, following the methodology proposed by Hayes and Scharkow [88], Zhao, Lynch and Chen [89], Nitzl, Roldan and Cepeda [90] and Carrión, Nitzl and Roldán [91], we propose differentiated analysis through three mediation models (Figure 3). Authors such as Hayes and Scharkow [88] recommend bias-corrected bootstrap confidence intervals as the most reliable test.

The main results for direct and mediating effects are summarised in Table 5. Again, it can be seen that the so-called direct effects are positive and significant ($\beta = 0.229$; $\beta = 0.391$; $\beta = 0.319$; $p < 0.001$); that is, urban planning, the environment and safety in cities have a positive influence on the happiness of European cities' residents. The significance of these factors had already been confirmed with the first hypotheses tested (H2, H3 and H4), and they were even ranked according to their value.

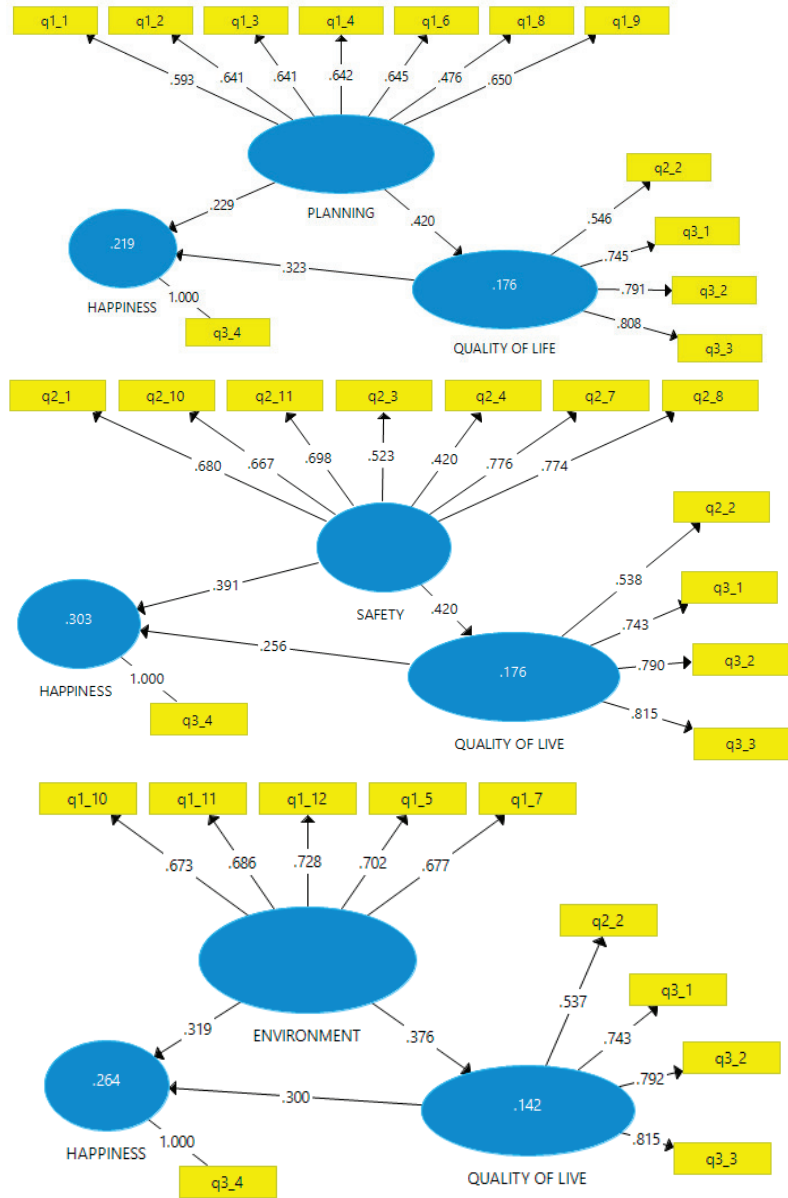


Figure 3. Mediation models. (Source: Own elaboration).

Moreover, the indirect effects of these three factors on happiness are also measured, and they are found to be significant when quality of life acts as a mediating variable, given that the confidence interval of these effects does not contain zero (Table 5). These effects were considered relevant in this research after a review of the literature review on how to test hypotheses about indirect effects [92,93].

Table 5. Mediating effect of quality of life on happiness.

	Simple Mediation	* Direct Effects	* Indirect Effects (Confidence Interval)	Results	VAF
H2M	Urban Planning -> Quality of Life -> Happiness	0.229	0.13566 (0.1251968–0.1459413)	complementary partial mediation	37.20%
H3M	Safety -> Quality of Life -> Happiness	0.391	0.10752 (0.0977916–0.1175247)	complementary partial mediation	21.57%
H4M	Environment -> Quality of Life -> Happiness	0.319	0.1128 (0.1038034–0.1227278)	complementary partial mediation	26.12%

Note: $n = 10.000$ submuestras; * $p < 0.001$.

Having obtained significant results for the indirect effects, we go on to check what type of effect it is and its magnitude [89,90]. Since the indirect effect and the direct effect are in the same direction—in this case, they are both positive—and are both significant; it can be concluded that the European citizens’ quality of life acts as a partial and complementary mediating variable between their happiness and urban planning, the environment and the safety of their cities of residence. The magnitude of the effect is calculated using the Variance Accounted For (VAF) (Equation (7)).

$$VAF = \frac{\text{Indirect effect}}{(\text{Direct effect} + \text{Indirect effect})} \tag{7}$$

Thus, having accepted hypothesis H2M, the mediating process accounts for 37.20% of the variance; that is, 37.20% of the effect of urban planning on happiness is positively mediated by quality of life. However, it should be highlighted here that in terms of direct effects, urban planning (0.229) is shown to have the lowest direct impact on the happiness of European citizens. It can, therefore, be concluded that quality of life plays a very important role as a mediator in this relationship since this mediating effect makes urban planning more relevant for citizens. In other words, if we take into account residents’ working and financial spheres, the infrastructure, access to and provision of public and private services, together with commuting efficiency, become essential for improving subjective life satisfaction, or what has been called citizen happiness. These results are in line with those reported by Papachristou and Rosas-Casals [17] and Zhang and Wang [16], who have shown that proper urban planning is vital in order to ensure residents’ quality of life [55–57] and, consequently, their happiness [16,32].

On the other hand, the opposite can be observed in regards to safety. Hypothesis H3M is accepted, but with a VAF value of 21.57%, which confirms the lower mediating effect of quality of life on the influence of safety on happiness. Conversely, when compared with the direct effect (0.391), it can be seen that of the three variables, safety is the one that has the greatest direct effect on happiness, but it becomes less relevant for happiness under the mediating influence of quality of life. These results are not conclusive since the review of the literature on public safety indicates that this factor has been the least studied in terms of its direct influence on citizens’ happiness. Given the relevance of these results, they call for further study and point to safety-related initiatives as a priority for local governments in order to ensure the happiness of their residents. These results are in line with the conclusions of Papachristou and Rosas-Casals [17], who claimed that citizens’ subjective happiness consists of the satisfaction provided by living safely.

Lastly, the mediating effect (26.12%) of quality of life on the relationship between the environment and the happiness of European citizens is verified, confirming hypothesis H4M. It has been shown how actions addressing the environment of European cities directly influence (0.319) the happiness of their citizens, but also accounting for quality of life means considering relevant local characteristics and policies related to cleanliness, air quality, noise level or the condition of streets and buildings. This evidence aligns with the article of

MacKerron and Mourato [64], who demonstrated how citizens are much happier outdoors in all types of habitats, whether green or natural, than in urban settings.

5. Conclusions

From a theoretical point of view, happiness can be measured in two ways. One would be multivariable, which considers that different aspects of life should be used for its measurement. On the one hand, there are those who consider that happiness is obtained through a single variable that measures general satisfaction with life. In this work, with the information available, we have used a single item as a measure of happiness.

On the other hand, the analysis of the factors affecting the happiness of the population has become critical, especially in situations as sensitive as those currently resulting from the COVID-19 pandemic. In this regard, the literature review has allowed us to verify that the most widely-analysed factors relate to the economic-labour sphere, with less of a focus on the influence of factors related to aspects of the city of residence.

Thus, based on the Flash Eurobarometer 419, we have developed a set of indicators to measure citizens' satisfaction with aspects related to urban planning, the environment and safety in the city, which are key elements for quality of life. We have been able to confirm their direct effects on the happiness of European citizens, as well as their indirect effects mediated by quality of life, i.e., the influence these factors exert through quality of life.

The results obtained indicate the hierarchy of issues that facilitate the happiness of European cities' residents. "Urbanites" also choose their residence based on their financial/labour and social environment, so the variable quality of life is a mediator for these factors. Thus, safety has the greatest significance for European citizens, followed by green policies and then issues of mobility, access to and provision of services, all of which give them satisfaction with their way of life. However, if the mediating effect of quality of life is included, the key factors are more balanced, as the effect of planning increases and that of safety decreases. Therefore, as a place of residence, the city satisfies all of a human being's needs for existence, with preferential emphasis on the financial and labour sphere, and, subsequently, complemented by matters of safety, the environment and urban planning.

This research opens up new lines of study, which will depend on the availability of information in the future, this being one of the limitations in this study since it has not been possible to analyse other possibly interesting variables about happiness, such as living in rural areas. In this sense, there are questions of comparability between the key factors for happiness and whether they are the same in geographical areas other than Europe. On the other hand, in the future, the collection of similar data in European cities after COVID-19 will be able to analyse the effect that the pandemic has had on these factors and determine if this situation has modified key aspects that citizens face to obtain happiness or even displaced preferences towards cities with lower population density. This has been a limitation at the time of the analysis of this research with data from 2015; however, similar data, but with Spanish cities, have already been published by the authors of this manuscript [94].

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Appendix A

Country	City	Frequency
AT—Austria	AT1-Graz	149
	AT2-Wien	176
BE—Belgium	BE1-Antwerpen	212
	BE2-Brussel	160
	BE3-Liege	167
BG—Bulgaria	BG1-Burgas	132
	BG2-Sofia	133
HR—Croatia	HR1-Zagreb	160
CY—Cyprus (Republic)	CY1-Lefkosia	108
	CZ1-Ostrava	161
	CZ2-Praha	191
DE-W—Germany—West	DE1-Berlin	145
	DE2-Dortmund	100
	DE3-Essen	90
	DE7-Rostock	66
	DE4-Hamburg	136
	DE5-Leipzig	89
DK—Denmark	DE6-Munchen	119
	DK1-Aalborg	90
EE—Estonia	DK2-Kobenhavn	118
	EE1-Tallinn	71
ES—Spain	ES1-Barcelona	143
	ES2-Madrid	144
	ES3-Malaga	145
	ES4-Oviedo	140
FI—Finland	FI1-Helsinki	152
	FI2-Oulu	158
FR—France	FR1-Bordeaux	162
	FR2-Lille	148
	FR3-Marseille	135
	FR4-Paris	186
	FR5-Rennes	171
	FR6-Strasbourg	175

Country	City	Frequency
GR—Greece	GR1-Athina	138
	GR2-Irakleio	137
HU—Hungary	HU1-Budapest	105
	HU2-Miskolc	94
IE—Ireland	IE1-Dublin	177
IT—Italy	IT1-Bologna	132
	IT2-Napoli	143
	IT3-Palermo	118
	IT4-Roma	123
	IT5-Torino	111
	IT6-Verona	118
LT—Lithuania	LT1-Vilnius	130
LU—Luxembourg	LU1-Luxembourg	180
LV—Latvia	LV1-Riga	193
MT—Malta	MT1-Valletta	49
NL—The Netherlands	NL1-Amsterdam	151
	NL2-Groningen	134
	NL3-Rotterdam	160
PL—Poland	PL1-Bialystok	158
	PL2-Gdansk	145
	PL3-Krakow	144
	PL4-Warszawa	157
PT—Portugal	PT1-Braga	143
	PT2-Lisboa	160
RO—Romania	RO1-Bucuresti	132
	RO2-Cluj-Napoc	166
	RO3-Piatra Nea	120
SE—Sweden	SE1-Malmo	127
	SE2-Stockholm	148
SI—Slovenia	SI1-Ljubljana	78
SK—Slovakia	SK1-Bratislava	145
	SK2-Kosice	118
GB—United Kingdom	GB1-Belfast	147
	GB2-Cardiff	145
	GB3-Glasgow	122
	GB4-London	158
	GB5-Manchester	122
	GB6-Newcastle	139
Total		9799

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Article

Major Shifts in Sustainable Consumer Behavior in Romania and Retailers' Priorities in Agilely Adapting to It

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Abstract: The sustainable consumption and integration of digital solutions with respect to sustainable consumption have been encouraged by the new European circular economy action plan. Digital adoption has been accelerated by the COVID-19 pandemic; companies have been challenged to rapidly adapt to the constant evolution of consumer needs and expectations, leading to valuable insights into the advancement of green business practices and a consequent rethinking of their business model. The purpose of this paper is to investigate the major shifts in sustainable consumer behavior on the Romanian retail market within the context of the Green European Deal, and retailers' priorities in agilely adapting to these significant evolutions. Based on a comprehensive literature review on these major shifts and significant evolutions at the national and international levels, a quantitative study was carried out to evaluate the Romanian retail market and identify the major challenges faced by retailers in dealing with the new set of priorities. The data collection was conducted via a survey used in the retail environment, applied within a Romanian supermarket chain. The Romanian retail sector has a particular configuration, which may have an impact upon the study's generalizability. Located in Central and Eastern Europe at the crossroads of the EU, the Commonwealth of Independent States (CIS), and the Middle East, Romania is a leading destination for foreign direct investment, and it is recognized for the similarities of its distribution and sales channels, the range of its retail outlets, and the local retail market dominance on the Big Box segment by reputed major retailers. A spectacular evolution is recorded in Romania's e-commerce market, including from the point of view of the long-standing and memorable traditional relationship between Romania and China which was confirmed more recently by Romanian consumers who prefer to buy online from stores in China. Our consumer research provides retailers with deep consumer insights with regard to their priorities in their agile adaptation. According to our research, Romanian consumers are environmentally concerned consumers, displaying an increased awareness about the important role they play with respect to impacting sustainable production and consumption by adopting green purchase behavior. Our study also points to the fact that retailers, although faced with challenges in targeting consumers with customized messages to reinforce their brand perception on sustainability issues, do pay considerable attention to sustainability as a personal value embraced by

consumers and are willing to focus on digitizing their business processes to enable new, sustainable business models.

Keywords: sustainable consumer behavior; Green European Deal; retailers' priorities; agile operating model; sustainable smart store of the future; global consumers' perception

1. Introduction

There is a real need for a mindset shift among retailers in learning to incorporate sustainability into products and services while preparing for the continuous change they are trying to adapt to, moving forward (upskilling and reskilling) into the more unstable and unpredictable future (now normal, next normal, never normal), and better managing the relationship to rapid change and obvious anxiety [1]. Hence, there is a need to move beyond what retailers already know and to build agile adaptability at the confluence of circular economy, sustainability, and sustainable development.

It is therefore highly relevant and urgent now to consider the discrepancy between consumers' attitudes towards sustainable consumption and their purchasing behavior with respect to sustainable products, and to better understand the link between retailers' physical strategies and the sustainable smart store of the future. All of these are an invitation to more research about consumers' decision-making impacted by both their perspective towards sustainability and their willingness to participate in it, in order to make better and more informed choices in their omnichannel journey. The findings of this study can be of interest to scholars researching this topic, considering that consumer preferences and shopping patterns have never changed as quickly as in the context of the COVID-19 pandemic. Consumer readiness to move to sustainable products has been the main driver of change (younger demographics, especially Generation Z, are, for example, aware of sustainability when it comes to their purchasing decisions). Moreover, consumer perceptions are inextricably linked to retailers, who need to be attentive to trends and build and maintain positive consumer perceptions of their brands. In addition to changes in the way they buy, the reasons why consumers buy have changed forever. Retailers, to renew their relationship with consumers, have had to rely operationally on accurate and in-depth data-based information. Consumers change their purchasing preferences according to their social, economic, and environmental impact. With the growth of the conscious consumer and the intention to make ecological and ethical purchasing decisions, retailers must integrate sustainability into the core of their business and look for new ways to grow by improving the efficiency of shopping, both online and offline, and being ready to meet the rapidly changing needs of consumers as the pandemic evolves. The increasing use of digital requires retailers to substantially increase their investment in omnichannel capabilities, which means expanding and aligning their strategic vision by monitoring and understanding all the points of interaction of consumers with retailers and brands. Consumers' changing of their purchasing behaviors has transformed the way retailers engage and interact with them. 'Digital' is not just about technology in business models, but also about people and mindsets. As the effects of the pandemic changed consumer habits, retailers must now adapt their strategies to continuously improve the experience they provide. However, this improvement is supported by optimizing operational efficiency along the supply chain to provide a convenient, personalized, and frictionless shopping journey across all channels. This paper focuses on:

- *The major shifts in sustainable consumer behavior* (increased consumer willingness to move towards sustainable products as well as to change their shopping habits in order to reduce their impact on the environment; enhanced consumer awareness about the key role consumers play in influencing sustainable production and consumption by adopting greener purchasing behaviors and attitudes; the reduction in the discrepancy between consumers' attitudes and their behavior concerning their sustainable

shopping decisions on the one hand and their intentions regarding the purchase of sustainable products on the other; increasing consumers' awareness of the concepts of UN SDGs, Industry 4.0 and Industry 5.0) *on the Romanian retail market within the context of digital transformation and of Green European Deal, and*

- *Retailers' priorities in agilely adapting to these significant evolutions, by identifying risk areas* (associated with: the disruptive technologies, consumers' perceptions with regard to the outcome of investments made by the supermarket chain in sustainability, consumers' uncertainty and anxiety, consumers' resistance to change caused by convenience and especially price) *and opportunities* (the translation of the consumers' uncertainty into trust; increased focus on responding to sustainability as an increasingly personal value of consumers; partnerships with suppliers that develop sustainable products; leveraging the e-commerce channel to provide new opportunities for circular consumption; targeting consumers with agile messages and tailored issues, responding to their needs for better information and education, and aiding them to adopt more sustainable lifestyles and to make informed choices in the omnichannel world).

Little research has been done on these new shifts or on the significant challenges of the so-called new normal (and the path to the next normal); beyond some valuable work which has been done to date, more comprehensive studies are needed to fill the current research gaps. Retailers' agile adaptation (identifying areas of risk and opportunities) cannot ignore major changes in sustainable consumer behavior. Our questionnaire on sustainable consumer behavior in retail considered this urgent need to understand these major changes in sustainable consumer behavior. Now more than ever, retailers need to have a good understanding of the way consumers integrate sustainability in their purchasing behavior, especially since there is usually an attitude–behavior gap (what people say they are willing to do is different from what they are actually willing to do).

The structure of this paper is as follows: Introduction, Literature review, Hypothesis development, Research Methods, Results and discussions, Conclusions (Summary, Implications, Limitations, and Future research) and References.

2. Literature Review

A significant number of studies analyze the important concepts and trends mentioned below about these concepts, as well as their impact on the trends on the one hand, and on society and consumer product goods and the retail industry on the other hand. Vague is their impact on the deep nature of the connection between the major shifts in sustainable consumer behavior and retailers' priorities in agilely adapting to it. Section 1 is subdivided into the following subsections: Section 2.1 The relationship between the concepts of circular economy, sustainability, and sustainable development; Section 2.2 Digitalization and its influence on the retail industry (Consumers' relationship and engagement within digital transformation; retailers' phygital strategies and the sustainable smart store of the future); Section 2.3 The discrepancy between consumers' attitudes towards sustainable consumption and their behavior in the purchasing of sustainable products. The need of understanding retailers' sustainability journeys (Resolving the challenging green shopper dilemma; consumers' decision-making impacted by their perspective towards sustainability. Helping shoppers make sustainable choices; prioritizing sustainability in the consumer sector: purposeful retail and shopping; meeting and exceeding consumers' expectations by providing improved experience using the lens of sustainability); Section 2.4 Consumers' perspective in the world's largest market towards sustainable consumption (Global consumers' perception on sustainability imperative; continuous acceleration and focused expansion of the Chinese consumers' trends existing earlier in time, based on improving consumer experience; China's sustainable future is challenging the other main global actors, and not only); Section 2.5 The Romanian retail sector's key role in sustainable production and consumption, and the increasing role of sustainable consumer behavior in Romania (Romanian retail market, an important market for the supermarket chains;

Romanian green consumers and implementation of sustainable development policies on the Romanian retail market).

2.1. *The Relationship between the Concepts of Circular Economy, Sustainability, and Sustainable Development*

According to Islam (2017), sustainability has caused doubts about our consumption patterns within the context of the radical environmental and social changes undergone by our planet: 'The consumption patterns in the world lead to an increasing and unending demand . . . There are many problems regarding the human impact on the environment such as the dilemma and tension between the economy and the environment, increasing demand and environmental vulnerability.' As shown by Islam and Yuhan, C. [2], valuable research has identified problems which have demonstrated that '*issues of sustainability can often be multifaceted in nature, with varying scales that could occur on both regional and global levels*', and as it was also demonstrated '*the strength of environmental sociology as a lens to understand the complexities of the issue of sustainability . . . The debates on contemporary globalization and sustainability are brought to the foreground, along with an open-ended and arguably long-standing question: Does capitalism have a human face?*' Like a bridge over time, the *Sustainable Brands 2021 Conference* (SB'21, San Diego, CA, USA, 18–21 October 2021), considered the major global event for the largest community of purpose-driven brands and leaders, seemed to offer an answer to the above-mentioned question through the keynote speech given by the cultural anthropologist Philip McKenzie, who want brands to enter a new type of social contract based on both stewardship values and regenerative principles which would change in significant way *how humans think, see, act and exist in the world* so as to direct a framework giving a central focus to people and planet considered together [3].

Kirchherr et al. [4] systematically investigated 114 circular economy definitions based on a coding framework and revealed that economic prosperity (followed by environmental quality) is considered to be the main aim of the circular economy. Within this developed framework they introduced the following definition: 'A circular economy describes an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations.'

They also recommended the inclusion of the consumer perspective in any circular economy definition adopted, taking into account the following aspects: the consumer perspective may be seen as the less popular side of the circular economy business model, the most central enabler of circular business models being the consumer [5]; for the circular economy it is essential to promote consumer responsibility [6]; for circular supply chains one must consider consumption processes, and not only the various production and distribution processes [7]; there is a potential circular economy risk of developing unviable business models due to lacking consumer demand determined by the adoption of a supply-side view only [8]; the circular economy involves "rethinking [9] consumption" as a necessary part. On the other hand, Kirchherr et al. also showed that despite the fact that the need for a circular economy to consider novel "production processes and consumption activities" was underlined a long time ago [10], other authors highlighted that "little is known about consumers' willingness to participate in (CE)" [11], with this statement being seen as confirming the research gap concerning the consumers' perspective on circular economy.

Within the context of the above-mentioned wide variation in approaching the circular economy, OECD, Paris, France adopted the approach of describing the circular economy through its characteristics [12], and "increased product repair and remanufacture, increased material recycling, more robust long-lived products through design, increased produce

re-use and repair, increased material productivity, improved asset utilisation, and modified consumer behaviour”, as underlined by Ekins et al. [13]. The relationship between the concepts of circular economy (sometimes equated with sustainable development), *sustainability* (consumers make a difference between social and environmental aspects of sustainability) and sustainable development (introduced following the Brundtland report, 1987) *is not obvious*. Where there is no doubt is that a circular economy would be more environmentally sustainable than a linear economy, according to Ekins et al. Moreover, as shown by Maryville University, St. Louis, MO, USA [14], it is essential to understand the differences between the two crucial concepts of sustainability that are often used interchangeably (which can only be achieved when all three following pillars are addressed together: economic/profits, environmental/planet, and social/people) and sustainable development (describing the processes for improving long-term economic well-being and quality of life without compromising future generations’ ability to meet their needs). According to Circular Ecology [15], true sustainability and a truly circular economy can be achieved only through balancing the above-mentioned three pillars of sustainability (often visualized as a Venn diagram, intersecting to share a common center, with only this area of sustainability being true sustainability); in addition, when only two out of these three pillars are achieved, none of the below are true sustainability: Social + Economic Sustainability = Equitable; Social + Environmental Sustainability = Bearable; Economic + Environmental Sustainability = Viable; “sustainable development may be considered as the pathway to sustainability”.

Horizon 2020 [16], known as the biggest EU Research and Innovation program representing the financial instrument implementing the Innovation Union, confirmed that research is seen as an investment in the future, and it was placed at the heart of the EU’s blueprint for smart, sustainable, and inclusive growth and jobs. ‘Digitising and transforming European industry and services’ and ‘Connecting economic and environmental gains—the Circular Economy’ are, for instance, two out of four mutually reinforcing Focus Areas in the current main Horizon 2020 work program. In a report concerning the last-mentioned Focus Areas, it was stated from the very beginning that the circular economy can be made a reality for a better world for all, beyond recognizing that the transformation from a linear economy to it is ambitious [17]. It is interesting to note that the above-mentioned analysis made by Ekins et al. identified important lessons resulting from the Chinese model of regional governance, which has gone beyond the large-scale demonstrations funded by EU’s Horizon 2020 program, and is more coordinated than the experimentation occurring among EU, Maastricht, The Netherlands or OECD, Paris, France member states. As a new growth strategy responsibly for responding to significant challenges, the European Green Deal for the European Union (EU) puts people first, protecting their health and well-being from environment-related risks and impacts and increasing active public participation. This significant approach of transforming the EU’s economy and society for a sustainable future included the mobilization of industry for a clean and circular economy based on an action plan (adopted initially in 2015, then fully completed in 2019) stipulating the necessary measures: encouraging both green business practices (new business models) and consumers’ sustainable choices and product options (supporting them in making greener decisions), and considering the role of digitalization in improving the availability of information on the products’ characteristics sold in the EU [18]. The new circular economy action plan (CEAP) adopted by the European Commission in March 2020 as one of the main building blocks of the European Green Deal [19] encouraged (among other aspects) sustainable consumption.

Based on a significant literature review, Hallstedt et al. [20] analyzed the connections between digitalization, servitization, and sustainability, and clarified the combined impact and consequences on product development capabilities in manufacturing firms. Within this framework, they underlined different aspects such as the following: one way to respond to the sustainability trend is to apply sustainable product development; in order to prioritize sustainability in product development, a stronger societal demand for sustainable solutions is needed; how the circular economy has become the primary framework to examine sustainability in practice; the fact that the linear resource society is not seen as a viable

solution, and as a consequence the interest in circular economy solutions is expanding very quickly. On the other hand, Het Groene Brein [21] described the clear difference between a linear economy (Step plan: Take-make-dispose; Focus: Eco-Efficiency; System boundaries: Short term, from purchase to sales; Reuse: Downcycling; Business model: Focuses on products) and a circular economy (Step plan: Reduce-reuse-recycle; Focus: Eco-Effectivity; System boundaries: Long term, multiple life cycles; Reuse: Upcycling, cascading and high grade recycling; Business model: Focuses on services). The circular economy needs consumer behavior change, with consumers playing a significant role in ensuring a properly functioning circular economy by both choosing sustainable products and using products longer, and repairing or taking them to the recycling shop. That is why sustainable consumer behavior must be stimulated [22].

In the CSB Sustainable Market Share Index™ review of US consumer purchasing of sustainability-marketed products (CSB meaning Center for Sustainable Business at the New York University Stern School of Business, New York, NY, USA), the new findings reveal among other aspects that sustainability-marketed products performed better in e-commerce compared to conventionally marketed products. On the other hand, in Europe, the largest brand study on sustainability is the Sustainable Brand Index™ (ranking annually both business-to-consumer and business-to-business brands), which measures stakeholders' perception of a brand's sustainability (over 1400 brands, selected independently based on the market share, turnover, and general brand awareness) across 34 industries and eight countries [23]. Depending on how they relate to sustainability, consumers are divided by the Sustainable Brand Index™ into four different behavior groups [24].

As shown by eMarketer analysts [25], there is no doubt that sustainability will remain a key area of concern for consumers (despite the fact that their values do not always directly translate into their behavior), with the current new emerging era in retail and ecommerce making significant information known with regard to the advancement in the direction of building green business practices (such as reusable and sustainably sourced materials, carbon footprint reduction, reusable containers, recyclable packages, green business certification, and donations to environmental causes). New research in a global context allowed for the identification of sustainability (becoming an important source of long-term competitive advantage needing to be done in an orderly, methodical way as companies' digitization or strategy development) as one of the priorities (revealed and accelerated by the COVID-19 pandemic) for Chief Executive Officers (CEOs) in the next normal [26].

A 2021 study by Accenture and the World Wide Fund for Nature (WWF) Singapore, and entitled "Sustainability in Singapore—Consumer and Business Opportunities" has confirmed that consumer consciousness on sustainability has been accelerated by COVID-19, with the CEO of WWF-Singapore highlighting how encouraging it is to see sustainability influencing consumers' purchasing decisions and giving a new business opportunity to organizations [27]. To provide a broad perspective on businesses' opportunities and challenges, the consumer study was complemented with business perspectives coming from interviews with 23 businesses, including retail.

According to Purcarea [28], in the current VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) time more than ever there is no doubt about retailers' need to become and remain at once consumers' trusted advisors and agile to consumers' changing behaviors, considering the role of consumers' feedback in ensuring the right insights as inputs in the optimization of retailers' processes. Within the current obvious emphasis placed on stimulating sustainable consumer behavior, one of the key questions remains how consumers understand this relationship between the concepts of circular economy, sustainability, and sustainable development. Within this context retailers need to identify consumers' new beliefs, habits, and positive memories on the one hand, and to analyze them in a highly detailed manner, aligning messages to consumers' mindsets and shaping sustainable consumer behavior with sustainable product offerings, on the other. Therefore, we investigated the extent to which there is a positive influence of consumers' willingness

to change their shopping habits (to reduce environmental impact, this willingness not having been elucidated) on retailers' increased concentration on responsibly answering to sustainability as a personal value of consumers (changing their behavior).

2.2. Digitalization and Its Influence on the Retail Industry

We have seen earlier not only that the circular economy needs consumer behavior change and that sustainable development may be considered the pathway to sustainability, which remains a key area of concern for consumers, but also that sustainability is becoming an important source of long-term competitive advantage for companies. Research by Purcarea et al. [29] showed that Romanian consumers' omnichannel shopping journey is strongly influenced by the successful use of AI-enabled interactions within the blending of physical experiences with digital ones.

2.2.1. Consumers' Relationship and Engagement within Digital Transformation

According to Sheen [30], in the digital age consumers' perspective of value is grounded in the products' performance and the level of the new products' connectedness and the relationship accompanying them, with consumers' relationship and engagement being the new key performance indicators. Consumers can experience the products designed to facilitate the establishment and maintenance of a digital relationship before purchasing them. Today's consumers are fully embracing digital technology, considering the experiences they have with other companies globally, by using web and mobile apps to find information instantaneously and pressuring companies to level up their experiences [31]. As shown by Accenture [32], users change over time how they engage with a product or service, and the business needs to change in response to users' expectations and feedback. Consumers' evaluation of both [33] the companies they do business with and the products purchased by them is determined mainly by their interaction experience (considering factors such as effort, convenience, personalization, uniqueness, in-experience learning, etc.) and product experience (considering factors such as product utility and usability, consumers' needs alignment, and life enrichment), and then by brand perception (consumers' view of the company's industry position and sense of alignment with the company's values, while price includes consumers' estimation of whether the product offers good value for money), with product experience having the greatest impact on customer loyalty.

Purcarea [34] referred to the connection between Marketing 5.0 and Society 5.0 within the context of the digital transformation understood as a complete reinvention of the business by deriving benefit from the digital technologies and supporting capabilities, rightly using the insights obtained based on customers' trust, engagement, and continuously improved customer experience (CX). Digital transformation is defined by the Institute for Digital Transformation as the integration of digital technologies into a business resulting in the reshaping of an organization that reorients it around customer experience, business value, and constant change. According to the Gartner Glossary, there are clear differences between: *digital transformation*, including anything from IT modernization to digital optimization (defined as the process of using digital technology to improve existing operating processes and business models) or the invention of new digital business models (defined as the creation of new business designs by blurring the digital and physical worlds); *digitalization*, meaning the use of digital technologies to change a business model and provide new revenue and value-producing opportunities (it is the process of moving to a digital business); *digitization*, seen as the process of changing from analog to digital form, also known as digital enablement (digitization taking an analog process and changing it to a digital form without any different-in-kind changes to the process itself).

As part of the digital evolution of a business, *digital adoption* is seen as the adaptation of digital technology to enable the understanding and analyzing of data and information related to the business, its customers, competitors, and industry, to create new customer touchpoints, and to deliver key digital experiences [35]. Digital adoption has been accelerated by the COVID-19 pandemic [36]. E-commerce growth, for instance, is driven

by this digital evolution, e-commerce sales being promoted by both forward-thinking consumer-product companies and retailers implementing effective conversational commerce strategies which are always-on in exploring unexpected changes. ZK Research confirmed that the COVID-19 pandemic significantly accelerated the digitization of the shopping experience, which had already started prior to the pandemic, with consumers seeking more and more digital experiences for all their needs and businesses struggling to personalize CX (and enhance customer engagement and loyalty accordingly) by finding and giving a lot of attention to shoppers' identities [37]. Moreover, according to the ZK Research 2021 IT Priorities Study, 67% of the technically savvy shoppers preferring a digital experience (the so-called "shopper 2.0s") confessed that following a single bad experience in the past 12 months they changed their brand loyalties; COVID-19 accelerated companies' digital CX plans (the number-one digital initiative being CX improvement), and the digital transformation of CX has generated substantial spending not only in contact centers, but also in mobile application development and digital experience management; unfortunately, customers' checkout experience was often disregarded, notwithstanding its critical dimension for retailers' success in today's digital-first era, in which retailers are also clearly challenged to invest in technology enabling the conversion of unknown shoppers and guests (as customers who never shopped with a retailer before) into data capable of being identified.

It is also well known that within their digital transformation, companies' new operating mode is enabled by digital technologies (including analytics, Internet of Things/IoT, AI and its subset Machine Learning, with technology and data being the backbone: digital infrastructure, technology strategy, IoT platforms, data lakes and data architecture, data governance, analytics platforms), which are valorized by an end-to-end transformation, the new value being captured from technology [38]. One of the main effects of the impact of the disrupting technologies which are the supporting structure of Industry 4.0 is on customers' expectations (considering the improvement of the way they are served), and not only on product enhancement, collaborative innovation, and organizational forms [39]. Retailers' advancement on the Romanian retail market [29] involves acting on the new patterns and behaviors by considering the new technology adoption, which is a central metric for assessing the successful use of Artificial-Intelligence-enabled interactions, for instance, within this context being Romanian consumers' perceptions of Artificial Intelligence.

According to the European Commission [40], the existing Industry 4.0 paradigm is complemented by its vision on "Industry 5.0", in which research and innovation drive the transition to a sustainable, human-centric, and resilient European industry, moving the focus from shareholder to stakeholder value, and, among other aspects, attempting to capture the value of new technologies (required by the twin green and digital transitions) while respecting planetary boundaries: "The Green Deal announced in December 2019 clearly sets out what Europe must do to transition to a sustainable economy . . . Innovations in green technology, combined with EU initiatives aimed at Digitising European Industry (including better use of big data and artificial intelligence) are a reality . . . The concept of the circular economy is a blueprint for a new economy, complies with the 12th UN's SDG for "sustainable consumption and production patterns", generates rapid and lasting economic benefits, and receives broad public support. It provides a positive, coherent innovation challenge, through which young people see the relevance and opportunities in terms of re-thinking and redesigning their future . . . the transition towards Industry 5.0 has already started . . ." On the other hand, the in-depth analysis of the regulatory sea change in sustainable finance and reporting made known by Reuters Events in August 2021 revealed, among other aspects, the impact of the technological improvements [41].

The above-mentioned new circular economy action plan (CEAP) adopted by the European Commission in March 2020 as one of the main building blocks of the European Green Deal also made reference to "Mobilizing the potential of digitalization of product information, including solutions such as digital passports, tagging and watermarks" as one of the aspects to be regulated on the basis of establishing sustainability principles by

the European Commission. This was within the context of building a sustainable product policy framework by designing sustainable products and empowering consumers and public buyers. According to the European Commission [18], there is continuous work being done towards harnessing the potential of research, innovation, and digitalization, as well as building the sustainable product policy framework and more sustainable production and consumption patterns. Within this context, a key building block is empowering consumers and providing them with cost-saving opportunities. Consumers' enhanced participation in the circular economy involves receiving trustworthy and relevant information on products at the point of sale. Products' journeys can be tracked with the help of digital technologies which can also make securely accessible the resulting data. Product passports, resource mapping, and consumer information (as applications and services) are driven by the architecture and governance system provided by the European data space for smart circular applications.

2.2.2. Retailers' Phygital Strategies and the Sustainable Smart Store of the Future

The roots of the idea behind the book *Sustainable Food Supply Chains: Planning, Design, and Control through Interdisciplinary Methodologies* [42] were planted at the Universal Exposition Expo Milano 2015, whose motto "Feeding the Planet" was chosen by combining issues of economic development, agriculture, energy, and sustainability. Within this specific framework, significant research results from the Food Supply Chain Center (FSC) of the University of Bologna, Bologna, Italy, were presented, the Center having been recognized worldwide for its focus on the creation of the decision-support tools aiding the design of the Sustainable Food Supply Chain operations. As shown by the European Retail Academy [43], the need to promote holistic research about food/health/sustainability and to ensure the penetration of knowledge and standards along the total supply chain from farm to fork has led to the signing of a Memorandum of Understanding by two international networks, EQA (Education Qualification Alliance), Bonn, Germany and ERA (European Retail Academy), Roesrath, Germany, in order to institutionalize a Thematic University Network (TUN, concept developed by the FoodNetCenter of the University of Bonn, Germany). Consequently, significant aspects such as encouraging sustainable food production and food consumption patterns, the relation between consumer willingness to pay/the evolution of consumer behavior and the information regarding ingredients and food production processes, taking into account labels' significant impact on consumer demand within the positive-negative asymmetry, etc., were also approached in Romania [44].

At Expo Milano 2015, on the occasion of the SHOP 2015 Conference, Purcarea [45] introduced as keynote speaker the road map for the store of the future and outlined how this challenge can be approached to tackle the problematic aspects that have emerged at the confluence of connectivity and convergence, by considering technological innovation, applications, and success stories in retail to continuously improve omnichannel shoppers' experience. Within this framework, it was recalled that education means life and civilization transmission, and the circular economy was advocated for as a regenerative economic model for implementing new technologies and for research and innovation [46]. This last message was well received, and was noticed recently in a systematic review of the circular economy and bioenergy as they have been addressed by education and communication [47]. As shown later by Bendle et al. [48]), retailers need: to better understand shifts in consumers' awareness (measuring awareness and knowledge), attitudes (measuring beliefs and intentions), and usage (measuring purchase habits and loyalty) in order to consider consumers' willingness to recommend and to search, etc.

Charm et al. [49,50] underlined that within the context of the current pandemic, the majority of global consumers changed their shopping habits—in other words retailers need to better understand this new consumer. Moreover, since the health, economic, and social impacts of the pandemic are not uniform, there are differences in consumer behavior across geographic markets and demographic groups. Nevertheless, to provide a more comprehensive perspective of these changes in consumer shopping behavior arising from

the various impacts, the above-mentioned NYU Stern Center for Sustainable Business [51], whose research showed the falseness of the widely held idea that consumers do not buy sustainable products, introduced a roadmap to sustainable e-commerce. They highlighted e-commerce retailers' need to understand consumers' values and assume responsibility for sustainability challenges and opportunities by starting to implement measurable solutions.

According to Accenture's new concept and solution "The Store of Tomorrow" (whose layout has three complementary parts: Aisle, Dark Store and Promenade), retailers today need a new integrated vision for the near future of retailing that includes strategy, data, experience design, supply chain, technology, and sustainability, since consumers are expecting retailers to contribute to greater sustainability, and they also need to optimize their online and offline operations holistically by connecting the dots so that their online-merge-offline (OMO) model ensures shoppers an omnichannel retail experience in which the store is a crucial part of the overall shopping journey [52]. One of the key ingredients for Accenture's Store of Tomorrow is enhanced sustainability and social responsibility, with the development of the OMO model allowing retailers fix ESG principles (environmental, social, and governance) firmly and deeply across their end-to-end functions. Thanks to this operating model, consumers can make better and more informed choices, with the ESG-related information being provided through digital displays; retailers can drive down their costs while optimizing carbon emissions by accessing clean energy and waste reduction across perishable goods, merchandising, and packaging material; and shoppers are provided with greater choice and convenience in their omnichannel journey, while retailers realize both revenue growth and cost optimization.

In a news interview for the online magazine EuroShop—the World's No. 1 Retail Trade Fair [53], Xenia Giese, the Industry Executive of Retail & Consumer Goods at Microsoft and co-author of the Microsoft/EHI white paper entitled "Sustainable Smart Stores 2021—Digital Sustainability Solutions for Retail", stated: "Many retailers already rely on digital solutions in their 'smart stores', whose operation is based on sensor technology, the Internet of Things and AI-supported applications . . . these types of stores are more energy-intensive than shops that do not or barely leverage digital technologies. This has drastically increased the demand for 'sustainable smart stores', which feature digital solutions to improve operational efficiency and to offer more customer services, while simultaneously emphasizing a focus on sustainability . . . There is enormous untapped potential in the five relevant fields for sustainable action: head office, logistics & supply chain management, merchandise planning & production, stores, consumers & circular economy . . . Innovative solutions offer far-reaching optimization potentials, which usually have positive effects on sustainability and core business processes. For example, the 'Pictofit augmented reality (AR) engine by Reactive Reality' creates a photorealistic custom avatar on the smartphone, offering a personalized customer experience that is designed to attract and retain customers thanks to virtual try-ons. The solution also reduces return rates since customer can virtually try on items with the right fit and dress size based on respective size and fit recommendations . . ."

Without a doubt, today's retailers need to guide their strategic decisions based on correct actionable data in order to ensure a better understanding of the needs of today digitally savvy buyers, who are also channel agnostic. Retailers' phygital strategies (in-store, online, e-commerce, m-commerce) must allow for the personalization of their consumers' journey and the delivery of seamless experiences, personalization, and omnichannel working closely together. This involves monitoring and understanding all the moments and micro-moments of consumers' interactions with retailers and brands, holistically thinking about the above-mentioned consumers' journey and overcoming their anxiety and friction [54–57]. Research findings have confirmed that there is an increased concentration of retailers in terms of digitizing processes (by creating a digital representation of physical objects or attributes), including the mode of retailer–consumer communication (social media, text messages, phone, etc.), enabling new business models to emerge with the help of new disruptive technologies (valorizing the digitized data and improving consumer experience). As living through the COVID-19 pandemic has increased social awareness, retailers are

under pressure to better understand explicitly how people, technology, and data come together to inform one another and make decisions. This is becoming rapid a source of survival and differentiation, with the accelerated change needing to be orchestrated and led based on decision intelligence and outcomes depending on business competency in connecting data, artificial intelligence, and analytics [58]. Within the context of established business designs and practices which are amplifying the risk of change, retailers also need to begin their journey toward composable business (composability making change easier, faster, safer, and less costly, while also allowing initiative in pursuit of an opportunity) with composable thinking (introducing, driving and anticipating more change), so as to ensure a new balance of stability (repeatable behavior) and agility (a changed behavior) and gaining control of the risk of either [59]. Recent McKinsey research confirmed that to respond faster to the current crisis many companies embraced agility, which means “moving strategy, structure, processes, people, and technology toward a new operating model by rebuilding an organization around hundreds of self-steering, high-performing teams supported by a stable backbone” [60]. Acting along this path, companies can ensure not only the improvement of delivery and the increase of speed, but also the enhancement of both consumer experience and employee experience. With regard to the challenge of continuously improving the consumer experience within the current crisis, McKinsey recommended for retailers other specific actions beyond embracing an agile operating model, namely: extending shoppability, digital-channel presence, and engagement, as well as ensuring zero friction digital experience; injecting innovation into the omnichannel by bringing more of the in-store experience online and launching or diversifying their delivery mechanisms; transforming store operations and ensuring new safety requirements for both customers and associates; and creating the store of the future as a core component of the omnichannel journey, educating consumers on product offerings, etc. [61].

There is a lack of studies with regard to retailers’ digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world. We therefore analyzed consumers’ relationship and engagement within digital transformation on the one hand, and retailers’ phygital strategies and the sustainable smart store of the future on the other. In this context, it is important for retailers to address two questions which have not yet been clarified: first, whether their increased concentration on responsibly answering to sustainability as a personal value of consumers (changing their behavior) is facilitating their digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world; and second, whether a positive influence has resulted from their digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world.

2.3. The Discrepancy between Consumers’ Attitudes towards Sustainable Consumption and Their Behavior in Purchasing Sustainable Products. The Need for Understanding Retailers’ Sustainability Journeys

Consumption patterns have long been recognized as major driver of complex environmental challenges such as climate change and the depletion of natural resources, while the win/win alliance between better consumption and production has long been recognized as being used to promote sustainable consumption [62]. Beyond regulatory and economic tools to influence consumers’ choices within this framework, there were also behavioral and communication/information provision tools used towards sustainable consumption. At the beginning of 2020, The Consumer Goods Forum (CGF—CEO-led, and the only organization bringing consumer goods retailers and manufacturers together globally) formed its Product Data Coalition of Action aiming both at the global implementation of a unique product identification system and at ensuring that all IDs can be verified in real time, so that by 2022 all retailers, manufacturers, and platforms follow a common Global Data Model [63]. Consumers (like everyone in the supply chain) will be able to verify in real time the ID (including data on sustainability) of all consumer products by scanning this unique code and accessing data that is centrally captured based on the Global Data Model [64].

2.3.1. Resolving the Challenging Green Shopper Dilemma

The term sustainable consumption is very noticeable in Agenda 21 at the United Nations (UN) (New York, NY, USA) Conference on Environment and Development organized in 1992 in Rio de Janeiro, Brazil [65]. Terlau and Hirsch [66] underlined the need for interdisciplinary cooperation between psychology, evolutionary and behavioral economics, marketing, and other disciplines (anthropology, sociology, neurology, etc.) in responsibly approaching sustainable consumption. They took into consideration the need for better understanding the complexity of measures (such as: to increase consumers' awareness and strengthen their individual responsibility, to improve the communication with regard to sustainable products' quality attributes, to improve consumers' acceptance of the sensory attributes of a sustainable product as regular users of the product category, to generate more transparency and trust by attested certificates and labels, etc.) necessary to influence consumer behavior (recognized for its unpredictability within the supply chain) towards this sustainable consumption, including considering the clear discrepancy (the so-called attitude–behavior gap having as a primary cause the dual action model developed by Daniel Kahneman [67], psychologist and Nobel Prize Laureate in economics) between consumers' attitudes towards it and their behavior in purchasing sustainable products. Choosing as a key predictor of the green buying behavior the attitude (understood as a durable set of beliefs about what predisposes consumers to behave in a particular way toward green products) toward environmentally friendly products, Gupta and Ogden [68] put forward for consideration the level of consumer involvement with environmental issues and the perceived consumer effectiveness as two personal norm conditions to strengthen the link between consumer attitude and behavior. Although as individuals consumers manifest clearly positive attitudes, they fail to execute on these exhibited attitudes by engaging in responsible behaviors (green behaviors, in our case). This identified attitude–behavior gap (between pro-environmental attitudes and green purchase behavior of the green consumer segment) seems difficult to deal with it in prospect, representing a real challenge. That is why Gupta and Ogden underlined that green consumers' behavior can be understood by examining factors influencing consumers' green purchases, with the most accurate market segments being possible on the basis of a mix of the demographic, psychographic, and individual characteristics of consumers.

Johnstone and Tan [69] suggested that consumers' intention to purchase green products may be influenced by their perceptions towards green products, consumers, and consumption practices. The authors identified three types of barriers to consumers purchasing green products (finding it too hard to be green, or being reluctant or resistant to participate in green consumption practices). Orzan et al. [70] made reference to several models used by various scholars to explain sustainable consumer behavior (such as the theory of planned behavior and of values-beliefs-norms), and also to the above-mentioned 'attitude–behavior gap', highlighting among other aspects how price, availability of eco-packaging, and social influences lead to this gap. Moreover, recent research on Europe's leading online platform for fashion and lifestyle Zalando [71] revealed, for instance, that this attitude–behavior gap across all of the assessed twelve dimensions (quality, value for money, brand responsibility, manufacturing, price premium, ethical labor, individual responsibility, influencers, repair, second-hand, disposal, and transparency) is shaping sustainable shopping decisions. Research by Google in partnership with Kantar, on the other hand, revealed that as sustainable living and purchasing become mainstream across the U.K., there is an urge for both businesses and the government to do more, as well as an 'underlying sense of consumer guilt at how cost and convenience are still large barriers to doing the right thing' [72].

According to GfK [73], despite the fact that there is an increasing awareness amongst a large part of consumers regarding the deterioration of the environment through the depletion of resources (with guilty feelings accordingly for their involvement), they nevertheless want options which do not involve significant cost or time or consumption of effort. As a consequence, both retailers and manufacturers are being challenged to understand this

‘conflicted consumer’ trend in their relevant markets and ensure, at the same time, the delivery of the products and of the expected performance, as well as identification from core areas that would enable a proper answer to the increase in the ecological consciousness of the consumers.

On the other hand, as shown by the above-mentioned study by Accenture and WWF Singapore [27], for consumers in Singapore to invariably make green choices, sustainable options are not sufficient. Consumers are confused by companies’ eco-credentials at the forefront of their products, and they want to verify more easily these companies’ claims. Similarly, a message recently posted on Twitter by the Centre for Sustainable Fashion [74] showed that: ‘Many of China’s young consumers think sustainability is cool, but there’s a long path ahead to it influencing how people shop’.

According to White, Habib, and Hardisty [75], sustainable consumption can be encouraged by using psychological factors (the so-called SHIFT framework: social influence, habit formation, individual self, feelings and cognition, and tangibility) to maximum advantage (for example, by drawing analogies between a sustainable action or outcome to a familiar experience, since sustainability is an abstract and intangible concept).

The use of the increasing awareness of sustainability to differentiate companies’ products (how the product is made, the sustainability benefits offered by the end-product itself, including, for instance, the additional benefit of enabling more sustainable consumption or the creation of more sustainable products and practices) is considered an interesting current development adding greater value [76]. More recently, Somers and Kohn [77], starting from the fact that both consumers’ choice of brands and investors’ choice of stocks are increasingly driven by sustainability, conducted an assessment (including appraising the efforts made by some well-known brands in the apparel and sporting goods sectors around creating a circular fashion ecosystem) about the fashion businesses (fast fashion, in particular) that are most sustainable. This assessment was based on their chosen social and environmental metrics, and it added the critical concept of disposability to reflect how the products are used. Within this context, a suggestive reference to a representative of Generation Z was made: a 13-year-old girl demonstrating an exemplary attitude towards sustainable consumption. This was within a context in which, as shown by Brown-West [78], according to the Business of Fashion’s inaugural Sustainability Index, companies are to a very great extent behind in making progress on sustainability, which is why there is a real need to do better and move faster by demonstrating real public accountability and publicly making known their chemical footprints. This would ensure greater visibility and traceability of their entire supply chains, making significant improvements beyond forming value chain coalitions and collaborations, and setting goals alone.

2.3.2. Consumers’ Decision-Making Impacted by Their Perspective towards Sustainability. Helping Shoppers Make Sustainable Choices

As shown by the above-mentioned BIO Intelligence Service [62], from the point of view of the classical description (as a balance between consumers’ needs, desires, and product prices), a consumer’s decision regarding sustainable consumption can be influenced only by changing either the needs and desires or the prices, with consumers’ understanding of their own needs and desires being influenced and shaped by marketers’ and advertisers’ work. According to Martuscello [79], consumer decision-making and behavior is impacted by anticipation. This in turn is involved with trust, which is an essential element for the coming attraction to brand experiences, a requirement of the social interaction, and a source of customer value.

Starting from the arguments of the American economist and Nobel Prize Laureate Kenneth J. Arrow (who expressed in his 1951 book *Social Choice and Individual Values* that individual choices are based on socially held and shared values), Laurence Busch from Michigan State University, Michigan, MI, USA [80] stated: “Today, we live in a world in which choice is celebrated as a virtually undiluted good . . . we can choose from a vast array of items in the local supermarket . . . Consumer choice is also seen as a means of promoting

fair trade, animal welfare . . . as well as protecting the environment and biodiversity, among other things. In short, choice is seen as both “revealing preferences” of consumers as well as their ethical stances with respect to various issues facing the world today . . . ”. On the other hand, in the *Journal of Consumer Culture* (the Europeans), Plessz et al. [81] stated: “Food consumption has become the subject of many prescriptions that aim to improve consumers’ health and environment . . . we assume that links that connect practices with prescriptions result from evolving social interactions . . . This link is not explicit, unique or stable . . . The content of environmental norms continues to change . . . the connections between environmental ‘sayings’ and specific ‘doings’ are topics of debates conducted by a wide range of social actors . . . ”.

A systematic review of consumers’ motivations to make green purchase decisions [82] identified some key research directions for the future, and revealed, for instance, that from the point of view of the research object, consumers’ subjectivity in answering the questionnaire can be weakened to a certain extent if scholars choose those consumers who have already purchased sustainable products as the research objects; that, regarding cross-cultural research, there is less related research in a cross-cultural context, since there are obvious differences between developing countries (such as China and India) and developed countries (mainly in Europe and the United States) concerning economic conditions, culture, and traditions, despite the fact that by considering these differences marketers can have access to relevant references to develop differentiated marketing strategies.

According to André, Carmon, Wertenbroch et al. [83], there are more choice options and related information for consumers in the age of Artificial Intelligence (AI) and Big Data, but it is necessary to consider not only different aspects with regard to the need for autonomy in consumer choice (such as constraints required for the solution of the preference for this autonomy, the detraction from consumers’ autonomy by automation and data-driven marketing practices, consumers’ limited understanding of the stakes because of recommendation systems), but also what the costs of experiencing autonomy in consumer choice are (both this experience and its consequences might be affected by marketing and consumption technologies’ automation). Bault and Rusconi [84] reflected on recent advances in decision neuroscience (the neurobiology of choice) by underlining how consumers’ individual decisions are strongly impacted by attentional (brain activity linked to the retrieval and comparison of values being modulated by attention) and affective factors which are manipulated externally, while Bell et al. [85] highlighted how the online environment is influencing a complex interaction of emotional factors which are key factors in the prediction of online transactional success (beyond consumers’ initial purchasing goals) and which allow for the active of promotion trust and brand loyalty (an antecedent of online brand loyalty being online brand trust) based on both cognitive and emotional factors. They also underlined that to obtain significant consumers’ data (such as the type of device used, the specific product desired or needed, the originally pursued motivations, the factors turning them into delayed buyers, and other individual differences), it is necessary to collaborate with online retailers.

In the introductory statement in *The Roadmap to Sustainable E-commerce* report released in July 2020 by EDF + Business, part of Environmental Defense Fund (EDF), New York, NY, USA, Tensie Whelan, Clinical Professor at NYU Stern and Founding Director of the NYU Stern CSB, underlined companies’ tremendous opportunity (as the above-mentioned report suggested) to win over the customer base by showing concern for the environment and having awareness that they are members of society through helping shoppers make sustainable choices. In this respect, online marketplaces can be used by e-commerce retailers to provide deeper education about both environmental and health impacts of products purchased everyday by shoppers, which involves including the necessary sustainability information of a product right on its product page, using certifications to highlight shoppers’ options, and improving eco- and socially conscious shoppers’ engagement by offering them rewards or discounts when they are making sustainable choices [86,87]. On the other hand, RILA, the US trade association for leading retailers [88], showed that in

order to encourage both sustainability strategies and financial performance, the NYU Stern CSB developed the Return on Sustainability Investment (ROSI) methodology, which can be applied as a customizable framework to all types of brands, retailers, and industries. RILA also brought to retailers' attention the current needs of reflecting on waste and recycling and of identifying areas of risk and opportunity at the level of their supply chains while trying to build long-term resilience [89]. In June 2021, the NYU Stern CSB released *The Business Case for Circularity at Reformation* [90], Reformation being a women's clothing brand and retailer committed to building a more circular global fashion system (including through its partnership with one of the largest online platforms for buying and selling second-hand apparel, the resale brand thredUP, Oakland, CA, USA) and having as a primary objective the reporting of its sustainability impact. Its partnership with thredUP, Oakland, CA, USA (and its insights uncovered by the ROSI methodology) among other aspects, resulted in encouraging consumers' purchasing of new clothing from a sustainability-oriented brand.

Recent research from McKinsey in collaboration with EuroCommerce [91] focusing on sustainability in European grocery retail underlined the growing importance of sustainability for consumers due to the pandemic crisis, and how they understand the critical role played by the food sector in climate change. Alldredge and Grimmelt [92] highlighted the real challenge of better understanding the ever-evolving consumers, arguing that as marketing is a dialogue, it is necessary that companies better align themselves with consumers' values (considering health, social justice, and the climate change crisis), with Chief Marketing Officers (CMOs) preparing for consumers' and expectations' constant evolution and rapidly obtaining insights (including from e-commerce sites) concerning their thinking or feeling by using advanced analytics without underestimate consumers' resilience.

2.3.3. Prioritizing Sustainability in the Consumer Sector: Purposeful Retail and Shopping

Ratcliffe and Stubbs [93] underlined the impact on retailing in the 1990s (after the replacement of the conspicuous consumption of the 1980s by consumer conservatism expressing the need to provide value for money) of the emergence of purposeful shopping and leisure shopping. Accenture [94] revealed that consumers who scored retailers higher on purpose spent 31% more (based on 2018 Accenture Love Index Research) compared with consumers who scored retailers lower. Retailers therefore need to rethink their purpose and serve a purpose in consumers' lives. As shown by Ancketill [95], positive change which benefits both society and the planet can be created and accelerated by a strategic approach (powered by transparency, localism, and discontinuity) coming from a brand or retailer's values and actions. NielsenIQ [96] has confirmed consumers' shift to purpose-driven product choices. While Cluster and Cooper [97] showed that today's consumers want to know what the sustainability efforts are behind their favorite brands; since purposeful shopping (digitally led given buyers' online research before purchasing) is mainstream, consumer packaged goods (CPG) companies must ensure that data are transparent from end to end of the value chain. This is because of consumers' evolving interests and concerns regarding what they buy and the retailers who bring them together, which involves complex ESG (environmental, social, and governance) measurement and greater visibility into supply chains.

It is also important, with respect to prioritizing sustainability in the consumer sector, both to define better the sustainable products to better engage consumers, and to highlight the opportunity coming with sustainability in green business building by rethinking the business model by starting with sourcing and logistics [98]. Research from global payables automation company Tipalti Europe revealed that United Kingdom (UK) businesses impacted by the COVID-19 pandemic and Brexit are considering more and more ESG/sustainability capabilities as the most important quality needed in a Chief Financial Officer (CFO) today [99]. A Deloitte UK survey [100] revealed that sustainability is considered most often by consumers on their frequent essential purchases (groceries, household items, personal care, and clothing), the main barrier to adopting a consumer sustainable lifestyle still being their lack of interest (the perceived cost incurred in this adoption and

issues around accessing relevant information about coming after it). In the digital economy, retailers are challenged to organize, interpret, and embed data into existing workflows, giving a finished surface to actionable insights from data [101]. Recent arguments have been put forward to invest in corporate social responsibility (CSR) actions as the most effective strategy to introduce and to increase sales of new sustainable products [102], considering the positive effects of a strong brand CSR reputation.

2.3.4. Meeting and Exceeding Consumers' Expectations by Providing Improved Experience Using the Lens of Sustainability

Islam [103] showed that sustainability has caused doubts about our consumption patterns (as we have seen earlier), and that environmental sociology is providing us a powerful lens to understand the current environmental problems and challenges, and to have ideas for a sustainable earth and design it. Pinn [104] underlined that as sustainability is a customer experience issue, companies need to meet customer expectations by improving customer experience (CX) using the lens of sustainability. According to McNamee and Fernandez [105], consumers can be helped to make sustainable everyday choices and to start to drive longer-term change by creating improved experiences brands that can communicate near-term goals and impact—not just long-term targets, with marketers' role being essential.

Regarding today's digital experiences, in the opinion of Forrester these experiences involve both the use of natural language (chat, voice, and other more visual digital experiences) and the anticipation of customer needs, with consumers expecting brands to obtain just the information or service they need in the consumers' best interests in the brand's digital journey, beyond the highly contextual and right-sized experiences expected [106]. A recent Forrester report looked, among other aspects, at offering moments-based customer experiences by innovating, which involves having marketers address contextually relevant engagement and anticipatory customer experiences by raising traditional campaigns to a more important level [107]. Prior research within a 2016 Forrester report entitled "The Dawn of Anticipatory CX" (CX = customer experience) revealed that the missing link in staying ahead of rising customer expectations is none other than anticipation [108], with the report showing how to valorize the power of anticipation and sustain long-term positive CX impact [109].

Data-driven customer science provides companies, as demonstrated by Emilie Kroner [110], the necessary insights to track, measure, and improve in core areas: providing easy, enjoyable, and convenient CX; rewarding shoppers in ways meaningful to them; providing personalized communications based on their customer preferences; providing the product assortment their customers want; promoting the products that matter most to their customers; providing prices that their customers perceive as fair; ensuring feedback by having a two-way conversation and emotional connection with their customers. According to Kroner, Field, and Delgado [111], CX is focused on long-term relationships and success, being part science (including by using the right digital technologies to reach consumers at the appropriate touchpoints, and planning, executing, and measuring against the tactics aligned to the strategy of a great CX program integrated into the organizational ways of operating) and not only part art (making people associate a brand with customer obsession and feel in every touchpoint, for instance). CX transformation into customer science (by merging different technologies, platforms, and insights) will ensure companies the next level of customers' contextual understanding [112]. As shown more recently by Gaia Rubera, Amplifon Chair in Customer Science at Bocconi University, Milan, Italy [113], marketing, big data, and machine learning are the three ingredients of customer science.

Respondents to the Winter 2021 EPAM Research Report entitled 'Consumers Unmasked' (Stage 2, December 2021: Quantitative Survey of 3005 citizens in the U.K., the U.S. and Germany, including EPAM Continuum Consumer Council) said the following: 'they wanted to understand retailers' sustainability journeys, and they expected open, transparent honesty in their communications.' EPAM Continuum Consumer Council is

composed of 71 Millennial and Gen-Z shoppers from each of the following five sectors: food, fashion, travel, fitness, and home [114].

An under-explored area in the research literature is that concerning how a sustainable product and sustainable consumption are working together from the point of view of retailers, by taking into account what consumers are thinking, feeling, saying, doing, and experiencing, considering them as co-creators in sustainable product development. Therefore, we investigated the extent to which there is a positive influence of retailers' sustainability agenda (including by fulfilling consumers' sustainability demands with new products and processes) on retailers' increased concentration on responsibly answering to sustainability as a personal value of consumers (changing their behavior) and on retailers' digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world.

2.4. Consumers' Perspective in the World's Largest Market towards Sustainable Consumption

2.4.1. Global Consumers' Perception of the Sustainability Imperative

As sustainable consumption and production are inextricably linked, the United Nations Division for Sustainable Development [115] used the term Global Consumer in a background paper for the U.N. Inter-Regional Expert Group Meeting on Consumer Protection and Sustainable Consumption, Sao Paulo, Brazil. Within this framework was highlighted the need of reinforcing the recognition of consumers' crucial role in protecting the global environment by including sustainable consumption objectives in the Guidelines for Consumer Protection. According to Jansson-Boyd [116], there are broader implications for the purchasing habits within the context of a global impact on consumer behavior crossing national borders as well as given the fact that many brands are frequently consumed across the world.

On the occasion of the 24th International Congress of the International Association of the Distributive Trade (A.I.D.A.), organized in Bucharest, Romania, on 18–19 May 1998, Jean-Jacques Van Den Heede, Vice-President Nielsen, spoke about the emergence of new technologies and the diversification of store concepts, as well as about a new type of relationship with consumers globally including by adopting more sustainable behaviors [117]. Louis Guelette, IBM Vice President, Distribution, underlined the significance of the real revolution in the management of distribution companies and their suppliers, within the context of e-business, its subset e-commerce, information technologies, and the adaptation of business to a society having sustainable development at its heart. The 2015 Global Sustainability Report launched by Nielsen [118] has provided new valuable insights on consumer expectations globally (with 30,000 consumers being surveyed in 60 countries throughout Asia-Pacific, Europe, Latin America, the Middle East, Africa, and North America). Among these insights are that some of the more traditional influences for many consumers were surpassed by commitment to social and environmental responsibility, with brand trust topping the list of sustainability factors influencing consumers' purchasing for 62% of consumers globally; that there is a greater likelihood for consumers in developing markets to both seek out and pay more for sustainable products, it generally being harder to influence consumers in developed markets (to purchase or pay more); that it is becoming more and more important to understand the connection between consumers' sentiments and their purchasing actions, with certain marketing messages that reach consumers by resonating with them as true value propositions.

Steenkamp [119] made a comparative analysis of global consumer culture (as an important force in the marketplace) and local consumer culture (enjoying a renewed interest within the suggested stalling or evolving of globalization). He highlighted, among other aspects, that it would be justifiable to focus initially on the demand side within the context of the underexplored contribution of consumer culture to brand equity. As a brand's commercial value derives from consumers' perception (driven by positive or negative consumer experience) of the brand name, it is a priority to consider the impact

of cultural marketing strategies, with the global consumer culture remaining a necessary topic for international marketing researchers.

Known worldwide for doing consumer-sentiment surveys, McKinsey [120] analyzed Generation Z and the Latin American consumers and revealed, for instance, the difference between Brazilian consumers (with very low levels of online shopping or online use of services prior to COVID-19) and Chinese consumers (who were already highly digital prior to COVID-19). Brazilians were usually very optimistic, but the unprecedented crisis touched them and made them significantly less optimistic, which was also translated into much more realism and expected planning in the future, as well as substantially more questioning or analyzing of their spending levels. The belief of McKinsey's researchers was that lack of trust in the retailer, the incredibly complicated logistics, or the online payments in Brazil were some of the factors preventing Brazilian consumers (according to their consumer experience) from buying online, but the COVID-19 crisis made them available for it. McKinsey's researchers also underlined something that gave them optimism, namely, the good example of the Brazilian company Alpargatas, Sao Paulo, Brazil (Alpargatas being known for its iconic brands such as Havaianas slippers) which has been very connected with sustainability initiatives. To understand Asia's Generation Z better, McKinsey [121] surveyed 16,000 consumers (in Australia, China, Indonesia, Japan, South Korea, and Thailand), and compared them with Millennials and members of Generation X (born from 1965 to 1979). Research findings showed many similarities between members of Generation Z and Millennials in the ways they think and shop, with customization becoming an expectation (not a nice-to-have option), for instance, in both cohorts. Furthermore, despite the fact that Asia's Generation-Z respondents said that they prefer ethical products, only a minority were willing to pay more for these products. Among Asia's Gen Z, the largest segments are the so-called brand-conscious followers (representing about 1/4 of respondents surveyed, those following trends and then buying usually online), premium shopaholics (enjoying every part of the shopping process), and ethical confidants (liking brands speaking to their values, preferring brands perceived as environmentally responsible and socially ethical).

The EY Future Consumer Index 2021 [122] stated as follows: 'There is no single "Sustainable Consumer". Values and attitudes vary. The nuance is critical. Many people would be willing to pay more if your product reflected their specific agenda. Consumers will look beyond a brand to consider the sustainability of your full value chain.' EY identified 'nuanced, complex, and often paradoxical differences' concerning 'what consumers value and which values they are prepared to actually pay for', which 'varies across countries, categories and segments.' But there is no doubt that: the largest segment of consumers (31%) is formed by 'Affordability first' (when the product price is low enough to have enough money to buy it); sustainability is seen through a different lens, and its priorities differ by country; there are generational differences; when purchasing sustainable products, consumer considerations differ by product category; globally, consumers have high expectations from companies' and brands' involvement in a sustainable future, assuming responsibility for ensuring transparency.

A recent global research study of more than 1000 technology marketing and PR decision-makers (across the U.S., Germany, U.K., Singapore, and China) released by Allison+Partners, San Francisco, CA, USA [123] revealed the disconnection between perception and reality (despite consumers' higher levels of purchasing decisions based on brand strength, mission, and values) caused by various aspects, such as major disparities between the messages' orchestrators and creators and those on the frontlines; that brand-led storylines are not receiving immediate attention and action when sales are getting involved; and that companies are not providing more authentic storytelling across all relevant markets (messages and media supported by technology used by marketers to communicate suffering from misalignment, exposure to unnecessary risk, channel inconsistency, etc.).

The second annual IBM, Armonk, NY, USA and National Retail Federation, Washington, DC, USA, global consumer retail study (there were 19,103 consumers surveyed across 28 countries in Fall 2021), entitled 'Consumers want it all: Hybrid shopping, sustainability

and purpose-driven brands' (and conducted by the IBM Institute for Business Value) has just been published [124]. This study reveals significant aspects, such as that sustainability is important, but fewer than 1/3 of consumers said that sustainable products represented more than half of their last purchase; that consumers shop via mobile apps (50%) and through websites (42%), but the majority still shop in store (65%), with younger generations being more likely to prefer hybrid shopping, as in the case of Generation Z (in-store shopping, 37%; hybrid shopping, 36%; online shopping, 28%); that sustainability-driven consumers are likely to be purpose-driven, while purpose-driven consumers are more likely (75% vs. 59%) to do research online, to buy more than what is on their shopping list (64% vs. 52%), to receive inspiration from social media posts (61% vs. 39%), and to introduce the brand or product to friends and family (58% vs. 36%); and that big retailers are significantly driving value with Artificial Intelligence (AI).

2.4.2. Continuous Acceleration and Expansion of the Chinese Consumers' Trends Existing Earlier in Time, Based on Improving Consumer Experience

In November 2015, a book entitled *China* was launched in Romania. The author of the first chapter of this book posted a newsletter article ("A book to understand Modern China") on the blog of the Romanian Distribution Committee Magazine, Bucharest, Romania [125]. This first chapter is subdivided into the following sections: Memories marked by a smile, the shortest path between friends; Goodwill as a fundamental value and cultural renaissance in the 21st century articulated on rapid economic development. A new economic development model; The Chinese model, the first place in terms of ability to stimulate the economy. China's strategy to build a harmonious society internally and a harmonious world internationally; Towards a sustainable model that balances growth with social harmony and innovation with environmental protection. A more profound ontology of social entrepreneurship; Evolving economic profiles of Chinese consumers, the most important trend in the development of the Chinese market. The revolution of sales of goods online; Forces which forge the future of China, and building the necessary skills to move forward. Challenges for scientific researchers in the field of international and comparative political economy; Instead of conclusions, also a smile, thinking about the wisdom of promoting consensus for a harmonious world.

The COVID-19 crisis impacted from the very beginning the shopping habits not only of Chinese consumers', but also of consumers and brands globally. Beyond the immediately obvious need for increased consumer and retailer employee protection, there was a rapid awareness of the importance of valorizing digital transformation, taking into account that the impact of the unprecedented crisis on geographies, channels, and categories was confirmed by retailers' POS data. Both a digital-first approach and agile organizational capabilities were required, as was increasing consumers' digital end-to-end engagement, increasing the transformation of people's capabilities and ways of working and of technology, and delivering value for consumers who are changing their shopping habits [126]. Two more implications were added to those already underlined, namely, the need of a continuous alignment of retailers with consumer trends (healthy, local, and delivering value) and an increased agility and resilience of retailers' supply chain. According to Poh, Zipser, and Toriello [127], there was a continuous acceleration and amplification in the importance of consumer trends existing prior to the current crisis, which was faced with resilience and confidence, even optimism, with all these also being translated into consumers' spending.

As we showed earlier, scholars have recognized that, the most central enabler of circular business models being the consumer, the circular economy has become the primary framework to examine sustainability in practice, and the interest in circular economy solutions is expanding very quickly; there were important lessons identified resulting from the Chinese model of regional governance, which has gone beyond the large-scale demonstrations funded by EU's Horizon 2020 program, and is more coordinated than the experimentation occurring among EU, Maastricht, The Netherlands or OECD, Paris,

France member states; the new EU's Circular Economy Action Plan confirms that the EU will continue to lead the way toward a circular economy at the global level, one of the recent deliverables being the Global Alliance on Circular Economy and Resource Efficiency, launched in February 2021 with the UNEP, Nairobi, Kenya and in coordination with the UNIDO, Vienna, Austria. We have also seen earlier that today's consumers are fully embracing digital technology, by considering the experiences they have with other companies globally, using web and mobile apps to find information instantaneously, and pressuring companies to level up their experiences; that users change over time how they engage with a product or service, and business needs to change in response to users' expectations and feedback; that, to respond faster to the current crisis, McKinsey recommended that companies build an agile culture and adapt to the next normal in retail, considering the consumer experience imperative.

McKinsey also recently shared new crucial lessons to learn with regard to how China is performing versus other retail markets. A special edition of the China Consumer Report [128] provided consumer and retail companies with the necessary insights within the challenging current crisis environment. The research findings revealed significant aspects, such as that China is growing in importance both as a consumer market and as a source of capital and goods, and is having a considerable impact on global supply chain management; that the acceleration of several preexistent trends (digital tools becoming increasingly popular solutions; the increasing role of technology and agility; Chinese consumers, especially the young, becoming more prudent and health-conscious, seeking better quality and healthier options); how the Chinese consumers remain among the most optimistic in these trying times; how the key players in grocery retail must strategically move to keep pace with the digital innovation happening very rapidly; that both well-known mega platforms such as Alibaba, Hangzhou, China and Tencent, Shenzhen, China and new platforms such as TikTok/Douyin and Bilibili are becoming increasingly relevant and are determining a hyper-fragmentation of outlets for reaching consumers (the so-called 'dustification' of consumer attention, where attention is defined as meaningful engagement); that 50% percent of Chinese consumers' shopping interest, and 25% of their purchases, were driven by the time spent using social or content apps; the increasing number of active monthly users of key social commerce platforms such as Pinduoduo, Shanghai, China and Xingsheng Selected, Changsha, China, with these being identified as five major archetypes in China's social commerce (Social-first commerce; E-commerce platform with social marketing; Social discounter; Community buy/S2B2C; and Social DTC); how critical these uncertain times are becoming to developing end-to-end omnichannel capabilities; how the next engine of China's domestic consumption growth is represented by Generation Z (the cohort of digital native consumers born between 1996 and 2010, about 15% of China's population), who tend to outspend their budget and desire unique products and services, are relatively more loyal to brands, and compared to Generation Z in other countries are more used to omnichannel shopping experiences but prefer individual merchants on ecommerce platforms; and that as Chinese consumers are becoming increasingly mature and consumer packaged goods (CPG) companies need sustainable growth, McKinsey's representatives recommend CPG to achieve this through revenue growth management (RGM, based on deep insights into how and why Chinese shoppers purchase certain products) and the gradual implementation of a series of short- and longer-term measures.

2.4.3. China's Sustainable Future Is Significantly Challenging the Other Main Global Actors, and Not Only Them

Beyond well-known aspects—such as "Circular economy", "Ecological civilization", and "Beautiful China" as the key concepts of green China, one of the key pillars of China's green transformation has been technological innovation; the cornerstones of China's green manufacturing system that is rapidly taking shape: green factories, products, industrial parks, and supply chains—there is no doubt that increasing Chinese investments in future technologies and strategic bets for its sustainable future will significantly challenge the

other main global actors [129]. The Brookings Institution [130] made reference very recently to the agreement to perform a two-year project entitled “Global China: Assessing China’s Growing Role in the World”, which confirms the Brookings scholars’ preoccupation with the impact of China as a truly global actor on every region and major-issue area.

New Chinese studies confirmed the evolution with regard to Chinese consumers’ perception on sustainability [131]: a rising better understanding of the importance of sustainable consumption in supporting a sustainable living environment, a slightly greater awareness of sustainable consumption among women compared to men, and more attention to sustainable consumption being paid by young people compared to older consumers, while from the point of view of the proportion of awareness on sustainability, it is much lower in the first tiers compared to lower tiers (according to MP Weixin QQ com/WeChat, a Chinese multi-purpose instant messaging, social media, and mobile payment app developed by Tencent, Shenzhen, China); the strongest sustainable consumption ability is possessed by Chinese consumers aged 30 to 49, but the most interest and awareness in this consumption is shown by young people between ages 20 and 29 (according to China Chain store and Franchise Association); more and more Chinese consumers are following the concept of “less is more” (rethinking how much they buy), staying away from fast fashion (which has a large environmental footprint for its production and disposal); and as knowledge is scarce, an essential role in educating Chinese consumers is played by sustainability-conscious Chinese key opinion leaders (KOLs, social media influencers having large numbers of followers on sites such as MP Weixin QQ com/WeChat, TikTok/Douyin, Bilibili—China’s YouTube, Xiaohongshu/Little Red Book—China’s Instagram).

On the other hand, new research from The Silk Initiative [132] with regard to what sustainability means to Chinese consumers started from the assertion that global consumers are increasingly acknowledging the impact of their personal consumption on both society and the environment, and are becoming more and more conscious about purchasing products which are environmentally or ethically sustainable. The edition of the TSI Navigator™ Compass published in October 2021 (a TSI’s dynamic data-intelligence platform collecting, analyzing, and visualizing the food and beverage landscape in multiple Asian markets) revealed significant findings [133], such as: how sustainability, as a purchase driver, is still nascent (despite the fact that most consumers agree on the importance of sustainability-related issues), with quality, taste, and safety continuing to be the most critical to conversion; that four main eco-segments were identified, namely, eco-unfamiliar, eco-ambivalent, eco-adopters, and eco-leaders (ranging from having very little knowledge of sustainability to waving the green flag of eco-consciousness); that cost is the most obvious barrier to eco-adoption, followed by a general lack of education and effective communication concerning sustainability, as well as an image problem associated with the fact that sustainable products negatively impact the taste (despite their healthy and safe characteristics) of the food and beverage product; that eco-adoption is driven by consumers’ place in society, personal health and wellness, and lifestyle; that it is important for brands to provide easy-to-understand claims with direct benefits to consumers, considering the role of: packaging (the first thing consumers are going to see about a product when scanning supermarket shelves), the brand’s right emotional space (sustainable products being considered more sincere and loyal to their consumers), creative, impactful and memorable campaigns (engaging consumers with sustainability messaging with the help of a mix of virtual activities, interactive displays, and offline events).

With regard to packaging, it is worth mentioning within this framework that: the above-mentioned study by Accenture and WWF Singapore, Singapore showed that top consumer demands from e-commerce platforms are less packaging and reverse logistics, while in choosing sustainable disposal options in everyday shopping over 30% of consumers consider sustainable ingredients and packaging as top factors; the above-mentioned exploratory study on Romanian consumers’ behavior concerning sustainable packaging [70] revealed not only that an important factor preventing Romanian consumers from adopting sustainable behavior is the lack of information (on environmental packaging, which has

a lower cost due to recycling and is more resistant over time), but also that Romanian consumers' willingness to pay more is due to their awareness of the impact of packaging used on the environment and their assumed responsibility for protecting it. On the other hand, on the occasion of the recent Business & Academic Partnership 2021, The 12th Supply Chain Management for Efficient Consumer Response Conference, SCM 4 ECR (an annual event jointly organized in Romania, with the 2021 theme being "Building supply and demand network resilience through digital transformation"), reference was made also to the environmental problems caused by excess packaging and the impact of packaging waste in the entire supply chain. This reference was made in the context in which The Consumer Goods Forum CGF, Paris (the Global Network Serving Shopper & Consumer Needs) launched in April 2021 an excess-packaging survey focused on total supply chain brick and mortar as well as growing online business, and had as title Drivers: Environmental Impact and Cost Reduction [134]. As shown very recently by The Consumer Goods Forum (CGF): packaging needs to become part of a circular economy [135]; the 2022 CGF China Day, which will take place in Shanghai on 17–18 February 2022, is expected to share both cutting-edge insights and positive-change best practices in food safety, health, sustainability, and the end-to-end value chain [136].

There are some similarities and differences between consumers in the three countries mentioned above. These aspects challenge us to further explore the cross-cultural context to identify some practical insights (for instance, as we will show below in the next sub-section, Romanian consumers said that they prefer to buy online from stores in China more than from stores in EU member states and the USA, while in the top foreign platforms preferred by Romanians AliExpress/Alibaba Group ranks second, in front of Amazon, Bellevue, WA, USA). There were also some other interesting evolutions in the Romanian retail market and not only there. For example, the largest Chinatown complex in Southeast Europe was opened in Romania in July 2011; a Business Review analysis in March 2020 identified China as the seventh trading partner of Romania [137]; in February 2021, Money Buzz! Europa (Money and Business News from Europe) made known that the Chinese retailer Mumuso, Shanghai, China (a fashion brand addressed to young people) opened its fourth mono-brand store in Romania [138]; China is recognized as the world's largest trader and manufacturer; and there is a relatively large number of sister cities (and sister counties) in Romania, such as Bucharest as the sister city of Beijing, and Constanța as the sister city of Shanghai, as well as four active Confucius Institutes [139].

Without a doubt, the business world is continuing to identify lessons to learn from China's experience in better mastering the crisis compared to other countries, and the fast-expanding Chinese retail market is considered a reference point in digital transformation while businesses are struggling to make themselves more sustainable.

Within a global consumer society reflecting consumers' global access to borderless supply and their need of trust as the most important sustainability factor influencing their purchasing on the one hand, and an underexplored contribution of sustainable consumer culture to brand equity on the other, more research is needed to shift consumers towards sustainable choices to make them consider sustainability when making a purchase and, when using and disposing of a product, favor those CPG companies and retailers that have, for instance, a positive approach towards environmental sustainability. It is required to first maintain sustainability and then to make it climb retailers' scale of priorities and connect retailers' sustainability agenda (including by fulfilling consumers' sustainability demands with new products and processes) with other strategic priorities such as supply chain disruptions, which play a key role in stalling globalization. Moreover, there is a complementarity of sustainability and digital technology if we consider, for instance: the possibility to unlock product data in a standardized way; the energy used at the level of a supply chain needing to be made more agile, including by avoiding risk; the impact of disruptive technologies such as artificial intelligence (used to identify trends in order to better understand and help consumers) on consumers' buying behavior and perceptions. It is important for retailers within this framework to address the challenge for

their sustainability agenda of clarifying how their need to translate consumers' uncertainty into trust (identifying risks associated with disruptive technologies and making them less severe) is influenced positively (more or less) both by consumers' willingness to change their shopping habits to reduce their environmental impact, and retailers' digital transformation to aid consumers to adopt more sustainable lifestyles and make informed choices in the omnichannel world.

2.5. The Romanian Retail Sector's Key Role in Sustainable Production and Consumption, and the Increasing Role of Sustainable Consumer Behavior in Romania

A market study by Flanders Investment & Trade [140] underlined that in terms of consumer potential Romania is the second market after Poland in Eastern Europe, and has a strategic location at the crossroads of three great markets (the EU, the CIS, and the Middle East), being a bridge between East and West for a market of 500 million consumers; there is hence great potential for trade. Focused on the e-commerce market in Romania, this study, launched in December 2020, made reference, among other aspects, to the Association of Big Retailers in Romania (AMRCR, Bucharest, Romania), to the Romanian Association of Online Stores (ARMO, Bucharest, Romania), and to the fact that Romania is also part of the International Market Place Network (IMN, Amsterdam, Noord-Holland, Nederland), including Emag Romania (the main Romanian player), Cdiscount France, ePrice Italy, and Real.de Germany. Other trends and opportunities were also revealed, such as: the expansion at the international level of local e-commerce major players, people's openness to global and international players, the expansion of logistics storage space (due to the increase in online sales and logistics optimization), the optimization of websites (consumers can easily access and shop by using their mobile device), and the development of fast delivery applications, etc.

The Romania—Market Overview by the US International Trade Administration [141–143] underlined the vast potential of the market (high-income mixed economy, high Human Development Index, skilled labor force, the largest electronics producer in Central and Eastern Europe/CEE) and its strategic location, as well as the fact that Romania, a leading destination in CEE for foreign direct investment, is ranked 12th in the European Union for total nominal GDP (and is the 7th largest when adjusted for purchasing power parity). From the point of view of distribution and sales channels, Romania's similarity to other European countries was highlighted with reference to wholesale, retail tiers, and support services (such as packaging, warehousing, and merchandising), which are considered fully developed. Also underlined were both the similarity to other European countries of the range of retail outlets (hypermarkets, supermarkets, cash and carry, department stores, specialty shops, gas station convenience stores, DIY shops, kiosks, street vendors, open-air markets, and wholesale centers) and the local retail market dominance in the Big Box segment by Carrefour, Cora, Kaufland, Lidl, and Mega Image on the one hand and in the cash-and-carry segment by Metro and Selgros on the other hand. With regard to Romania's e-commerce market (with the context favoring the adoption of e-commerce, which for 2021 is expected to increase by 20–30%), there were revealed various aspects, such as: that revenue was projected to reach USD 3208 million in 2021, with an expected annual growth rate (CAGR 2021–2025) of 9.20%, resulting in a projected market volume of USD 4562 million by 2025; that by 2025, the number of users is expected to amount to 10.6 million users; that in 2021, user penetration will be 48.1%, and it is expected to hit 56.7% by 2025; that the average revenue per user (ARPU) is expected to amount to USD 348.50; with a projected market volume of USD 1,542,551 million in 2021, with most revenue being generated in China; that an increasingly important role in the sales strategy has been gained by the social networks; that live shopping (according to Veranda Shop Online) will also develop, mainly for niche products; that for August 2021, the most visited of Romania's e-commerce and shopping websites was emag.ro, followed by olx.ro and compari.ro; that nearly 1/3 of Romanian consumers (according to an iSense Solutions study for GPeC) said that they prefer to buy online from stores in China (27%) rather than from

stores in EU member states (23%) and the USA (4%), while in the top foreign platforms preferred by Romanians AliExpress (Alibaba Group, Hangzhou, China) ranks second, in front of Amazon, Bellevue, WA, USA.

2.5.1. The Romanian Retail Market, an Important Market for Supermarket Chains

Step by step, Romanian retail market has become an important market for the large distribution chains [144]. CBRE (CB Richard Ellis, or CBRE, Dallas, Texas, USA; in 2021, Fortune named CBRE the Most Admired real estate company for the third year in a row; its ninth time on the list) underlined in 2015 that: in Romania, after the boom period of 2006–2008 (when the predominant business model was a franchisee operation) and the very difficult period during 2009–2013, the recovery showed its signs step by step, but the market continued to be polarized between dominant centers and secondary schemes; it is a real need for attaining a profound understanding of Romanian consumer behavior, the country being ranked in the 22nd position globally out of 67 markets in terms of attractiveness and future plans of retailers for expansion [145]. Tanase [146] showed that 2015 was one of growth for FMCG sales in major retailers, mostly due to their continuous investment and expansion, covering more and more retail formats (this evolution being made at the expense of small businesses in the traditional trade).

Romania recorded significant progress on the e-commerce market impacted by the champion Emag (Dante Group – Dante International SA, Bucharest, Romania) Marketplace, according to a report conducted by the Romanian Competition Authority in 2018 [147]. From the point of view of the cumulative segment of online sales and physical stores, the market leader Dante Group recorded a slight and continuous decline in its market share, while the challenger Altex Group, Voluntari, Romania, continuously recovered from the difference in the period 2013–2016, but at the level of the market shares of the main online retailers Altex maintained its leadership position, while Dante remained in second place. In 2016 some structural changes took place: PC Garage joined Dante group, while the platforms owned by Kelion and domo.ro platform joined the platforms group owned by Corsar. The above-mentioned report underlined among other aspects that according to data (collected on 10 December 2017) from Alexa.com (an Amazon.com company; it will be retired on 1 May 2022), Emag.ro was the only trading platform which entered the top 20 in popularity for the main online trading platforms (being outperformed only by sites belonging to foreign entities such as Google, YouTube, Facebook, Yahoo, etc.) on the basis of average daily traffic and number of pages visited (being followed the in top 100 by: altex.ro—ranked no. 24, pcgarage.ro—no. 38, cel.ro—no. 63, mediagalaxy.ro—no. 99 și flanco.ro—no. 100).

According to Colliers [148], both retailers' activity and expectations in Romania were affected by the COVID-19 crisis, including from the point of view of consumers' appetite for shopping. On the other hand, dramatic shift was recorded in Romanian consumers in favor of online shopping (but this trend was already visible prior to the pandemic) beginning with the first Romanian COVID-19 case [149], and a possible acceleration of the offline–online convergence in retail was also announced [150]. Research findings from Deloitte Romania, Bucharest, Romania, based on a Deloitte Romanian Consumer Trends questionnaire, highlighted how retailers were challenged to embrace new technology more quickly than they had planned, following the identified consumers' preferences: there was a predominance among the socially conscious shoppers in supporting local brands (55%), then the convenience seekers (33%) and the bargain hunters (7%), as well as the stockpilers (6%). Furthermore, a recent Romania Overview by Colliers [151] showed the intention of major FMCG chains to expand their e-sales business within the context of the shopping patterns changed by COVID-19.

Statista presented in July 2021 the major retail chains for food shopping in Romania in 2020, according to revenue [152]. The total number of retail chains in Romania (as of June 2021) was also presented by Statista [153]. On 12 January 2022, the Romanian Distribution Committee [154] presented the traditional Top Retailers of the Romanian

Market by Number of Stores (including all the stores operating by 31 December 2021), as shown in below (Figure 1).

Top Retailers of the Romanian Market by Number of Stores (2021)

Store Type	Nº	Name	Group	Year of entrance on the Romanian market	Number of stores (2021)*	
					Total**	Bucharest
Hypermarket	1	Kaufland	Schwarz	2005	147	17
	2	Carrefour	Hyparlo	2001	43	11
	3	Auchan	Adeo	2006	33	8
	4	Cora	Delhaize	2003	13	7
Cash & Carry	1	Metro	Metro	1996	30	5
	2	Selgros	Rewe	2000	23	4
Supermarket	1	Mega Image	Delhaize	1994	389	256
	2	Carrefour Market	Hyparlo	2008	184	16
Discount Supermarket	1	Lidl	Schwarz	2010	318	37
	2	Penny	Rewe	2001	301	35
Proximity Store	1	La Doi Pași	Metro	2012	1698	25
	2	Profi	MidEuropa	1995	1508	118
	3	Shop & Go	Delhaize	2012	516	396
	4	MyAuchan	Adeo	2017	125	28
	5	Carrefour Express	Hyparlo	2012	104	17
Do It Yourself	1	Dedeman	Dedeman	2002	54	7
	2	Brico Depot	Kingfisher	2013	36	7
	3	Leroy Merlin	Adeo	2012	19	4
	4	Hornbach	Hornbach	2007	8	3
Home & Deco	1	JYSK	JYSK Group	2007	51	14
	2	Mobexpert	Mobexpert	1993	26	4
	3	Ikea	Ikea	2007	2	2
Electronics	1	Flanco	Flanco Retail	1992	160	10
	2	Altex	Altex	1992	110	15
	3	Media Galaxy	Altex	2004	18	4

*Includes all the stores operating by 31th December 2021

**In each category (hypermarket, supermarket etc.) retailers are ordered according to their total number of stores

Figure 1. Top Retailers of the Romanian Market by Number of Stores (2021). Source: Romanian Distribution Committee, 2022 (work cited).

It is interesting to note that prior to the GPeC SUMMIT, November 2021, Bucharest, Romania (considered to be the most important e-commerce and digital marketing event in the region), GPeC provided information, among other things, about various subjects, for instance, that Romanians' trust in online stores has increased significantly from 32% in 2020 to 41% in 2021 (according to the "International eComm Pulse 2021" study by iSense Solutions for GPeC), showing how online shopping is becoming a common way to shop; that 20% of Romanians ordered online for the first time since the beginning of the pandemic, and 85% of those who buy online have expanded the range of products purchased online with at least one new category (according to a study conducted by Nielsen Norman Group, Fremont, CA, USA, in early 2021); that, compared to 2020, online commerce in Romania will increase in 2021 by approximately 15% (GPeC estimate, together with the main players), bringing the entire sector to approximately 6.5 billion euros generated by online sales, compared to 5.6 billion euros at the end of last year [155].

2.5.2. Romanian Green Consumers and Implementation of Sustainable Development Policies on the Romanian Retail Market

The key role played by the retail sector in sustainable production (improving green supply chains, taking into account retailers' impact linked to store and warehouse operations and logistics, etc.) and consumption (improving retailers' own environmental performance, promoting the purchase of green products, and better informing consumers) was recognized in the European Commission's proposal for a Sustainable Consumption and Production (SCP) Action Plan in July 2008 [156]. Despite this fact, further research on the sites (non-updated with the latest information) of the Romanian retail companies (belonging to international groups) revealed that only six (from 11 selected) companies have some (relatively low) concerns about the implementation of sustainable development policies, mainly related to corporate social responsibility and environmental protection, and only sporadic actions with regard to raise awareness of consumers and producers have been taken [157]. Dabija and Pop [158]. They also underlined the increase of retailers' green marketing-specific actions undertaken in the last few years, valuing more and more the inclusion of sustainability concepts and being ready to intervene in their target segments' environmentally friendly education.

Concerning the Romanian green consumers, other research findings published in 2015 noted their education and buying power (with retail stores frequented by better-off shoppers being identified as the most promising outlets for green products appealing to these discerning green customers). The authors highlighted the need of continuing to increase green marketing practices by considering both consumers' income and information in helping them choose green products [159]. Next year, the results of the fourth of Romania's top supermarkets surveys (11 retailers: Auchan, Billa, Carrefour, Cora, Kaufland, Lidl, Mega Image, Metro, Profi, Penny Market, and Selgros) conducted by the World Wildlife Fund (WWF), Bucharest, Romania (introduced in 2012, the WWF Retailer Scorecard annual survey assesses retailers' environmental performance by analyzing their environmental policies and the availability of certified products on retailers' shelves) showed only still small improvements (with only Kaufland obtaining half of the maximum score, followed by Auchan, Carrefour, Mega Image, and Billa, which scored above 40%, while Profi, Lidl, Cora, Penny Market, Metro, and Selgros obtained much lower scores). The few steps in the right direction need to be continued in accordance with both changing consumer behavior and the introduction of a new business model based on the inclusion of sustainability [160].

Dabija, Bejan, and Grant [161] explored deeply the impact of consumers' green behavior on green loyalty on the Romanian retail market, providing a good analysis in four retail formats (based on consumption patterns, shopping habits, and shopping behaviors, and demonstrating empirically some significant differences in the generation of consumers' green loyalty for these retail formats). Romanian consumers are in general increasingly aware of the need to adopt green behavior. The study also highlighted the combined effects on green loyalty in retail of green behavior, responsible consumption, and predisposition for environmental protection, without neglecting to suggest, among future research directions in building green loyalty, the need to analyze other retail-specific elements such as product assortment, ambience, personnel, etc. Dabija, Bejan, and Dinu [162] showed the connection between Generation Z's sustainable behavior and their preferences, attitudes, and reasons in choosing those retailers that intend strongly to implement green and sustainable offers. Generation Z is greener, sustainability-oriented, and tech-savvy, and retailers need to reflect, adopt, and implement green strategies accordingly. While Dabija, Bejan, and Puscas [163] investigated Generation Z (who are more concerned about environmental protection actions and are keener to adopt green products), their research findings indicated the respondents' favorability toward retailers' sustainability orientation (those with useful and proactive contributions to both resource preservation and environmental protection), including looking after employees' welfare and being involved in their local communities.

In the last few years, there was a significant evolution in preoccupations with circular economy, sustainability, and sustainable development on the Romanian retail market.

For instance, the second sustainability report by Kaufland [164], which covered the 2017 financial year (1 March 2017–28 February 2018), underlined that sustainability is essential to how they do business, with its key impact areas being mainly associated with 5 of the 17 UN SDG goals (hunger, well-being, education, economic growth, and sustainable consumption and production). This also means being involved, including in the largest national ecological education campaign (Let’s Get Green!), a project organized by Let’s Do It, Romania! (LIDR) in partnership with Kaufland Romania. In October 2020 the Environmental Manager at Carrefour Romania spoke, for example, about their packaging policy (including how their own brand products are packaged) and their circular economy project “We value plastic”, as well as about consumers’ education [165].

The Act For Good initiative, launched in 2021 by Carrefour, allowed shoppers to receive points (a unique shopper’s code could be activated in any Carrefour supermarket at the cash register by downloading the Carrefour app) and to benefit from a personalized experience with social impact in just one place [166]. On 24 March 2021, Lidl Romania submitted its third sustainability report to the Secretary-General of the United Nations as an indication of a full embrace by Lidl Romania of the UN Global Compact and its principles and its continuing efforts to contribute to the UN SDGs and related targets [167]. In this third sustainability report, Lidl Romania (Reporting period: 1 March 2019–29 February 2020) confirmed key aspects of its sustainability strategy, including recyclability (that all of Lidl own-brand product packaging, approximately 80% of its product range, would be recyclable in the highest possible proportion by 2025) and organic products according to their customers’ preferences [168].

In November 2021, Auchan Romania launched its first Sustainability Report [169]. Auchan, known as a supporter of the circular economy, created a Textile Collection and Recycling Project. On the other hand, PENNY discounter is continuing its expansion plan in Romania, and started a big program of certification, BREEAM (Building Research Establishment’s Environmental Assessment Method), for all its stores currently under construction [170].

There is a lack of studies concerning the particular configuration of the Romanian retail sector, which may have an impact upon the study’s generalizability, by perceiving at least two aspects: as an EU member country, Romania has a strategic location at the crossroads of three great markets (the EU, the CIS, and the Middle East); it is a leading destination in CEE for foreign direct investment and is recognized for the similarities of its distribution and sales channels, the range of its retail outlets, and the local retail market dominance in the Big Box segment by reputed major retailers; Romania’s e-commerce market is continuing to undergo spectacular evolution, including from the point of view of the long-standing and memorable traditional relationship between Romania and China, which was confirmed also more recently by Romanian consumers, who prefer to buy online from stores in China rather than from stores in EU member states and the USA, while in the top foreign platforms preferred by Romanians AliExpress/Alibaba Group ranks second, in front of the e-commerce giant Amazon.

The above-mentioned new information regarding the traditional Top Retailers of the Romanian Market by Number of Stores was added in the context of ongoing discussions at the level of the established ‘Academic & Business Partnership’ with: The Consumer Goods Forum, E2E Value Chain (Paris); the European Retail Academy (Roesrath, Germany); Professor John L. Stanton, Chairman and Professor of Food Marketing, St. Joseph’s University Philadelphia (Philadelphia, PA, USA), Founder and Editor Journal of Food Product Marketing, U.S. Private Label Manufacturers Assoc. Hall of Fame, and European Retail Academy Hall of Fame; the Romanian Distribution Committee (organizer of the above-mentioned 24th International Congress of the International Association of the Distributive Trade); the Romanian Association for Consumers’ Protection (APC Romania), Valahia University of Targoviste, Targoviste, Romania, University of Medicine and Pharmacy (UMF) ‘Carol Davila’ Bucharest, Bucharest Academy of Economic Studies, Bucharest, Romania, etc.; and (other) foreign universities involved in the Academic & Business Partnership.

3. Hypothesis Development

Our research hypotheses were developed by:

- (a) Considering existing evidence: the practitioner experience mentioned earlier, the literature review (including gaps identified by us and presented in each area of the literature), as well as our own prior work. With regard to our prior recent work, it is worth remembering the aforementioned research on Romanian consumers' perceptions of Artificial Intelligence [29] and on retailers' need to become and remain consumers' trusted advisors and agile to consumers' changing behaviors in the current VUCA time more than ever [28]. It is also important to consider how necessary it is to take into account how and when to assess consumers' satisfaction on the basis of comparisons between actual purchases and preset standards and expectations, considering the effect–effort relationship or the purchases' performance [171]. And that within the context in which: a Big Data analysis of consumer satisfaction following the impact of the COVID-19 pandemic on the customer end of retail supply chains in a main investing EU country in Romania revealed a general and significant decline in consumer satisfaction [172]; the relationship between satisfaction and loyalty can occur through more or less important mediators, such as perceived switching costs or perceived lack of attractiveness of alternative offerings [173]; the choices of today's consumers, expanded by the mix of traditional and digital marketing, are putting pressures on both retailers and their suppliers to better drive consumers' loyalty by building better brand partnerships in order to cross-share more effectively consumers' information within their recently disrupted supply chains, increase consumers' engagement and connection, and improve their experience based on a deeper understanding of consumer behavior through richer data clarifying consumers' value [174]. It is interesting to note that the above-mentioned second annual IBM, Armonk, NY, USA and US National Retail Federation, Washington, DC, global consumer retail study published in January 2022 confirmed what we revealed in our aforementioned research [29] with regard to the role of AI in the way retailers can significantly drive value.
- (b) Using reasoning to deduce what will happen in our specific context of interest: by identifying our problem of interest with regard to shifts in sustainable consumer behavior and retailers' need for deep consumer insights in their agile adaptation, while enabling sustainable business models; determining the significance of this problem (the extent to which consumers will benefit from our findings; the extent to which the findings will be applicable to retail business practice and consumer education, etc.); determining the feasibility of studying the significant problem of interest.

The research was based on six hypotheses (H1–H6) shown below, “Consumers' willingness to change their shopping habits to reduce environmental impact” (“W”, a single exogenous variable) being seen as the input construct (allowing the statement of the hypothesis H1 below), considering our focus on “Retailers' digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world” (“D”), through the facilitating function of “Retailers' increased concentration on responsibly answering to sustainability as a personal value of consumers changing their behavior” (“R”, a mediating variable allowing the statement of the hypothesis H4 below). As shown in Figure 2 below, “Retailers' increased concentration on responsibly answering to sustainability as a personal value of consumers changing their behavior” (“R”):

- Depends on “Retailers' sustainability agenda, including by fulfilling consumers' sustainability demands with new products and processes” (“S”, an endogenous variable allowing the statements of the hypotheses H2 and H3 below), the “S” construct appearing as a moderating factor with regard to the “R” and “D” constructs;
- Impacts “Retailers' digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world” (“D”), being a mediating factor between the “W” and “D” constructs.

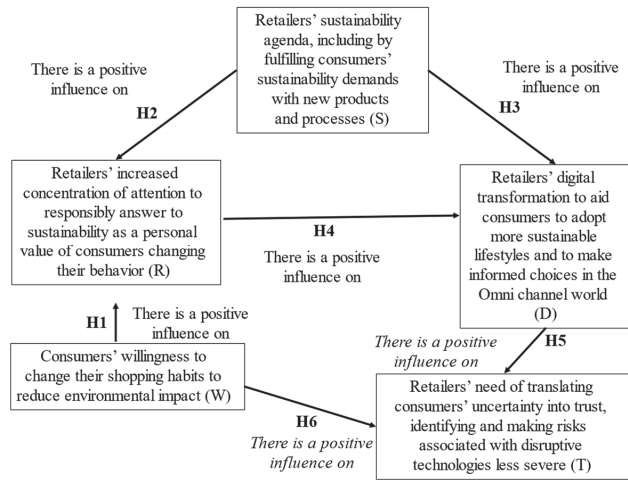


Figure 2. The theoretical research model. (Source: Own research, based on the literature).

The theoretical research model designed on the basis of a valuable quantitative model [175] allowed for the exploration of the causal relationships between the above-mentioned main constructs identified (to which was added a fifth construct within the challenging context of the digital disruption impacting consumers' perceptions, attitudes, intentions, behavior, and experience: "Retailers' need to translate consumers' uncertainty into trust, identifying risks associated with disruptive technologies and making them less severe" (T). This above-mentioned research model designed in accordance with the theory of structural equation modeling (SEM) reflects the following hypothesized influences shown by the SEM's path diagram:

Hypothesis 1 (H1). "Consumers' willingness to change their shopping habits to reduce environmental impact" ("W") has a positive influence on "Retailers' increased concentration on responsibly answering to sustainability as a personal value of consumers changing their behavior" ("R").

Hypothesis 2 (H2). "Retailers' sustainability agenda, including by fulfilling consumers' sustainability demands with new products and processes" ("S") has a positive influence on "Retailers' increased concentration on responsibly answering to sustainability as a personal value of consumers changing their behavior" ("R").

Hypothesis 3 (H3). "Retailers' sustainability agenda, including by fulfilling consumers' sustainability demands with new products and processes" ("S") has a positive influence on "Retailers' digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world" ("D").

Hypothesis 4 (H4). "Retailers' increased concentration on responsibly answering to sustainability as a personal value of consumers changing their behavior" ("R") has a positive influence on "Retailers' digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world" ("D").

Hypothesis 5 (H5). "Retailers' digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world" ("D") has a positive influence on "Retailers' need to translate consumers' uncertainty into trust, identifying risks associated with disruptive technologies and making them less severe" ("T").

Hypothesis 6 (H6). Consumers' willingness to change their shopping habits to reduce environmental impact ("W") has a positive influence on Retailers' need to translate consumers' uncertainty into trust, identifying risks associated with disruptive technologies and making them less severe ("T").

4. Research Methods

Based on the above-mentioned comprehensive literature review, a quantitative study was employed to investigate the major shifts in sustainable consumer behavior on the Romanian retail market within the context of the Green European Deal, and retailers' priorities in agilely adapting to these significant evolutions. A structural equation model and an associated "Sustainable Consumer Behaviour on the Romanian Retail Market Questionnaire" were used. The data collection (on the basis of this questionnaire) in the quantitative study was performed via a survey conducted in a supermarket chain (data collected face-to-face inside the supermarket) in Romania from 7 June 2021 to 28 June 2021. In this study, we took into account 1005 respondents, all customers of the supermarket chain, the age structure being presented in Table 1 below. The sampling methodology was a random one, a mixture between the systematic approach (every 20th person) and a stratified approach (gender structures). Thus, the study has a high legality for this well-defined group: "Customers in Romania who do their shopping physically in the stores of the analyzed supermarket chain" (for reasons related to privacy, we cannot disclose the name of the store chain; to ensure the anonymity of the respondents, no personal identification data were collected). The research tool has a high level of validity and was effective in measuring major changes in the sustainable behavior of consumers (the defined group), as well as the way in which retailers with physical store chains adapted. The questionnaire consisted of a set of 38 questions answered by the above-mentioned sample of 1005 respondents. As shown in Table 1 below, the average time spent to answer the questions was 8.30 min. As for the type of questions, closed questions were used, and the type of data sought (to be obtained from these closed questions) was from factual, opinion, and behavioral questions.

Table 1. Sample Structure (research).

Romania	Younger Than 18	18–25 Years Old	26–35 Years Old	36–45 Years Old	46–55 Years Old	56–65 Years Old	66 Years or Older	Total
Male	10	135	114	149	54	28	3	493
Female	8	143	127	153	51	33	7	522
Total	18	278	241	302	105	61	10	1015

Participation was voluntary and the confidentiality of the responses was ensured. All respondents answered the 38 questions and went through all the testing phases.

The generation of the items was based on a combination of inductive and deductive strategies, and involved reviewing the literature and our own previous research as well as conducting interviews with stakeholders (experts and clients). We generated an initial set of approximately 100 items, focusing on their environmental impact habits, retail trends and sustainability agenda, their digital transformations, and associated risks, as reflected in the cited studies. In parallel, we conducted focus group interviews with top and middle management (10 people), commercial workers (20 people) from four (4) companies in Romania, and retail clients (20 people). We had an approximately equal distribution by sex, and the respondents were between 27 and 52 years old, with a median of 38 years. Participants were asked about the topics listed above and were asked to come up with a concrete example of daily activities, the purpose being not only to evaluate the applicability of the constructs, but also to identify directions that were not captured in the literature. Following these phases, new elements were identified regarding the risks associated with disruptive technologies, but also regarding the sustainability demands from customers.

Thus, an additional number of over 30 items was generated, bringing the total number to 130.

The measuring tool for major changes in sustainable consumer behavior (the defined group), as well as the way in which retailers with physical store chains adapt, was analyzed by five professors from different fields belonging to the departments of management-marketing, economics, and sociology. The research verification form was analyzed using the “face validity technique”, and the feedback obtained was used to improve the tool. Improvements were made to the selection of items (deletion and addition), unclear terms, ambiguous wording, etc. Following this process, we removed about 50 items, reducing the cart to 80. Next, a group of three university assistants from the same departments, together with Master’s students, formed a new jury to validate the content for a new selection, but also to assign the items to the relevant variables. In this new phase, another 30 items were removed and another 20 underwent major changes. These 50 items were revised by the authors once again in order to adapt the theoretical content and make sure that it reflects exactly the defined dimensions. All these steps helped us to make sure that the items modified and retained for empirical analysis were clear, respecting of the hypotheses, and consistent. We dropped another number of items, leaving 38. All items were assigned a 5-step Likert scale: W (between 1—strong disagreement, and 5—strong agreement); R, S, D, T (Yes, Partly true, Neutral, Rather not, and No). For the next step, we ran a pilot test involving 30 respondents (these 30 respondents were not included in the final study; they are not among the 1005 respondents on whom the study is based). We thus aimed to increase the level of stability and internal consistency of the instrument. The 30 respondents provided additional feedback on the “face validity” process, marking some errors, elements less known to those in academia, but also other suggestions aimed at increasing the quality of the tool. The response time was also measured, and certain questions were reworded to shorten the time taken to complete the questionnaire. Subsequently, the reliability of the instrument was measured using Alpha Cronbach. The Cronbach Alpha value was greater than 0.6 for each construct and was considered acceptable. The final form is presented in Table 2 below.

Table 2. The latent variables and related items.

Consumers’ Willingness to Change Their Shopping Habits to Reduce Environmental Impact (W)	W1	When choosing a brand, are you looking for specific attributes which are important to you?
	W2	Would you rather select brands based on how well they align with your personal values, such as sustainability, changing your behavior accordingly (purpose-driven consumers) or based on price and convenience (value-driven consumers)?
	W3	Are you shopping in the so-called (by Google and Forrester, 2015) micro-moments (shopping while doing something else, turning to a device like a smartphone, making decisions and shaping preferences)?
	W4	Are you willing to change your shopping habits to reduce environmental impact?
	W5	Do you think that sustainability is important for consumers in Romania, and that there are lifestyle changes to address this challenge?
	W6	Do you think there has been a change in your attitude as a consumer in direct and sustainable response to a newly appreciated risk?
	W7	Do you think that there is a gap between your purchasing attitude (encouraged by the above-mentioned awareness) and your current buying behavior as a responsible consumer (considering the different individual, social and situational factors influencing your decision process)?

Table 2. Cont.

Retailers' Increased Concentration on Responsibly Answering to Sustainability as a Personal Value of Consumers Changing Their Behavior (R)	R1	Do you agree with the Circular Economy Action Plan (CEAP, adopted by the European Commission in March 2020, as one of the main building blocks of the European Green Deal, Europe's new agenda for sustainable growth), which ensures the adoption of the new sustainable model by businesses, consumers, entrepreneurs, and public authorities?
	R2	Do you agree with the European Green Deal (EGD) for the European Union (EU) proposed for the EU and its citizens by the European Commission (Communication and Roadmap on the European Green Deal, committing to climate neutrality by 2050) in December 2019 (before the start of the COVID-19 pandemic) and aimed at increasing the efficient use of resources by moving to a clean and circular economy, stopping climate change, and reducing pollution?
	R3	Do you agree with the opinion of the European Commission that the European Green Deal is also seen as a lifeline from the COVID-19 pandemic?
	R4	Do you agree that the European Green Deal should also take into account the "2030 Agenda for Sustainable Development" (which includes 17 Sustainable Development Goals/SDGs) adopted by the United Nations (UN) in 2015 as a global plan for sustainability, so as to meet the needs of current generations without compromising those of future generations?
	R5	Do you agree with Japan's initiative known as "Society 5.0" in which smart technologies are to support sustainable development? "Society 5.0" (next level after the current Information Society, a policy for a data-driven society promoted by the digital revolution) has been officially defined as "A human-centered society that balances economic advancement with the resolution of social problems by a system that highly integrates cyberspace (AI, Big Data) and physical space"?
	R6	Did you know that consumer products are the largest source of environmental impact in the modern world, contributing to climate change, destroying widespread natural resources and ecosystems, exposing people to hazardous chemicals, and filling the ocean and landfills around the globe?
Retailers' Sustainability Agenda, Including by Fulfilling Consumers' Sustainability Demands with New Products and Processes (S)	S1	Are you as a shopper expecting brands to offer products and services both with eco-friendliness in mind and for the right price?
	S2	Did you notice any preoccupations of the supermarket chain (or of some supermarket chains) which can be considered related to the European Green Deal?
	S3	Do you think that there is a need for improved promotion with regard to the three pillars of sustainable development (economic, social, and environmental)?
	S4	If you will choose a brand with sustainability in mind, will you do research before purchasing it, wanting assurances?
	S5	Do you think that the supermarket chain generates your awareness of consequences of sustainable shopping through better communication about sustainability (such as rational advertising with regard to its sustainability efforts or the use of emotions in motivating consumers' shift towards sustainable behavior and reward programs mixed with communication in social media to increase green sales) and its practice of Corporate Social Responsibility (thanks to an assortment of sustainable products with a socially and environmentally compatible supply chain)?

Table 2. Cont.

	S6	Do you think that the supermarket chain is increasing transparency in its supply chain by integrating environmental, social, and governance (ESG) requirements into procurement policies?
	D1	Was the source of information for what you noticed more from social networks and less from classic advertising spots?
	D2	Was access to the source of information (for those 816 respondents, from 1015, who noticed preoccupations of the supermarket chain related to the European Green Deal) provided by marketing messages influencing the purchase received on mobile devices?
	D3	Do you think that the COVID-19 pandemic has changed fundamentally the supermarket chain's way of engaging consumers by offering so-called "phygital" experiences?
	D4	Do you think that the supermarket chain takes into account consumers' evolving perceptions of sustainable-product efficacy (in accordance with their environmental values) and is struggling to stimulate their perceptions of the company as investing in sustainability, including in partnerships with suppliers developing sustainable products (by making technology investments)?
Retailers' Digital Transformation to Aid Consumers to Adopt More Sustainable Lifestyles and to Make Informed Choices in the Omnichannel World (D)	D5	Do you think that the supermarket chain is improving its approach with regard to e-commerce platforms, home delivery services, and take-back systems (as key value factors), in terms of the efficiency, safety, and sustainability of supply chain management, distribution systems, and the use and disposal of packaging?
		Do you think that, as an expression of its responsibility for the environmental and health impact of their products and operations, the supermarket chain can help shoppers make sustainable choices by using their online marketplace to provide more in-depth education with regard to the everyday products' impact on the environment and shoppers' health?
	D7	Do you think that the supermarket chain could use an e-commerce platform to attract and engage the conscious consumer who wants to know more about the impact of a product on the environment and health (in addition to the recourse by the supermarket chain to the use of e-mail, social networks, online promotions, etc.)?
	D8	Do you think that the supermarket chain could use the e-commerce channel to provide new opportunities for circular consumption (for new business models which extend the product life cycle, such as renting, repurchasing, and reselling)?
	D9	Do you think that the supermarket chain has improved the customer-oriented systems (such as websites or applications) so that its customers are stimulated to adopt more sustainable lifestyles and make informed choices?
	D10	Coming back to the channel of e-commerce used by the supermarket chain, do you think that e-commerce can play a role in driving the green economic recovery from the COVID-19 pandemic while addressing climate change?

Table 2. Cont.

Retailers' Need to Translate Consumers' Uncertainty Into Trust, Identifying Risks Associated with Disruptive Technologies and Making Them Less Severe (T)	T1	As a consumer, could you say that you perceive a certain inability to predict to what extent the supermarket chain can help shoppers make sustainable choices or strengthen their sustainable consumption routines?
	T2	As a consumer, would you say that, perceiving the above-mentioned inability, you take the risk of not accurately predicting the outcome of investments made by the supermarket chain in sustainability, including in partnerships with suppliers who develop sustainable products (by investing in technology)?
	T3	Do you think that the supermarket chain could take a strategic decision to synchronize their innovation activity (through investments in sustainability, new technologies, digital transformation, etc.) in the context of the COVID-19 pandemic so that, within the competitive battle on the relevant market with other supermarket chains (which reduce investments of this kind), it can obtain the first-mover advantage?
	T4	Within the context of the COVID-19 pandemic, the supermarket chain faces continual change in the direction needed to deal with the complex situation. Do you think that in its management of uncertainty the supermarket chain you frequent has the capability to act for improvements in the necessary directions (costs improvement, performance, confidence in achieving goals)?
	T5	As a consumer, would you say that you are averse to uncertainty with regard to the result of investments in sustainability made by the supermarket chain (prior experiences or beliefs influencing your interpretation of forecasts and predictions)?
	T6	Assuming that you are averse to uncertainty with regard to the result of investments in sustainability made by the supermarket chain, would you also say that, in the case of such uncertainty, you feel anxious?
	T7	In order to maintain relevance and stay competitive, the supermarket chain, like any business today, needs to consider the digital readiness of its workforce to transition into digitized workflows that are enabled by software and technology. In your opinion, is the supermarket chain facing this challenge?
	T8	It was demonstrated that, within the context of the COVID-19 pandemic, digitization is crucial to a company's survival. Do you think that the supermarket chain has identified ways that digital transformation can aid its customers to adopt more sustainable lifestyles and to make informed choices?
	T9	Recent research highlights companies' need to translate uncertainty into confidence, ensuring differentiation on this basis, identifying risks and making them less severe or painful (including those associated with emerging technologies, and taking advantage of these technologies to optimize their risk function), and turning digital risks into competitive advantage to activate digital trust. Do you think that the supermarket chain is building a digital framework which can deliver sustainable value from risk and transform consumers into digitally trusted partners?

5. Results and Discussions

Once the six hypotheses from the model presented above were stated, we resorted to the survey method, based on the questionnaire. We had five latent variables: W, R, S, D, T, and 38 related items are described in the above Table 2. In Table 3 below the means and the standard deviations (SD = standard deviation) for the variables included in the

study are presented. For the analysis, we used both the R and R-studio software package, and the Amos software package from IBM. We used a series of indicators to determine the validity of the model, such as the coefficient of determination—CD, the standardized root mean squared residual—SRMR, the root mean square error of approximation (RMSEA), the non-normed fit Tucker–Lewis index—TLI, the goodness of fit index—GFI, the adjusted goodness of fit index—AGFI, and the comparative fit index—CFI.

Table 3. The mean and the standard deviations for the variables included in the study.

		MEAN	SD		MEAN	SD	
W	W1	3.759606	1.477425	D	D1	3.568627	1.716809
	W2	2.519212	1.615194		D2	2.746798	1.513231
	W3	3.809852	1.503547		D3	4.210837	1.431155
	W4	3.928079	1.510564		D4	3.929064	1.596623
	W5	3.91133	1.511305		D5	4.212808	1.323447
	W6	4.131034	1.370142		D6	4.223645	1.394633
	W7	3.827586	1.558468		D7	4.203941	1.301942
		MEAN	SD	D8	4.208867	1.363703	
R	R1	3.358621	1.71588	D9	3.846305	1.712589	
	R2	3.364532	1.703669	D10	3.835468	1.610959	
	R4	3.325123	1.690765		MEAN	SD	
	R5	2.881773	1.721145	T1	3.836453	1.740812	
	R6	3.661084	1.777964	T2	3.850246	1.607195	
			MEAN	SD	T3	3.844335	1.703751
S	S1	4.60197	0.882213	T	T4	3.854187	1.661853
	S2	4.212808	1.365261		T5	3.849261	1.69054
	S3	4.072906	1.510843		T6	3.833498	1.59414
	S4	3.660099	1.745587		T7	3.84532	1.685509
	S5	3.84532	1.685509		T8	3.847291	1.626133
	S6	3.848276	1.647613		T9	3.862069	1.586024

The Latent Variables

W. “Consumers’ willingness to change their shopping habits to reduce environmental impact” was evaluated on a Likert scale with five levels, between 1 (strong disagreement) and 5 (strong agreement). For this, the survey participants answered seven questions: W1–W7. The higher the values of each question, the greater the availability of consumers to changing their shopping habits. For these items, the lowest score was 2.519 for W2, which indicates a resistance to consumer change, when we take into account the factors of convenience and especially price, which would rather translate into value-oriented consumers. The highest score, 4.131, was obtained for W6, from which we conclude that the process of paradigm change is in full swing. This aspect was reinforced by the high values from W4 and W5 (3.928 and 3.911), which reflect the awareness among respondents.

R. “Retailers’ increased concentration on responsibly answering to sustainability as a personal value of consumers changing their behavior” was evaluated through six questions, R1–R6; again, we used a Likert scale with five levels: Yes, Partially true, Neutral, Rather no, and No. The closer the values are to 5, the more we can consider that retailers pay more attention to sustainability as a personal value of consumers. The lowest score of 2.882 was obtained for R5 with regard to the awareness and validation of the Japanese

initiative known as “Society 5.0”. On the other hand, programs supported by European bodies scored above 3.32, which is logical for a population that is largely pro-European.

S. “Retailers’ sustainability agenda, including by fulfilling consumers’ sustainability demands with new products and processes” was evaluated by defining a variable with six items, evaluated on a Likert scale with five levels: Yes, Partially true, Neutral, Rather no and No. Survey participants answered questions S1–S6. The higher the values, the better retailers’ sustainability agenda was outlined. For these items we obtained the highest average values, with a score of 4.602 for S1. Consumers want sustainable products, but this should be reflected as little as possible in costs. Moreover, in the case of S1 we observe the lowest value for the standard deviation, which indicates a high degree of homogeneity among respondents on this question. At the opposite pole is item S4, with a score of 3.660, which indicates a slightly above average predisposition to do research on the sustainability of the products to be purchased.

D. “Retailers’ digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world” was evaluated by defining a construct with 10 items, evaluated on a Likert scale with five levels: Yes, Partially true, Neutral, Rather no, and No. The higher values for the 10 questions (D1–D10) reflect an increased concentration of retailers on digitizing processes, including the mode of retailer–consumer communication. The lowest value of 2.747 was obtained for the item D2, which indicates a still low use of communication via mobile devices. A series of questions obtained a score over 4.20, with D6 having a value of 4.224, which explains the role of the retailer in accessing online information with regard to the everyday products’ impact on the environment and shoppers’ health.

T. “Retailers’ need to translate consumers’ uncertainty into trust, identifying risks associated with disruptive technologies and making them less severe” was also evaluated, with the help of a Likert scale with five levels: Yes, Partially true, Neutral, Rather no, and No. Survey participants answered nine questions (T1–T9), and as a means of interpretation, the higher values indicate a consumer anxiety, which should be addressed by retailers by reducing the associated risks. For this last variable, we observe the narrowest range of the mean values, between 3.834 and 3.862—values which are significantly above average for all the items considered. In this context, it would be more interesting to note the differences between the degrees of homogeneity. Thus, for T1 we record the highest value of the standard deviation and implicitly a lower degree of homogeneity regarding the inability of retailers to predict to what extent they can help shoppers to make sustainable choices or strengthen their sustainable consumption routines. At the opposite pole is T9, with the lowest value of the standard deviation, which translates into an increased degree of homogeneity concerning the digital framework built by the retailer, which can deliver sustainable value from risk and transform consumers into trusted partners.

In the social sciences, although a number of measurement methods of internal consistency reliability have been proposed, such as Omega [176], GLB (Greatest Lower Bound) [177], GLB.fa, or GLB.a [178], the most frequently used is Cronbach’s alpha index, still proposed since 1951. The standardized calculation formula is as follows:

$$\alpha = \frac{N\bar{c}}{\bar{v} + (N - 1)\bar{c}}$$

where N represents the number of items, \bar{c} is the average inter-item covariance among the items, and \bar{v} is the average variance.

At least in the case of items that follow a normal distribution, the use of alpha is recommended, as it avoids overestimation problems. Another aspect that is intensely debated is related to the acceptable lower limit of Cronbach’s alpha value. Cho and Kim [179] have reservations about the application of arbitrary or automatic cutting criteria, and suggest that the minimum accepted values should be determined individually based on the purpose of the research, the importance of the decision involved, and/or the research stage (i.e., exploratory, basic, or applied). Nunnally advances the idea of a threshold of 0.5

for exploratory stages, as well as a threshold of 0.9 for applied research [180]. In principle, a higher value (close to 1) is considered better, and the lower limit most often circulated is 0.7 (it can take values between 0 and 1; if the scores are not allocated correctly, alpha can also take negative values, although this is an exception). However, there is also the reverse of the medal; a value that is too high can highlight redundant questions. The alpha value can also be manipulated: Cortina [181], for instance, showed that variables containing at least 20 items will have a coefficient greater than 0.7, even if the intercorrelations between them are very small.

George and Mallery [182] suggest a multi-level approach consisting of the following aspects: “ ≥ 0.9 —Excellent, ≥ 0.8 —Good, ≥ 0.7 —Acceptable, ≥ 0.6 —Doubt, ≥ 0.5 —Weak, ≤ 0.5 —Unacceptable”. It should be noted that reliability refers to data and not to scale or unit of measurement.

For calculating Cronbach’s alpha indices, we used the “lrm” and “DescTools” packages developed under the R software [183,184]. With the help of these packages, we could calculate the potential values of alpha in case we eliminated any of the items. Thus, adjusting latent variables has become much simpler. In Table 4 below, we present the results obtained. We note on the one hand the value of 0.904 (excellent) obtained for the construct T. “Retailers’ need to translate consumers’ uncertainty into trust, identifying risks associated with disruptive technologies and making them less severe”, as well as 0.824 for the construct D. “Retailers’ digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world”. We also record acceptable values for R. “Retailers’ increased concentration on responsibly answering to sustainability as a personal value of consumers changing their behavior” (0.785) and for S. “Retailers’ sustainability agenda, including by fulfilling consumers’ sustainability demands with new products and processes” (0.763). The only construct that raises questions but is still very close to the lower limit of acceptability is the construct W. “Consumers’ willingness to change their shopping habits to reduce environmental impact”, with a value of 0.682.

Table 4. Scale reliability.

	Scale	α Cronbach	Number of Items
W. Consumers’ willingness to change their shopping habits to reduce environmental impact	1–5	0.682	7
R. Retailers’ increased concentration on responsibly answering to sustainability as a personal value of consumers changing their behavior	1–5	0.785	6
S. Retailers’ sustainability agenda, including by fulfilling consumers’ sustainability demands with new products and processes	1–5	0.763	6
D. Retailers’ digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world	1–5	0.824	10
T. Retailers’ need to translate consumers’ uncertainty into trust, identifying risks associated with disruptive technologies and making them less severe	1–5	0.904	9

The model generated with the help of the Amos software package produced by IBM is presented in Figure 3 below.

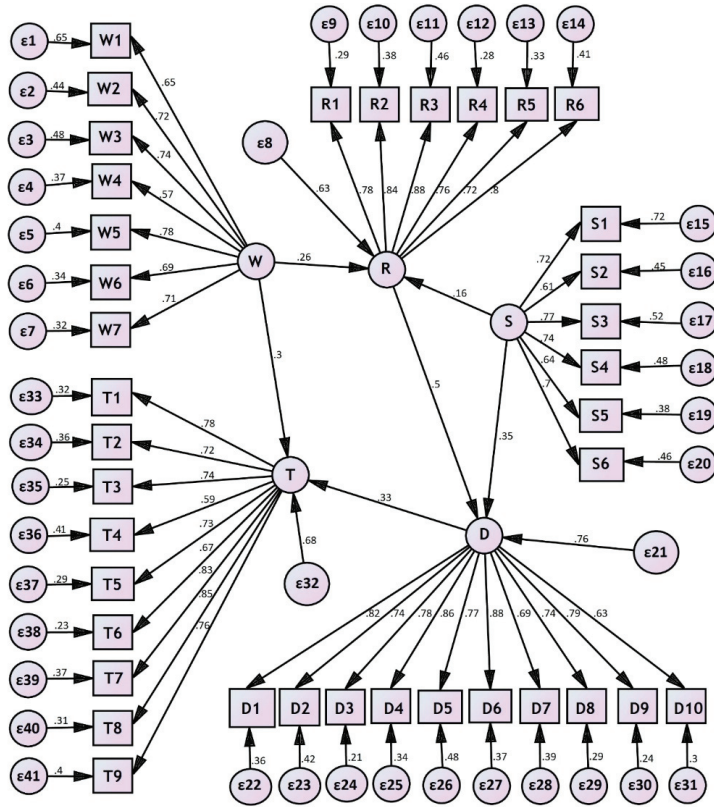


Figure 3. The model generated with the help of the Amos software package produced by IBM.

Five of the six working hypotheses were validated, because the *p*-value is less than 0.05. In the case of the sixth hypothesis, between “Retailers’ digital transformation to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world” (“D”) and “Retailers’ need to translate consumers’ uncertainty into trust, identifying risks associated with disruptive technologies and making them less severe” (“T”), there is a direct link, but the associated risk is approximately 16%. The output also generated by the Amos software package produced by IBM is presented in Table 5 below.

Table 5. The output generated by the Amos software package produced by IBM.

Hypothesis	Relation	β	<i>p</i> -Value	Decision
H1	R←W	0.261	0.000	Valid model
H2	R←S	0.164	0.000	Valid model
H3	D←S	0.345	0.012	Valid model
H4	D←R	0.496	0.003	Valid model
H5	T←D	0.332	0.163	Risk of 16%
H6	T←W	0.290	0.038	Valid model

Ideally, the loading factors should be greater than 0.7, but we can consider that values greater than 0.5 are acceptable. Two of the coefficients are less than 0.6 (0.57 and 0.59) and seven are less than 0.7. The remaining 29 meet the optimal criterion. In the last phase, it is

useful to evaluate the accuracy of the model by checking the fit indices. In the research we analyzed the four categories: absolute fit, incremental fit, residual-based fit, and predictive fit. By looking at these values, we reconstructed the model several times, and we will now discuss the final values which we consider to be appropriate.

The first thing we analyze is related to absolute fit indices that do not help to approximate the amount of variance that can be explained by the proposed model. The most important are the chi-square (which we want to be as small as possible) and the matching goodness index (or the adjusted matching goodness index). However, the chi-square, like the p -value and GFI, may be affected by the sample size. For example, in this case we would want a p -value greater than 0.05, which we did not get (p -value = 0.48). Given the large size of the sample, however, we consider that the model is good, looking further at the ratio between chi-square and the degrees of freedom (degrees of freedom): $CMIN/DF = 1604$. This ratio should be as low as possible, with some authors recommending values <5 as allowed in certain circumstances and values <3 as very good [185]. We can thus consider that the model is suitable for the covariance matrix.

Incremental match indices show the second block of information and try to compare the model built with a basic model. Most authors recommend values greater than 0.9 for each of these indicators. We take a closer look at the value of the standard matching index (NFI), which may also be affected by the sample size. Comparative fit indices (IFC) = 0.942; the Tucker–Lewis index (TLI, which is in fact a non-normed fit index) = 0.936; and the relative fit index (RFI) = 0.906 indicates a good fit.

Residue-based matching indices, as the name suggests, analyze the differences between the observed covariates and the estimated variants. Meyers et al. [186] show that values of these indicators higher than 0.1 indicate a poor match, between 0.08 and 0.1 a moderate match, less than 0.08 a reasonable match. An average approximation error (RMSEA) = 0.033 indicates a model that fits well. Moreover, the confidence interval does not include zero.

Predictive matching indices such as the Akaike information criterion (AIC), the Akaike constant information criterion (CAIC), and the Bayesian information criterion (BIC) are used only to choose the best of several models. The one with the lowest values is preferred.

6. Conclusions

6.1. Summary

It is highly relevant and urgent now to consider the discrepancy between consumers' attitudes towards sustainable consumption and their purchasing behavior with respect to sustainable products, and to better understand the link between retailers' physical strategies and the sustainable smart store of the future. Consumers' preferences and shopping patterns have never changed as quickly as they have in the context of the COVID-19 pandemic. The findings of this study can be of interest to scholars researching consumers' decision-making impacted by both their perspective towards sustainability and their willingness to participate in it, and may enable them to make better and more informed choices in their omnichannel journey. These findings are based on a retail sector with a particular configuration, which may have an impact upon the study's generalizability:

- As an EU member country, Romania has a strategic location at the crossroads of three great markets (the EU, the CIS, and the Middle East), is a leading destination in CEE for foreign direct investment, and is recognized for the similarities of its distribution and sales channels, the range of its retail outlets, and the local retail market dominance in the Big Box segment by reputed major retailers;
- Romania's e-commerce market is continuing to undergo a spectacular evolution, including from the point of view of the long-standing and memorable traditional relationship between Romania and China, which was confirmed also more recently by Romanian consumers, who prefer to buy online from stores in China rather than from stores in EU member states and the USA, while in the top foreign platforms preferred

by Romanians AliExpress/Alibaba Group ranks second, in front of the e-commerce giant Amazon.

As mentioned earlier, since the obvious impact of the COVID-19 pandemic on consumers' behavior is global, a more or less unconscious shift appears to have taken shape in consumers towards sustainability and purpose-driven brands within a phygital retail landscape, with consumers taking into account the sustainability of retailers' entire supply chain process ensuring greater visibility and traceability. Retailers need increased concentration on answering in a responsible manner to sustainability as a personal value of consumers (changing their behavior) and must continue digital transformation (considering the complementarity of sustainability and digital technology) to aid consumers to adopt more sustainable lifestyles and to make informed choices in the omnichannel world. Sustainability is seen across countries, product categories (which can influence consumers' feelings with products' purpose-driven element), and consumer segments through a different lens, but beyond global consumers' similarities and differences (including generational and cohort differences) the sustainability-driven consumers seem to be purpose-driven, but impacted by their satisfaction with new and improved, real and immersive experiences resulting from the relationship between purposeful retail and purposeful shopping. On the other hand, purpose-driven positioning also means that retailers must manage consumers' emotions, with the difference in consumers' perceived value being created with the help of phygital marketing strategies (across all channels, touchpoints, and micro-moments) focused on sustainable brands' (having points of parity and differentiation) and products' value proposition and based on both sustainable consumers' and sustainable prospects' insights. This means that retailers need to listen to all consumers (including considering the risks associated with consumers' uncertainty and anxiety within the context of the COVID-19 pandemic and recession crisis) and improve their experiences, enabling hybrid shopping and making them choose sustainable smart stores (in-store, online, mobile, BOPIS/Click & Collect, BORIS, Curbside pickup, etc.).

In developing our research hypotheses based on a consideration of the existing evidence beyond our own prior work, practitioner experience, and the literature review including gaps identified by us and presented in each area of the literature, we payed attention also to key research directions suggested by a recent systematic review of consumers' motivations to make green purchase decisions, and have both avoided consumers' subjectivity in answering the questionnaire and considered lessons to learn from cross-cultural research.

Here are the key findings on the relationship between the major shifts in sustainable consumer behavior on the Romanian retail market and retailers' priorities in agilely adapting:

1. Consumers perceive how retailers are becoming step by step more aware of the need to manage and reduce consumers' resistance to change through the range of products offered, the merchandising techniques used, and the assistance offered in the phygital space, confirming in this way the continuous integration of sustainability into their operational and strategic activities.
2. Consumers perceive how retailers are paying more attention to sustainability as a personal value of consumers.
3. Consumers perceive that retailers already have a significant sustainability agenda.
4. Consumers perceive an increased concentration of retailers on digitizing processes (by creating a digital representation of physical objects or attributes), including the mode of retailer–consumer communication (social media, text messages, phone, etc.), and the enablement of new business models with the help of new disruptive technologies (valorizing the digitized data and improving consumer experience).
5. Consumers feel the need for consumers' uncertainty and anxiety to be better addressed by retailers within the context of the COVID-19 pandemic, by reducing the associated risks, and for retailers to confirm their honesty and transparency by asking for and acting on consumers' feedback and translating consumers' uncertainty into the trust that consumers expect.
6. The research developed a clear understanding of:

- Consumers' increasing awareness of their important role in impacting sustainable production and consumption by adopting greener behavior and attitudes, mainly the digital natives who are more proficient in the use of new technologies, and thereby enabling the smoothing of sustainable consumption;
- Retailers' challenge of targeting consumers with agilely adapted messages and issues (based on the new technologies disrupting retailers' traditional strategy of using distribution channels to deliver the products within the digital ecosystems) strengthening brand perception on sustainability and answering to consumers' needs for better information and education so as to reduce the difference between the reality of their behavior and attitudes on the one hand, and their reported purchasing intentions of sustainable products (which purchases were performed better online versus in-store) on the other.

6.2. Implications

From the point of view of managerial implications, the findings of the present research have implications for retailers' systemic thinking and acting from a new level of knowledge about the future of the Romanian consumer market, and allow them to better capitalize on sustainable consumption opportunities, improve the necessary risk culture, and generally move in the right direction by, among other things, considering the need for lessening the gravity of the impact on sustainable consumption of the COVID-19 pandemic and the sharp increases that have already been predicted for electricity and gas prices.

The challenging perspective taken by this action-oriented research (based on inside knowledge but trying to obtain both insider and outsider knowledge to maintain the appropriate detachment) allowed not only for objectivity, sensitivity, and empathy, but also for an understanding of the matters, reflection, and the identification of the necessary change, confirming the importance of generating knowledge through applied business and academic partnerships. From this point of view, cross-cultural events such as the aforementioned 2022 CGF China Day (which will take place in Shanghai, China on 17–18 February 2022), which are expected to share both cutting-edge insights and positive change regarding best practices in food safety, health, sustainability, and the end-to-end value chain, could add to the general knowledge necessary to harmonize the major shifts in sustainable consumer behavior and retailers' priorities in agilely adapting to it.

6.3. Limitations

The above-mentioned findings of the present research are to some extent constrained by certain limitations, some of which provide opportunities for further research:

- (a) Similar to other recent studies based on objective questionnaires that are answered after a face-to-face interview, the answers came rather from young people. Thus, over half of the respondents (more precisely 52.9%) were people up to 35 years old, and over 82% were up to 45 years old—in other words: Xennials + Millennials + Gen Z. Only 10.3% of respondents were between 46–55 years old and just over 6% were between 46–65 years, the weakest-represented segment being 'over 66 years old', in which we find less than 1 percent of the total number of respondents. We made these clarifications out of a desire to explain the degree of representativeness in our study. The explanations have several hypotheses, the most important being related to the COVID-19 pandemic and the way in which the elderly choose to protect themselves by limiting their exposure time in public spaces.
- (b) Although we considered the feedback obtained after the 'face validity technique', as well as the pilot test, we consider that some questions may require a certain degree of knowledge of the concerns related to circular economy, sustainability, and sustainable development. For this reason, those questions have been adjusted and additional explanations have been added of some specialized terms or of some legislative initiatives. The questionnaire was addressed to Romanian clients, and by translating it into English some terms may seem less intelligible.

- (c) Another weakness is the size of the focus groups and the pilot test group, for which larger sizes would have been preferred. At the same time, following the adjustments, the W, R, and S constructs were left with only 7, 6 and 6 items, respectively. These are relatively small numbers, which can also affect Cronbach's alpha values. However, the whole process of building items is a strong point, with many of the items being built based on interviews specially designed for this study. The dimensions identified in this study represent novelty elements in specialized research.
- (d) Another strong point that we would like to mention is the above-mentioned conducting of in-person interviews, a superior procedure to online interviews, where there is no adequate control over the seriousness of the respondents. This strength, at the same time, is a limitation, if we think of those people who, being fearful, interacted less or even avoided shopping in stores, as previously stated.

6.4. Further Research

Following the values in Table 4 on scale reliability, we observe the lowest value for Cronbach's alpha index to be -0.682 . We will try to recalibrate the model by changing the questions related to the latent variable W. Consumers' willingness to change their shopping habits to reduce environmental impact. Another aspect we have in mind would be to increase the degree of representativeness of the age categories over 46 years by changing the manner of asking questions. Given our good collaboration with the supermarket chain, we will try to extend the study to other countries where the 'parent company' is present. This aspect would also be a premiere, and we will compare consumer behavior and perception with retailers' responses within the Romanian context but also within other countries where there is a presence.

The action-oriented research can go far beyond the postulated hypotheses derived from the practitioner experience mentioned earlier, the literature review (including gaps identified by us and presented in each area of the literature), as well as our own prior work. It allows for maintaining the appropriate detachment and offers promising areas to work on the new perspective on harmonizing consumers' willingness to change their shopping habits to reduce environmental impact, their possibilities of spending more on sustainable products, and retailers' ability to process the context of consumption patterns in order to educate consumers regarding sustainable consumption (making them feel good about it beyond simply the price), keep sustainability promises, and keep up with the pace of digital transformation.

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Article

An Empirical Evaluation of Customers' Adoption of Drone Food Delivery Services: An Extended Technology Acceptance Model

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Abstract: A single technological advancement in the business sector tremendously changed customers' lifestyles and consumption behavior. Drone technology is one of the main revolutions that increase business efficiency at a lower cost. However, the acceptance of emerging technologies is not rapid in developing markets. Therefore, this study aims to evaluate customers' adoption of drone technology in the context of food delivery services. This study has used an extended technology acceptance model (TAM) to assess customers' behavior. Product processing innovativeness, information processing innovativeness, and subjective norms have been added as additional constructs into TAM. The data of 354 customers from five different cities of Pakistan have been collected and analyzed through partial least square structural equation modeling (PLS-SEM). The results of the study revealed that all proposed hypotheses, except the positive influence of perceived ease of use on perceived usefulness, were accepted. Further, the results depict that perceived usefulness, subjective norms, and attitude were the major predictors of customers' adoption of drone food delivery services. In addition to this, customers' word of mouth has a greater influence and reach than other forms of marketing communication. Therefore, practitioners and marketers may consider hosting competition programs to experiment with drone food delivery systems to enhance the acceptance of this technology among the masses.

Keywords: product processing innovativeness; information processing innovativeness; subjective norms; perceived ease of use; perceived usefulness

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1. Introduction

The ways of interaction between customers and retailers are changing due to technological advancements [1]. In recent times, retailers are adopting dynamic technologies to execute complex business operations [2]. This technological change has reduced employees' participation, and increased customers' involvement in the design and delivery of products and services, creating challenges and opportunities for businesses [3]. To compete with the globalized business world, companies must adopt advanced technology for efficient and seamless business processes [1]. In many countries, drone food delivery services are not commercialized due to legal constraints [4]. However, this technology has huge potential to fulfill customers' needs. Due to technological innovation in retail sectors, the relationship between customers and retailers has improved and ultimately increased customers' loyalty to particular retailers [4]. Particularly, drone technology has had a substantial impact on

food delivery services [2,5]. In addition, drones are an innovative solution to traditional food delivery services, such as cars and motorcycles, which contribute to traffic jams and environmental pollution [2].

The adoption of drone technologies has huge potential in the retail sector due to its vigorous service delivery system. In recent times, various chains such as YO! Sushi, a London-based chain restaurant, Francesco's Pizza in India, and Casa Madrona hotel in the U.S. have successfully implemented drones food delivery services to customers. UberEats is planning to launch a drone delivery service as it is more efficient than traditional food delivery through partners who use bikes and cars [4]. Foodpanda, a food delivery company in Pakistan is planning to launch drone food delivery services in the name of PandaFly. PandaFly will be the first Pakistani commercial drone to provide drone food delivery services in Pakistan. Flytrex, a company that develops drones stated that drones can cover a distance of three miles within 5 to 10 min. Further, they reported that drones are more efficient than humans as they make five deliveries within an hour compared to two to three deliveries [2]. In addition, a study indicated that the use of drone technology for food delivery would significantly reduce environmental pollution [5]. Researchers posited that the current food delivery system that is based on gasoline-powered vehicles such as car and motorcycles cause pollution to the environment. Contrary to this, drone-based food delivery services are environmentally friendly because they are operated by batteries that are charged with electricity [6]. Past empirical studies reported that drone food delivery services are environmentally friendly. For example, previous researchers highlighted that drone-based food delivery services have an advantage over motorcycle delivery services because they reduce global warming potential (GWP) [7]. Another study suggested that drone-based delivery services can reduce greenhouse gas emissions [8]. Climate change has made Pakistan a highly vulnerable country among the developing nations [9]. Therefore, the introduction of drone delivery services will help to reduce environmental pollution and thus protect the environment.

A comprehensive review of the literature reveals that drone food delivery services will not have an issue with commercialization in the coming years. However, academic literature is very scarce related to this emerging topic due to the newness of technology [4,7,10]. For example, a recent study has focused on technological and legal aspects of using drone delivery services, and failed to address consumer perception which is an essential element of technology adoption [11,12]. Further, some researchers highlighted the importance of improving the usage of drone food delivery services but they did not assess the usefulness of the technology from customers' perspectives [4,10]. Another study explored the association between eco-friendly drone technology and customer behavioral intention, failing to address customers' innovative traits [2]. Recently, researchers integrated the technology acceptance model (TAM) and theory of planned behavior (TPB) theories and studied the customers' intention to use drone delivery services [4]. They found that technology-related constructs and core constructs of TPB positively affect customers' intention to use drone delivery services. However, the moderating effect of product innovativeness was insignificant. Unlike a recent study that assessed only product innovativeness in the customers' adoption of drone food services [4]. To address this research gap, the current study has focused on both dimensions of customer innovativeness in the adoption of drone technology in the context of food delivery services. Particularly, the current study attempts (1) to explain customer innovativeness in the domain of drone delivery services, (2) to explore the ease and usefulness of drone delivery services, (3) to identify the importance of subjective norms in building attitude towards drone delivery services, and (4) to assess the relationship between attitude and sub-dimension of behavioral intention which includes word of mouth, willingness to pay more, and intention to use.

Thus, the current study integrated TAM with domain-specific innovativeness (product processing innovativeness and information processing innovativeness) and subjective norms in the context of drone food delivery services. Since the 1990s, the concept of innovativeness has gained momentum and become the center of attraction for marketers

and practitioners around the globe [4,13,14]. Extant literature reveals the importance of innovativeness in a specific domain to attain a competitive edge in the market and increase the probability of innovative product adoption [4,15]. In addition, subjective norms were found an important construct that informs about the use of technology, the person may believe that technology is beneficial which in turn leads to an intention to adopt it [16].

2. Theoretical Foundation: Technology Acceptance Model

Since TAM was introduced in academia, the theory has become very popular, supported by data, and being adaptable to predict the use of new technology [17]. The model focuses on how the characteristics of new technology affect consumers' perceptions and how the customers ultimately use that technology [16,18]. The main point of TAM is that usefulness and the ease of use perceived by consumers are linked to consumers' attitudes toward using new technology. Furthermore, the consumers' attitudes toward using new technology are critical to the use of new technology [19,20]. Past studies have proposed several modifications that were considered essential to improve the predictive power of the technology acceptance model [21,22]. Several studies attempted to develop extended TAM to predict individual intention to adopt technology [16,23]. Most of the past studies have been done in the context of IT-related technologies. However, some studies have been conducted on the use of non-IT technologies such as apparel shopping [4,24], bottled water usage [25], acceptance of electric vehicles [23], intention to use YouBike system [26], outsourcing in organizational decision making [27], and acceptance of sustainability labels [28]. Therefore, TAM is the most appropriate model to predict customers' intention to use drone delivery. The extended technology acceptance model is presented in Figure 1.

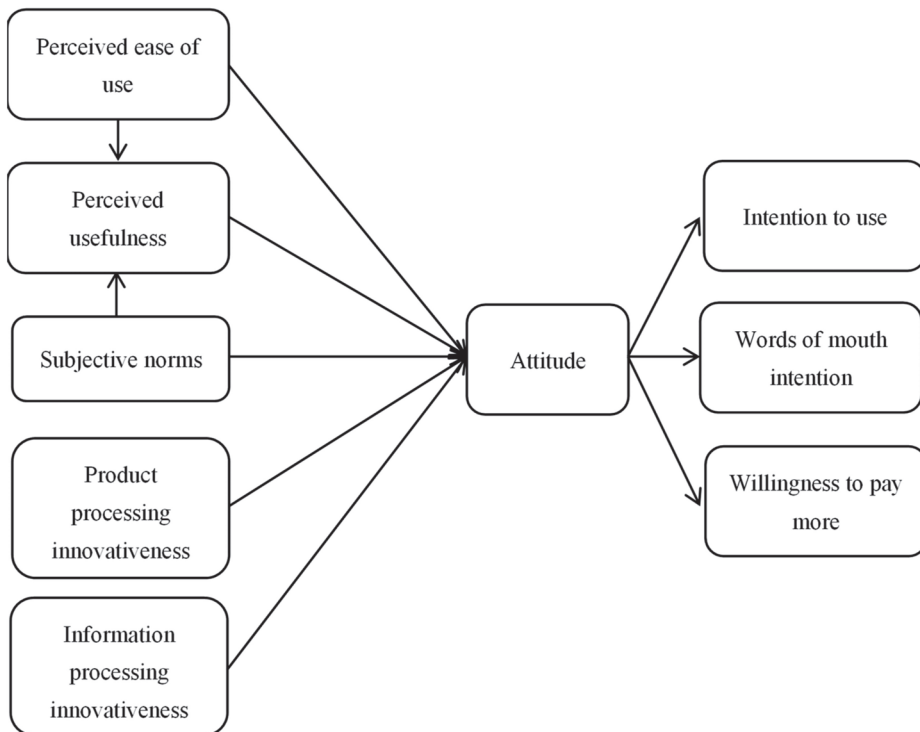


Figure 1. An extended technology acceptance model.

2.1. Perceived Ease of Use

Perceived ease of use—also known as ‘complexity’ in innovation diffusion theory [29]—has been described as a significant predictor of technology adoption. For example, one study found that poor interface systems led to poor user performance, resulting in the rejection of many technologies [30]. In the context of electronic commerce, the success was depending upon the customer service features, products, site designs, and navigation and entertainment features [31]. Prior studies have shown that sites designs include updated information, simple checkout procedures, good layout, transparent navigational structures, effective search engines, and user-friendly interfaces were important aspects of online shopping [32–34]. In line with this, researchers found that perceived ease of use has a positive influence on teachers’ attitudes towards mobile learning at higher institutions [35]. In the context of drone delivery services, perceived ease of use positively influenced attitudes towards drone delivery services [4].

2.2. Perceived Usefulness

Perceived usefulness refers to an individual’s belief that using a specific system will accelerate his or her performance [36]. Prior researchers argued that perceived usefulness is a primary construct in TAM that predicts consumer attitude towards the virtual store, and a crucial factor that determines the behavioral intention [37]. Similarly, another study revealed the positive influence of perceived usefulness on attitude and behavioral intention to use online retail stores [32]. In the context of online retail stores, researchers argued that perceived usefulness significantly enhanced consumers’ attitudes and intention to use online retailers [38]. In line with this, researchers found that the perceived usefulness of mobile apps has a positive influence toward the adoption of the app in the medical education system [39]. Extant literature depicts that perceived usefulness is a significant factor in technology adoption. For example, studies showed that technology usefulness has positive influence on the adoption of the Google Applications platform [40] and customers’ online purchases [41].

Prior studies depict the significance of technology-related constructs in the adoption of technological products. Hence, we assume that perceived ease of use and perceived usefulness are significant predictors of drone-based delivery services. Thus, we propose the following hypotheses:

Hypothesis 1 (H1). *Perceived ease of using drone food delivery service has a positive influence on attitude towards drone-based delivery services.*

Hypothesis 2 (H2). *Perceived ease of using drone food delivery services has a positive influence on the perceived usefulness of drone-based delivery services.*

Hypothesis 3 (H3). *Perceived usefulness of using drone food delivery services has a positive influence on attitude towards drone-based delivery services.*

2.3. Subjective Norms

Subjective norms are an important antecedent influencing people’s behavior. It is the perceived pressure of a person towards behaving in a certain manner. Researchers found that important referents such as family and friends affect consumers’ belief in the use of technology [42]. Researchers found that the influence of subjective norms on an individual is due to internalization, which refers to incorporating a referent’s belief about the usefulness of a system [16]. Past studies revealed that subjective norms have a positive influence on users’ perceived usefulness of technology [43,44]. For example, a study conducted on the acceptance of mobile commerce (m-commerce) revealed that subjective norms positively influenced the usefulness and attitude towards the acceptance of m-commerce [45]. Another study on US consumers’ use of mobile technology for shopping fashion goods revealed that subjective norms positively influenced the perceived usefulness of mobile technology for shopping [46]. Similarly, researchers revealed that

subjective norms positively influenced the attitude towards mobile payment-based hotel reservations [47]. Extant literature revealed the significant effect of subjective norms on attitudes towards using technology via perceived usefulness [48,49]. Based on prior studies results related to the significant role of subjective norms in the adoption of innovative products, we propose the following hypotheses:

Hypothesis 4 (H4). *Subjective norms positively influence the usefulness of drone food delivery services.*

Hypothesis 5 (H5). *Subjective norms positively influence attitudes towards drone food delivery services.*

2.4. Domain-Specific Innovativeness

Domain-specific innovativeness (DSI) is related to individual inclination towards the adoption of a product class and refers to the tendency of a person to learn about the products within the particular domain [50]. The concept of domain-specific innovativeness is first presented by Robertson [51]. He suggested that consumers can innovate in the particular product class or related product classes. Consumers who have a propensity in the specific domain would react more towards the innovation in that category [52]. For example, people who have expertise in the domain of automobiles would better evaluate the performance of the high-power engine. Experts in the cosmetic industry would better evaluate the positive and negative aspects of beauty cream. This perception is due to the individual innovativeness in the domain of a specific product class [50]. Further, DSI is a better predictor of consumer behavior than global innovativeness [50,53]. In the context of electronic commerce, domain-specific innovativeness positively influenced consumers' acquisition and adoption of new products [54].

Prior research showed that consumers at any time can be innovative in a specific category, and at the same time, they can be a laggard in other product categories [55], and the measurement is only possible through a domain-specific environment [50]. The usefulness of domain-specific innovativeness can be seen in the number of consumer behavior researches [56–58]. Past studies have applied domain-specific innovativeness (DSI) in different domains such as rock music [59], wine consumption [60], online shopping [61], tourism management [62], and information technology usage [63]. Although domain-specific innovation was proved to be an efficient predictor of consumers' product adoption, researchers found a weak relationship between domain-specific innovativeness and new products adoption [64]. Researchers indicated that the current scale for adaptive behavior is biased as it does not cover other aspects of innovativeness [65]. That is, past researchers measured the adoptive dimension of domain-specific innovativeness such as purchase experience and time of adoption. Thus, to overcome this issue, the current study has conceptualized domain-specific innovativeness into two dimensions: product processing innovativeness and information processing innovativeness. Product processing innovativeness focuses on the specification of the product class [53], and information processing innovativeness relates to the knowledge and novelty-seeking aspect of domain-specific innovation [56]. Recently, researchers found that consumer novelty seeking has a positive impact on attitudes towards drone food delivery services [66].

The extant literature on innovativeness reveals the significance of both dimensions of domain-specific innovativeness, that is, product processing innovativeness and information processing innovativeness in the adoption of technology. Therefore, we assume that product processing innovativeness and information processing will positively influence the attitude towards the adoption of drone-based delivery services. Hence, we propose the following hypotheses:

Hypothesis 6 (H6). *Product processing innovativeness will positively influence customers' attitudes towards drone food delivery services.*

Hypothesis 7 (H7). *Information processing innovativeness will positively influence customers' attitudes towards drone food delivery services.*

2.5. Impact of Attitude on Behavioral Intentions

This study proposes that attitudes towards drone delivery service have a positive influence on three dimensions, including word of mouth, willingness to pay more, and intention to use [4,67,68]. First, the intention is the individual degree of willingness to perform or not a particular behavior in the near future [10,69]. Researchers found that the intention to use products or services is based on a positive evaluation of using the product or services [67,70,71]. Second, word of mouth represents consumers' informal communication directed to other people about the characteristics of the consumed products or services [68,72]. The impact of word of mouth is greater than an advertisement as it is considered more reliable and imparts greater confidence to purchase the products and services [73,74]. The third dimension of behavioral intention is a willingness to pay more. It is defined as the customers' willingness to pay high prices for the purchase of products and services [75]. Extant literature found that attitude has a positive impact on behavioral intentions [4,66,71].

Researchers argued that the TAM supports the effect of attitude on behavioral intentions [16,76]. Several studies have found a positive influence of attitude on behavioral intention. For example, attitude positively affects behavioral intentions for the purchase of green products [77], and the intention to use drone food delivery services [1]. Similarly, in the context of using drone food delivery during COVID-19, scholars found that attitude has a positive influence on behavioral intention [2]. Previous researchers merged TPB and TAM and predicted that attitude has a positive influence on customer behavioral intention to use drone food delivery services [4]. Similarly, other researchers found that attitude positively influences intention to use technology. For example, a study on using robotic technology in restaurants confirmed the positive influence of consumers' attitudes towards robotics on three dimensions of behavioral intentions—intention to use, word of mouth, and willingness to pay more [67]. In the context of using drone food delivery, researchers found that attitude has a positive influence on intention to use, word of mouth, and willingness to pay more [68]. Prior studies empirical and theoretical backgrounds provide evidence that attitude has a significant impact on the behavioral intention of customers. Hence we propose the following hypotheses:

Hypothesis 8 (H8). *Attitude towards drone food delivery service has a positive influence on intention to use drone food delivery service.*

Hypothesis 9 (H9). *Attitude towards drone food delivery service has a positive influence on word of mouth.*

Hypothesis 10 (H10). *Attitude towards drone food delivery service has a positive influence on willingness to pay more.*

3. Methodology

3.1. Measurement

This study has adapted measurement scales from past studies. The items of perceived usefulness and perceived ease of use were adapted from the study of Choe et al. [4]. They adapted both scales from previous studies [69,78] and used them in the context of drone delivery services. Perugini and Bagozzi [79] items were used for the measurement of attitude towards drone delivery service and subjective norms. The measuring items for product processing innovativeness and information processing innovativeness were adapted from the studies of [44,80]. Hwang et al. [67] items were adapted for the measurement of three behavioral constructs: word of mouth, intention to use, and willingness to pay. A five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree was used for the measurement of constructs' items. The questionnaire for this study consists of two parts:

demographic information of the respondents and questions covering the constructs. The final questionnaire was evaluated by four academic experts from the field of marketing and management. They assessed the content, language, grammar, layout of the questionnaire and proposed minor changes in the wording to meet the purpose of the study. Then the items of the constructs were evaluated by conducting a pilot test on 50 respondents. The results of the pilot test were satisfactory as all factors loading met the minimum threshold value that is 0.70. The items of measuring constructs are given in Table A1.

3.2. Data Collection

The data of the respondents were collected in the restaurants of the five main cities of Pakistan (Karachi, Islamabad, Lahore, Hyderabad, and Quetta). The collection of data was done by the 22 students studying in the final years of MBA and MPhil programs. Before assigning the task of data collection, students were given an online demonstration explaining the process of data collection. Since drone delivery services are not fully commercialized in many countries, respondents, therefore, have little knowledge of drone delivery services. To overcome this problem, first, we asked respondents to watch a one-minute and 56-s video that illustrated food delivery through a drone service (see the link in Appendix A). Then we requested the respondents to fill out the questionnaire. The data collection was started soon after the government announcement of lifting Corona restrictions in the country. It was carried out between 2 August 2021 to 9 December 2021. A total of 672 questionnaires were distributed to the respondents of the study. However, respondents were reluctant to fill out the questionnaires due to their busy schedules and privacy issues. At the end of the survey, we received 383 responses. After discarding the incomplete questionnaires, 361 were validated for data analysis. The response rate was 53.72%.

4. Data Analysis

Statistical Package for Social Sciences (SPSS) and partial least square structural equation modeling (PLS-SEM) were used to analyze the data. We utilized SPSS for data purification and assessing common method bias, and PLS-SEM for the analysis of measurement and structural model.

4.1. Data Screening

Before conducting the final analysis, we applied the Mahalanobis distance technique for the identification of outliers in the data. There were seven outliers whose probability values were less than 0.001. Therefore, we excluded these multivariate outliers from our final analysis. This made our final sample size 354. Further, we performed Harman's [81] single factor test to assess whether common method bias was a threat or not. Common method bias occurs when the researchers use self-reported data and rely on a single source [82]. A substantial bias exists in the data if a single factor explains more than 50% variance [83]. The study result showed that a single factor explaining 28.32% variance in the data depicted that common method bias was not a threat to data credibility [83].

4.2. Participants' Profile

The study's participants belonged to five different cities in Pakistan. In terms of gender, 218 of the 354 participants were male, comprising 61.6% of the total sample. Married individuals were 203, accounting for 57.3 percent. In terms of qualifications, 146 individuals had bachelor's degrees, with a percentage of 41.2. One hundred and forty-six participants earned roughly 172 US dollars per month, making a 41.2% representation. In Pakistan, the average salary of a person is around 229 US dollars (PKR 40,000) per month. Table 1 shows the participants' information.

Table 1. Participants' Profile.

		Frequency	Percentage
Gender	Male	218	61.6%
	Female	136	38.4%
Marital Status	Unmarried	151	57.3%
	Married	203	42.7%
Qualification	Freshman	52	14.68%
	Bachelor	146	41.2%
	Master	144	40.7%
	Doctorate	12	3.4%
Household income	1 US\$ to 172 US\$	146	41.2%
	173 US\$ to 344 US\$	72	20.3%
	345 US\$ to 515 US\$	56	15.8%
	516 US\$ to 688 US\$	51	14.4%
	689 US\$ or more	29	8.2%

4.3. Reliability and Convergent Validity

The internal consistency of the data is characterized as “reliability” [84]. Internal consistency was examined in this study using Cronbach’s alpha (α) and composite reliability scores. The Cronbach’s alpha (α) values greater than 0.60 suggest the internal consistency of the data. Cronbach’s alpha (α) values between 0.70 and 0.80 are deemed credible. While the values between 0.80 and 0.90 are considered to be substantially reliable. The values of all constructions were more than 0.80, indicating internal consistency. Another way for establishing internal consistency is the composite reliability (CR) rating. Internal consistency is better measured by CR [85]. All constructions had CR values larger than 0.90, demonstrating internal consistency. The degree of resemblance of measurement constructs when assessed using diverse measuring methods is referred to as convergent validity [84]. We used three measures to determine convergent validity: composite reliability (CR), outer loadings, and average variance extracted (AVE). Table 2 shows that the values of CR ranged from 0.845 to 0.934, outer factor loadings values ranged between 0.696 to 0.933, and AVE values ranged from 0.646 to 0.826 confirming the presence of convergent validity [85,86]. Figure 2 shows the measurement model that depicts the strength of relationships (path coefficients) among the constructs.

4.4. Descriptive Statistics and Discriminant Validity

Descriptive statistics test was performed to assess the values of mean, median, mode and standard deviation as shown in Table 3. The degree to which measurement constructs differ from one another is referred to as discriminant validity [85]. The establishment of discriminant validity is required for the appropriateness of the statistical results [87]. The discriminant validity of this study was determined using two measures: the Fornell and Larcker criteria and the Heterotrait-Monotrait (HTMT) ratio. According to Fornell and Larcker’s [86] criteria, a construct should have more variances with its components than other constructs [85]. As demonstrated in Table 3, the diagonal values, i.e., the square roots of AVE, were bigger than the inter-correlation among the constructs, indicating discriminant validity [88]. Second, the discriminant validity was determined using the HTMT ratio criteria. HTMT values less than 0.90 are required for the establishment of discriminant validity [87]. The HTMT value of all constructs shown in Table 4 was less than 0.90, confirming the discriminant validity.

4.5. Predictive Power of the Inner Model

In the study, model fit criteria were assessed through the values of coefficient of determination (R^2) and cross-validated redundancy (Q^2) [85,87]. The variance explained by the independent constructs on dependent constructs is represented by the value of (R^2). The value of (R^2) for endogenous constructs was 10.5%, 17.3%, and 18.9% for word of

mouth, intention to use, and willingness to pay more respectively, which moderated the predictive accuracy of the studied model. Next, we assessed the value of cross-validated redundancy (Q^2) through the blindfolding method. In this method, a (Q^2) value above zero indicates that the model has an adequate predictive relevance. The values of (Q^2) for word of mouth, intention to use, and willingness to pay were 6.6%, 10.9%, and 11.8% respectively, which showed that the model possessed an adequate predictive relevance.

Table 2. Reliability Testing and Convergent Validity.

Constructs	Items	Loading	Cronbach's Alpha	CR	AVE
Perceived ease of use	PEOU1	0.807	0.798	0.881	0.712
	PEOU2	0.859			
	PEOU3	0.864			
Perceived usefulness	PU1	0.725	0.761	0.860	0.674
	PU2	0.881			
	PU3	0.848			
Subjective norms	SN1	0.893	0.874	0.923	0.799
	SN2	0.908			
	SN3	0.880			
Product processing Innovation	PPI1	0.808	0.864	0.865	0.711
	PPI2	0.840			
	PP13	0.876			
	PPI4	0.847			
Information processing	IPI1	0.803	0.764	0.908	0.680
Innovation	IPI2	0.855			
	IPI3	0.814			
Attitude	ATD1	0.882	0.894	0.934	0.826
	ATD2	0.933			
	ATD3	0.910			
Intention to use	ITU1	0.859	0.723	0.844	0.646
	ITU2	0.698			
	ITU3	0.845			
Willingness to pay more	WTP1	0.900	0.768	0.861	0.676
	WTP2	0.856			
	WTP3	0.696			
Words of mouth	WOM1	0.824	0.723	0.845	0.647
	WOM2	0.870			
	WOM3	0.711			

Note: CR = Composite Reliability; AVE = Average Variance Extracted.

4.6. Hypothesis Testing

The results of the hypotheses testing are presented in Table 5. Hypothesis 1 suggests that perceived ease of use has a positive effect on attitude, which has been accepted ($\beta = 0.097$, $p = 0.038$) since the significant value was less than 0.05. Hypothesis 2 proposing the positive influence of perceived ease of use on perceived usefulness was rejected ($\beta = -0.096$, $p = 0.127$). The positive impact of perceived usefulness on attitude proposed in hypothesis 3 was supported ($\beta = 0.334$, $p = 0.000$). Subjective norms had a significant positive impact on the perceived usefulness (H4: $\beta = 0.274$, $p = 0.000$), and attitude (H5: $\beta = 0.275$, $p = 0.000$) was accepted. The results of hypotheses 6 and 7 revealed that product processing innovation (H6: $\beta = 0.147$, $p = 0.016$), and information processing innovation (H7: $\beta = 0.173$, $p = 0.001$) have a positive impact on attitude. Hypotheses 8 to 10 posit the positive influence of attitude on intention to use (H8: $\beta = 0.418$, $p = 0.000$), word of mouth (H9: $\beta = 0.327$, $p = 0.000$), and willingness to pay more (H10: $\beta = 0.437$, $p = 0.000$) respectively, which were accepted. Hence, it could be concluded that all of the proposed

hypotheses were accepted except hypothesis 2. The results of the structural model are shown in Figure 3.

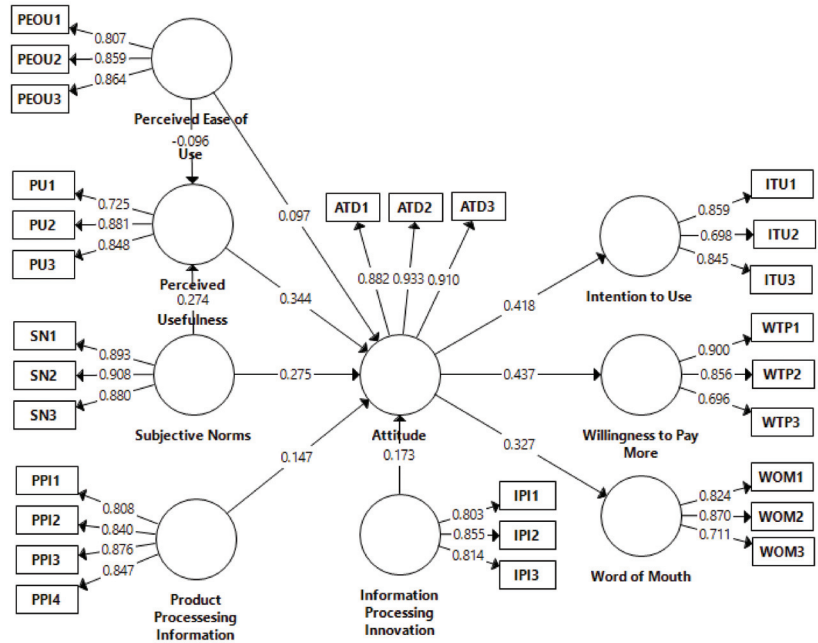


Figure 2. Measurement model.

Table 3. Descriptive Statistics and Discriminant Validity Analysis.

Latent Variables	Mean	Median	Mode	SD	1	2	3	4	5	6	7	8	9
Attitude	4.01	4.00	4.00	0.70	0.909								
Product Processing innovation	4.01	4.00	4.00	0.69	0.427	0.824							
Intention to use	4.13	4.00	4.00	0.66	0.418	0.357	0.804						
Perceived ease of use	4.20	4.00	5.00	0.68	0.286	0.332	0.555	0.844					
Perceived usefulness	3.52	3.66	4.00	0.84	0.497	0.154	0.193	−0.008	0.821				
Information processing innovation	4.07	4.00	4.00	0.73	0.544	0.343	0.320	0.313	0.411	0.843			
Subjective norms	4.26	4.00	4.00	0.65	0.553	0.429	0.279	0.321	0.244	0.605	0.894		
Willingness to pay	4.03	4.00	4.00	0.68	0.437	0.334	0.543	0.339	0.274	0.295	0.292	0.822	
Words of mouth	3.67	3.66	4.00	0.76	0.327	0.193	0.320	0.164	0.473	0.321	0.176	0.390	0.804

Notes: The bold diagonal values refer to the square root of the AVE of each construct. All correlations are statistically significant ($p < 0.01$). SD = Standard deviation.

Table 4. Heterotrait-Monotrait Ratio (HTMT) Results.

Latent Variables	1	2	3	4	5	6	7	8	9
Attitude									
Product Processing innovation	0.515								
Intention to use	0.517	0.485							
Perceived ease of use	0.338	0.425	0.740						

Table 4. Cont.

Latent Variables	1	2	3	4	5	6	7	8	9
Perceived usefulness	0.583	0.190	0.234	0.086					
Information processing innovation	0.612	0.419	0.398	0.368	0.492				
Subjective norms	0.624	0.528	0.359	0.383	0.278	0.688			
Willingness to pay	0.494	0.420	0.733	0.429	0.333	0.331	0.325		
Words of mouth	0.406	0.265	0.439	0.221	0.637	0.408	0.220	0.512	

Table 5. Hypotheses assessment summary.

Hypotheses	Beta	SE	p-Values	T-Values	Decision
H1: PEOU → ATD	0.097	0.098	0.038	2.058	Supported
H2: PEOU → PU	−0.096	−0.096	0.127	1.538	Not supported
H3: PU → ATD	0.344	0.345	0.000	7.346	Supported
H4: SN → PU	0.274	0.278	0.000	5.339	Supported
H5: SN → ATD	0.275	0.274	0.000	4.285	Supported
H6: PPI → ATD	0.147	0.146	0.016	2.392	Supported
H7: IPI → ATD	0.173	0.174	0.001	3.429	Supported
H8: ATD → ITU	0.418	0.419	0.000	7.369	Supported
H9: ATD → WOM	0.327	0.336	0.000	6.712	Supported
H10: ATD → WTP	0.437	0.441	0.000	9.769	Supported

Notes: Beta 5 standardized coefficient path, SE 5 standard error, path coefficient is significant if $p < 0.05$ for two-tailed tests. ATD = Attitude, IPI = information processing innovation, ITU = intention to use, PEOU = perceived ease of use, PU = perceived usefulness, PPI = product processing Innovation, SN = subjective norms, WTP = willingness to pay more, WOM = word of mouth.

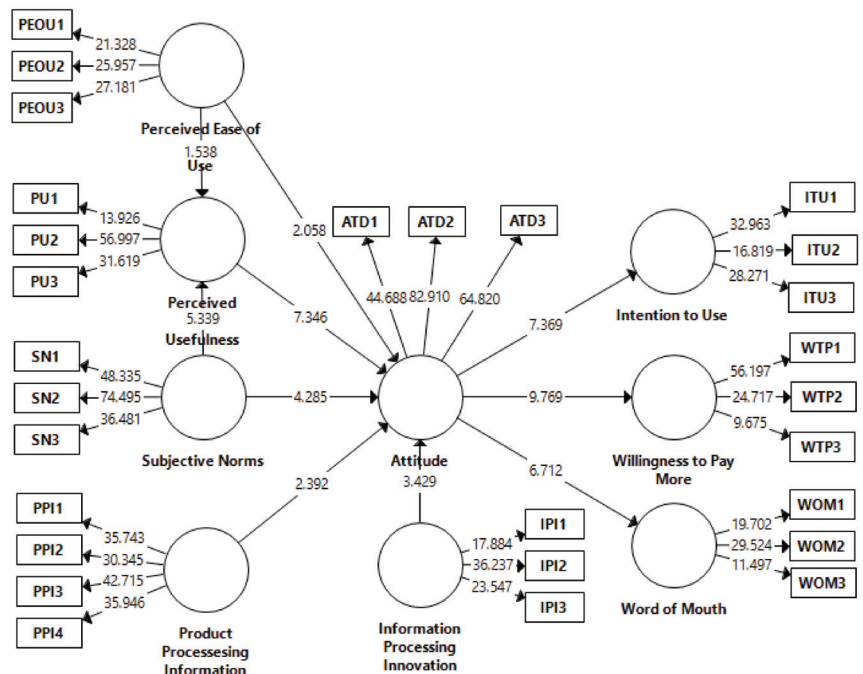


Figure 3. Structural model.

5. Discussions and Implications

The results revealed that perceived ease of use and perceived usefulness significantly affect customers' attitudes towards drone delivery services which is consistent with prior studies [4,21,76]. However, the positive influence of perceived ease of use on perceived usefulness was insignificant which matches with the findings of [89]. Customers' are unable to assess the practical impact of drone food delivery services because these services are not fully commercialized in developing nations. In the study of [49], they integrated subjective norms into TAM and found a significant and positive influence of subjective norms on the perceived usefulness of technology. The result of this study confirms that subjective norms have a positive influence on the perceived usefulness of drone food delivery services. Further, the study confirms the positive influence of subjective norms on attitude towards drone food delivery services which is consistent with the study of [90]. Further, the findings of the study revealed that product processing innovativeness and information processing have a significant impact on attitude towards drone food delivery services. These findings are consistent with prior studies which indicate the significant product processing innovative and information processing innovativeness on attitude towards emergent technologies [58,63,67]. Finally, the results depict that attitude towards drone food delivery services has a positive influence on three dimensions of behavioral intention: intention to use, word of mouth, and willingness to pay. These findings are consistent with previous studies that argued that customers with a positive attitude will say positive things about technology, use the technology, and pay extra money to avail the services of technology [4,67,68]. The results of the current study are in line with past studies except for the positive relationship between perceived ease of use and perceived usefulness. Further, unlike other studies, this study extends TAM by incorporating both constructs of domain-specific innovativeness that help to understand customers' acceptance of drone technology in the context of food delivery services.

Theoretically, this study has contributed to the TAM by confirming the significant impact of innovativeness in the adoption of drone technology [63,66]. Further, some studies found a weak and insignificant impact of domain-specific innovativeness on the adoption of novel technologies [64,91], particularly an insignificant effect of product processing innovativeness [56]. Further, the study also finds that subjective norms are significant predictors of attitudes in the adoption of drone technology in the context of food delivery services. Previous researchers also found that subjective norms have a significant effect on attitude towards the adoption of drone technology [42,49]. The addition of subjective norms in the context of drone food delivery services provides strong empirical evidence related to the significance of the construct. Hence the current research confirms the findings of previous studies and validated the significance of extended TAM in the context of drone food delivery services. Further, unlike previous studies in the context of drone food delivery services [1,2,4], the current study has extended TAM and assessed the behavioral intention into three dimensions (word of mouth, intention to use, and willingness to pay more). The results demonstrate that attitude significantly influenced the dimensions of behavioral intention.

There are several practical implications of this study. First, the marketing managers should extensively promote the usage of drone food delivery services since the results revealed the positive influence of perceived ease of use and perceived usefulness on attitude towards the drone food delivery service. In the context of developing markets such as Pakistan, the traditional food delivery system, which is normally operating through motor-bikes and cars, has many issues due to heavy traffic jams and personnel management [4,10]. Therefore, the introduction of drone food delivery services improves the efficiency of the process and food delivery system. Further, the current delivery system is based on gasoline-powered vehicles (cars and motorcycles) causing environmental pollution. Therefore, marketers should focus on the environmentally friendly aspect of new technology to encourage the adoption of drone food delivery services. Secondly, the positive influence of product processing innovativeness and information processing innovativeness on attitude

denotes the significance of drone food delivery service technology. Therefore, it is suggested that marketers need to focus on the benefits of innovative technology to customers to build a positive image of drone foodservice technology. Additionally, the advertising should focus on cost-effective and efficient delivery services of the drone to customers to generate a positive perception regarding the adoption of innovative drone technology. Thirdly, the results of the study indicate the positive influence of subjective norms in the adoption of drone technology. In a collective society such as Pakistan, subjective norms have huge importance regarding the adoption of the technology [92], therefore, marketers should emphasize the attributes of drone delivery services that offer benefits to the extended family system in a collective culture. Fourthly, the results of the study depict that customer's attitude leads to three forms of behavioral intentions: word of mouth, intention to use, and willingness to pay more. Therefore, it is recommended that food delivery service providers should focus on the encouragement of word of mouth to promote the adoption of drone food delivery services [67,93]. They posited that potential customers' word of mouth has greater influence and reach than other forms of marketing communication. In this regard, practitioners and marketers may host several competition programs to experiment with the drone food delivery system that would eventually help the association between subjective norm and behavioral intention. Lastly, the positive relationship between attitude towards drone food delivery service and customers' willingness to pay more denote the acceptance of innovative technology. Therefore, marketers should start extensive advertisements to penetrate the market and increase customers' involvement in drone food delivery services [66].

6. Conclusions and Future Research Directions

The current study aims to examine customers' behavioral intentions related to drone-delivery food services. This study has integrated subjective norms and domain-specific innovativeness constructs: product processing innovativeness and information processing innovativeness into TAM to predict customers' behavioral intention. Further, this study assessed the impact of customers' attitudes on behavioral intention constructs: intention to use, word of mouth, and willingness to pay more. The cross-sectional data of 354 restaurants customers from five main cities of Pakistan has been collected for this study. The result of ten hypotheses indicates that the proposed theoretical model possesses adequate relevancy and predictive power in the context of drone delivery food services in the Pakistani market. Although the current study has several theoretical and managerial implications, it has some limitations that need careful consideration. First, the data of respondents were collected from a developing market context, therefore, generalizability would be an issue because the respondents of developed countries may have a different opinion regarding drone delivery services. Therefore, it is recommended for future research to collect data from advanced countries' customers and compare the findings with the developing countries for a comprehensive understanding of novel technology adoption. Second, this study has only used quantitative techniques to evaluate the behavioral intention of the respondents. The findings of the quantitative study can be generalized but it covers the specific dimensions under study. To comprehensively understand customers' perceptions regarding drone food delivery services, future researchers should conduct in-depth interviews with the respondents. Third, this study has used the purposive sampling technique for the collection of data that may result in biases in data. Future studies can use different types of sampling techniques to avoid biases in data. Fourth, the data of this study has been collected at the same time which may cause common methods. Therefore, Harman single factor was conducted to ensure that common method bias is not a threat. The result depicts that a single factor contributed very low variance [94]. Therefore, Podsakoff [83] suggested to collect data at different times to avoid common method bias issues.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Measurement items.

Constructs and Measurement Items		Source(s)
Perceived Ease of Use		Choe et al. [4]
PEOU1	Learning to use drone food delivery services seems to be easy to understand.	
PEOU2	It seems to be easy to use drone food delivery services when ordering food.	
PEOU3	It does not seem to be difficult to use drone food delivery services.	
Perceived Usefulness		Choe et al. [4]
PU1	Drone food delivery services would enable me to receive food more quickly.	
PU2	Using drone food delivery services could make it easier for me to receive food.	
PU3	Using drone food delivery services seems to be convenient when receiving food.	
Attitude		Perugini and Bagozzi [79]
ATD1	I have a favorable attitude towards the use of drone food delivery services.	
ATD2	Drone food delivery service is good.	
ATD3	I have a positive attitude towards the use of drone food delivery services.	
Subjective norms		Perugini and Bagozzi [79]
SN1	Most people who are important to me think I should use drone food delivery services when ordering food.	
SN2	Most people who are important to me would want me to use drone food delivery services when ordering food.	
SN3	People whose opinions I value would prefer that I use drone food delivery services when ordering food.	
Product Processing Innovativeness		Fu and Elliott [80]
PPI1	Drone food delivery service is one of the first products of its kind in the market.	
PPI2	Drone food delivery service is totally new to the market.	
PPI3	Drone food delivery service represents a new product/service category for customers.	
PPI4	Drone food delivery service is innovative.	
Information Processing Innovativeness		Lu, Yao and Yu [44]
IP11	If I heard about new technology, I would look for ways to experiment with it.	
IP12	Among my peers, I am usually first to explore new technologies.	
IP13	I like to experiment with new products and services.	

Table A1. Cont.

Constructs and Measurement Items		Source(s)
Intention to Use		Hwang et al. [67]
ITU1	I will use a drone food delivery service for dining.	
ITU2	I am willing to use a drone food delivery service for dining.	
ITU3	I am likely to use a drone food delivery service for dining.	
Words of mouth		Hwang et al. [67]
WOM1	I am likely to say positive things about a drone food delivery service	
WOM2	I am likely to recommend a drone food delivery service.	
WOM3	I am likely to encourage others to use drone food delivery service.	
Willingness to pay more		Hwang et al. [67]
WTP1	I am likely to pay more for drone food delivery service.	
WTP2	It is acceptable to pay more for a drone food delivery service.	
WTP3	I am likely to spend extra in order to use a drone food delivery service.	

Video link: <https://www.youtube.com/watch?v=PA7NYuH0BIY&t=1s> (accessed on 10 December 2021).

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Article

The Role of Commitment in an Extended Theory of Planned Behavior: Test of Its Mediating Effect with Partial Least Squares Structural Equation Modeling

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Abstract: The theory of planned behavior (TPB) is popular for studying behavioral intentions. While the direct relationships between the three antecedents (i.e., attitudes toward the behavior, subjective norms, and perceived behavioral control) and intentions in the TPB have been extensively studied, the authors of this study hoped to draw attention to the variable “commitment”. It is interesting to explore whether commitment mediates the relationship between the three antecedents and intentions. Furthermore, this study attempted to investigate if the TPB is appropriate for explaining students’ intentions to learn sustainability. Like many other countries, sustainability has been widely integrated into primary and secondary education in China. However, if students are not interested in or feel that they are not capable of learning sustainability, they may be reluctant to do so. Therefore, this study aimed to examine an extended TPB model with a sample of 181 students from a public junior secondary school in China through factor-based partial least squares structural equation modeling. The results showed that the model could explain the intention to learn sustainability. Specifically, this research found that commitment mediated the relationships of attitudes toward learning sustainability, subjective norms, and perceived behavioral control to the behavioral intention.

Keywords: theory of planned behavior; commitment; PLS-SEM; geography education; intention

MSC: 62H15

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1. Introduction

The theory of planned behavior (TPB) is popular for studying behavioral intentions. It is hypothesized that attitudes toward the behavior, subjective norms, and perceived behavioral control are the antecedents of behavioral intentions [1]. Attitudes toward the behavior refer to the extent of an individual’s positive or negative reaction to a specific behavior; subjective norms refer to the extent to which an individual responds positively to the social preferences of the referent others; perceived behavioral control refers to an individual’s perception of his or her confidence in performing a specific behavior [2]. For Ajzen [3], perceived behavioral control is the general state of both perceived self-efficacy (i.e., one’s confidence in the ability to perform a specific behavior) and perceived controllability (i.e., one’s confidence in having the resources to perform a specific behavior), which are the internal and external influences of behavioral intention, respectively. Ajzen and his colleagues are continually pushing for the latest advances and applications of the theory through their own research work [4–8]. Since it was proposed, the theory has been widely applied in various contexts (e.g., [9–11]). Moreover, the context of the current study is about students’ intentions to learn sustainability knowledge (will be discussed in detail in the next section). In regard to school and college education, this theory is considered having important implications for explaining students’ behavioral intentions, including college students’ intentions to use a wiki for group work [2], students’ intentions to take

English courses in Chinese schools [12], Chinese students' communicative intentions [13], and college students' mobile learning intentions [14].

Although the direct relationship between the three antecedents and intentions have been extensively studied, the authors of this study would like to draw attention to the variable "commitment", which may play a role in explaining behavioral intentions. Commitment, generally referring to "a promise or firm decision to do something" (in the Cambridge Dictionary), is rarely employed in an extended TPB model. However, an individual's commitment to an organization (i.e., organizational commitment) has long been the determinant of the intention to stay or quit an organization (e.g., [15,16]). This has also been extended to the study of commitment beyond organizational commitment, such as employee and job commitment [17,18]. For example, Cuskelly and Hoye [19], studying the retention of early career sports officials, found that the commitment to officiating affected the intention to continue officiating. In a study of personal information management motivation, Hwang, Lin, and Shin [20] found a significant relationship between knowledge system commitment and knowledge sharing intentions. Moreover, Lee and Jeong [16] used a sample of 459 employees from multiple companies in South Korea and found that organizational commitment mediated the positive relationship between job insecurity and turnover intention. Based on other studies' findings that affective commitment was amongst the strongest dimension in explaining the intention to remain in a company, Orgambidez, Borrego, and Vazquez-Aguado [21] further found a significant relationship between general self-efficacy of work and affective commitment to the organization. Therefore, it would be interesting to explore whether commitments should be included in the TPB. Recently, Ajzen and Kruglanski [22] proposed the inclusion of motivation to act as a mediator between the three antecedents and intentions in explaining an intentional behavior. In a similar vein, this study posits that the TPB is extended with commitment, which attenuates the links between the three antecedents and intentions.

To test the proposed extended TPB model, this study uses partial least squares structural equation modeling (PLS-SEM). Unlike the covariance-based SEM (CB-SEM), the PLS-SEM is the variance-based SEM (VB-SEM), suitable for testing path models with non-normal data and smaller samples [23]. Since a purposive and convenient sample was employed (i.e., violation of multivariate normality of the data) in this study, the PLS-SEM method is more appropriate to examine the hypothesized model. This study uses Warp-PLS7.0 developed by Professor Ned Kock. The Factor-Based PLS Type CFM3 algorithm is adopted because it can improve computation efficiency [24]. The robust factor-based method (also known as consistent PLS [23]), similar to the CB-SEM, is employed to account for measurement errors. In addition, this software tool can determine the structural model fit [24], which is crucial in this study to examine the mediating role of commitment. There is no shortage of studies on mediating effects in the mainstream literature (e.g., [25–27]). The test of mediating effects will be described in a later section.

2. The Context of This Study

The concept of sustainability has been integrated into primary and secondary education in China [28]. Another related term is sustainable development (SD). For Maude [29] (p. 47), sustainability refers to "a sustainable state or condition", while SD refers to "a process of economic and social change". For Liu [30] (p. 246), sustainability education (SE), also known as education for SD (ESD) or education for sustainability (Efs), emphasizes "social, economic, and environmental sustainability and the interaction of these three elements". Take geography as an example. According to China's newly revised Geography Curriculum Standard for Compulsory Education [31], students should understand the concept of SD in geography so that they can learn to become active and responsible citizens, so as to protect the environment and maintain good social characteristics of the country as well as the world. Sustainability has thus become part of the standard geography curriculum, which should contribute to the development of a holistic experience not only around philosophical and theoretical issues but also around practical ones [32].

The purpose of incorporating sustainability into education is to sustain the planet by allowing students to develop their ability to relate the concept to everyday life [33]. Because of this, SE has been added to different school curricula around the world [34]. According to Noble and McGrath [35], it is crucial for our young people to learn to be resilient before they reach adulthood. The education system should be able to foster positive attitudes in students, enabling them to think logically and to be able to distinguish right from wrong [36]. It is important to increase their understanding of sustainability during their mental development stage. In fact, SE involves not only “high-quality subject matter knowledge” but also “modern researched pedagogical content knowledge”, and relies on “teachers’ interpretations and transformations of subject matter knowledge” to stimulate students’ interest in learning [32] (p. 2).

However, if students lack interest in or feel that they are not capable of learning sustainability, they may be reluctant to do so. Therefore, their perceptions of sustainability influence their intentions to learn sustainability because, as noted by Khudhair [37], such perceptions make a substantial contribution in driving their intentional behavior through their preferences for learning sustainability. Once they plan to study sustainability, their academic performance will improve. Existing literature contains a lot of research on students’ learning intentions. For example, Cheng [25] found that students’ attitudes toward e-collaboration were important in enhancing their intentions to collaborate online with group members on group projects. Likewise, the intent of learning sustainability is also worth exploring. By understanding the factors that influence students’ behavioral intentions, schools can find ways to motivate students to learn sustainability. In addition, the commitment to learning sustainability may play a role in explaining students’ learning intentions. Yet, the concept of learning commitment is rarely discussed in the extant literature [38]. Although infrequently used, similar terms have caught the attention of researchers. For example, students’ involvement or engagement in online learning refers to their commitment to online learning [39,40]. Therefore, this study aims to fill the research gap by examining the role of commitment in an extended TPB. As such, the following research objectives have been set:

1. Determining the extent to which the TPB can explain students’ intentions to learn sustainability through the factor-based PLS-SEM method.
2. Examining whether commitment plays a mediating role between the three antecedents (i.e., attitudes, subjective norms, and perceived behavioral control) and intentions.

3. Hypothesized Models

The present study aims to explore whether the commitment to learning sustainability plays a mediating role in explaining the intention to learn sustainability. As such, three models are developed: the original model of the TPB (i.e., Model A) and two extended models. In Model A, the three antecedents (i.e., attitudes toward learning sustainability, subjective norms, and perceived behavioral control) are proposed to influence the intention to learn sustainability (i.e., Hypotheses 1–3). In the first extended model (i.e., Model B), in addition to the above three hypotheses, it is further posited that attitudes toward learning sustainability (Hypothesis 4), subjective norms (Hypothesis 5), and perceived behavioral control (Hypothesis 6) are positively related to the commitment to learning sustainability, which in turn is positively related to the intention to learn sustainability (Hypothesis 7). In the second extended model (i.e., Model C), Hypotheses 1–3 are deleted while retaining the four new hypotheses in Model B. By comparing these a priori models with an empirical research design, it is possible to determine whether the inclusion of the variable “commitment” is suitable for explaining behavioral intentions. The hypotheses are listed below:

Hypothesis 1 (H1). *Attitudes toward the learning of sustainability are positively related to the intention to learn sustainability.*

Hypothesis 2 (H2). *Subjective norms are positively related to the intention to learn sustainability.*

Hypothesis 3 (H3). *Perceived behavioral control is positively related to the intention to learn sustainability.*

Hypothesis 4 (H4). *Attitudes toward learning sustainability are positively related to the commitment to learning sustainability.*

Hypothesis 5 (H5). *Subjective norms are positively related to the commitment to learn sustainability.*

Hypothesis 6 (H6). *Perceived behavioral control is positively related to the commitment to learning sustainability.*

Hypothesis 7 (H7). *The commitment to learning sustainability is positively related to the intention to learn sustainability.*

4. Research Method

4.1. Participants and Procedure

This is a quantitative study. An online survey was conducted and a self-report questionnaire in Chinese was designed to collect quantitative data from a sample of students in a public junior secondary school in Huizhou City, China. The experience of these students in learning sustainability in geography was the focus of this study because geography is one of the main subjects involved in teaching sustainability. As stated in the China's new Geography curriculum standards, the essence of the compulsory geography education is to understand the geographical environment and form geographical skills and SD concepts [31]. Thus, SE has become part of the standard geography curriculum. Furthermore, Huizhou City was selected because it is not a first-tier city and is generally considered to have lower educational performance than first-tier cities, such as Beijing, Shanghai, and Guangzhou. Motivating students' enthusiasm for learning is one of the core missions of teachers across the city. Therefore, this research may help to explore the issues that hinder students' acquisition of sustainability knowledge. Recommendations can then be made to increase students' intentions to learn sustainability.

The questionnaire was divided into two parts. The first part collected personal information (demographic background), such as gender, years of working, teaching subject, etc. The second part collected respondents' perceptions of the target variables (those in the later section of Measures). Ethical clearance was obtained. A total of 181 valid responses were received from a sampling frame of 259 students, representing a response rate of approximately 70%. An analysis of respondents' demographics reveals that approximately 50.3% were male students ($n = 91$) and approximately 49.7% were female students ($n = 90$). Their ages ranged from 12 to 16 (mean = 13.22). Respondents were asked about the number of subjects, other than geography, that were considered having elements of sustainability. The results were quite diverse. Seventy-seven respondents reported 1 subject, followed by 2 subjects ($n = 68$), 3 subjects ($n = 14$), and 4 subjects ($n = 22$). Specifically, most students ($n = 156$) studied sustainability from biology, followed by physics ($n = 93$), social studies ($n = 58$), and chemistry ($n = 36$). To test whether gender, age, the number of subjects with sustainability (i.e., their accumulated experience), and the subjects they taught acted as extraneous variables [41], t-statistic and correlation tests were performed. The results indicate that they were independent of the latent variables, with the exception of the number of subjects with sustainability that was modestly related to subjective norms ($r = 0.16$, $p < 0.05$) and perceived behavioral control ($r = 0.18$, $p < 0.05$). Therefore, all demographic variables were not included in further analysis.

4.2. Measures

There are five latent variables in this study. The items that measured these variables were mainly adapted from Ajzen [42] and are listed in Appendix A. Their measures were described as follows:

1. Attitudes toward the behavior were measured by using a seven-point bipolar adjective scale, such as boring/interesting and negative/positive, for four items;
2. Subjective norms were measured with four items, using a Likert seven-point scale, from strongly disagree (1) to strongly agree (7);
3. Perceived behavioral control was measured using a seven-point Likert scale in two items from strongly disagree (1) to strongly agree (7);
4. Intention to learn sustainability was measured in three items by using a seven-point Likert scale ranging from strongly disagree (1) to strongly agree (7);
5. Adapted from Cuskelly and Hoye [19], this study used a seven-point Likert scale ranging from strongly disagree (1) to strongly agree (7) with three items, in terms of enjoyment and comfort of learning sustainability, to measure the commitment to learning sustainability.

4.3. Statistical Analysis

The PLS-SEM was employed to examine both measurement and structural models (see Appendix B for Model A with both latent variables and corresponding measurable items). In the measurement model, the relationship between a latent variable and its respective measurable items was proposed. This involves testing the reliability and validity of the measure, including composite reliability, Cronbach alpha reliability and convergent validity [23].

In the structural model, the relationship between two latent variables (i.e., the relationship between an independent variable and a dependent variable) was proposed. The survey results were interpreted by (1) the adjusted R^2 contribution of all independent variables that explained the variance of their respective dependent variable and (2) the beta coefficient (β) of each independent variable that explained the variance of its respective dependent variable. Compared to the R^2 value, the adjusted R^2 value is more suitable for comparing various models with the same dependent variable because the adjusted value corrects for the expansion in R^2 coefficients caused by non-significant independent variables in each latent variable block [23,24]. For the test of the structural model, the method suggested by Kock [24] was employed, which will be described in the next section.

5. Results

Table 1 shows the mean scores, standard deviations, and correlations for the five latent variables. The mean scores of the variables indicate that all variables were positively rated, with mean scores ranging from 4.67 to 5.38 (out of a seven-point scale). The standard deviations of the variables also indicate that the subject scores for each variable tended to be quite close to the mean score. Finally, the table shows that the latent variables were all significantly correlated. Therefore, the hypotheses are worth examining.

Table 1. Means, standard deviations, and correlations for the five latent variables.

Variable	Mean	SD	1	2	3	4	5
AT	5.35	1.11	(0.873)				
SN	5.14	1.24	0.710 ***	(0.851)			
PBC	4.67	1.37	0.463 ***	0.545 ***	(0.783)		
COM	5.04	1.21	0.836 ***	0.763 ***	0.594 ***	(0.851)	
INT	5.38	1.24	0.806 ***	0.644 ***	0.555 ***	0.832 ***	(0.836)

Notes: AT = attitudes toward the learning of sustainability; SN = subjective norms; PBC = perceived behavioral control; COM = commitment to learning sustainability; INT = intention to learn sustainability; numbers in parentheses are square roots of average variances extracted; *** $p < 0.001$.

5.1. Test of the Measurement Model

Measurement biases were assessed through the test of reliability, convergent validity, and discriminant validity of the reflective measures of the latent variables [23]. Table 2 presents the results. First, the internal consistency of the latent variables was good because their composite reliability values ranged from 0.759 to 0.927 and Cronbach’s alpha values ranged from 0.758 to 0.928, both of which were above the threshold of 0.7 [24]. Second, the convergent validity of all latent variables appeared to be sufficient because (1) their AVE values were between 0.613 and 0.762, exceeding the threshold of 0.50 and (2) each item has a structure loading above 0.7 for its respective latent variable [23]. Third, the discriminant validity of all latent variables was confirmed by meeting the Fornell–Larcker criterion; that is, the square root of AVE of each latent variable was higher than the correlation coefficients between this latent variable and other latent variables (see Table 1) [23].

Table 2. Results for assessing the measurement model.

Variable	AVE	Composite Reliability	Cronbach’s Alpha	Structure Loadings
AT	0.762	0.927	0.928	0.845 ↔ 0.913
SN	0.725	0.913	0.913	0.744 ↔ 0.903
PBC	0.613	0.759	0.758	0.743 ↔ 0.821
COM	0.725	0.888	0.888	0.831 ↔ 0.869
INT	0.698	0.874	0.874	0.797 ↔ 0.856

Notes: AT = attitudes toward the learning of sustainability; SN = subjective norms; PBC = perceived behavioral control; COM = commitment to learning sustainability; INT = intention to learn sustainability; AVE = average variance extracted.

5.2. Test of the Three Structural Models

Structural models were assessed by means of the full collinearity test, output model fit, coefficient of determination (R^2) for each dependent variable, and the standardized beta coefficient (β) for each hypothesized relationship [23,24]. To test for multicollinearity (also known as full collinearity) among the latent variables in the three structural models, this study employed the full collinearity VIF (FCVIF), which could also be used to assess common method biases. The FCVIF identifies both vertical and lateral collinearity involving all latent variables in a structural model, thereby outperforming the “classic” VIF that considers only vertical collinearity [24]. For minor multicollinearity and common method biases, the FCVIF value of a variable should be less than 3.3 for regression-based models and less than 5 for models incorporating measurement errors, such as factor-based PLS-SEM models [43], while this threshold could also be relaxed to 10 for highly correlated variables [24]. Tables 3–5 show that the FCVIF values were all less than 5, except for commitment in models B and C where the value was slightly larger than 5, suggesting that both multicollinearity and common method biases were trivial. For readers’ information, the “classic” or vertical collinearity VIF values for the latent variables in the three models ranged from 1.614 to 4.275 (where only one of them was higher than 3.3), all below the threshold of 5 for factor-based PLS-SEM [24].

Table 3. Results for assessing the structural model A.

Dependent Variable	Independent Variable			R^2	Adjusted R^2
	AT β	SN β	PBC β		
INT (3.880)	0.591 *** (4.244)	0.203 ** (2.635)	0.162 * (1.685)	0.740 -	0.736 -

Notes: Numbers in parentheses are FCVIF values. AT = attitudes toward the learning of sustainability; SN = subjective norms; PBC = perceived behavioral control; INT = intention to learn sustainability; β = beta coefficient; R^2 = coefficient of determination; FCVIF = full collinearity variance inflation factor. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Table 4. Results for assessing the structural model B.

Dependent Variable	Independent Variable				R ²	Adjusted R ²
	AT β	SN β	PBC β	COM β		
COM	0.521 *** (3.898)	0.311 *** (2.616)	0.172 ** (1.679)	- (5.503)	0.795 0.672	0.791 0.664
INT	0.406 *** (4.126)	-0.071 (2.616)	0.101 (1.679)	0.383 *** (5.503)	-	-

Notes: Numbers in parentheses are FCVIF values. AT = attitudes toward the learning of sustainability; SN = subjective norms; PBC = perceived behavioral control; COM = commitment to learning sustainability; INT = intention to learn sustainability; β = beta coefficient; R² = coefficient of determination; FCVIF = full collinearity variance inflation factor. *** $p < 0.001$; ** $p < 0.01$.

Table 5. Results for assessing the structural model C.

Dependent Variable	Independent Variable				R ²	Adjusted R ²
	AT β	SN β	PBC β	COM β		
COM	0.531 *** (3.880)	0.303 *** (2.635)	0.172 ** (1.685)	- (5.643)	0.800 0.703	0.797 0.701
INT	- (4.244)	- (2.635)	- (1.685)	0.838 *** (5.643)	-	-

Notes: Numbers in parentheses are FCVIF values. AT = attitudes toward the learning of sustainability; SN = subjective norms; PBC = perceived behavioral control; COM = commitment to learning sustainability; INT = intention to learn sustainability; β = beta coefficient; R² = coefficient of determination; FCVIF = full collinearity variance inflation factor. *** $p < 0.001$; ** $p < 0.01$.

Tables 3–5 show the test results for the three structural models (A, B, and C), respectively. In these models, each dependent variable was significantly explained by the corresponding independent variable(s), as indicated by their respective adjusted R² values. In a regression model, the β value indicates whether an independent variable is significantly related to a dependent variable. Since the β value is standardized, the higher the β value, the stronger the relationship between the two variables. Figures 1–3 illustrate the results of the three hypothesized models. Moreover, if the hypothesized relationship is found to be significant, a hypothesis is supported, and vice versa. In Table 3, attitudes toward learning sustainability, subjective norms, and perceived behavioral control explained 73.6% of the variance in learning intentions of sustainability, while in Tables 4 and 5, attitudes, subjective norms, and perceived behavioral control explained 79.1% and 79.7%, respectively, for the variance in commitment to learning sustainability. Furthermore, in Table 4, attitudes, subjective norms, perceived behavioral control, and the commitment to learning sustainability explained 66.4% of the variance in the intention to learn sustainability, while in Table 5, the commitment to learning sustainability explained 70.1% of the variance in the intention to learn sustainability.

5.3. Comparison of the Three Structural Models

To compare the three structural models to find the best-fit model, three indicators were used: average path coefficient (APC), average R² (ARS), and average adjusted R² (AARS) [24]. They measured the explanatory power of a model, and the best-fit model should have the largest values of these indicators [24]. While each of the three structural models showed a very good data fit, Model C (APC: 0.461, $p < 0.001$; ARS: 0.752, $p < 0.001$; AARS: 0.749, $p < 0.001$) outperformed Model A (APC: 0.319, $p < 0.001$; ARS: 0.740, $p < 0.001$; AARS: 0.736, $p < 0.001$) and Model B (APC: 0.281, $p < 0.001$; ARS: 0.733, $p < 0.001$; AARS: 0.728, $p < 0.001$). This shows that Model C was the best fit for the data.

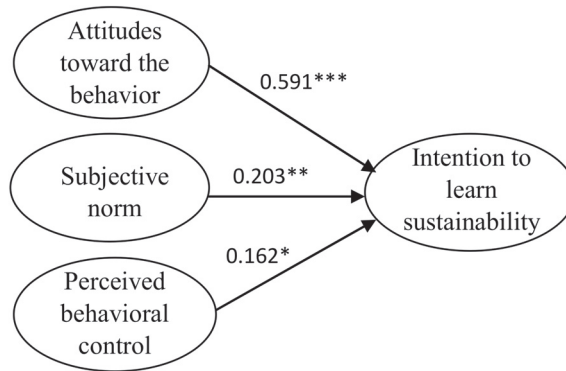


Figure 1. The results for the original model A. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

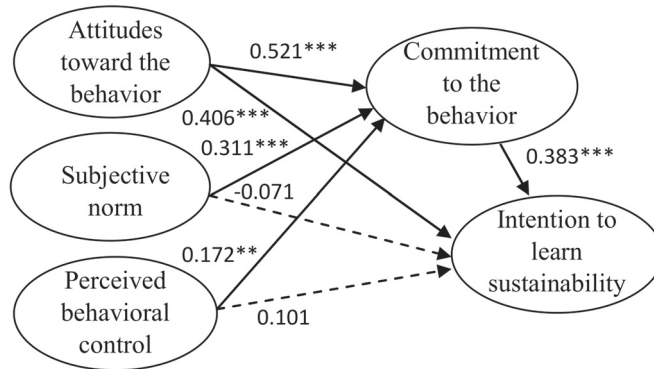


Figure 2. The results for Model B. A solid line means a significant relationship, while a dotted line means a non-significant relationship. *** $p < 0.001$; ** $p < 0.01$.

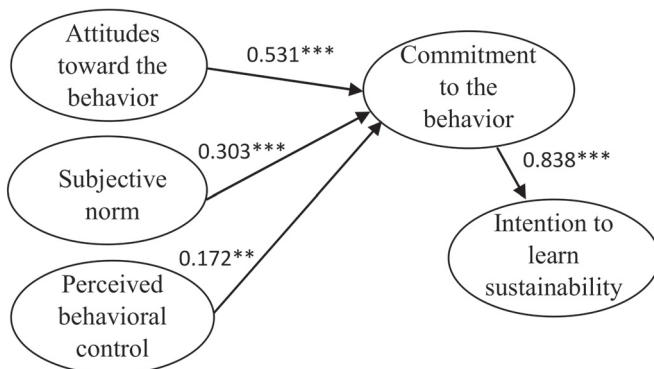


Figure 3. The results for Model C. *** $p < 0.001$; ** $p < 0.01$.

Regarding the influence of each independent variable in Model C, attitudes toward the behavior ($\beta = 0.531$, $p < 0.001$), subjective norms ($\beta = 0.303$, $p < 0.001$), and perceived behavioral control ($\beta = 0.172$, $p < 0.01$) were significantly related to the commitment to learning sustainability, supporting H4, H5, and H6, respectively. The study has also found that the commitment to learning sustainability was significantly related to the intention of

learning sustainability ($\beta = 0.838, p < 0.001$), supporting H7. Finally, as this study supports Model C, H1, H2, and H3 were removed and would not be explained.

5.4. Test of Mediating Effects of the Commitment to Learning Sustainability

To provide stronger evidence to determine whether commitment could play a role in Model C, an investigation of its mediating effect was conducted [44]. In light of the findings reported in the previous sections, the mediating role of commitment was examined. A two-step approach was used in this study [25]. The first step involved evaluating the three conditions given by Baron and Kenny [45]. If any of these conditions are not met, the mediating effect would be negligible [46]. Once these conditions are met, another mediation test (i.e., the second step) would be performed. Given the results shown in Tables 3–5, the three conditions were met. First, attitudes, subjective norms, and perceived behavioral control were significantly associated with intentions. Second, attitudes, subjective norms, and perceived behavioral control were significantly associated with commitments. Third, commitment and intention were significantly related after controlling for attitudes, subjective norms, and perceived behavioral control.

The second step is to perform the Sobel's product of coefficients test, which is probably the most popular method to test for mediation effects [47]. This test relies on standard errors and is suitable for nonlinear multivariate analyses, including WarpPLS [24]. The Sobel's z-value and the significance level of each mediating effect were computed according to the formula provided by Preacher and Hayes [48]. The results show that the commitment to learning sustainability significantly mediated the relationships of attitudes ($z = 6.808; p < 0.001$), subjective norms ($z = 4.116; p < 0.001$), and perceived behavioral control ($z = 2.351; p < 0.01$) to the intention to learn sustainability.

6. Discussion

This study has found that Model C was the best-fit model. The results show that the extended TPB is suitable for explaining the intent of learning sustainability. The main contribution of this study is twofold. First, the study has found that attitudes, subjective norms, and perceived behavioral control could explain the commitment to learning sustainability. This is a new discovery that alters our understanding of the consequence of these three exogenous variables, which were originally thought to be directly related to behavioral intentions. Perhaps, adding the variable "commitment" to the TPB offers a more comprehensive model for understanding the phenomenon. Future research in this area is therefore strongly recommended. Among these three exogenous variables, students who had a more positive attitude toward learning sustainability were found to be more committed to learning sustainability. For example, school gardening may help students develop their intrinsic values in conserving flora and fauna [49]. Teachers may also increase students' awareness of local environmental issues, with a particular focus on how knowledge of sustainability can improve the situation. Moreover, students who were followers of their referent others were found to be more committed to learning sustainability if such referent others would like them to do so. Thus, it becomes important to find who their referent others are. Their encouragement and support for students should not be ignored. On the other hand, students who were more confident in learning sustainability were found to be more committed to learning it. In order to help students to improve their self-efficacy of learning sustainability, teachers should plan effective learning activities to stimulate students' interest in learning [50]. With the aid of modern computer technology and geography teaching equipment, teachers can help students overcome the difficulties in studying junior middle school geography that is usually involved in understanding SD issues with scientific methods. As pointed out by Cai [51], geography teachers should provide students with rich and joyful geography lessons while learning sustainable geography knowledge.

Second, this research has found that commitment was positively related to the intention to learn sustainability. This is another new discovery and is consistent with the

existing literature that organizational commitment is the cause of the intention to quit or stay in the organization, especially empirical studies like Lee and Jeong [16] who found the mediating role of organizational commitment between job insecurity and turnover intention. This enhances the understanding of the TPB, which has not yet accounted for the commitment-intention pair that has long been adopted in the study of employee turnover. Since environmental awareness and consciousness are the common goals of learning both geography and SD [52], teachers should help students develop an interest in environmental protection in order to strengthen their willingness to learn sustainability, especially focusing on certain consumption behaviors as the underlying causes of corresponding environmental consequences, thereby encouraging greater participation in learning sustainable resource spending [53].

7. Conclusions

This study, perhaps the first of its kind, supports an extended TPB model that adds the variable “commitment” as a mediator regulating the influences of attitudes, subjective norms, and perceived behavioral control on sustainability learning intentions. It also demonstrates how to compare the three theoretical models using the robust factor-based PLS-SEM through the structural model fit indicators. Besides its empirical contributions, this study has limitations. First, the sample was students from a junior secondary school in China; thus, the results may not be generalized to a larger population, such as all schools in China, let alone schools in other countries. The results should be interpreted with care. Having said that, this study still provides some useful information for those who are interested in this research topic or teachers who need to teach sustainability in a subject. Furthermore, this research used a cross-sectional questionnaire survey, which had the problem of common method biases. Yet, this has been resolved by checking FCVIF. The method bias effect was trivial in this study. All in all, this may be the first study to consider the inclusion of commitment into a TPB model. It is recommended to continue examining the value of commitment in explaining behavioral intentions. Among other theories, the three-dimensional model of organizational commitment proposed by Allen and Meyer [15] has been widely used to study employee turnover. Future research may explore the role of these dimensions (i.e., affective, continuance, and normative) of other commitment types in explaining behavioral intentions, such as comparing the effects of these dimensions of commitment to learning sustainability on the intention to learn sustainability. Other compelling insights may then emerge.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of The Education University of Hong Kong (with approval code: 2021-2022-0168 and approved on 29 December 2021).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data for this study are held by the first author. For any access to the data, please contact the first author.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1 lists the items for measuring each variable.

Table A1. Corresponding items for each variable.

Variable	Item
Attitudes toward learning sustainability	I feel that learning sustainability in geography is boring/interesting. I feel that learning sustainability in geography is negative/positive. I feel that learning sustainability in geography is useless/useful. I feel that learning sustainability in geography is bad/good.
Subjective norm	I would like to learn sustainability in geography because people who are important to me think that I should do it. I think that people whose opinions I value would encourage me to learn sustainability in geography. People who are important to me think that learning sustainability in geography is good. I know some people who are important to me have learnt sustainability in geography.
Perceived behavioral control	If I want to, it is easy for me to learn sustainability in geography. To me, learning sustainability in geography is not a challenge.
Intention to learn sustainability	I intend to learn sustainability in geography. I am willing to learn sustainability in geography. I plan to learn sustainability in geography.
Commitment to learning sustainability	I enjoy discussing about sustainability with others. I feel comfortable in learning sustainability in geography. In general, I am dedicated to learning sustainability in geography.

Appendix B

Figure A1 exhibits the original TPB model with both variables and their corresponding items.

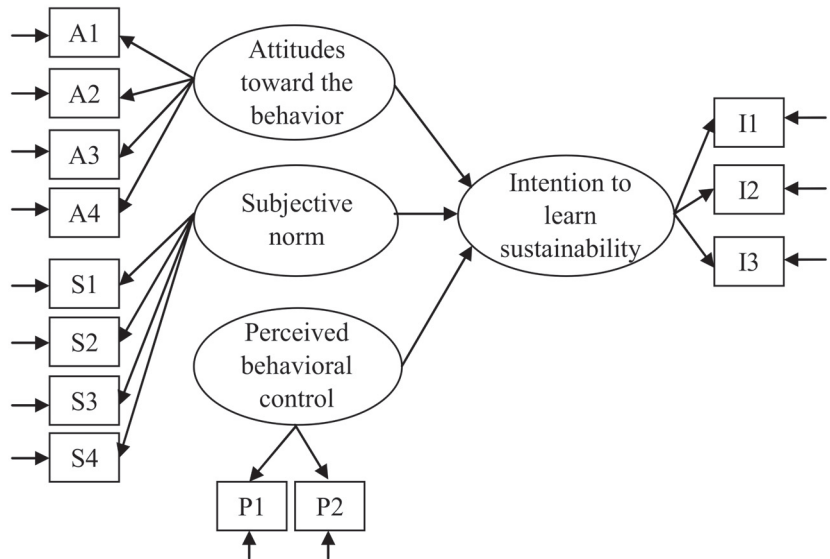


Figure A1. The original TPB model (same as Model A).

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Article

Enhancing PLS-SEM-Enabled Research with ANN and IPMA: Research Study of Enterprise Resource Planning (ERP) Systems' Acceptance Based on the Technology Acceptance Model (TAM)

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Abstract: PLS-SEM has been used recently more and more often in studies researching critical factors influencing the acceptance and use of information systems, especially when the technology acceptance model (TAM) is implemented. TAM has proved to be the most promising model for researching different viewpoints regarding information technologies, tools/applications, and the acceptance and use of information systems by the employees who act as the end-users in companies. However, the use of advanced PLS-SEM techniques for testing the extended TAM research models for the acceptance of enterprise resource planning (ERP) systems is scarce. The present research aims to fill this gap and aims to show how PLS-SEM results can be enhanced by advanced techniques: artificial neural network analysis (ANN) and Importance–Performance Matrix Analysis (IPMA). ANN was used in this research study to overcome the limitations of PLS-SEM regarding the linear relationships in the model. IPMA was used in evaluating the importance and performance of factors/drivers in the SEM. From the methodological point of view, results show that the research approach with ANN artificial intelligence complements the results of PLS-SEM while allowing the capture of nonlinear relationships between the variables of the model and the determination of the relative importance of each factor studied. On other hand, IPMA enables the identification of factors with relatively low performance but relatively high importance in shaping dependent variables.

Keywords: traditional PLS-SEM; artificial neural network (ANN) analysis; Importance–Performance Matrix Analysis (IPMA); ERP system acceptance; TAM model

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1. Introduction

This article concerns enhancing traditional techniques in PLS-SEM with both artificial neural network (ANN) analysis and Importance-Performance Matrix Analysis (IPMA) when analyzing the maturity stage of the acceptance of enterprise resource planning (ERP) systems.

A review of the literature reveals that traditional PLS-SEM has been a powerful tool in researching business information solutions for the past 40 years [1–9]. With increasingly advanced and complex business information solutions, the PLS-SEM approach has also been increasingly used. However, advanced techniques and their resulting improved usability of PLS-SEM results that are achieved by combining such analysis with techniques such as ANN analysis are rarely reported.

The use of the PLS-SEM technique is very common in various fields of research where the researcher is interested in identifying statistically significant influencing factors for the dependent variables of the model. The limitation of the PLS-SEM technique is reflected, in particular, in the assumption of linear relationships between the model variables [10,11].

Although this limitation is important for a number of areas where this approach is applied, its importance is even more pronounced in management, which deals with human decisions that are multidimensional and complex by nature [12,13].

One possible approach is to supplement the results achieved by the PLS-SEM technique with the ANN method, which is one of the most valuable and commonly implemented artificial intelligence tools. The need to implement advanced data analysis methods in the discipline of management and business sciences, in general, is growing. In such cases, ANN can be an effective option for solving complex prediction problems. In management, these approaches are particularly successful in modeling nonlinear relationships between a dependent variable (or variables) and input data. Therefore, the previously mentioned disadvantage of PLS-SEM being able to recognize only linear relationships can be overcome precisely by using ANN, which recognizes nonlinear relationships [10,14]. In addition, traditional statistical methods and models assume that consumer decisions are linear and compensatory, which means that the deficiency of one factor may be compensated by improving other factor predictor [15]. This is often not the case in acceptance studies, i.e., consumer assessment as well as the decision-making process may not be compensatory and applied linear models might be inaccurate, so ANNs could be used to successfully resolve this issue [16]. Next, ANN techniques can give higher prediction accuracy as compared to linear ones [11,17], and they are also more robust and flexible [13]. Finally, the introduction of another research method would help to verify and reinforce the results obtained by PLS-SEM, thus improving the validity and reliability of these results [18]. However, because the ANN approach is not aimed at testing hypotheses and studying the impact of factors on the dependent variable(s) [10,14,18,19], the obtained PLS-SEM results from the first part of our research study are used in forming an ANN model that includes the statistically significant factors identified in the PLS-SEM.

IPMA is used in the last part of the research to assess the performance of key factors influencing the key dependent variables of the model. The implementation of IPMA provides additional results and important information that adds value to the PLS-SEM findings. The analysis of path coefficients, which allows the analysis of the importance dimension of an individual factor, is enriched in IPMA by considering the performance dimension through the average values of latent variables along with their indicators [20].

The importance of the research and of methodological approach we propose is high for managerial practice, as presented in this paper by the study of the acceptance of ERP systems based on the theoretical conceptual model—the technology acceptance model (TAM). It should be emphasized that with the digitalization of business, the importance of information systems in companies is enormous. Nowadays, in the time of the so-called digital transformation, the use of ERP systems in companies is necessary as they represent a central (main) information system to support almost all business processes on the operational levels of the companies [21]. In addition to that, the main characteristics of ERP systems are enterprise-wide integration, modular design (including business modules such as accounting and finance, purchasing, sales, manufacturing, services, human resources, etc.), a central common database where each data is written once, real-time operations, integration with other information systems, best business practices, consistent user interface, strategic planning, automatic functions, etc., [21–28]. Although ERP systems were first mentioned by Gartner in 1990, they remain the most important standard software to support business processes in companies, where technology has changed several times over the decades and the functionalities of these solutions are constantly being added to and expanded [29]. Since ERP systems are standard information systems created according to best practice, companies are expected to take over business processes ERP systems when implemented, which often leads to changes in business processes within the company and, among other things, to a different way of working for users. The successful implementation of ERP systems increases the company's competitive advantages since research has shown that the effective use of ERP systems can notably decrease the time required to conclude business processes and increase the process of the effective sharing of information

in companies [22,23]. On the other hand, ERP system implementations very frequently fail, thus leading to unachieved yet expected benefits [24,25], especially in the stage of use (also called the mature stage) of the ERP lifecycle in the company. In this stage, theoretically, users gain in-depth knowledge of how to utilize the ERP system and therefore adopt the system such that the usage itself is beginning to be a constant, daily activity. Several studies (i.e., [26,27,30,31]) have identified that users' unwillingness and their negative attitudes to adopt and use the implemented ERP systems may be a common reason for ERP system implementation failures. Our research provides in-depth insights into the importance of the external and internal factors of the business information system that shape and influence the effective mature use of ERP systems in companies.

The empirical study presented in this paper was conducted in an automotive multinational corporation consisting of several subsidiary companies across several countries. In this industry, great emphasis is placed on the use of ERP systems in the entire manufacturing supply chain, especially in terms of reducing costs, speeding up and automating production, and better product quality [28], so the acceptance of ERP systems is very important for the studied corporation. The corporation implemented an SAP ERP solution provided by SAP AG in all subsidiary companies in the past and is now, after many years of use, in its maturity stage; therefore it should be used at the advanced level by their SAP ERP users. While the acceptance of the newly implemented ERP systems in companies is often studied--the so-called stabilization phase in the five-year period after the introduction of the ERP into the company--there are many fewer studies regarding the maturity stage, referring to the advanced and therefore different usage and acceptance issues. In this paper, we therefore present a large corporation that has been using the ERP long enough to be able to analyze its mature, advanced use, while at the same time being multinational and diverse. Better knowledge regarding the factors that shape user acceptance of the ERP system in the mature stage is needed for successful ERP applications and use [30,32–35]. For this reason, the main purpose of this research is to enrich the results of PLS-SEM with the advanced data analysis methods of ANN and IPMA, thus creating the basis for evidence-based, grounded business decisions to support the development of the mature use of ERPs in companies.

The structure of the paper is as follows: Section 2, Materials and Methods, introduces the methodological techniques that were implemented in the paper, followed by a brief description of the ERP systems and the theoretical model, TAM, as the basis of our case research. The last two subsections in this section detail the research model and research approach. Results, described in the subsections according to the defined stages of the research design, are given in Section 3. Then, the research model formed, the results obtained, the practical value for evidence-based decision making and some ideas for future research are discussed in Section 4. Section 5 describes the main conclusions.

2. Materials and Methods

2.1. PLS-SEM

PLS path modeling is an SEM technique based on the analysis of variance. It has become an accepted technique for analyzing path models with at first latent variables (called the measurement model) and then their relationships (the structural model) [36]. It is often used in the fields of the social sciences, especially in economics and business science [37–39].

Within SEM, a set of relationships between independent and dependent variables (one or more of both) can be modeled, while variables can be constructs as well as measured variables. The aim of the SEM can be to examine (test) the model, to test determined model hypotheses, to reform the model formed, or to test two or more interrelated models [40]. Covariance-based SEM (such as AMOS, EQS, LISREL) and component-based SEM (such as PLS) are two types of SEM. The SEM allows researchers flexibility in modeling relationships between several endogenous (η) and exogenous (ζ) latent variables or constructs. There are

two types of linear relationships: inner and outer relationships [41], as presented through the example in Figure 1.

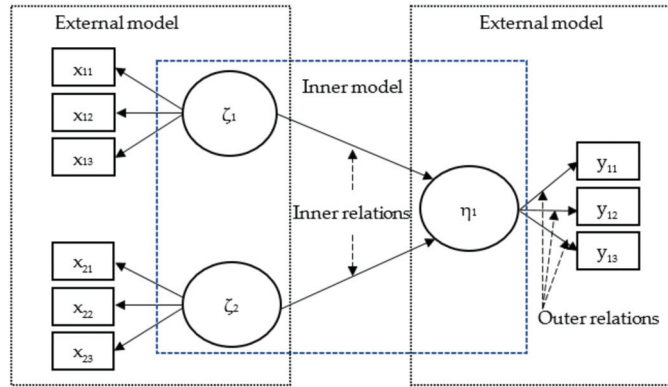


Figure 1. Example of the SEM model.

The internal model (also called the measurement model) determines the relationships between unobserved constructs, whereas the external models (or the structural models) determine the relationships between the construct and its observed or measured indicators [42]. The relationships between measured variables and constructs originate from external relations that can be defined either as reflective or formative ones. Reflective items designate the effects of the investigated construct. Formative items compose the studied construct. The Bentler–Weeks method is used for component-based SEM specifications [40], where each latent or measured variable in the model is either dependent or an independent variable. SEM specification is expressed by the following “set of equations [40], p. 743:

$$\eta = B\eta + \Gamma\zeta + \zeta \tag{1}$$

where

- η vector of dependent constructs ($m \times 1$),
- ζ vector of independent constructs ($k \times 1$),
- B is a ($m \times m$) matrix of regression coefficients between dependent variables,
- Γ is a ($m \times k$) matrix of regression coefficients between dependent and independent variables, and
- ζ is an error vector ($m \times 1$).

The measurement model is assessed first. The evaluation of reflective measurement models consists of composite reliability (*CR*) for the assessment of the reliability of each indicator, internal consistency, and average variance extracted (*AVE*) to assess convergent validity [43]. The internal consistency reliability measure for a specific construct used is Cronbach’s α , where M represents the number of indicators ($i = 1, 2, \dots, M$) by which the specific construct is measured, and s_i^2 is the variance of the i -th indicator for each construct [43]:

$$\text{Cronbach's } \alpha = \left(\frac{M}{M-1} \right) \left(1 - \frac{\sum_{i=1}^M s_i^2}{s_i^2} \right) \tag{2}$$

Due to the limitations of Cronbach’s α (i.e., assumptions that all indicators are equally reliable and as the number of items in the model increases, the Cronbach’s α may increase,

even if it does not contribute to greater reliability of the measurement scale), an additional measure of internal consistency reliability was used—a CR measure, defined as [43]:

$$CR = \frac{\left(\sum_{i=1}^M l_i\right)^2}{\left(\sum_{i=1}^M l_i\right)^2 + \sum_{i=1}^M var(e_i)} \tag{3}$$

Here l_i constitutes the standardized outer loading of the i -th indicator ($i = 1, 2 \dots M$) of the specific construct and $var(e_i)$ constitutes the i -th indicator’s variance of the measurement error. Due to the fact that CR tends to overestimate the internal consistency reliability, we report both criteria.

To assess the convergent validity of constructs, AVE measure was used [40], representing the communality of a specific construct:

$$AVE = \left(\frac{\sum_{i=1}^M l_i^2}{M}\right) \tag{4}$$

The Fornell–Larcker criterion, cross-loadings, and HTMT ratio (the heterotrait–monotrait ratio) of correlations may be implemented to assess discriminant validity [37–39]. The Fornell–Larcker criterion [44,45] requires the construct to share more variance with its associated indicators than with any other construct. Therefore, AVE should be larger than the squared correlation with any other construct. Garson [38] pointed out that cross-loadings are alternative to AVE and that at a bottom level, each indicator has the highest correlation with its own construct, compared with any other construct. HTMT ratio presents “the geometric mean of the heterotrait–monotrait correlations divided by the average of the monotrait–hetero method correlations”, as defined by Henseler et al. [37] who suggest that HTMT value should not exceed 0.90, while Garson [38] set the threshold at 1.0

The next stage of the research is focused on the structural model analysis—on hypothesis testing, which consists of the assessment of standardized path coefficients significance and the level of R^2 values. Garson [35] pointed out that including predictors in the model be likely to increase R^2 , although the exposed predictors have only an insignificant level of impact on the dependent variable; therefore, it is necessary to use adjusted R^2 . Adjusted R^2 can be computed by the formula:

$$Adjusted R^2 = 1 - \left(\frac{(1 - R^2)(n - 1)}{(n - k - 1)}\right) \tag{5}$$

where R^2 is the unadjusted R^2 , n equals the size of the sample, and k is the number of predictors.

Statistical significance of the path coefficients was calculated implementing the bootstrapping resampling method, where five thousand sub-samples were included [46]. The bootstrap method allows testing the null hypothesis that the standardized path coefficient equals 0 in the population. Using the standard error of the bootstrap obtained distribution, a t test is used to test whether the path coefficient (for example β_1) is significantly different from 0, as follows:

$$t = \frac{\beta_1}{se_{\beta_1}^*} \tag{6}$$

Here $se_{\beta_1}^*$ represents the standard error of the bootstrap derived distribution for β_1 , while β_1 is the path coefficient estimated from the original model and empirical data.

The coefficient of determination (R^2), as defined above, describes “the amount of variance of the dependent construct explained by all of the explanatory constructs affecting it. Its values are from 0 to 1. The higher the value better the predictive capacity of the model” [47]. Chin determined that “0.19 is weak, 0.33 is moderate, and 0.67 is substantial explanatory power of the model” [48]. In addition to the R^2 values, the size effect f^2 is used,

which is defined as the change in the coefficient of determination value when an individual independent construct is excluded from the model. Its equation is as follows [49]:

$$f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}} \quad (7)$$

Here $R^2_{included}$ and $R^2_{excluded}$ are the coefficient of determination values for the dependent variable when an individual independent “construct is included in or excluded from the model” [49].

A mediation effect is generated if certain construct or variable intervenes between two existing constructs. An arrow between the two constructs represents the direct relationship or effect, while indirect effects involve a set of relations where one or more constructs are intervening. Hair et al. [49] pointed out that mediation effects are often present in the models but are often not analyzed. There could be two types of non-mediation in the model: (1) “direct-only non-mediation”, with significant direct effect only and (2) “no-effect non-mediation”, where there is no significant effect and three mediation types: (i) “complementary”, where both direct and indirect effects are significant and pointing in the same direction, (ii) “competitive”, where both effects are significant but pointing to opposite directions, and (iii) “indirect-only mediation”, where only the indirect effect is significant [43,50]. Hair et al. [45] pointed out to the importance of the bootstrapping of the indirect effects’ sampling distribution. They added that bootstrapping needs no assumptions regarding the sampling distribution of the statistics or the form of the variables’ distribution and can be applied to small sample sizes with a higher level of confidence.

The next step includes the blindfolding procedure. Its objective is to assess the model’s predictive accuracy. The blindfolding approach introduced by Wold [51] was implemented that is based on the cross-validation (cv) strategy and includes the calculations of cv-redundancy and cv-communality for constructs and indicators. The index of cv-redundancy index (i.e., Stone-Geisser’s Q^2) “measures the quality of the structural model, where the cv-communality (H^2) measures the quality of the measurement model” [38]. H^2 uses only the measurement model. It measures the capacity of the path model to predict the manifest variables directly from their own latent variable by cv. The mean values of the Q^2 that refer to the dependent constructs are used to assess the overall quality of the structural model if they are positive for all dependent constructs’ subparts. An H^2 and Q^2 value that is greater than 0 indicates the relevance and predicting power of the structural models and measurements [38].

2.2. Artificial Neural Network Analysis (ANN)

PLS-SEM, as well as the other well-known conventional statistical techniques, work exceptionally well when the relationships among variables are linear. As a linear technique, it cannot consider any non-linear effects in the research model, which in some cases could lead to over-simplification and inaccurate results [52]. In order to overcome this potential drawback, ANN models are introduced. ANN is “a massively parallel distributed processor made up of simple processing units, which have a neural propensity for storing experimental knowledge and making it available for use” [53] and it is analogous to the human brain as it learns and stores data through iterative learning process. Artificial neural networks are complex models, classified as artificial intelligence/machine learning techniques, which easily model non-linear relationships [54,55]. In addition, ANN models are also more accurate as compared to the linear models [56] and also more robust and flexible [13,19]. Unfortunately, the ANN approach, due to “black-box” operating nature of ANN models, cannot be used to test of causal relationship among variables [57,58]. Therefore, a hybrid, two-step approach is suggested [16,59]: Firstly, PLS-SEM is used to test hypotheses, i.e., to establish statistically significant predictors of dependent constructs, and, secondly, only significant predictors are utilized as constructs in ANN models. A broad

review of the studies combining SEM and ANN in technology acceptance studies can be found in Kalinic, et al. [60].

Though numerous different types of ANNs exists [60], in this research, feedforward back-propagation multilayer perceptron (MLP) is used as one of the most common and most popular ones [61,62]. An input layer and one or more hidden layers along with an output layer form typical MLP ANN model, while each layer consists of one or more neurons, as presented in Figure 2.

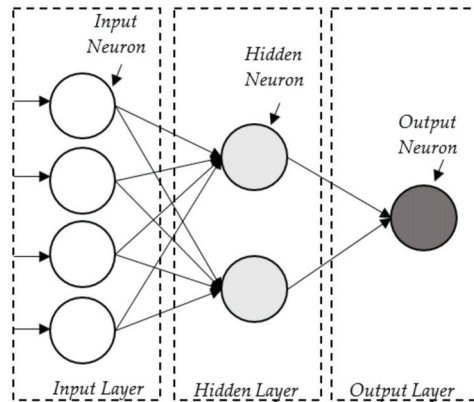


Figure 2. An example of MLP ANN.

The number of significant predictors in the model determines the number of neurons in the input layer (i.e., input neurons); while the number of neurons in the output layer (i.e., output neurons) equates the number dependent constructs (outputs) [54,63]. The number of neurons in hidden layer(s) (i.e., hidden neurons) generally depend on the neural network architecture (the numbers of hidden layers, model inputs and outputs), activation functions, sample size, etc., [64] and often is selected using trial-and-error or by simulation software [65].

Input neurons simply accept input signals and forward them to the neurons in the hidden layer. A single neuron is a simple computing unit. First, the weighted sum of all inputs to the neuron is calculated. For example, this sum for the *i*-th hidden neuron would be:

$$s_i = \sum_{j=1}^n w_{i,j}x_j + b_i \tag{8}$$

where x_j is the value of *j*-th input signal, *n* equals the number of inputs, $w_{i,j}$ is synaptic weight connecting *j*-th input with *i*-th hidden neuron, and b_i is a bias (or a threshold) of *i*-th hidden neuron. The initial values of synaptic weights and biases are set randomly, between 0 and 1, and final values are determined through iterative training process which minimizes cost function, via the backpropagation of error. The output of the hidden neuron is finally calculated by feeding a previously calculated weighted sum through the activation function, which brings nonlinearity to the ANN model. There are different examples of triggering functions (e.g., Rectified Linear Unit—ReLU, hyperbolic tangent), but the most frequently used in the behavioral studies is Sigmoid [60]. Here, the output of the activation function, i.e., the output of *i*-th hidden neuron— h_i is calculated as:

$$h_i = \sigma(s_i) = \frac{1}{1 + e^{-s_i}} = \frac{1}{1 + e^{-(\sum_{j=1}^n w_{i,j}x_j + b_i)}} \tag{9}$$

where s_i is previously calculated weighted sum of inputs. Although complex ANN models (deep learning) consist of several hidden layers, even ANNs with just the single one can

model any continuous function [55] and recent study shows that the most of technology acceptance studies used ANN models with just one hidden layer [60].

The k -th neuron in the output layer (in a more general case, with more than one output) calculates the output y_k of the ANN model in the same way as hidden neurons: as a weighted sum of its inputs (which are the outputs of the hidden neurons), fed through the nonlinear activation function, e.g., sigmoid:

$$y_k = \sigma(sh_k) = \frac{1}{1 + e^{-sh_k}} = \frac{1}{1 + e^{-(\sum_{l=1}^m v_{k,l}h_l + c_k)}} \tag{10}$$

where h_l is the output of l -th hidden neuron, m is the number of hidden neurons, $v_{k,l}$ is synaptic weight connecting l -th hidden neuron with k -th output, and c_k is a bias of k -th output neuron.

2.3. IPMA

Standard PLS-SEM studies support details on the relative significance of constructs in the structural model and explains relationships among them. As an alternative to analyzing the importance dimension (i.e., the path coefficients), IPMA examines the performance dimension. IPMA involves five steps [20]. The first step demands checking the fulfilment of the eligibility requirements for performing the analysis. The second step represents the computation of the performance values of the latent variables. To make it possible to interpret the performance levels and to compare them, IPMA rescales indicator scores between 0 and 100 (0—the lowest, 100—the highest). The rescaling of j -th observation for indicator i ($i = 1, 2, \dots, M$) proceeds via:

$$x_{ij}^{rescaled} = \frac{E(x_{ij}) - \min(x_i)}{\max(x_i) - \min(x_i)} \times 100 \tag{11}$$

In Equation (11) x_i is the i -th indicator, $\min(x_i)$ and $\max(x_i)$ constitute its minimum and maximum value respectively, while $E(x_{ij})$ constitutes its actual score for respondent j . The rescaled construct is the linear combination of both the rescaled indicator's data and the outer weights. The rescaled weights are calculated on the basis of the standardized outer weights of the PLS path model estimation after being unstandardized. The third step involves analysis of the constructs' importance values (i.e., the meaning of construct) that are derived from the total effect (the total sum of all the indirect effects and the direct effects in the structural model [43]). In the fourth step, the creation of the importance–performance map for a chosen construct originates from these previous results using scatter plotting. In the fifth step, IPMA may be expanded on the indicator level to gain accurate data on the highly likely successful managerial measures [20]. IPMA, therefore, extends the results of the standard PLS-SEM method [46].

2.4. ERP Systems and the Technology Acceptance Model

Organizations are implementing ERP systems to increase productivity as well as turn out to be more responsive. As several studies have revealed, one reason for ERP systems implementation disasters can be recognized as employees' unwillingness to accept and use an implemented ERP system [25,66–69]. Huang and Yasuda [67], in their wide-ranging study of 86 surveyed scientific papers on ERP subjects, indicated that many scientific papers deal with the pre-implementation phase combined with the implementation phase of ERP implementation, but postimplementation studies are seldom. Schlichter and Kraemmergaard [69], in their wide-ranging study of 885 peer-assessed abstracts of journals, also showed a study about the optimization of ERP systems which indicated that post-implementation, usefulness, the accomplishment of competitive benefit through ERP systems, ERP systems employees, and the financial benefits of ERP systems should all be assessed. Several other researchers also indicated the issue of the low utilization of ERP systems, i.e., employees do not take advantage of the implemented ERP system at a higher

stage [21,25,32,66,70–72]. Therefore, researchers have focused their research attempts on the acceptance of ERP systems by employees in companies to study circumstances that lead to the use of ERP systems at an advanced level.

Several theoretical models are known for researching the acceptance and use of information systems and information technology (IS/IT) in general. The most often used theoretical theories and models are the “theory of planned behavior” [73], the “theory of reasoned action” [74], the “technology acceptance model (TAM)” [75,76], the “innovation diffusion theory” [77], the “technology–organization–environment model” [78], the “unified theory of acceptance and use of technology” [79,80], etc. (see [27,81]). Among them, the TAM proved to be very promising for researching different viewpoints of ERP systems acceptance and the use by of these systems by users (employees) in companies [22,27,32–35,64,82–84]. The TAM, defined and verified by Davies, is well established and tested in numerous studies (for the latest research, see [27]). Therefore, TAM was used as a research model in several research studies conducted in the past 10 years. Among others, the most important research studies were conducted by Costa et al. [32], Scholtz et al. [71], Calisir et al. [72], Mayeh et al. [83], Shih and Huang [85], Youngberg et al. [86], Erasmus et al. [87], Klaus and Changchit [88], Putri et al. [89], Grandón et al. [90], Koksalmis and Damar [91], etc. These researchers have, in their research studies, experimented with the TAM model by developing TAM model extensions and modifications.

The structure of the TAM is as follows: construct perceived usefulness (PU) and construct perceived ease of use (PEOU) represent the most relevant beliefs for systems and technology (the ERPs) acceptance by users [75]. The construct PU is defined as ‘*the degree to which a person believes that using a particular system would enhance his or her job performance*’ [75], p. 320. In contrast, the construct PEOU refers to ‘*the degree to which a person believes that using a particular system would be free of an effort*’ [75], p. 320. According to TAM, construct PU and construct PEOU have a positive effect on the construct user’s attitude (AT) regarding using a system or technology, which further affects the construct user’s behavioral intention (BI) to use it. The stronger the intentions to use the system or technology, the higher the level of actual use (U). TAM also includes the expected impact of the construct PEOU on the construct PU [76].

Lately, when researching ERP acceptance, models have been developed that expand the described TAM with various external constructs, especially with constructs considered as antecedents of construct PEOU and construct PU, such as Venkatesh and Davis’s TAM 2 [92], the model of the determinants of construct PEOU by Venkatesh [93], and TAM 3 developed by Venkatesh and Bala [94]. The research model, presented in this paper, was extended with the external constructs, that proved important by Sternad et al. [33–35]: organizational process characteristics (OPC), system and technological characteristics (STC) and personal characteristics with the information literacy (PCIL). These are affecting the construct PU and the construct PEOU.

An additional external construct, namely perceived work compatibility (WC), was included in our research model, seen as the employees’ perception of fit between the ERP system used and employees’ motivation to use it, regardless of the confirmed suitability [82] and refers to the level to which the ERP system enables the employees to perform their working duties using the implemented ERP system. Additionally, the TAM research model in our case was redesigned by replacing the constructs BI and U with extended use (ExU), since our research case focuses on factors affecting the present-day use of ERP systems in the maturity phase. The construct ExU was initially proposed by Hsieh and Wang [95] in their studies. ExU is defined as the usage which exceeds the average, normal use and can guide to a higher quality of the results and benefits [95]. ExU, therefore, refers to the complexity and in-depth use and frequency of using different ERP functionalities [27,30,31,34,35,41,64,77–81,83,92–94,96–98].

The relationships associated with these additional constructs (WC and EXU) are as follows: construct WC influences construct PU [82,96]; that is, with the increased perceived fit of the ERP system to the job needs the perceived usefulness increases, as well. A well-

founded assumption may also be set regarding the direct impact of the construct WC on the construct AT and on the construct ExU. Suppose ERP users perceive that the system increases compatibility with their everyday duties. In that case, they gain an expanded positive posture toward using that system, including its extended use [26,34,35,76]. The research model is further defined in the next section and presented in Figure 3.

2.5. Research Model

The research model of our research case is based on TAM, as described in the previous section, and is presented in Figure 3 below. The external factors grouped in personal (PCIL), organizational (OPC), and technological (STC) groups of factors are expected to affect the construct PU and construct PEOU of ERP systems, along with the construct WC. In Figure 3, Davis's initial TAM research model [75,76] is marked in grey. As already mentioned, construct PEOU has an impact on the construct PU, while both influence construct AT and that further has an impact on the construct ExU by employees.

Regarding the use of ERP systems by its users, we can assume, as already mentioned, that a relation among construct WC and construct PU exists, as well as the direct impact of the construct WC on construct AT and on the construct ExU.

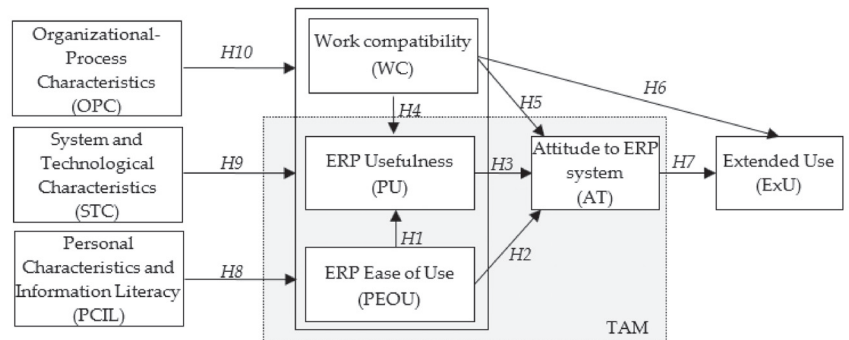


Figure 3. Conceptual Model [30–32,65]; extended by the authors.

Hypotheses that reflect the dependencies and directions of relationships are based on the TAM model and its extensions [22,27,32–35,64,72,82–84]. Therefore, we hypothesized:

- H1.** PEOU of ERP use has direct positive impact on PU of ERP use.
- H2.** PEOU of ERP use has direct positive impact on AT towards ERP use.
- H3.** PU of ERP use has direct positive impact on AT towards ERP use.
- H4.** WC with ERP users' job description tasks has a direct positive effect on their PU of ERP use.
- H5.** WC with ERP users' job description tasks has a direct positive effect on AT towards ERP use.
- H6.** WC with ERP users' job description tasks has a direct positive effect on the ExU.
- H7.** AT towards ERP use has a direct positive effect on the ExU.

The issue of the TAM research model-based studies that are focused on ERP systems is that many of them include a very modest range of external factors influencing user acceptance and use of these systems [33,34]. When ERP systems are used in companies, a larger number of external factors may be important for shaping ERP user acceptance. Consequently, for higher-order factors, it may be important to group several external factors together. In our research, the factors of the second order were formed when hypothesizing the following:

- H8.** A conceptual external factor of personal characteristics and information literacy (PCIL) statistically significantly influences the antecedents of AT and ExU.

H8a. A conceptual external factor PCIL statistically significantly influences the WC.

H8b. A conceptual external factor PCIL statistically significantly influences the PU.

H8c. A conceptual external factor PCIL statistically significantly influences the PEOU.

H9. A conceptual factor of the system and technological characteristics (STC) statistically significantly influences the antecedents of AT and ExU.

H9a. A conceptual external factor STC statistically significantly influences the WC.

H9b. A conceptual external factor STC statistically significantly influences the PU.

H9c. A conceptual external factor STC statistically significantly influences the PEOU.

H10. A conceptual factor of organizational-process characteristics (OPC) statistically significantly influences the antecedents of AT and ExU.

H10a. A conceptual external factor OPC statistically significantly influences the WC.

H10b. A conceptual external factor OPC statistically significantly influences the PU.

H10c. A conceptual external factor OPC statistically significantly influences the PEOU.

2.6. Research Approach

For our research study, we chose an international corporation that consisted of several subsidiaries which operated in the automotive industry in four countries. Researching ERP systems and their acceptance in the automotive industry is the topic of several researchers. Published research, in the majority of cases, applies TAM as a research model for different aspects of technologies and information systems, including researching ERP acceptance [99–104]. Therefore, we used TAM as basic research model to study the international corporation, which consisted of companies which are suppliers producing car components/parts for major car producers worldwide. Because the study aimed to research ERP use in its mature stage when ERP is used at an advanced level and because we wanted to research its use in different organizational cultures, we selected these companies. They implemented SAP ERP systems 19 years ago and conducted several upgrades to the systems used. The companies involved are in four countries and employ more than 4000 employees. We addressed a random sample of users in these companies, consisting of 860 employees who have been using the ERP system for several years and can be considered advanced users. We sent them e-mails with invitations and a link to the web questionnaire.

The questionnaire was prepared in four languages (Slovenian, Serbian, Croatian, and the Bosnian and Herzegovinian language) according to the international character of the of companies studied. Before starting a survey, a pilot study took place, which included a group of ERP advanced users and a group of key users from different companies. Based on their feedback, a few minor changes were made to make the questions more understandable to respondents in different countries. The elements with the missing data were excluded, resulting in 208 valid questionnaires that were further analyzed (24.19%).

The empirical data were analyzed in the five stages of the methodological approach involving the PLS-SEM by using SmartPLS 3 [46] and the ANN analysis by using IBM SPSS 20, as follows:

- The measurement model is assessed in the first step;
- The structural model is assessed in the second step;
- The third step includes the blindfolding procedure;
- The fourth step includes use of ANN analysis;
- The fifth part of our research includes IPMA.

While analyzing data, the approaches defined by Henseler et al. [37] and Garson [38] and Hair et al. [43,45] were implemented.

3. Results

3.1. Description of the Sample

Table 1 displays the sample structure details. Among respondents, 27.4% (57) were female and 72.6% (151) were male, and all were employees and users of the implemented ERP system. The majority, over 65%, reported to have at least some higher education; others reported secondary educational levels or less. Sample characteristics are in Table 2.

Table 1. Number of responses per country.

Country	All Users *	% of Users per Country	Frequency in the Sample	Relative Frequency in the Sample
Slovenia	557	64.77%	141	67.79%
Croatia	196	22.79%	48	23.08%
Bosnia and Herzegovina	94	10.93%	16	7.69%
Republic of Serbia	13	1.51%	3	1.44%
Total	860	100.00%	208	100.00%

* in a multinational group of manufacturing companies in the automotive industry

Table 2. Descriptive statistics of respondents' characteristics.

Characteristics	Frequency	Relative Frequency
Gender		
Female	57	27.4%
Male	151	72.6%
Age		
20–29	16	7.7%
30–39	62	29.8%
40–49	74	35.5%
>50	56	27.0%

Collected data show that respondents use the ERP system for about three hours daily. 59.1% (123) are employed in positions at the operational level (e.g., professional experts and other similar positions), 29.3% (61) are managers at the low level (e.g., manager of a group or manager of an organizational unit), 20.6% (22) are managers at the middle level, and 1% (2) are managers at the corporate governance and/or top management level. The total working experience equals, on average, 16.1 years, while the average working time at the current position equals 8.1 years.

3.2. The Assessment of the Measurement Model

The measurement model constructs were valued via assessment of reliability, then via convergent as well as discriminant validity. Second-order external factors (implementing the repeated indicators technique—the hierarchical component model proposed by Wold [51]) were formed. Some external first-order factors did not meet the evaluation requirements—therefore, the following four factors were excluded from further analysis: the factor computer self-efficacy and the factor experience with computers were excluded from the PCIL second-order factors, and the factor ERP training and the factor organizational culture were excluded from the OPC second-order factors. Results of reliability and convergent validity for constructs are presented in Table 3. Results of discriminant validity are presented in Table 4 and hypotheses testing results are in Table 5. Table 6 brings the results of second-order factors. All results are discussed as follows.

Cronbach's α and CR measures were calculated [37,38,45]. As shown in Table 3, for each of the 14 scales used in the study Cronbach's α and CR were higher than threshold, which is 0.7, thus confirming their reliability [37,38,45].

Table 3. Psychometric properties of the research instrument (sample size = 208).

Construct	Indicator	Mean SD	Loadings	CR	α	AVE	R^2 Adj. R^2
PCIL: Personal Innovativeness	PI1	5.28 1.43	0.73	0.82	0.82	0.61	
	PI2	4.54 1.71	0.79				
	PI3	5.33 1.54	0.82				
PCIL: Computer Anxiety	CA1	6.32 1.06	0.85	0.80	0.79	0.66	
	CA2	6.46 1.05	0.77				
STC: ERP Data Quality	DQ1	4.60 1.39	0.77	0.92	0.92	0.66	
	DQ2	4.65 1.50	0.80				
	DQ3	4.04 1.62	0.80				
	DQ4	4.52 1.57	0.82				
	DQ5	4.23 1.66	0.82				
	DQ6	4.64 1.62	0.85				
STC: System Performance	SP1	4.64 1.62	0.89	0.88	0.88	0.60	
	SP2	5.18 1.35	0.71				
	SP3	5.03 1.35	0.79				
	SP4	4.70 1.40	0.71				
	SP5	4.97 1.40	0.85				
STC: User Manuals (Help)	UM1	4.38 1.55	0.93	0.88	0.88	0.71	
	UM2	4.56 1.35	0.80				
	UM3	4.31 1.40	0.79				
STC: System Functionality	SF1	3.64 1.57	0.91	0.91	0.91	0.83	
	SF2	3.60 1.66	0.92				
OPC: Business Processes Fit	BPF1	4.86 1.45	0.93	0.93	0.93	0.87	
	BPF2	4.88 1.41	0.93				
OPC: ERP Support	SU1	4.61 1.61	0.69	0.71	0.71	0.55	
	SU2	4.29 1.51	0.80				
OPC: ERP Communication	CU1	4.09 1.65	0.71	0.74	0.75	0.50	
	CU2	3.65 1.57	0.70				
	CU3	4.64 1.51	0.73				
PU	PU1	4.76 1.51	0.88	0.97	0.97	0.89	0.674 0.669
	PU2	4.70 1.56	0.94				
	PU3	4.74 1.55	0.97				
	PU4	4.67 1.53	0.98				
PEOU	PEOU1	4.61 1.48	0.88	0.83	0.82	0.57	0.614 0.612
	PEOU2	4.49 1.48	0.88				
	PEOU3	4.05 1.58	0.72				
	PEOU4	4.24 1.51	0.76				
WC	WC1	4.50 1.49	0.87	0.89	0.89	0.74	0.594 0.588
	WC2	4.75 1.45	0.88				
	WC3	4.92 1.35	0.83				
AT	AT1	5.74 1.21	0.70	0.84	0.82	0.73	0.669 0.664
	AT2	5.21 1.45	0.99				
ExU	ExU1	3.02 2.19	0.76	0.90	0.90	0.64	0.379 0.372
	ExU2	4.21 1.51	0.88				
	ExU3	3.98 1.63	0.80				
	ExU4	3.89 1.64	0.74				
	ExU5	3.45 1.44	0.80				

Note: α = Cronbach's α ; R^2 = explanatory power or variance; Adj. R^2 = adjusted R^2 .

Convergent validity was examined via Fornell and Larcker's criteria: all item factor loadings should be significant and higher than threshold, which is 0.70, and AVE for each construct, where threshold is 0.50 [43]. All item factor loadings in our study fulfilled these criteria except for one indicator that equalled 0.69, which is also above the minimal

satisfactory level (0.50) suggested by Fornell and Larcker [43]. AVE values were above 0.50. The Cronbach’s α , CR as well as AVE of the second-order model are presented in Table 6. Cronbach’s α were above 0.70, CRs were above 0.80, and AVEs were equal to or above 0.50. As shown in Figure 4 and Table 6, the loadings of the first-order factors on the second-order factors went above 0.70, with the exception of two indicators, which were 0.64 and 0.68, thus still fulfilling the criteria for the minimal satisfactory level. Measurement scales show strong convergent validity.

The discriminant validity was analyzed using the criteria described in Section 2.1. Details of this estimation are presented in Table 4. All measurement loadings were above 0.70. This represents that the reflective model fits well [37,38,45] and cross-loadings were lower (data and results available by request). Additionally, all HTMT variables were less than 1.0 (italic numbers in Table 4). All three criteria of discriminant validity are fulfilled.

Table 4. Results of discriminant validity (intercorrelation of the latent variables and HTMT variables (italic).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1: PCIL: Personal Innovativeness	0.78													
2: PCIL: Computer Anxiety	0.33 (0.33)	0.81												
3: STC: ERP Data Quality	0.11 (0.13)	−0.03 (0.06)	0.81											
4: STC: System Performance	0.16 (0.18)	0.05 (0.10)	0.77 (0.76)	0.78										
5: STC: User Manuals	0.14 (0.15)	0.04 (0.08)	0.66 (0.66)	0.52 (0.52)	0.84									
6: STC: System Functionality	−0.17 (0.16)	−0.22 (0.22)	−0.48 (0.48)	−0.63 (0.63)	−0.32 (0.32)	0.91								
7: OPC: Business Processes Fit	0.04 (0.07)	0.05 (0.07)	0.75 (0.75)	0.66 (0.67)	0.47 (0.47)	−0.49 (0.49)	0.93							
8: OPC: ERP Support	0.14 (0.16)	0.21 (0.21)	0.58 (0.57)	0.52 (0.52)	0.54 (0.54)	−0.52 (0.53)	0.44 (0.44)	0.74						
9: OPC: ERP Communication	0.10 (0.12)	0.16 (0.16)	0.52 (0.52)	0.46 (0.46)	0.50 (0.50)	−0.46 (0.46)	0.46 (0.46)	0.70 (0.71)	0.75					
10: PU	0.15 (0.15)	0.13 (0.14)	0.58 (0.58)	0.61 (0.61)	0.39 (0.39)	−0.56 (0.56)	0.66 (0.66)	0.30 (0.30)	0.31 (0.31)	0.94				
11: PEOU	0.19 (0.19)	0.07 (0.07)	0.67 (0.66)	0.71 (0.71)	0.57 (0.57)	−0.62 (0.61)	0.63 (0.62)	0.47 (0.47)	0.40 (0.39)	0.71 (0.70)	0.76			
12: WC	0.23 (0.23)	0.13 (0.13)	0.65 (0.65)	0.64 (0.64)	0.48 (0.48)	−0.62 (0.62)	0.71 (0.71)	0.54 (0.54)	0.50 (0.50)	0.82 (0.81)	0.74 (0.74)	0.86		
13: AT	0.31 (0.32)	0.27 (0.29)	0.45 (0.45)	0.55 (0.57)	0.35 (0.35)	−0.53 (0.55)	0.49 (0.50)	0.42 (0.43)	0.35 (0.37)	0.70 (0.71)	0.69 (0.71)	0.82 (0.82)	0.86	
14: ExU	0.40 (0.40)	0.05 (0.10)	0.33 (0.33)	0.38 (0.38)	0.28 (0.28)	−0.30 (0.30)	0.43 (0.43)	0.21 (0.21)	0.24 (0.24)	0.51 (0.51)	0.44 (0.41)	0.61 (0.61)	0.53 (0.53)	0.80

Note: Square root of AVE in bold text; HTMT values in italic text.

Garson [38] pointed out that “standardized root means square residual (SRMS) calculates the difference among the model-implied correlation matrix as well as the observed correlation matrix” and added that the model is well-fitted if SRMS is lower than 0.08. However, some researchers use the more lenient cut-off of 0.10. The SRMS value of the research model in this paper stands at 0.09, and presents that model as allowable.

All criteria of the measurement model were met, so we were able to continue our analysis with the structural model analysis.

3.3. Structural Model

The hypotheses listed above were tested. As already mentioned, bootstrapping (5000 sub-samples) was used to examine the statistical significance of each path coefficient by performing *t* tests [48].

Table 5 and Figure 4 include the results obtained. Construct PEOU had no significant impact neither on construct PU ($t = 0.90, p > 0.05$) nor on construct AT ($t = 0.98, p > 0.05$). Further, construct PU had a weak positive impact on construct AT ($t = 2.79, p < 0.05$). Construct WC had a strong and significant positive impact on construct AT ($t = 4.81, p < 0.01$), construct PU ($t = 6.38, p < 0.01$), and construct ExU ($t = 6.56, p < 0.01$). Additionally, construct AT had a weak but important impact on construct ExU ($t = 2.20, p < 0.05$).

Table 5. Hypothesized relationships (for all TAM constructs and significant relationships of extended TAM constructs).

Relationship	β (Path Coefficient)	95% Confidence Interval	<i>t</i> Statistics	f^2
OPC→WC	0.25	[0.108; 0.388]	3.50 **	0.08 ^a
STC→WC	0.49	[0.341; 0.621]	6.82 **	0.22 ^b
PCIL→WC	0.11	[0.012; 0.205]	2.18 *	0.04 ^a
STC→PU	0.19	[0.059; 0.332]	2.79 **	0.03 ^a
WC→PU	0.56	[0.383; 0.721]	6.38 **	0.42 ^c
PEOU→PU	0.09	[−0.114; 0.290]	0.90 n.s.	0.00
SCT→PEOU	0.71	[0.629; 0.771]	19.55 **	1.59 ^c
WC→AT	0.50	[0.277; 0.684]	4.81 **	0.33 ^b
PU→AT	0.21	[0.036; 0.376]	2.79 **	0.01
PEOU→AT	0.09	[−0.080; 0.274]	0.98 n.s.	0.00
WC→ExU	0.43	[0.295; 0.558]	6.56 **	0.15 ^a
AT→ExU	0.16	[0.005; 0.298]	2.20 *	0.01

Note: Path significance: ** $p < 0.01$; * $p < 0.05$; n.s. = not significant. f^2 thresholds: a > 0.02 (weak effect); b > 0.15 (moderate effect); c > 0.35 (strong effect).

As shown in Figure 4 and Table 6, the second-order factors significantly positively impacted construct WC, construct PU as well as construct PEOU. Second-order factor PCIL shows significantly positive but weak impact on construct WC ($t = 2.18, p < 0.05$). Second-order factor STC had a weak impact on construct PU ($t = 2.79, p < 0.01$), a moderate impact on construct WC ($t = 6.82, p < 0.01$) and a very strong positive impact on construct PEOU ($t = 19.55, p < 0.01$). Additionally, the second-order factor OPC had a weak positive impact on construct WC ($t = 3.50, p < 0.01$). In addition to this, other relationships between second-order factors OPC, STC, and PCIL on one side and constructs of original TAM (namely PEOU, PU and WC, on the other side were tested, but none of the relationships were significant.

Table 6. Path coefficients—external constructs in the second-order model.

First-Order Constructs	Second-Order Constructs		
	PCIL $\alpha = 0.75$ CR = 0.75 AVE = 0.50	STC $\alpha = 0.85$ CR = 0.86 AVE = 0.51	OPC $\alpha = 0.84$ CR = 0.84 AVE = 0.51
PCIL: Personal Innovativeness	0.89 ($t = 48.50$)		
PCIL: Computer Anxiety	0.68 ($t = 9.60$)		
STC: ERP Data Quality		0.91 ($t = 60.56$)	
STC: System Performance		0.88 ($t = 44.90$)	
STC: User Manuals (Help)		0.70 ($t = 15.42$)	
STC: System Functionality		−0.66 ($t = 15.11$)	
OPC: Business Processes Fit			0.71 ($t = 16.89$)
OPC: ERP Support			0.84 ($t = 39.06$)
OPC: ERP Communication			0.88 ($t = 47.68$)

Note: *t* values are in brackets; all values are signed at $p < 0.01$.

The variance explained for each dependent variable is indicated by the R^2 generated for each regression equation. The structural model gives a demonstration of predictive power since R^2 and adjusted R^2 for key dependent variables are very high. R^2 is 0.59 for construct WC, 0.67 for construct PU, 0.61 for construct PEOU, 0.67 for construct AT, and 0.37 for construct ExU, as presented in Table 3. All adjusted R^2 are “moderate” according to Chin [48], except AT and PU, which are “substantial”. The research discovered that the research model used explains, on average, a high proportion of the variance since the average R^2 equals 0.58. The model average f^2 (as defined in Section 2.1), which equals 0.24, reflects the moderate effect size-independent factors have on dependent factors (Table 5). The highest effect was identified for second-order factor STC on construct PEOU ($f^2 = 1.59$), and it contributes the most to the research model average effect size.

Moderating effects for the factors of the extended TAM were explored, and the results are presented in Table 7:

- When analyzing the impact of construct WC on construct ExU, complementary mediation exists, while direct effect as well as indirect effect are significant. Indirect effects analysis shows the following results:
 - The indirect effect of AT (AT; WC→AT→ExU) is significant ($\beta = 0.081, t = 1.993, p = 0.046, [0.008; 0.171]$);
 - The indirect effects of PU and of AT (WC→PU→AT→ExU) do not meet the significance threshold ($\beta = 0.019, t = 1.509, p = 0.131, [0.001; 0.053]$);
- When analyzing the impact of construct WC on construct AT, complementary mediation exists, while direct effects and an indirect effects via construct PU are significant and pointed in the same direction;
- When analyzing the impact of construct PEOU on construct AT, neither direct nor indirect effects are significant (no-effect non-mediation);

For second-order factors, total effects on construct ExU were calculated—these effects exist and are important. Each group of second-order factors significantly impacts the construct ExU:

- OPC significantly affects the construct ExU ($\beta = 0.133, t = 3.450, p = 0.001$);
- STC has a significant effect on construct ExU ($\beta = 0.277, t = 5.961, p = 0.000$);
- PCIL has a significant effect on construct ExU ($\beta = 0.057, t = 2.114, p = 0.035$).

Further analysis shows that for all three second-order factors, only the indirect effect through construct WC is significant (OPC→WC→ExU: $\beta = 0.108, t = 3.099, p = 0.002$; PCIL→WC→ExU: $\beta = 0.046, t = 2.085, p = 0.037$; STC→WC→ExU: $\beta = 0.210, t = 4.588, p = 0.000$), while indirect effects through construct PU and construct PEOU are not statistically significant.

Table 7. Direct and indirect effect of extended TAM model.

	Direct Effect (DE)	95% Confidence Interval of DE	t Value	Significance ($p < 0.05$)?	Indirect Effect (IE)	95% Confidence Interval of IE	t Value	Significance ($p < 0.05$)?
WC→ExU	0.432	[0.295; 0.558]	6.563	Yes (0.000)	0.081	[0.008; 0.171]	1.993	Yes (0.046)
WC→AT	0.495	[0.277; 0.684]	4.805	Yes (0.000)	0.117	[0.008; 0.171]	2.417	Yes (0.016)
PEOU→AT	0.089	[-0.080; 0.274]	0.980	No (0.327)	0.020	[-0.017; 0.095]	0.733	No (0.464)

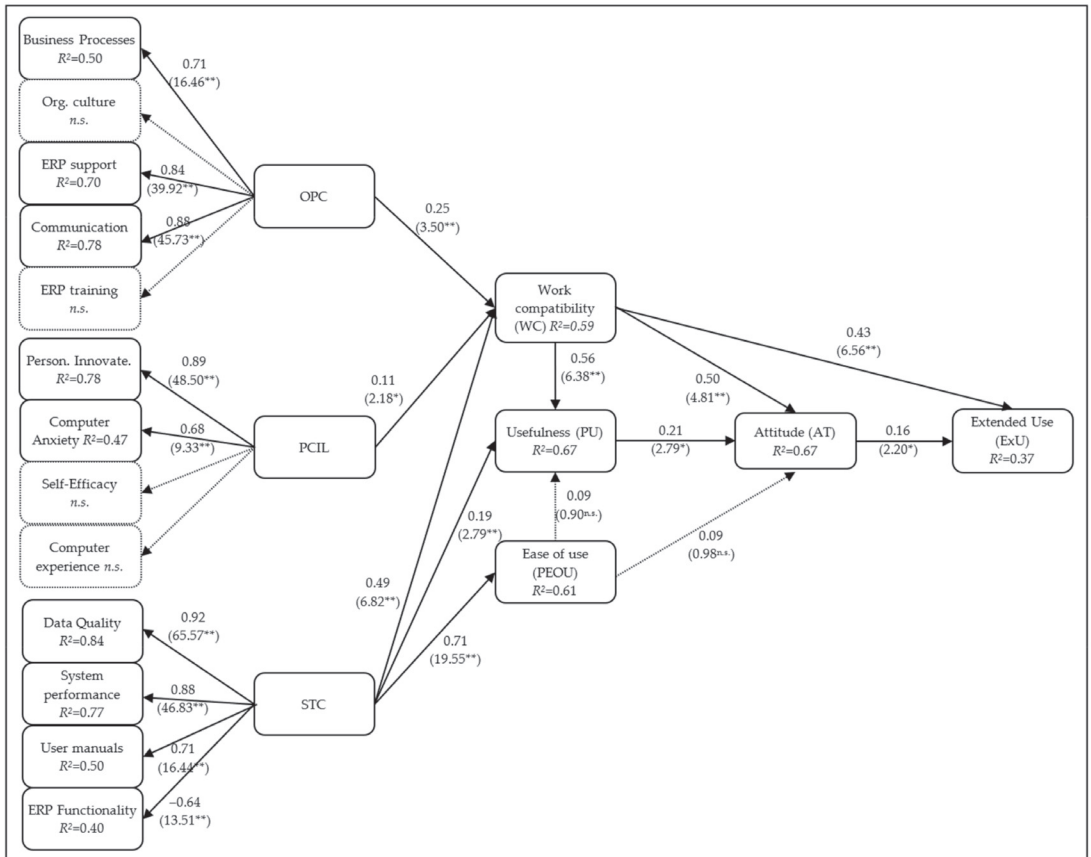


Figure 4. Findings of structural model analysis. Note: Path sign.: ** $p < 0.01$; * $p < 0.05$; n.s. = not significant (dotted arrows).

3.4. Blindfolding Procedure

In addition to assessing the R^2 values (i.e., a measure of predictive accuracy), the Stone–Geisser’s Q^2 value (i.e., a criterion of predictive relevance) was calculated as well. The blindfolding approach [51] calculates the cv-communality index (H^2) as well as the cv-redundancy index (Q^2) for constructs and indicators. An H^2 and Q^2 values greater than zero confirm that the structural and measurement models are important for forecasting [38]. As can be seen from Table 8, all values of H^2 exceed 0 (average values of $H^2 = 0.492$) and all values of Q^2 exceed 0 (average value of $Q^2 = 0.442$). Our measurement model shows a higher level of quality as compared with the structural one. Since the value of 0.02 indicates “a small effect size, 0.15 a medium one, and 0.35 a high effect size” [105], both models have a high level of predictive acceptability.

Table 8. cv-redundancy (Q^2) and cv-communality (H^2) indices.

Construct	H^2	Q^2
PCIL: Personal Innovativeness	0.456	0.559
PCIL: Computer Anxiety	0.427	0.353
PCIL	0.250	
STC: ERP Data Quality (Content)	0.597	0.582
STC: System Performance	0.511	0.504
STC: User Manuals (Help)	0.576	0.38
STC: System Functionality	0.604	0.396
STC	0.432	
OPC: Business Processes Fit	0.640	0.454
OPC: ERP Support	0.296	0.533
OPC: ERP Communication	0.322	0.504
OPC	0.342	
PU	0.830	0.547
PEOU	0.456	0.32
WC	0.611	0.403
AT	0.448	0.437
ExU	0.558	0.217

3.5. Artificial Neural Network Analysis

The next step is the application of ANN models. They are applied to classify the relative impact of only important predictors acquired from analysis of PLS-SEM. Based on the proposed research model and the results of PLS-SEM, it is possible to create four ANN models: Model 1, where the inputs are OPC, PCIL, and STC and the output is WC; Model 2, where the inputs are STC and WC and the output is PU; Model 3, where the inputs are WC and PU and the output is AT); and Model 4, where the inputs are WC and AT and the output is ExU).

However, before assessing the ANN models, the ANOVA Test of Linearity was applied [15,62]. It tests the presence of non-linear relationships in potential ANN models. The results of the ANOVA test of Linearity are included in Table 9.

Table 9. ANOVA Test of Linearity.

	Sum of Squares	df	Mean Square	F	Sig.	Deviation from Linearity
WC × OPC	1.275	35	0.036	1.242	0.184	NO
WC × PCIL	0.842	21	0.040	0.877	0.621	NO
WC × STC	2.000	55	0.036	1.108	0.310	NO
PU × STC	2.217	55	0.040	1.038	0.419	NO
PU × WC	0.379	17	0.022	0.962	0.503	NO
AT × WC	0.864	17	0.051	2.922	0.000	YES
AT × PU	0.249	10	0.025	0.903	0.531	NO
ExU × WC	0.809	17	0.048	1.237	0.239	NO
ExU × AT	0.841	11	0.076	1.808	0.055	NO

The test results show that the connection among construct WC and construct AT has a statistically significant deviation from linearity (with significance $p < 0.05$), while the relationship between construct AT and construct ExU is very close to this conclusion ($p = 0.055$). These results justify the introduction of artificial neural networks, which are capable of considering non-linear effects present and, therefore, of more accurately modeling user behavior.

In this research, ANNs were formed in SPSS 20. All ANN models have one hidden layer [59], and the number of neurons in this hidden layer was regulated by simulation software system [65,106]. There were two hidden layers for all four ANN models. As an activation function in hidden as well as output layers, sigmoid was used [58,101]. An example of an ANN model created in SPSS is shown in Figure 5.

The testing research sample was split into training sub-sample (90% of the data) and testing sub-sample (left over 10% of the data) [19,107]. Among the more common prob-

lems in the ANN analysis is the over-fitting—the situation when the ANN model simply remembers all training cases and loses the capability for general analysis, i.e., forecasting the result accurately with a previously invisible set of inputs [64]. To avoid this situation, ten-fold cross-validation was used [52,107].

“The RMSE (Root Mean Square Error) is applied to estimate the predictive accuracy of ANN models” [65,108]. The results that refer to both sets of data (testing and training) for all 10 ANNs were obtained (Table 10).

Low average values for RMSE for all four ANN models, for both training and testing datasets (varying from 0.0913 to 0.1354), reflect the good predictive power of the models [57].

Finally, to determine the relative importance of each predictor (variations of the output for different values of the input), sensitivity analysis of the ANN models was performed. The normalized significance of each predictor was computed by dividing the relative significance values by the largest significance value [16,107]. It is usually expressed in percentages. The results of ANN sensitivity analysis, i.e., the relative and normalized importance of the predictors in each ANN model, were obtained (Table 11).

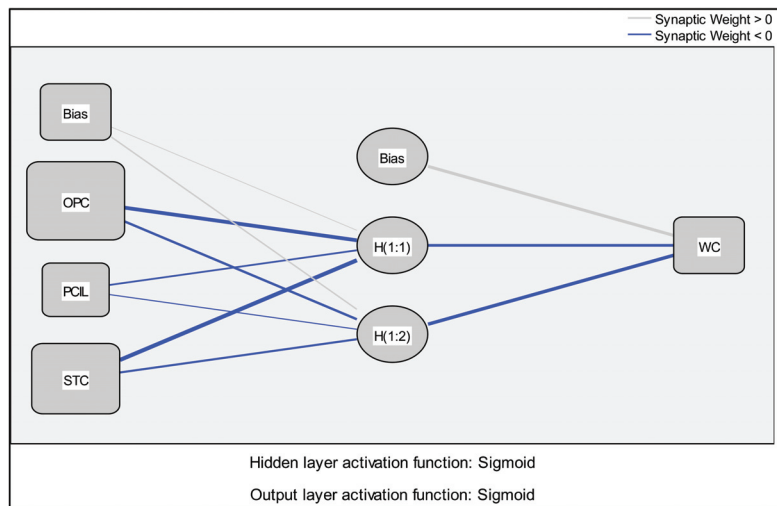


Figure 5. An example of an ANN model—Model 1.

Table 10. RMSE values of ANN model.

ANN	Model 1 Inputs: OPC, PCIL, STC; Output: WC		Model 2 Inputs: STC, WC; Output: PU		Model 3 Inputs: WC, PU; Output: AT		Model 4 Inputs: WC, AT; Output: ExU	
	Training	Testing	Training	Testing	Training	Testing	Training	Testing
1	0.1320	0.0915	0.1049	0.1311	0.1066	0.0978	0.1344	0.1327
2	0.1141	0.1040	0.1100	0.1053	0.0997	0.1089	0.1329	0.1225
3	0.1191	0.1159	0.1254	0.0983	0.1296	0.0673	0.1311	0.1499
4	0.1113	0.1240	0.1127	0.0926	0.0988	0.0805	0.1601	0.1309
5	0.1164	0.0934	0.1091	0.1049	0.1022	0.0737	0.1322	0.1189
6	0.1124	0.1095	0.1075	0.1146	0.0937	0.1234	0.1312	0.1306
7	0.1114	0.1486	0.1075	0.1125	0.0988	0.0819	0.1356	0.1338
8	0.1178	0.1040	0.1105	0.0881	0.1038	0.0840	0.1343	0.1246
9	0.1162	0.0784	0.1100	0.1065	0.0975	0.1079	0.1309	0.1290
10	0.1163	0.0957	0.1093	0.0990	0.0984	0.0880	0.1314	0.1237
Mean	0.1167	0.1065	0.1107	0.1053	0.1029	0.0913	0.1354	0.1297
St. dev.	0.0060	0.0197	0.0056	0.0123	0.0100	0.0177	0.0088	0.0086

The most significant predictor of WC is the OPC—(second-order construct), followed by STC (second-order construct) and PCIL (second-order construct), which is in contrast with the PLS-SEM results, in which STC had a stronger effect than OPC. WC was identified as a far more important antecedent of PU than STC, which is the same as predicted by PLS-SEM, with a minor relative difference in influence—the ANN model predicted that this relative difference was slightly lower than that predicted by PLS-SEM. Similarly, WC was identified as a far more significant predictor of AT than PU, which is again the same as predicted by PLS-SEM results. Again, there was a minor relative difference in influence—the ANN model predicted that this relative difference was slightly higher than the PLS-SEM predictions. Finally, the ANN model predicted that WC has a stronger influence on ExU compared to AT, which is in line with PLS-SEM findings, but the relative difference was slightly lower. These minor differences between the two techniques and the results obtained reflect the higher prediction accuracy of the ANN models, which consider existing non-linear effects among variables [62].

Table 11. Neural network sensitivity analysis.

Network	Model 1 Relative Importance			Model 2 Relative Importance		Model 3 Relative Importance		Model 4 Relative Importance	
	OPC	PCIL	STC	STC	WC	WC	PU	WC	AT
1	0.498	0.072	0.43	0.242	0.758	0.568	0.432	0.666	0.334
2	0.39	0.208	0.402	0.214	0.786	0.778	0.222	0.71	0.29
3	0.529	0.152	0.32	0.263	0.737	0.547	0.453	0.608	0.392
4	0.471	0.121	0.408	0.398	0.602	0.955	0.045	0.588	0.412
5	0.451	0.117	0.433	0.218	0.782	0.759	0.241	0.69	0.31
6	0.56	0.149	0.291	0.296	0.704	0.872	0.128	0.737	0.263
7	0.503	0.02	0.478	0.237	0.763	0.946	0.054	0.637	0.363
8	0.426	0.068	0.506	0.321	0.679	0.683	0.317	0.746	0.254
9	0.499	0.186	0.315	0.285	0.715	0.914	0.086	0.716	0.284
10	0.529	0.01	0.461	0.318	0.682	0.907	0.093	0.724	0.276
Average Importance	0.486	0.110	0.404	0.279	0.721	0.793	0.207	0.682	0.318
Normalized Importance (%)	100.0	22.7	83.3	38.7	100.0	100.0	26.1	100.0	46.6

3.6. The Importance–Performance Map Analysis (IPMA)

To obtain further insights, IPMA was used, by merging the importance (I) and performance (P) dimensions analysis [20,38]. IPMA allows identifying areas where the action is required. Namely, one may identify parts of the process with relatively high importance yet relatively low performance to implement the corresponding management tools leading to improvements. Table 12 and Figure 6 show both dimensions of the constructs influencing the dependent variable—ExU.

Table 12. Data of the importance–performance map for extended use of ERP system (ExU).

	Importance	Performance
AT	0.162	74.207
OPC	0.133	57.527
PCIL	0.057	77.587
PEOU	0.018	56.665
PU	0.034	61.965
STC	0.277	62.019
WC	0.532	62.075
Mean value	0.173	64.578

IPMA results are presented by the two-dimensional graph, where the horizontal axis describes the “importance” (total effect) of influential factors using a scale from 0 to 1, and the vertical axis describes their performance, using a scale from 0 to 100. The graphs in Figure 6 and Table 12 reveal that the most important construct was WC, followed by STC,

AT, OPC, PCIL, PU, and PEOU. However, the construct with the best performance was PCIL, followed by the AT, STC, WC, PU, OPC, and PEOU. The most important finding is that the performance of WC does not match its importance. Consequently, for managerial activities to increase the ExU, the emphasis should be on the construct of WC, which can be obtained by emphasizing the predecessors of the second-order construct STC and second-order construct OPC, where performance still has the possibility for significant improvements.

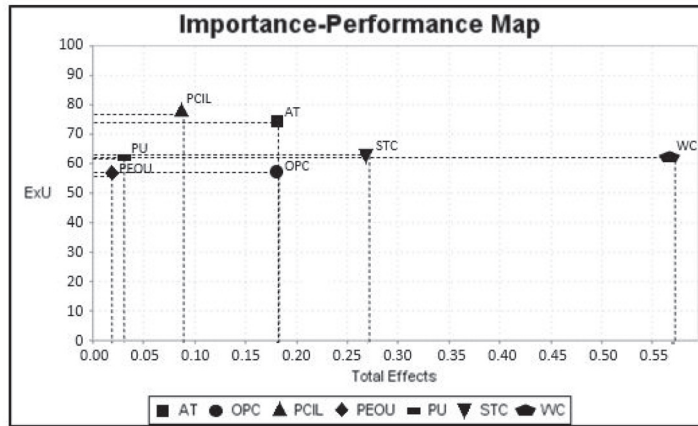


Figure 6. 3 IPMA for the endogenous variable extended use of the ERP system (ExU).

4. Discussion

The main objective of this paper is to show the effectiveness of the proposed methodological process, which consists of five phases and are aimed at determining the important information provided by the results of each implemented methodological phase: (i) PLS-SEM—assessment of measurement model; (ii) PLS-SEM—assessment of structural model; (iii) PLS-SEM—the blindfolding procedure; (vi) ANN analysis based on PLS-SEM results; (v) IPMA procedure based on PLS-SEM results.

We presented a research case and a model of constructs influencing the adoption and in-depth use of important information technology in companies by employees. We emphasize that the information technology we are considering is crucial for maintaining the company’s competitive position and for creating its competitive advantages; moreover, in the conditions of the digitalization of business, which are especially present in the automotive industry (which we considered in our research case), the in-depth use of information systems in the company is the basis of and condition for the operation (existence) of the company. The information technology in question is the ERP, which is a core information system in modern companies.

The importance of successful ERP implementation in all phases of the life cycle is extremely important for companies [46,64,69,81]. Nevertheless, this implementation often suffers from failure, reflecting the fact that the success of the advanced use of ERPs in companies is influenced by several factors, in turn influencing the level of acceptance of these systems by employees. In the research case presented in this paper, we analyzed the factors that influence the acceptance of ERPs by employees in companies based on the attitude they develop towards this information technology and their in-depth use of it. The importance of this topic for companies is also evidenced by extensive research work and the search for solutions to reduce the failure rate through process modeling with a series of theoretical models. In doing so, the TAM has been confirmed to be appropriate in a number of different cases, with SEM proving to be an appropriate methodology used to test the model [11–14,109–113].

Although business information solutions and systems themselves are becoming increasingly complex, the research methodology for testing theoretical models in this field

relatively rarely uses advanced, new approaches within SEM or their combinations with advanced artificial intelligence methods despite the high level of complexity associated with human decisions (which is, of course, the case in the field addressed in this study). Results show that the proposed methodological process enriches results of PLS-SEM; this is achieved using the advanced data analysis methods of the ANN and IPMA, thus creating the basis for evidence-based, grounded business decisions to support the development of the mature use of ERPs in companies. We explored a combined methodological approach involving PLS-SEM, advanced new procedures in this framework, and ANN analysis of artificial intelligence that can intervene in the linearity of the SEM model. We wanted to supplement the PLS-SEM results in terms of the assumption of nonlinear relationships in the model on one hand and, on the other hand, to establish the ranking of the factors obtained with PLS-SEM according to their relative importance as predictors.

The research results obtained in the first three phases (i) PLS-SEM—assessment of measurement model; (ii) PLS-SEM—assessment of structural model; and (iii) PLS-SEM—the blindfolding procedure) follow.

The outcomes endorse the existence and significance of most of the expected relationships foreseen in the structural model using the PLS-SEM technique (Figures 3 and 4), except relationships for construct PEOU (hypotheses H1 and H2), which are two relationships proposed by Davis [75,76]. As Figure 4 shows, construct PEOU had no significant impact on the construct PU and/or the construct AT. This finding corresponds with findings of research studies by other authors, which argue that PEOU seems to be more meaningful during implementation phases of the ERP system and becomes less important in the latter stages of the ERP system life cycle, when the system is in use for a longer time [30,76].

Data analysis shows that construct PU had a direct positive impact on the construct AT, which confirms H3 and prior conducted research studies [33,75,76]. Construct WC was introduced as the level to which an ERP user is able to implement almost all of his/her work duties using implemented ERP system. Our investigation shows that construct WC influenced construct PU, which confirms hypotheses H4 and prior findings [34,35,81,97]. Construct WC also directly and indirectly (through construct PU) influenced construct AT, which confirms hypotheses H5 and prior research studies [30,34,35]. Construct WC also directly and indirectly (through construct AT) influenced construct ExU, which confirms hypothesis H6 [35]. Construct AT did not have as strong a direct impact on construct ExU as construct WC, but it was a significant one (which confirms H7).

The research included external factors by grouping them into second-order factors (which confirms hypotheses H8a, H9a, H9b, H9c and H10a). Results (Figure 4, Table 8) show that several important external factors were identified.

Research results of the fourth phase ((vi) ANN analysis based on PLS-SEM results) that enrich the results of the first three phases follow.

The results show that some relationships show a significant deviation from linearity, which was expected given the content characteristics of the variables in the model. There were some, albeit minor, differences between the findings of the traditional PLS-SEM technique in addition to the ANN analysis, which can represent important added value and useful information for the informed decision-maker and the basics for business decision-making. For example, such a result is a different order of importance for factors or predictors of WC values: the most important predictor was OPC, followed by STC and PCIL, which is in contrast to the PLS-SEM results, in which STC had a stronger influence than OPC. Similarly, the ANN model predicted that WC had a stronger impact on ExU as compared to AT, which is consistent with the PLS-SEM findings, but the relative difference between their importance in ANN is slightly smaller. The results of the ANN analysis and the differences with the SEM results reflect the higher prediction accuracy of the ANN models, which consider existing non-linear effects among variables [62].

Research results of the fifth phase ((v) IPMA procedure based on PLS-SEM results), add the following important information to what has already been gained.

The last step in the research was the importance–performance analysis to identify the gap between the levels of importance and the levels of performance of factors in the model. Based on IPMA results, the researched company can improve ExU through construct WC and its second-order antecedents, as well as via the STC, where the most effort should be focused on data quality and accuracy, higher system performance, better user manuals, and improved ERP system functionalities.

By implementing this methodological approach, this research gives important insights on how to increase the recognition of the impact of several constructs that can expand the level of the ExU in the maturity stage. Knowing the structure of the individual important factors that we have identified, but which have not yet been sufficiently developed in the company, it is possible to form direct instructions for the implementation of managerial decisions based on the results of the research. The implementation of these decisions then affects the success of the acceptance of the ERP system in the mature phase of the use of these systems in the company and results in more in-depth use of ERP solutions by ERP users. This contributes to improvements in their productivity.

This study was limited to quantitative research and was conducted using the TAM research method for the described sample. We also believe that the described findings can be extended by implementing the qualitative approach, which could further enrich the understanding in the field of acceptance and perception of information technology by employees in companies. As we have already noted, human perception and assessment are complex. Therefore, additional qualitative research, with in-depth interviews with carefully selected focus groups (IS/IT users, managers, developers of business information systems) could represent important value-added content from the conducted quantitative research. In addition to that, it would make sense to upgrade this research by examining the differences regarding acceptance of an ERP system by two groups (management and employees) as the scope of functionality that one group of users (employees) has to use varies greatly as compared to the other group (management). This study was also limited to the mature stage of ERP usage in the company; therefore, future research may also investigate the factors that influence the acceptance of ERP solutions in different stages of the life-cycle of ERP usage in companies. Furthermore, it would be also worth studying and testing the model for other business information systems such as CRM, HRM, DMS, etc.

5. Conclusions

The results of our research are important from two perspectives: (i) from a methodological perspective and (ii) from a business practice perspective, to provide a basis for evidence-based decision-making.

From a methodological point of view, we showed how to upgrade the traditional PLS-SEM method results with the artificial intelligence method of ANN analysis and with new advanced techniques within PLS-SEM. We showed how to enrich the results of the PLS-SEM model by identifying nonlinear relationships in the model and by analyzing the relative importance of factors in the model, as well as by IPMA, which in some way shows a bottleneck in the process—the possible gap between the levels of importance and performance for individual factors in the model.

On this basis, business managerial decisions can be more in-depth and reasoned. We used this approach in the example of the model of the acceptance of business information systems by users in organizations, where we studied the mature stages of the use of ERP systems in a company. The presented methodological process is useful in various areas of the business decision-making process in organizations.

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Abbreviations

ANN—artificial neural network; **IPMA**—Importance–Performance Matrix Analysis; **ERP**—enterprise resource planning; **TAM**—technology acceptance model; **CR**—composite reliability; **AVE**—average variance extracted; **HTMT**—heterotrait–monotrait; **PU**—perceived usefulness; **PEOU**—perceived ease of use; **AT**—user’s attitude regarding using a system or technology; **BI**—user’s behavioral intention; **U**—actual use; **OPC**—organizational process characteristics; **STC**—system and technological characteristics; **PCIL**—personal characteristics with the information literacy; **WC**—perceived work compatibility; **ExU**—extended use; **SRMS**—standardized root means square residual; **H²**—cv-communality index; **Q²**—cv-redundancy index; **RMSE**—root mean square error.

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Article

Relationship between Entrepreneurial Orientation and Business Performance among Malay-Owned SMEs in Malaysia: A PLS Analysis

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Abstract: Entrepreneurship has become a key part of economies, and having an entrepreneurial orientation for SMEs is essential for success. EO and dimensions may differ in different cultures and different countries, thus a cross-cultural validation is suggested by the existing literature, which is lacking Malaysian perspectives. The objective of this study is to examine the relationships between entrepreneurial orientation (EO) and business performances of Malay-based SMEs in Malaysia and used the Partial Least Square (PLS) approach for data analysis. The research model for this study was drawn from the literature on entrepreneurship. This study identified five entrepreneurial orientations and tested hypotheses on which EO has a significant influence on business performance with empirical data from a sample of 407 Malay-based SMEs in Malaysia. The PLS regression analysis shows that risk-taking, proactiveness, innovativeness, and achievement factors are the significant elements of entrepreneurship orientation. Nevertheless, one independent variable, i.e., autonomy does not exhibit any relationship. This study offers a significant contribution to the current literature by empirically analyzing the link between the subcomponent of EO and business performance, specifically in the Malaysian SME sector, which has not been explored comprehensively. The paper's interesting findings can serve to remind entrepreneurs that they cannot neglect the element of EO in their activities, particularly the success of the business. The research could be useful for policymakers to obtain some ideas and develop policies to help SMEs in Malaysia. Specifically, to enhance the performance in the SMEs sectors, the government should enforce easy to use, consistent, and standardized policies in all SMEs sectors and for all other stakeholders in boosting these sectors.

Keywords: achievement; autonomy; business performance; innovativeness; Malaysia; Malay; risk-taking; proactiveness; PLS; SMEs

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1. Introduction

Entrepreneurship has become a key part of economies, and having an entrepreneurial orientation is essential for success [1]. Lumpkin and Dess [2] defined entrepreneurial orientation (EO) as the process, practices, and decision-making activities that lead to new entry [2]. According to Lumpkin and Des's entrepreneurial decision-making practices, methods and styles are portraying due firm's strategic orientation. Another researcher similarly described that the above are closely related to the strategic decision-making process and strategic management [3]. Decision-making activities, practices, and strategic orientations reflect directions of behaviors chosen by entrepreneurs. Lumpkin and Dess [2]

also refer to entrepreneurial orientations as entrepreneurial behaviors. Based on those definitions, entrepreneurial orientations can be described as the directions of actions and practices which project a firm's strategic movement for the future.

Research on entrepreneurial orientation has remarkably grown in the international business research arena. Entrepreneurial orientation has also been the basis for several studies in many countries. Runyan et al. [4] studied the USA and China. Zhai et al. [5] studied China. Keh et al. [6] studied Singapore. Sapienza, De Clercq, and Sandberg [7] studied Belgium. Galbreath et al. [8] studied Italy. Rezeai and Ortt [9] studied the Netherlands. These researchers suggested that EO and dimensions may differ in different cultures and different countries. Companies operating within a certain country's borders will not always operate in the same way as companies in other countries. [8]. Researchers also suggested that models that may be developed in one country must be examined in another country. It can be argued EO is relevant to the study of entrepreneurship and EO has unique characteristics so cross-cultural validation might be better for further research [10,11]. From this point of view, we studied Malay-based SMEs in Malaysia.

Small and medium-sized firms (SMEs) play a substantial and crucial role in the economic growth of many nations across the world, particularly in developing economies. Globalization has lowered economies of scale, increasing the growth potential for SMEs [12]. Small and medium-sized enterprises (SMEs) in developing countries must contend with dynamic, ever-changing, and less established institutional environments. Due to their size and lack of industrial possibilities, SMEs in underdeveloped countries rely heavily on informal, social, and political connections. In order to deal with these ordeals, SME owners' leadership orientation, which refers to their entrepreneurial orientation techniques, acts as a prelude to effective company performance [13].

Several recent studies have emphasized the need for more study into the interdependence between strategic orientations and other explanatory factors of entrepreneurial performance [14]. Small and medium-sized enterprises (SMEs) performance refer to the results of their business activity. According to Abebe's [15] study, small and medium-sized enterprises (SMEs) with a strong entrepreneurial orientation are more likely to succeed. Specifically, Hakala [16] proposes a "complimentary approach" to studying strategic orientations, focusing on the links between them and the patterns they produce.

The Malaysian economy relies heavily on small and medium-sized businesses (SMEs), which account for 38 percent of the country's GDP or more than MYR 500 billion (GDP) [17]. Around 97.2 percent of Malaysia's businesses are small and medium-sized enterprises (SMEs), and they employ close to 70 percent of the country's workers [17]. The Malaysian government pays particular attention to local businesses through programs such as the Bumiputera Enterprise Enhancement Program (BEEP) and the Tunas Usahawan Belia Bumiputera Program (TUBE), which aim to generate jobs and increase exports. This sector has a high number of entrepreneurs, fueled by the government's many incentives and Malaysia's position.

Malays are the predominant race among the multi-racial country in Malaysia. Chinese and Indians are the other two races. Malays are not very skillful as they join in business later, are not capable of surviving, and do not have much experience [18]. During British colonial rule in Malaysia, British rulers favored the Chinese community to enter the mainstream of Malaysian business and economy [18]. As a result, Malays are now lagging behind. People of Chinese descent are now controlling the Malaysian economy and business. This has resulted in a huge disparity between Malay and Chinese in the areas of education, entrepreneurship, and employment [18]. However, there must be a particular research focus on their business performance and possible factors. A few studies were conducted on entrepreneurial orientation and firm performance from a Malaysian perspective. Malaysian researchers conducted similar research on micro-enterprises [19] and on the retail industry [20]; however, they ignored the Malay origin entrepreneurs. To meet Malaysia's vision to uplift the Malaysian people to the mainstream, it is essential to know how entrepreneurial orientation relates to their business performance. Here, there

are research gaps to explore. This research, therefore, seeks to fill that gap by examining the relationship between EO and the firm performance of Malay-based SMEs in Malaysia. With this, present research enriches the EO and SME literature by contributing specific insight (Malay origin case) which will be helpful for other nations in predicting their under-nourished segment of people.

The remainder of the article is organized as follows: The next part reviews existing research on the association between entrepreneurial orientation and SME success and section third develop our study's hypothesis. A description of how we collected the data and operationalized our construct measurements can be found in the fourth section. Section 5 presents our study's findings and Section 6 discusses the results. The Section 7 is dedicated to discussing the limits of our findings and recommending additional study directions. Section 8 brings an end to the investigation.

2. Literature Review

2.1. Dimensions of Entrepreneurial Orientation

According to the research on entrepreneurial orientation by Okhomina [21] and Rauch and Frese [22] entrepreneurs are proactive, risk-taking, competitive, and innovative compared to non-entrepreneurs. In the literature, EO has been operationalized in various ways. Wiklund [23] described entrepreneurial orientation in general as:

“... points to a number of actions that can be regarded as entrepreneurial, i.e., the development of new products and markets, proactive behavior, risk-taking, the start-up of new organizations and the growth of an existing organization”.

Researchers tried to identify the dimensions of EO. According to Herani and Andersen [24], Lumpkin and Dess [25], Lumpkin and Erdogan [26], Weaver et al. [27], and Awang et al. [28] proactiveness, innovativeness, risk-taking, competitiveness, and autonomy are the most popular EO used by the researchers. Although there are different views on which dimensions are more relevant and whether EO is unidimensional or not, proactiveness, risk-taking, and innovativeness are accepted by scholars as the most important and relevant dimensions [29]. As reported by Weaver et al. [27], the four dimensions, i.e., autonomy, proactiveness, innovativeness, and risk-taking, have been adapted by numerous research scholars such as Covin and Slevin [30], Knight [31], Dess, Lumpkin, and Covin [32], and Dickson and Weaver [33]. Due to the competitive and independent nature of entrepreneurs, Lumpkin and Dess [2] introduced five important dimensions of EO competitive aggressiveness, proactiveness, risk-taking, innovativeness, and autonomy.

Moreover, some researchers view competitive aggressiveness and proactiveness are similar. For example, Okhomina [21] and Venkatraman [34] stated that “pro-activeness refers to the processes aimed at anticipating and acting on future needs by seeking new opportunities, introducing new products and brands ahead of the competition, and strategically eliminating operations that were in the mature or declining stages of the life cycle.” Next, Kotler et al. [35] noticed that to continue success in business entrepreneurs search for new opportunities by introducing new brands and products in competitive markets.

Further, as reported by Okhomina [21], Schumpeter's [36] theory of “creative destruction” suitably describes the head-to-head rivalry between firms as an “incessant race to get and keep ahead of one another”. In a highly competitive market, leading firms are aggressively being pursued by existing competitors and unforeseen challenges that seek new ways to outdo them in terms of satisfying customers [37]. Aggressively seeking new ways reflects both proactiveness and competitive aggressiveness. Covin and Slevin [30] also described proactiveness as competing aggressively with other firms [27]. For that reason, this present study excluded competitive aggressiveness from the five dimensions of entrepreneurial orientations identified by Lumpkin and Dess [2].

With regard to associations between the dimensions, some researchers considered EO as a unidimensional concept [30,38]. These researchers suggested combining these four dimensions. Other scholars argue that EO dimensions are independent of each other [2,39]. The argument behind this is that all these four dimensions are performed independently

and differently. Moreover, these researchers stated that in different situations SMEs may take risks in some situations, and in other situations cautious to take the risk. Some researchers provided empirical and theoretical support and shows that EO dimensions each other vary independently [2,40,41]. Based on the above discussion, this research used four EO dimensions: risk-taking, innovativeness, proactiveness, and autonomy.

Krauss et al. [42] also have identified achievement orientation as another orientation construct that affects business performance. In the present study, achievement orientation is included as another orientation factor along with four-other factors; autonomy, innovativeness, risk-taking, and proactiveness complying with the scholars discussed above.

2.2. Relationships between Entrepreneurial Orientation and Business Performance

Entrepreneurial orientations are always treated as an independent variable of firm performance. This is because performance is treated as a measure of firm success or achievement and is believed by research scholars [30,43] to be due to the strategic orientations (entrepreneurial orientation) of firms.

Previous researchers such as Covin and Slevin [44], Kreiser et al. [39], Lumpkin and Dess [2], Wiklund and Shepherd [45], and Lumpkin and Dess [25], examined the relationships between entrepreneurial orientation on firm performance and found that EO significantly improves business performance. Some other researchers such as Coulthard [46], Madsen [47], Keh et al. [6], Chow [48], and Jantunen et al. [49], identified a positive relationship between EO and business performance in the developed countries and the large-scale organizations. Whereas all research focused on the entrepreneurial orientation of established organizations, still there is a dearth of research on SMEs specifically Malay-based SMEs in Malaysia.

3. Research Framework and Hypotheses

Based on the previous literature and our research objective, this research proposed a conceptual framework in Figure 1. In this conceptual framework, EO is treated as the independent variable, and firms' performance is considered the dependent variable.

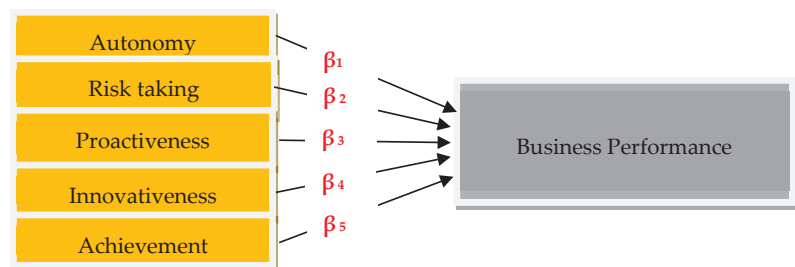


Figure 1. Conceptual Framework.

3.1. Autonomy

The word autonomy is related to the freedom of doing actions by a particular individual or group. It represents the independency of given boundaries as per the industry norms within which the concerned person or group has no restrictions from the organization [2]. Autonomy is not only meant as a sovereign act but also signifies the ability to exercise individuals' ideas and efforts to implement them [50]. According to Davis [51] autonomy is in two modes; autocratic and generative where both modes ensure independent actions but generative is process-oriented sharing ideas while autocratic is individualistic applying autonomy. There is an obvious relationship existed between autonomy and organizational performance. "The higher level of autonomy will produce higher organizational performance" quoted by Baba and Elumalai, [52] in conjunction with the various related studies throughout the world. In Ghana, it was found as one of the factors which hindered

organizational change [53] whereas in the case of Australia it is revealed that autonomy was rated as the most important factor to improve firm performance. From the study in the Asian region, Xu, [54] studied in China where he found that gross output was positively influenced by managerial autonomy, and in Japan [55] it is reported that among workers in the financial institution, whereby autonomy was one of the factors which motivated increase in employee knowledge which in turn contributed to increased organizational performance while the similar result was found in another study by Eriksson and Thunberg [56] amongst ICT based SMEs in Sri Lanka. It suggests that there was a positive relationship existed between autonomy and sales growth and employee growth where he pointed out autonomy had the highest strength in the relationship among other factors.

On the contrary, in the context of SMEs scenarios might be an anomaly as the owner of SMEs who is autonomous and likes to drive employees with his ideas and vision and is reluctant to delegate authority properly. In the same way, Kasumawardhani [57], an Indonesian researcher who studied SMEs in central Java, found no positive relationship between autonomy and organizational performance in Indonesia. Thereby, he suggests that offering autonomy can lead to job satisfaction for the employees but in some cases, autonomy might hamper the achievement of goals if the independent spirit and freedom of action of employees are not taken into account with the factors like leader's characteristics and stages of firm's development.

H1: *Autonomy is positively related to business performance.*

3.2. Risk-Taking and Its Relationship with Business Performance

Risk is the probability that there is a chance of obtaining less than the expectation [58], which is deemed as inevitable for entrepreneurs when conducting any business. Historically it is embedded with entrepreneurship ever since the term entrepreneurship was first coined by Cantillon in the 1980s [59–61]. Successful entrepreneurs are those who are ready to take present ambiguity for future prospects [62] but risk must be judgmental and calculated [63]. A study in Australia found that risk-taking that involved taking calculated risks had a positive impact on firm performance, but taking risks that were considered daring actions were considered detrimental to firm performance [46]. Davis [51] found a positive relationship between two aspects which is supported partially by Kreiser et al. [39]. Kreiser in his study showed organizations adopting a modest level of risk-taking were the highest performers when compared with their counterparts who assume very high or very low levels of this dimension. Rauch et al. [45] found a positive relationship but the intensity of the relationship was less than the other factors of EO. On the other hand, Naldi et al. [64] and Sebor, Lee, and Sukasame [65] found a negative relationship. The reason explains the negativity is that in the case of SMEs the owners try to keep control their business with family fund as well as through involvement of family members. Additionally, the culture of risk aversion could be a reasoning factor.

H2: *Risk-taking orientation is positively related to business performance.*

3.3. Proactiveness

Proactiveness can be regarded as a pre-responsive behavior of an individual forecasting future new opportunities or challenges. As per Rauch et al., [45] proactiveness in business is "an opportunity-seeking, forward-looking perspective characterized by the introduction of new products and services ahead of the competition and acting in anticipation of future demand". It is a market leader behavior other than follower [2] in which identifying and evaluating new opportunities and monitoring market trends are involved [66] to seize new markets and to be well advanced compared to the competitors.

The relationship between organizational performance and proactiveness among firms are found in the different study and no study observed to be negative so far. However, on which level it is important is debatable. Proactiveness at early growth stages exposed a positive effect on organizational performance [62], and this association prolongs as the

venture ages. As venture ages, the higher is the impact of proactiveness on business performance [2]. The highest strength of correlation between proactiveness and organizational performance was found when compared with other EO dimensions [39,62].

H3: *Proactiveness orientation is positively related to business performance.*

3.4. Innovativeness

Innovation is better known as creativity [67] and creativity is “the application of a person’s mental ability and curiosity to discover something new”. Where there is no creativity there would be no force to be innovative [68]. So, creativity is the source of better innovation. Simultaneously, the organization that fails to innovate will expire in the long run [63]. Innovation can be categorized into four classes, i.e., creation of a new product/service, expansion (extension), replication (duplication) of an existing product or service line, and synthesis with the combination of existing and new processes [69].

Innovation as an element of EO has been found in positive correlation with the business performance [33,39,40,45,56] and contributes to a particular firm moving one step ahead of rivals by its practice in all sorts of business even in the SMEs also [70]. In the context of Greek SMEs, innovation was identified to have a significant effect on business performance [71] while Malaysian SMEs were found to be the same among 182 SMEs in the manufacturing sector [72].

H4: *Innovativeness orientation is positively related to business performance.*

3.5. Achievements

A motive or need for achievement is a desire to do well to achieve a sense of personal accomplishment [73]. Achievement orientation has been taken as one of the EO factors as individuals with a high need for achievement perform better with non-routine tasks and take responsibility for their performance [42]. McClelland [73] stated that owners with strong achievement orientation lead to growth and success in the business. According to Koop et al. [74], Rauch and Frese [75], and Spencer and Spencer [76] success of a firm depend on owners’ achievement orientation. According to Krauss et al. [42], it is observed that achievement orientation has a significant relationship with the firm’s performance. Miner et al. [77], in a longitudinal study, found their measure of achievement motivation to significantly predict firm performance (i.e., growth in number of employees, sales growth, and entrepreneur annual income).

H5: *Achievement orientation is positively related to business performance.*

4. Research Design

In this research, Malay-based SMEs were chosen to test the empirical model. Data analysis techniques, respondents’ profiles, and measurements are discussed below.

4.1. Survey Design and Sampling

A cross-sectional approach was used to test the hypothetical relationships among Malay-based SMEs in Malaysia. To focus on SMEs, the respondents were found from MARA (Majlis Amanah Rakyat) and sent 1000 emails to obtain acceptance from SME owners. More than 50% of the Malaysian population are Malay. So, Malay people were chosen as the respondents for this study. The sample size was calculated using G-Power software with a 95% confidence level for the two-tailed test [78]. As per [79], with a power of 0.85 (power in behavioral and social science should be greater than 0.80) and an effect size of 0.20, a minimum sample size of 89 participants with five predictor variables was necessary for this study. Furthermore, Reinartz et al. [80] recommended that the sample size in the SEM study should be a minimum of 100 participants. Altogether 443 respondents agreed to participate in this research. Researchers personally visited the company and collected data from them. A total of 36 respondents were discarded due to at least one section missing response and finally, 407 cases were then accepted and analyzed. Data

was collected within March to September 2021. Since the sample size issue is a potential source of problems, this study utilized a total of 407 samples. The targeted respondents were the owner of the SMEs as the owner makes all decisions in all aspects of business and this projecting EO should be clearer.

More than 50% of respondents were male compared to their female counterparts. Age groups between 41 and 50 are found to respond to our questionnaire and 66 of them are married. Out of 407 respondents, 237 of them involved in business for more than four years and they have less than 8 employees.

The equations of the research model are as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon_i \quad (1)$$

where Y is the business performance (dependent variable); β_0 is the regression coefficient (constant); $\beta_1, \beta_2, \beta_3 \dots$ are the regression beta values; and $X_1 =$ autonomy orientation, $X_2 =$ risk taking orientation, $X_3 =$ proactiveness orientation, $X_4 =$ innovativeness orientation, $X_5 =$ achievement orientation, and $\epsilon_i =$ error or residual (Equation (1)).

4.2. Measurement

Entrepreneurial orientation dimensions that are employed in this research were adapted from Awang et al. [28] study. Awang et al. study adapted these items from Lumpkin and Des's [2] study. The dimensions were risk-taking, proactiveness, autonomy, and innovativeness with a total of 12 items. Five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was mentioned in the questionnaire. Achievement orientation was measured with scales from Kohli et al. [81] and Chien and Hung [82]. All items were modified for this research. All respondents were needed to agree or disagree with the statements related to an entrepreneurial orientation that best describes their reaction.

Most researchers prefer subjective measures to examine business performance for SMEs. Researchers suggested that subjective measures can be an effective way to examine the business performance of SMEs [83]. Managers of SMEs are always very reluctant to provide financial data to outsiders. The subjective method is used as it is supported by other researchers [84–86]. Out of seven items, a total of six items of business performance ranging from 1 (substantially decrease) and 5 (substantially increase) were adopted and modified for this research from Schalk's [87] study.

<i>Autonomy</i>
The firm administrator gives a unique idea and made a success out of it.
The firm enables the passing of entrepreneurial ideas generated by members of firms to manage.
The firm administrators don't take ideas generated by members of firms and make their own decisions.
The firm administrators are driven by the vision to establish their realm.
The firm autonomy orientation gives a positive result to the firm performance
<i>Proactiveness</i>
The firm takes responsibility and does whatever it takes to ensure an entrepreneurial venture produces a successful outcome.
The firm's pro-activeness involves insistence, flexibility, and readiness to assume responsibility for failure.
This firm enables us to anticipate future needs and take opportunities.
This firm capitalizes on opportunities to gain benefit.
This proactive orientation made influenced the firm performance.

<i>Risk-Taking</i>
The firm involves in errors a certain degree of risk and speculation.
Firms always avoid taking a risk when the risk is unavoidable.
The risk taken by the firms is predictable.
The risk taken is calculated in the failure of the firms.
The risk-taking orientation of the firm influence the performance of the company.
<i>Innovativeness</i>
This firm's environment follows the shape of the latest market.
This firm comes out with new ideas for the product, services, administration, or technological processes.
The new idea applied to this firm is relevant to the firm, market, and environment.
The new idea from the firm can be cultured to all the staff and administration
Innovativeness of the company gives positive results to the firm performance.

4.3. Data Analysis Technique

To test the hypothetical model this research applied PLS-SEM (partial least square structural equation modeling). Ringle et al. [88] suggested assessing causal relationships through a path model. The PLS path modeling technique is considered one of the general techniques measured by different indicators. According to Compeau et al. [89], both PLS and principal component factors analysis use the component base technique. According to Henseler et al. [80], researchers in management systems, strategic management, and marketing areas used this PLS technique. Research in e-bidding used the PLS-SEM technique to examine the willingness [90]. Aibinu et al. [91], also used the PLS-SEM approach in developing organizational justice modeling and another study assessed the causal relationship between cost overrun and construction resources. In entrepreneurship researchers such as Ferreira et al. [92] also applied the PLS-SEM technique. In HRM practices Triguero-Sanchez et al. [93] study used this PLS-SEM approach. To test the path modeling this research applied Smart-PLS3.0 statistical software. The main intention to use the Smart PLS technique in this research is to identify construct validity and finally assess a path model.

4.3.1. Measuring Construct Validity and Discriminant Validity

In this research construct validity was considered to test internal consistency. To examine the construct validity of the restrained construct's composite reliability (CR) score, average variance extracted (AVE) and Cronbach's alpha tests were used. Discriminant validity and convergent validity results can be seen in Table 1. According to Fornell and Larcker [94], the AVE score should be higher than 0.5. In this research, we can see the AVE values are higher than 0.5, which indicates met the criteria of the acceptable range of convergent validity [80,94,95]. The off-diagonal value of the $\sqrt{\text{AVE}}$ is greater than the squared correlation with other constructs, which ultimately met the adequate standard of discriminant validity [80,94].

Table 1. Correlation of latent variables and square roots of AVE.

Variables	Performance	Autonomy	Risk-Taking	Proactiveness	Innovativeness	Achievement	AVE	Cronbach's Alpha
Performance	0.728						0.531	0.8215
Autonomy	0.496	0.813					0.6611	0.8719
Risk taking	0.52	0.514	0.726				0.5279	0.7362
Proactiveness	0.503	0.535	0.499	0.737			0.5442	0.778
Innovativeness	0.521	0.420	0.5408	0.445	0.769		0.5926	0.8282
Achievement	0.629	0.537	0.4902	0.538	0.445	0.813	0.6611	0.8156

In Table bold elements, the square root of AVE.

Additionally, the HTMT value was found to be superior to Fornell–Larcker in a variety of scenarios [96]. If the HTMT value is more than 0.85/0.90, it has a discriminant validity problem [96]. The findings of this study are below the 0.90 criterion (Table 2). According to these investigations, the validity of the data appears to be satisfactory.

Table 2. Heterotrait–Monotrait (HTMT).

Variables	Performance	Autonomy	Risk-Taking	Proactiveness	Innovativeness	Achievement
Performance						
Autonomy	0.694					
Risk taking	0.680	0.714				
Proactiveness	0.664	0.741	0.672			
Innovativeness	0.722	0.596	0.732	0.649		
Achievement	0.778	0.711	0.634	0.652	0.589	

4.3.2. Reliability

According to Zhang et al. [97], for assessing survey scales and instruments the most common method used is internal consistency reliability. Cronbach’s alpha and composite reliability (CR) are the most common methods used to assess reliability. The CR value can be varied between 0 and 1. In any model, the CR value should be higher than 0.7 [98]. Nunnally [99] also suggested that Cronbach’s alpha value should be equal to 0.7 or higher. Wong and Cheung [100] argued that if the value is higher than 0.7, the data is fall into the highly acceptable range. Based on the above discussion it can be summarized that the Cronbach’s alpha and CR value should be higher than 0.7. Table 1 shows that all Cronbach’s alpha and CR values are higher than 0.7, which indicates acceptable evidence of sufficient convergent validity and reliability.

4.3.3. Structural Model

The structural model was evaluated by assessing path co-efficient, the explaining power of the model, and explained variance. Figure 2 has shown the path co-efficient value with PLS results. Explained variable tested based on the R^2 value of the endogenous variable. According to research R^2 value is weak when the value is 0.02, moderate when the value is 0.13 and value is substantial when the value is equal and higher than 0.26. Figure 1 in this research shows the R^2 value of an endogenous variable (performance) is 0.531, which indicates that the endogenous construct explains 50% of the variance. It is higher than the value of 0.26, which means the model is considered very satisfactory.

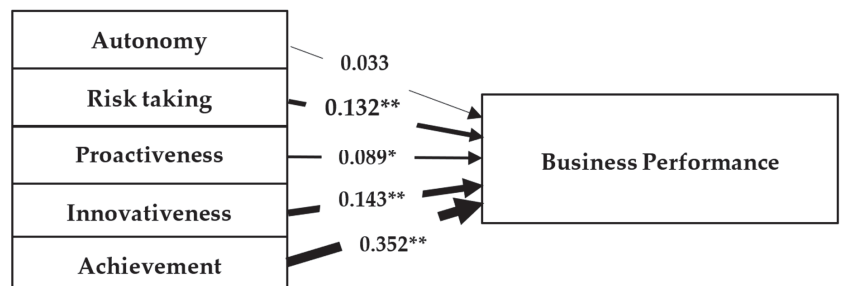


Figure 2. The path coefficient value. * Significant at 0.05 level and ** Significant at 0.01 level.

In this research GoF is the global criterion of the goodness of fit used to assess the performance of the path model in both structural and measurement models. GoF ($0 \leq \text{GoF} \leq 1$) index is obtained as a geometric mean of the average communality index and average R^2 value. According to Ringle et al. [101] based on the commonality indexes and R^2 values calculated with the average communality index average R^2 value was calculated as 0.5013 and 0.531, respectively. Thus,

$$\begin{aligned} \text{GoF} &= \sqrt{\text{Communality} \times R^2} \\ &= \sqrt{0.531 \times 0.5031} = 0.516 \end{aligned}$$

In this study, the GoF value obtained was 0.516 which is higher than the accepted value of 0.36 for huge effect sizes of R^2 . To compare with the baseline value suggested by Akter et al. [98] where $\text{GoF}_{\text{small}} = 0.1$, $\text{GoF}_{\text{medium}} = 0.25$, and $\text{GoF}_{\text{large}} = 0.36$. The result of this GoF value confirms that PLS path modeling has explaining power is substantial. Based on the guideline by Wetzel et al. [102] for the adequate support of GoF, it has also been reported that this PLS model is valid globally.

5. Hypotheses Discussion

According to Adams et al. [103], the validation of the hypothetically assumed relationship between variables was identified from the PLS path coefficients, structural model. A causal relationship can be interpreted based on the standardized beta coefficient of ordinary least square regressions. Table 3 shows the path coefficients and t-value of each exogenous construct.

Table 3. Results of hypotheses testing.

Hypotheses	Path Coefficient (β)	t-Value	Significance
Autonomy Performance	0.033	0.865087	Not Significant
Risk-taking Performance	0.134	2.535752 **	Significant
Proactiveness Performance	0.089	1.965510 *	Significant
Innovativeness Performance	0.143	2.944450 **	Significant
Achievement Performance	0.352	6.920889 **	Significant

* Significant at 0.05, ** Significant at 0.01.

PLS regression results show that autonomy is not a significant predictor of business performance ($\beta = 0.033$; t-value 0.865 significant at $p > 0.05$). However, this finding is contrary to the findings by Bavon, [53], Xu, [54], Izumi and Ayse, [55] who studied large industries. Further, in the case of SME study, the Sri Lankan study by Eriksson and Thunberg [56] also supports the previous study not only finding a relationship but also having the highest strength in the relationship between autonomy and business performance among other factors. However, the findings by Kasumawardhani [57] and Baba and Elumalai [52], who studied from the perspective of Indonesia and Malaysia, respectively confirms present study's outcome and suggested that autonomy might hamper in achievement of goal if independent spirit and freedom of action of employees are not taken in to account which reassures that autonomy is not an important factor in influencing business performance of Malay-based SMEs in Malaysia.

Consistent with the study of Davis, [51] the research found that risk-taking was positively and significantly related to business performance. This study also confirmed other studies such as Coulthard [46] found that risk-taking is important ($\beta = 0.1343$; t-value 2.535 significant p -values = 0.05) rejecting the finding by Naldi et al. [64] and Seborá et al. [65] who showed a negative relationship. Taking risks keeps an entrepreneur in thinking of new approaches and allows striving which in return helps him put on the right track of performance. Research shows that it is important for the company owner or manager to tackle risk in the business [63]. These results are also supported by findings by other researchers [39].

From the third proposition (Hypothesis 3), this study found a significant positive relationship ($\beta = 0.089$; t-value 1.965 significant p -values = 0.05) between proactiveness and business performance complying with all the studies so far, such relevant to this. Nevertheless, the strength of the relationship varied over the study. The study by Kreiser et al. [39] and Hughes and Morgan, [62] found the highest strength of correlation between proactiveness and organizational performance compared with other EO dimensions which are the differences in the present study showing a lower strength among others. The possible reasons could be the maturity of the business. Proactiveness at early growth

stages exposed a positive effect on organizational performance [62], and this association prolongs as the venture ages. As venture ages, the higher is the impact of proactiveness on business performance [2]. Most of the Malay-based SMEs started following the success of Chinese-based SMEs in Malaysia which indicates an early stage of maturity of Malay-based SMEs. Yet, this research confirms the previous studies.

Based on the study results shown in the PLS regression value that innovativeness is significantly and positively related to the business performance of Malay-based firms in Malaysia. The significant relationship results ($\beta = 0.143$; t -value 2.944 significant p -value = 0.01) authenticating the findings of the study by Kreiser et al. [39], Rauch et al. [45], Davis [51], Hughes and Morgan [62], Coulthard [46], and Kasumawardhani [57] based on other than SMEs. In the context of SMEs, the study based in Greece [71] and even in Malaysia [52,72] another such study innovation was identified to have a significant effect on business performance while this study accentuates the same with an addition on the strength of the relationship is found to be moderate.

In accordance with the study by Koop et al. [74], Rauch and Frese [75], and Spencer and Spencer [76], the study results show that achievement orientation is significantly and positively ($\beta = 0.352$; t -value 6.921 significant p -value = 0.01) correlated to the business performance among Malaysia-based SMEs in Malaysia. Furthermore, the result is also supported by the study by Krauss et al. [42] where he showed achievement is an important factor as individuals with a high need for achievement perform better with non-routine tasks and take responsibility for their performance. Conversely, this result did not match with the claim of an insignificant relationship in another study in Malaysia by Poon et al. [104]. It is worth mentioning that achievement orientation was observed to be the strongest in terms of significance among all the dimensions tested in this study.

6. Limitations and Recommendations for Future Research

Situational and time constraints were the main limitations of this research. Respondents for this study were chosen from Klang Valley only. It is recommended, that future researchers should choose wider geographical areas for generalizing our study results. This study also was only based on the respondents from Malay. In terms of EO and motivation, the cross-cultural study should be used in future research which will investigate the differences between Malays and other races. It is also important to examine the similarities and dissimilarities characteristics of different nationalities, sizes, and industries that could also be conducted in further research.

Cross-country and cross-cultural empirical research could be appropriate to verify our research results. Furthermore, similar research can also be replicated based on business life cycles such as introductory, growth, or matured levels of SMEs. Similarly, to obtain a deeper understanding of entrepreneurship orientation the research scope could also be extended with the different intensity of various dimensions, i.e., mild, medium, and strong levels of autonomy, risk, innovativeness, proactiveness, learning, and achievements. Future research should also need to examine the relationship between religion, education, race and gender, and firms' performance. To verify the current study results, it is suggested to examine the cross-section on a larger platform could be applied. Moreover, other models could be used to clarify the relationship between entrepreneurship orientation toward business performance. Future inquiries could also be influenced by this one by examining the mediating and moderating effect between entrepreneurial orientation and business performance of SMEs' employing a more sophisticated method.

7. Implications

7.1. Implications for Research

This study presents preparatory research based on racial classification and strictly on Malay-based SMEs. Our research provides numerous key contributions to the EO literature. *First*, our research adds to a better knowledge of the performance implications of EO as well as a deeper comprehension of a sub-component of the EO—performance connection.

It has been demonstrated that a combination of the multiple sub-components of EO can result in improved performance, in a manner similar to the study conducted by Linton and Kask [105]. We discovered that the major sub-components in our study were risk-taking, proactivity, innovativeness, and achievement. These sub-components differed from the sub-components shown to be significant by Lee and Chong [20] in the context of Malaysian manufacturing in their study. *Second*, this research contributes to Malaysian SME literature by investigating EO on the Malay (local people) who are relatively behind in controlling Malaysia's business sectors. *Third*, our result found inconsistent results such as autonomy is found as insignificant where the new variable achievement orientation significantly to predict organizational performance. This demonstrates that the statistical relevance of EO sub-components varies based on the sample of data and industry. *Fourth*, most research focuses on developed financial markets, and little is known about SMEs in developing or emerging economies such as Malaysia. The current work makes a significant contribution to closing this gap in the literature. Early studies by Vu [106] indicated the association of the EO dimension with SMEs' success in devolving economies, and Shah and Ahmed [107] for LDCs.

7.2. Implications for Practice

The use of Malay-based SMEs as a sample in this study provides evidence that the EO construct is valid and relevant in the organizational context of any type of SMEs as well as larger firms; in other words, the EO concept is not only for larger firms, as widely reported in the literature. The study comes up with five significant indicators of entrepreneurship orientation of Malay-owned SMEs. Government agencies such as Matrade, MARA, and other government agencies should create better awareness regarding the benefits of starting a revised thinking on orientation factors to improve entrepreneurs' businesses more profitable and risk-free. Arranging seminars or campaigns to make them educated on these issues would be a better one. Moreover, all government agencies should closely work with all SMEs in Malaysia and need to identify the problem and also need take necessary policies to rectify them.

It is also suggested to enhance the probability of performance in the SMEs sectors, the government should enforce handy, consistent, and standardized policies in all SMEs sectors and all other stakeholders in boosting these sectors.

8. Conclusions

In conclusion, it is interesting that the findings of this study which is used the PLS approach to test the relationships between EO and business performance and make it clear that EO significantly leads to the business performance of Malay-based SMEs in Malaysia. The PLS regression analysis shows that risk-taking, proactiveness, innovation, and achievement factors are the significant elements of entrepreneurship orientation. Nevertheless, one independent variable, i.e., autonomy, does not exhibit any relationship. The highest strength in the relationship was found in the achievement factor while the lowest was found in proactiveness. This investigation implies that EO is the main driver for SME performance; that all dimensions of EO are not compulsory to value or consider for business performance. This study purely gives us an idea about the assessment of EO on enhancing organizational performance in the SME sector. As the Malaysian government has emphasized the growth of small businesses, an understanding of the influence of entrepreneurship orientation on the business performance of SMEs is invaluable.

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Article

If You Aim Higher Than You Expect, You Could Reach Higher Than You Dream: Leadership and Employee Performance

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Abstract: Leadership is about lifting a person’s vision, raising their productivity to higher standards and creating a personality beyond their usual capabilities. Our study examines the Pygmalion effect and leader-member exchange (LMX) on employee task performance via organizational commitment. The data was collected from 280 middle-level managers from top ten banks in Pakistan. This study offers three main contributions to the literature. First, our results discover a strong link between the Pygmalion effect, LMX and employees’ task performance through mediation of organizational commitment. Secondly, our study indicates that leaders should have higher quality relationships with employees and higher task performance expectations. Finally, most previous studies focused on leadership approaches or have been conducted in western developed countries. To our knowledge, this study is a unique contribution to the literature on leaders’ expectations in changing and diverse environments, as in underdeveloped countries like Pakistan.

Keywords: employee performance; leader-member exchange (LMX); leaders expectations; social exchange; commitment

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1. Introduction

In order to satisfy human needs, organizations develop innovative products and services which may grant them sustainable competitive advantage. To achieve long-term goals, firms use a wide range of resources, including human skills and potential to satisfy the individuals’ demands by adhering to basic social standards Shahzad et al. (2018).

Employee performance creates the antagonistic advantage of the organization in current fierce competition and strengthens its long-standing prosperity. If a firm encourages own employees entirely by monetary contract, it will not be able to maximize the workforce productivity. Therefore, a promising social and psychological support is needed Bartlett et al. (2012); Cascio (2003).

There is evidence in existing scientific literature that leaders’ high expectations shape individuals’ task performance. When perceived by employees, leader expectations (LE) drive employee performance. The definition of leader expectation draws on the individual beliefs of employees about the expectations of leaders regarding their assigned duties with respect to engagement in a particular job. The expectation of occurrence is high when workers behave to favor a particular event to happen—in other words, people perform willingly when they expect something to happen Tierney and Farmer (2004). When leaders show these high expectations, employees are likely to try to meet their expectations in the context of intentions to perform tasks, maintain quality, or work harder.

The reciprocity of social exchange underpins the association between the leader and their follower. The role of the leader is able to enhance reciprocity and to improve relationships, and this effect tends to get stronger over time Emerson (1976). However, expectations

between leader and follower in the context of behavior may differ, resulting in misunderstandings and generating uncertainty. Hence, an enlightenment of the workplace is critical in meeting the expectations of both leaders and followers. Despite the fact that employees are well informed about what they are expected to do—either through written instruction or verbal—most organizations are unaware about the real workload and the enthusiasm of employees Van Hemmen et al. (2015). As observed, when leader performs his business position actively and reaps valued customers, the leaders' high expectations boost staff service performance. On the other hand, leaders' high expectations of their followers play an essential role in shaping their identity Likert (1967).

Furthermore, a leader that establishes high expectations sets high targets and encourages their people to generate higher levels of productivity. The acknowledgment and encouragement from that leader will push them to provide high-quality service Livingston (1969). Still, employees responsible for a high quality of work are more conscious and are often seeking a solution to a current problem. Thus, considerable support is required from leadership due to the sensitivity and vulnerability of this work. In order to communicate their own ideas and assure high performance, individuals require high quality associations or relationships Cole et al. (2002). High quality relationships between followers and leaders must be established as a way to boost work performance: within such interactions leaders provide opportunities and essential resources to employees, thus creating a favorable working milieu Farh et al. (2017).

The literature shows a variety of antecedents of performance such as organizational commitment Rigtering and Weitzel (2013), leader-member exchange (LMX) Woo (2018); Farrukh et al. (2017), and culture Rahmah and Fatmah (2018), to name a few. However, research regarding the process through which different contextual factors affect employee performance is underdeveloped Sinha and Srivastava (2013). Additionally, high quality relationships between leaders and employees play a vital role in shaping high working standards and increasing labor task performance. The successful delegation of individual tasks, information and resource support to employees is able to enhance their motivation, and develop and promote their performance Scott and Bruce (1994).

Therefore, in this study, we integrate leader expectations and leader-member exchange as antecedents of employee performance. Generally, high-quality LMX encourages employees to participate in decision-making and commit to a greater extent to their job; they experience fewer task-related challenges, demonstrate loyalty, responsible attitude, and readiness for more responsibility De Jong et al. (2011). Furthermore, high-quality LMX even aspire to go beyond their agreed-upon job duties, to be more flexible and voluntary in their activities, to build a good work atmosphere and to perform better. On the other hand, employee productivity may be influenced by leaders directly, so more attention should be devoted to the leader-employee interaction in order to develop a better knowledge of service quality Grošelj et al. (2020); Lenka and Gupta (2019).

One further aspect, the organizational commitment, suggests employees are more excited when their sense of commitment to the organization is triggered, so organizational commitment is seen as an antecedent to proactivity. Individuals' creative contribution and passionate actions in performing tasks in teams are the examples of proactivity as a result of their commitment to an organization. Strauss et al. (2009) observed that effective commitment can benefit organizations by directing employees' attachment to a company; there is a strong link between organizational commitment and organizational member proactivity. Employees' commitment to a particular organization can lead to proactive behavior and contribute to that organization's success, so energetic behavior within organizations is becoming increasingly important. However, few studies have investigated this problem so far.

Previous research examines exchange relationships in isolation (Buch, 2015), thus largely disregarding the fact that employees are involved in multiple relationships at work, including employee-organization, employee-team and employee-supervisor relationships Bordia et al. (2010). To advance social exchange theory, it has been advocated recently

that the linkages between different relationships should be incorporated into analysis Bordia et al. (2017). Hence, we acknowledge that the LMX exists with other formal and informal organizational relationships simultaneously and that LMX should not be studied in isolation.

Furthermore, Graen (1976) mentions that the relationships that employees have with their coworkers and supervisors represent two key social relationships at work. However, several unproven ideas still exist in the literature with respect to the problem of whether exchange relationships with supervisors are interconnected Cole et al. (2002), thus suggesting the need to investigate whether the interaction between exchange relationships with leaders is able to boost employees' task productivity.

This study finds that LE (Pygmalion effect) and LMX are positively linked to employees' high performance; moreover, the organizational commitment for performance mediates these linkages. Our contribution to the literature is threefold. First, this study attempts to investigate the effect of LE (Pygmalion effect) and LMX on employees' high performance. The literature in this field is scarce and the theoretical development is weak because traditional collaborative leadership approaches are more relevant to the performance Scott and Bruce (1994). Second, this paper contributes to the literature on the quality of work and may also help practitioners in formulating interventions to foster innovations in organizations that will ultimately lead to better task performance. Finally, most of the past studies have been conducted in western developed countries, while our research contributes to the literature and practice by gathering survey data from a population of middle-level managers in the banking sector of Pakistan, a developing and very diverse country with its own social, economic and environmental peculiarities. Although this study does not include any cultural aspects, we imply that there might be some differences in responses to survey questions because of the cultural background. To our knowledge, this is the first paper studying a link between LE and LMX with the mediation of organizational commitment in a non-western country.

Section 2 briefly explains the concepts examined in this paper and describes literature background and hypotheses. Section 3 presents the data and methodology. Findings are presented in Section 4 and then discussed in the following Section 5. Finally, Section 6 concludes our research with limitations.

2. Literature Background and Hypotheses

2.1. Leader Expectations (Pygmalion Effect)

When we behave in a way that favors the occurrence of a specific event, we perform willingly when that event is expected to occur. On the other hand, leaders' high expectations from their followers play an important role in defining their role identity.

Historically, there was a belief that individual's expectations might influence the behavior of others. This psychological phenomenon, or so called Pygmalion effect, was first coined by Merton in 1948 to describe someone's proclivity to meet other people's expectations Tierney and Farmer (2004). To put it another way, the Pygmalion effect describes a situation in which other people's expectations of a specific person influence other individuals' performance. This effect has been primarily observed in the educational context (classrooms), with the findings indicating that teachers' expectations influence students' academic performance Chang (2011); Friedrich et al. (2015).

At all levels leaders have a dominating influence on employees Dhamija et al. (2019). The adoption of proactive leadership skills can assist in molding staff behaviors in order to attain the required high level of performance. Employee performance is impacted by a leader's activities because a leader communicates their expectations to their followers, and employees fight to reach these standards Suliman (2002).

If we consider the Pygmalion effect relevant for employee performance, a question formulated by Eden becomes relevant Eden (1984) *if raising teacher expectations improves pupil performance, wouldn't raising manager expectations improve subordinate productivity?* Existing literature confirms the significance of the expectations of leaders: the leader who

expects more assumed a higher-level of performance. However, this statement goes back to general knowledge and very few scholars investigated this theory to study how leaders' expectations affect process and can be used to enhance the output of an organization. In contrast to these assumptions, various Pygmalion mechanism theorists have focused on measuring the productivity level of a firm and the increased effort of individuals in accomplishing work tasks.

Still, appraisal of internal working procedures and the impact of the Pygmalion process are significant. Leaders should be aware of the consequences of their expectations for their staff since these high expectations may have a significant impact on employee performance Goddard (1985). According to existing concepts, a so called Galatea effect is one of the fundamentals of the Pygmalion process. Hence, to reach higher levels of productivity supervisors and managers design improved leadership styles and behaviors for subordinates. As a result of the high expectations and unique leadership attention they are receiving, their employee performs better: whether the majority of performance improvements are driven by the leader's high expectations, it is regarded a significant variable within the Pygmalion process. Thus, the Pygmalion effect, with its emphasis on high expectations and impact on behavior, may provide a strong and valuable framework for investigating important concepts such as employee performance. We believe that the Pygmalion effect phenomenon can play an important role in increasing productivity.

Hypothesis 1a. *Leaders' expectations (Pygmalion effect) have a positive impact on improving employees' task performance.*

The organizational commitment is described as an individual's personal feelings about the organization. Commitment is observed when an employee's personal values, priorities and goals harmonize with the organization's objectives.

In a study by Joo and Lim (2009), higher commitment levels were observed among employees and firms where employees' and organizational values are aligned; commitment itself refers to employees' psychological attachment to a firm. Smith and Meyer (2009) mention that *in order to create and sustain a desirable organizational outcome, everyone must be a part of the organization hence obey and respect the organization's norms*, so organizational commitment has a critical and positive impact on employee performance.

Despite the *promising management tool* role of the Pygmalion effect Eden (1984), few studies have been conducted at the organizational level. The latest research addressed the so called self-fulfilling prophecy (SFP) phenomenon, leaving however the problem of inconsistencies and challenges in organizational performance (e.g., individual) in the context of the Pygmalion concept unattended Tierney and Farmer (2004). Still, the importance of Pygmalion mechanism lies within the concept of subordinates' high performance as a result of high expectations and a high level of employees' inspiration to perform well and dedicate themselves to achieve better results.

Hypothesis 1b. *Leaders' expectations (Pygmalion effect) have a positive impact on the employee performance linked to organizational commitment that individuals perceive as supportive of high performance.*

2.2. Leader-Member Exchange

The relationship between leader and employees is a necessary determinant of work attitude and behavior because leaders are those *who inspire their followers through quality relationships and support by providing them with a friendly culture, which then results in employees producing high-quality work* Surucu and Sesen (2019). An authentic interaction between leaders and employees (or high-quality LMX) increases employees' sense of cohesion and trust, while trust between leader and employees is an important prerequisite for better performance. LMX reduces people's fear and gives them confidence so they can perform above-standard and high-quality work. High LMX levels within an organization make

employees feel secure in the knowledge that if they perform well, their output will be acknowledged, but even they fail, their leader will encourage them. Employees in high LMX are closely associated with their leaders who supply them with more technical support, expertise and knowledge. This knowledge and skill may inspire employees' cognitive processes and encourage them to take an active role in task performance Mumford et al. (2002). Furthermore, employees involved in high-quality LMX tend to encourage their colleagues to behave proactively in order to fulfill job responsibilities: when the observer's perception is stretched towards cognitive equilibrium, those individuals having close relationships with a notable person in the team (e.g., the leader) are more likely to be warmly welcomed by other team members. As a result, the focus member's reputation and trustworthiness within the team will increase Lau and Liden (2008).

LMX plays a vital role in increasing staff productivity by providing effective assistance but also strong support. The growth of leadership caliber may offer a strong foundation for the development of employee attributes within a company, either via direct or indirect links between employee performance and leadership. Existing literature Duan et al. (2017) confirms that LMX has a positive influence on high-quality work, resulting in better performance. The explanation for this interaction is based on Emerson's social exchange theory Emerson (1976) which states that employees feel grateful to match their leaders' efforts by engaging in additional work role behavior. As a result, employees respond by participating in proactive actions that promote the business goals. In addition, LMX may encourage proactive behavior among workers and provide employees with a sense of security Huynh et al. (2019) which may be an important incentive to achieve higher performance levels.

Hypothesis 2a. *Leader-member exchange has a positive impact on employee task performance.*

There is a concern that LMX may have an impact on employee performance through organizational commitment. We believe that generating such a commitment through friendly, supportive and high-quality relationships with employees cultivates the intention to do work. Kozlowski and Doherty (1989) mention that supervisors and leaders are representatives of organizational policies, strategies and procedures; thus, employees consider their supervisors' actions to be corporate policies. As a result, any encouraging action taken by a leader is regarded as an organization's support which creates a sense of affiliation to the firm. However, even though a relationship between LMX and organizational commitment has been studied so far, how organizational commitment mediates the relationship between LMX and employees' performance is still poorly investigated.

Hypothesis 2b. *Leader-member exchange is positively linked to employee performance, provided that organizational commitment is supportive of higher employee performance.*

2.3. Organizational Commitment and Employee Performance

One more literature record refers to the positive impact of organizational commitment on employees' performance Khan et al. (2010). An organizational commitment is defined as a cognitive interpretation of organizational values Smith and Meyer (2009) and refers to a psychological relationship.

Provision of essential resources to realize an idea is critical for commitment, and their distribution is another indicator to the organization of the assistance of high-quality employee relationships. The relationship between high quality LMX, commitment and employee performance is also rooted in social exchange theory Emerson (1976): when leaders interact in a trustworthy and appreciative manner, generalized reciprocity appears. The social exchange theory's principle of restricted reciprocity can be used to explain how organizational commitment leads to high employee performance. Employees' commitment to the organization creates reciprocity in the context of intentions to perform tasks, quality work, or more work. As a result, we believe that in reciprocity employees become more

productive and have better intentions to work; this is the stage at which employees feel committed to the organization and perform well.

Hypothesis 3. *Organizational commitment have a positive impact on employee performance.*

All five hypotheses are represented by a single model depicted in Figure 1. It also contains a framework along with hypothesized relationships between observed variables.

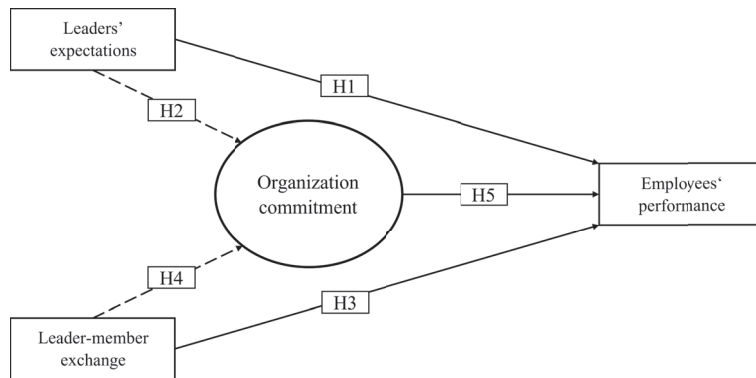


Figure 1. Summary of research framework.

3. Data and Methodology

While existing research on employees' quality of work and its antecedents have been undertaken from a western viewpoint, in our paper we would like to investigate the influence of leaders' expectations and leader-member exchange in motivating employee performance in an environment which is different from Europe and the US in terms of economy and environmental and social aspects. Pakistan was chosen for our research due to its diverse and collectivist nature Khan (2022) so we expect to record those cultural attributes that may impact the context of LMX and leadership expectations. As long as cultural values act as normative rule guides for employees, dictating the guiding rules and norms in both personal and professional life Walumbwa et al. (2007), individual values show how anyone is impressed and influences others, as well as how leadership is considered and evaluated. Consequently, by targeting the case of Pakistan, this study adds to the literature by considering the role of leadership in employee performance.

The target population for this research includes all employees at the middle level of management (branch, area and operational managers) in the top ten banks, including public, private and multinational corporations, in Pakistan over a ten year period (2010–2020). We focused on middle-level managers because they have a double role—on the one hand, they are leaders to their juniors and, on the other hand, they act as employees to the senior level management. With 8761 branches in the country (for all top ten banks), nearly a third of them are located in three major cities of Pakistan—Karachi, Lahore and Islamabad—with almost ten thousand employees.

For the purpose of this study, the data was gathered at the primary level by a questionnaire. Our questionnaire includes two main sections. First, employees were asked to answer four demographic questions (gender, age, experience, qualification). In the second stage, employees expressed their opinion on over 21 questions covering four major topics:

- employee performance (EP), including five measures of the productivity level (related to high quality, excess, intention, intentions to perform task of work and high level of performance) similar to Shahzad et al. (2018),
- organizational commitment (OC), covering six items as in study by Meyer et al. (1993),
- leader's expectations (LE), with three items adapted from Tierney and Farmer (2004) and

- leader-member exchange (LMX), covering seven items from Scandura and Schriesheim (1994).

The responses from the target audience were gathered using a seven-point Likert scale ranging from strongly disagree (1) to strongly agree (7). In order to fit the questionnaire to the Pakistan context, the wording for some of the questions was changed. After that, the questionnaire was distributed to 650 mid-level management employees (branch managers, area managers and operations managers). A total of 350 filled questionnaires were returned (response rate 54%). After screening, 70 responses were dropped, leaving us with 280 valid responses to analyze (valid response rate 43%).

4. Results

4.1. Pilot Test

As our questionnaire items were adopted from previously published studies, we carried out a pilot test to guarantee the validity and reliability before a broad distribution of the questionnaires. The pilot test was carried out on a sample of 39 responses, with a minimum suitable threshold of thirty entries for the pilot run as stated by Johanson and Brooks (2010). To test the validity of items, the factor analysis (multivariate technique) was used. Data are subjected to two requirements prior to factor analysis: Kaiser Meyer-Olkin (KMO) test and Bartlett's test of sphericity. The KMO value for our sample is 0.899, which is substantially higher than a threshold value of 0.60 Kaiser (1974).

Bartlett's sphericity test determines if the correlation matrix is an identity matrix, indicating that the factor model is inapplicable Malhotra et al. (2006). If the Bartlett value is significant ($p = 0.05$), then it is possible to employ the principle component analysis (PCA), a process used to compress a larger collection of variables into smaller ones to optimize the interpretation and minimize the information loss Jolliffe and Cadima (2016). For our case, the null hypothesis was rejected (approx. chi-square: 1 221.46; DF = 210; $p = 0.000$) indicating that the variables in the population correlation matrix were uncorrelated. Table 1 contains the factor loadings for the pilot test (items with loadings at 0.40 or less were deleted from the final survey questionnaire).

Table 1. Measurement model evaluation for validity and reliability.

Construct	Items	Factor Loadings	CR	AVE
Employee performance	EP1	0.898	0.949	0.788
	EP2	0.874		
	EP3	0.884		
	EP4	0.896		
	EP5	0.886		
Organizational commitment	OC1	0.884	0.967	0.831
	OC2	0.927		
	OC3	0.908		
	OC4	0.910		
	OC5	0.930		
	OC6	0.910		
Leaders' expectations	LE1	0.899	0.937	0.832
	LE2	0.912		
	LE3	0.925		
Leader-member exchange	LMX1	0.826	0.942	0.700
	LMX2	0.851		
	LMX3	0.890		
	LMX4	0.885		
	LMX5	0.854		
	LMX6	0.764		
	LMX7	0.871		

4.2. Data Analysis

Given that the purpose of this study is to predict employee performance based on the leaders' expectations and leader-member exchange, the partial least square structural equation modeling (PLS-SEM) technique was used. PLS-SEM is a common approach for management and social science research which has been widely applied in prior studies Aydin (2020); Khan et al. (2020); Khan (2022) when the major purpose of the study is to assess a core model and show a target construct Hair et al. (2019). Additionally, it prioritizes the optimization of the endogenous construct prophesy above the model fit.

The results were computed with the help of SmartPLS Software (3rd version). PLS-SEM is a two-step process. In the first stage, the measurement model's validity and reliability are evaluated. Table 1 displays the composite reliability (CR), extracted average variance (AVE) and factor loadings (FL). The observed values were above the 0.70 cut-off threshold for factor loadings and composite reliability, and above the 0.50 cut-off point for average variance Hair et al. (2017), thus confirming the measurement model's internal consistency and convergent validity.

We analyze the measurement model's discriminant validity (DV) using the Fornell-Larcker criteria and the heterotrait-monotrait (HTMT) correlation ratio, as indicated by Hair et al. (2017). The degree to which one construct differs from another is referred to as discriminant validity. The observed HTMT ratio for all variables was below 0.85; our model also meets the Fornell-Larcker criterion, demonstrating discriminant validity (see Table 2).

The structural model is examined in the second stage of PLS-SEM evaluation. The bootstrapping tool integrated in SmartPLS Software was used to assess the relevance of all path coefficients. The results displayed in the Table 3 demonstrate that all five hypothesized relationship were supported. The graphical representation of our outcome is depicted in Figure 2.

Table 2. Heterotrait-monotrait (HTMT) ratio and Fornell-Larcker criterion.

HTMT Ratio	EP	LMX	LE	OC
Employee performance				
Leader-member exchange	0.794			
Leaders' expectations	0.722	0.654		
Organizational commitment	0.839	0.771	0.803	
Fornell-Larcker Criterion	EP	LMX	LE	OC
Employee performance	0.888			
Leader-member exchange	0.741	0.837		
Leaders' expectations	0.662	0.597	0.912	
Organizational commitment	0.795	0.731	0.747	0.912

Table 3. Findings.

Hypothesis	Mean	SD	T-Value	p-Value	95% CI	
LE » EP	0.115	0.052	2.225	0.027	0.338	0.546
LE » OC	0.480	0.058	8.292	0.000	0.013	0.217
LMX » EP	0.336	0.069	4.822	0.000	0.206	0.470
LMX » OC	0.447	0.055	8.051	0.000	0.338	0.546
OC » EP	0.464	0.077	6.070	0.000	0.309	0.602
Organizational commitment mediation						
LE » OC » EP	0.223	0.050	4.490	0.000	0.135	0.325
LMX » OC » EP	0.226	0.040	5.185	0.000	0.132	0.287

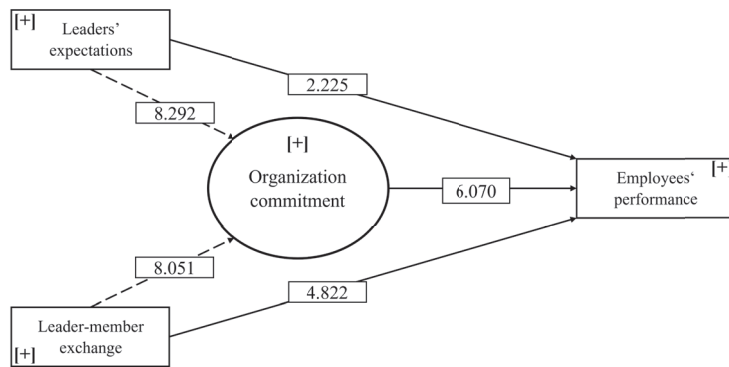


Figure 2. Summary of research framework.

5. Discussion

This study developed and tested a model to prove that leadership influences employee performance through organizational commitment. We were able to confirm all five hypotheses formulated in this research (see Table 3).

The findings of Hypothesis 1a confirm a significant impact of leaders' expectations of high task performance from their employees and are in line with previous papers linking leaders' high expectations with employees' extra-role behaviors such as high quality of work Farrukh et al. (2019). This demonstrates the importance of individual commitment to the organization in fostering employee high performance. Thus, we may testify that when a leader expects high levels of task achievement from his or her employees, the employees will reciprocate by being involved in the tasks that have been assigned to them.

We also confirmed that employees who have a positive relationship with their boss perceive organizational dedication to be beneficial for better levels of performance (Hypothesis 1b). Furthermore, if the leader has high expectations of their followers in terms of extra-role conduct while simultaneously demonstrating respect to their subordinates, employees will reciprocate by performing high-quality work. This outcome contradicts with the finding by Sutton and Woodman (1989) but, on the contrary, stays in line with the findings in the literature Redmond et al. (1993); Tierney and Farmer (2004); Tierney et al. (1999). These studies demonstrate that the Pygmalion effect may be used to understand employee performance, particularly when the performance criteria is based on high quality of job performance.

Moreover, the results also revealed a positive impact of organizational commitment impact on employee task performance (Hypotheses 2b and 3). Those employees who are committed with the organization yield higher productivity as compared to those who are less committed. We also observed that commitment to the organization mediates not only the relationship between leader-member exchange, but also the relationship between a leader's high expectation (Pygmalion effect) and individual's performance. The leader's high quality relations exchange, as a form of social exchange, generates positive emotions towards the organization in employees, but also generates obligations to the organization.

The results also showed that leader-member exchange (Hypothesis 2a) has a positive impact on employee performance, implying that the performance may be improved by creating a high-quality linkage. We already mentioned that a high-quality connection provides employees with a sense of belonging, independence and better self-esteem, which is reciprocated by employees in the form of extra-role behavior. A clear comprehension of each other's duties may be recognized as a result of a quality exchange link between employees and supervisors, resulting in a greater intention to perform work Atitumpong and Badir (2018).

6. Conclusions

Our study adds to the literature and practice in many ways. To our knowledge, this is the first study to look into how leader expectations (Pygmalion effect), leader-member exchange and organizational commitment affect employee performance. Also, although some proof of an association between leader-member exchange and employee performance existed in the literature Atitumpong and Badir (2018), no study examined this association with employee performance, a wide concept constituent of work intentions to perform tasks, excess work and high quality work. Hence, this is a one-of-a-kind contribution to the literature on leadership and performance enhancement. Furthermore, the majority of previous studies on performance have focused on leadership approaches rather than specifically on leaders' expectations (Pygmalion concept). This study broadens our understanding of leaders' expectations in fostering employee extra-role behavior Kierein and Gold (2000); Tierney and Farmer (2004): if employees view organizational commitment to be helpful, leaders' expectations will yield greater results.

Our findings also provide credence to the behavioral plasticity theory Brockner (1988). Employees may feel more valued in the company if they watch a leader's encouraging conduct; this may increase their self-esteem in the organization, prompting them to exert more effort to improve their productivity, especially when followers lack confidence in themselves. Employees with poor organizational self-esteem feel that their efforts would go unnoticed. According to our research, employees with low self-esteem are more impacted by their social circumstances than those with strong self-esteem. This point of view was supported by a number of other scholars as well Mossholder et al. (1981); Gardner and Pierce (1998).

Some of our findings rooting in leader-member exchange theory may be important for managerial purposes. First, we observed that a positive relationship between leaders and members would motivate employees and their interest in non-regular activities, because excess work, intentions to perform tasks and high-quality work are not always part of the official daily routine. As a result, we may recommend managers to cultivate a relationship based on mutual trust, encouragement, empowerment and respect, which may be rewarded with higher performance quality. Additionally, leaders or supervisors have to maintain a high level of interaction with their subordinates by holding frequent meetings for feedback and information exchange which stimulates and encourages subordinates to do high-quality work. Furthermore, firms should encourage and educate managers on how to sustain a high-quality exchange connection by providing them with the required resources.

Our findings support the assumption that employees require a supportive atmosphere in order to execute extra-role activities, and we advise that leaders should pioneer the formation of a pleasant, supporting environment by providing necessary resources and time. Furthermore, our outcome shows that the presence of devoted subordinates increased the influence of leaders' expectations. As a result, we believe that leaders should set extra-role behavior standards for their followers while simultaneously generating an enthusiastic environment in which people desire to remain self-attached.

Although this work credits several significant implications for current theory and practice, a few limitations apply that hint to future research opportunities. We advise that consecutive studies should focus on longitudinal data collection methodologies to better understand the causal and effect connection, because the variables in this study are behavioral and perception-based which may not fairly assess more than one moment in time. Furthermore, because this study did not examine the influence of leader-member exchange and leaders' expectations on dimension level, we urge that future research may investigate this relationship at both the dimension and construct levels for a more comprehensive understanding. Finally, in our paper we tested the outcome for only a few cities, so we may propose testing the same model on a cross-sectional level to improve its generalizability.

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Article

The Effect of Product Knowledge, Perceived Benefits, and Perceptions of Risk on Indonesian Student Decisions to Use E-Wallets for Warunk Upnormal

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Abstract: (1) Background: The purpose of this research is to find out how product knowledge, benefit perception, and risk perception variables affect the decision to use e-wallets (Go-Pay). (2) Methods: The population used in this study is Indonesian students who used Go-Pay to carry transactions at Warunk Upnormal of Dipatiukur Branch, West Java, Indonesia. The sampling technique used by the author is a non-probability sampling technique. Meanwhile, the type of sampling used by the author is accidental sampling. Based on the calculations made, the sample used in this study is 100 Indonesian students. Furthermore, the research method used in this study is quantitative methods. Data analysis was carried out using structural equation modeling (SEM). (3) Results: this study indicates that the final product knowledge and perception of risk have a positive and significant effect on user satisfaction. The latent variable of perceived benefits has a negative and insignificant impact on the decision to use. (4) Conclusions: the latent variables of product knowledge and risk perception have a positive and significant effect on user satisfaction. Meanwhile, the latent variable of perceived benefits has a negative and insignificant impact on the decision to use the e-wallet.

Keywords: product knowledge; perceived benefits; perceived risk; usage decisions

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1. Introduction

China is one of the pioneers in the use of financial technology. WeChat and Alipay are examples of financial technology (fintech) companies from China that are able to shift the dominance of banking. These two payment platforms control the majority of payment transactions and prevent banks from moving freely in the retail business. Citing Forbes, currently, both digital wallets hold 80–90% of payment transactions. There are at least two reasons for the development of mobile payments, especially Alipay and WeChat Pay. The first reason is regarding the infrastructure. In China, the internet infrastructure is developing rapidly at high speed. Second, banking services are considered unfriendly. Therefore, people think that going to the bank is difficult because they have to queue and fulfill various requirements to have an account and get a debit card. In addition, credit cards from banks in China are not popular because Chinese people do not like to have debt. In this case, Alipay and WeChat are gaining fantastic popularity; this is proven by their active users, who reached 520 million and 1 billion monthly, respectively. Furthermore, their consumers invested more than USD 2.9 trillion in 2016 [1].

Consumers rely on online information provided by others, which may be credible to adopt and may profoundly influence their behavior, subjective norms, beliefs, intention, and attitude. Involvement, information credibility, and information quality are important

sources that appeal to consumers' social ties [2]. Consumers' psychology and their intention to using online payment platforms are becoming interesting to understand, and increasingly, it has become complicated in the current global market. Therefore, in a broader view of the psychologically driven consumers, motivation and consumer decision-making process features are critical for consumers' online information adoption in making their decisions on using mobile payment services [3].

Another factor that can be a primary determinant of someone wanting to use a technology service is the perception of risk, which is a concern about uncertainty or the possibility of loss when transacting online; one of the electronic payment services is an electronic wallet which has been seen as a facility that provides convenience and convenience in transactions. However, many people see that this technology also has risks, especially because it is related to payments. Although it contains risks according to some, many customers still believe in it and continue to use it [3].

One of the growing e-payment services in Indonesia is Go-Pay. Go-Pay is an e-wallet presented by Go-Jek to make it easier for its customers to complete transactions on the Go-Jek application. The global research institute, Growth for Knowledge (GfK) Indonesia, released data at the end of 2015 related to the use of transportation applications in Indonesia. It is known that the Go-Jek application is the most widely used, with the number of users reaching 21.6% of the total smartphone technology application users in Indonesia [4]. As shown in Figure 1, smartphone users' data in Indonesia in 2016 are estimated to reach 65.2 million users [5]. If you look at this, the number of Go-Jek application users is 21.6% of the 65.2 million users, reaching 14,083,200 users. Among these, many users of the Go-Jek application service and almost every downloader has used the Go-Pay service because of the free balance program for users who enter a referral code/voucher and a discount program. It is also known that Go-Pay transactions' growth has been very high since it was first launched [6].

In addition to the two factors above, a person will also consider the perceived usefulness in using a service technology. Perceived usefulness is the extent to which a person believes that using a technology will help improve their performance. Go-Pay users can get benefits defined as positive impacts received by users while using Go-Pay. The advantage of using Go-Pay services for customers is that Go-Jek service rates are cheaper [4]. This is expected to encourage Go-Jek service users to use Go-Pay, so that users who feel that Go-Pay is helpful for them are expected to increase their use of Go-Pay.

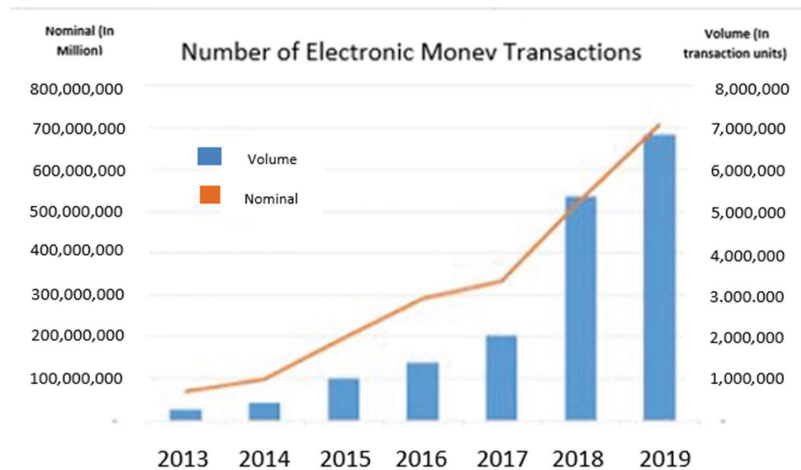


Figure 1. Number of electronic money transactions.

Along with the development of technology and the rise of e-commerce, the volume and value of transactions using e-money are experiencing an increasing trend in Figure 1 [7]. Since 2017, the increase was significantly even higher, and the importance of e-money usage increased by 2473% from 2013 to 2019. This was accompanied by an increase in transaction volume, which reached 920% over the same period. From the data that describe the use and value of transactions using non-cash payment systems, it can be seen that the use of non-cash payment instruments has been currently and increasingly chosen by the public to make payments for transactions, both goods and services.

Go-Pay is intensively promoting its products with various strategies, some of which are by offering discounts and cashback to encourage people to use the application. These two apps quickly became the consumer's choice, and other players dropped out regularly because they could not compete with this application. Go-Jek is getting serious about strengthening Go-Pay services by acquiring three local financial technology (fintech) startups: Kartuku, Midtrans, and Mapan. The acquisition of these three local startups is because they have processed a total transaction of more than IDR 67.5 trillion per year, either through credit, debit cards, or digital wallets for users, service providers, and affiliated merchants.

According to Figure 2 the Financial Times Confidential Research Mobile Payment [8], the top five electronic money providers in Indonesia are Go-Pay, Ovo, Trash, BCA Klikpay, and Doku wallet. The FT Confidential Research Mobile Payment survey found Go-Pay the most popular mobile payment platform in Indonesia. Still, it faces stiff competition from Ovo, part of the conglomerate Lippo Group. However, this year, the two companies will face even tougher competition as traditional banks have a larger market share. Go-Pay was used by nearly three quarters of mobile payment users in the last three months of July–September, slightly higher than in the same period the previous year, followed by OVO, which is used by about 42%. To date, Go-Pay has partnered with 28 financial institutions and has been accepted by more than 240,000 business partners in various cities in Indonesia, 40% of which are MSMEs [6].



Figure 2. Most popular mobile payment services.

Indonesian youth's understanding of financial technology is still general and limited to the meaning of words, as well as understanding young people towards cash. According to Ferdiana, interest in using Go-Pay is not high, and companies engaged in financial technology can develop well, but it takes a lot of time and requires public education and knowledge. It is possible, if later financial technology will master payment transactions, there will be special financial statements to report all cashless based financial transactions [9]. Contrarily, Sembiring et al. found Go-Pay technology is accepted by the community, especially by early adopters of innovation who, in this study, are proxies with students and well accepted. Students are a relatively young age group, so they tend to have a high level of acceptance against the risks of new innovations. In addition, they are also seen as more familiar

with new technologies [10]. Perception of benefits, convenience, trust, familiarity, and risk together equally influenced the intention of using electronic wallets and Go-Pay [9]. The perceived benefits and ease of use have no significant effect on the intention of using e-wallets, while the perceived risks and attitudes have a significant influence on the intention of using e-wallets [11]. Zhang and Yu added that electronic buying behaviors were made in terms of consumers' perception of the risk of product effects, consumers' perception of service risks, and consumers' perceptions of other risks. The degree of trust in the e-wallet platform and negative reports about the platform also affect buying behavior [12]. Arifin et al. found in the term of e-wallet five factors of perceived risk that have a significant negative influence on intention to use e-wallets while shopping online, and social risk was found to be insignificant. Among these factors, security risk is the main contributor for consumers to deter from using an e-wallet while purchasing online [13]. The development of e-wallets has led to some challenges to consumers, which comprise security of payment, data protection, the validity and enforceability of the e-contract, insufficient information disclosure, product quality, and enforcement of rights. This issue emerged because many retailers do not understand the main factors that will contribute to consumers' perceived risk. Consumers' perceived risks will influence consumer attitudes toward decision to use e-wallets. Studies on consumers' perceived risks toward intentions to use e-wallets are still inconclusive. Thus, this paper fills the gap in the research area, focusing on students' decisions to use e-wallets.

This study aims to analyze Indonesian students' intentions to use e-wallets in this era of rapid technological advancement, using the technology acceptance model (TAM) as the base. It is also envisaged to analyze if product knowledge, perceived benefits, and perceptions of risk can be considered as an independent factor and variable influencing the decisions to use e-wallets for Indonesian students. With the ever-growing popularity of use of e-payments taking place in applications, risk issues, and high competition, researchers were interested in researching the factors that cause someone to decide to use an e-wallet (Go-Pay) in conducting transactions. A notion stating effective shaping of the student intention to use technology could be achieved at this stage as well. A handful of researchers have studied the TAM model to describe the intention of use of technology amongst students. The results from this study will conceivably help us understand the relationships among the TAM constructs when applied to a bigger sample. The research questions mentioned below are proposed: RQ1. Is the TAM an efficient model to explain Indonesian students' intention to use an e-wallet? RQ2. Which are the significant relationships among the constructs in the TAM in explaining Indonesian students' intention to use an e-wallet?

2. Literature Review

2.1. Technology Acceptance Model (TAM)

As a general rule, acceptance is characterized as "an enmity to the term dismissal and means a positive choice to utilize a development". Leaders need to know the issues that influence clients' choices to utilize a specific framework so they can consider it during the improvement stage. This is a typical inquiry of both professionals and analysts as to why individuals acknowledge new innovations. Responding to these inquiries can help them to better techniques for planning, assessing, and anticipating client reactions to new advancements [14]. TAM has proven to be a theoretically helpful model for predicting and explaining user acceptance of information technology. Based on this definition, TAM is used to describe the rejection or acceptance of a technology. TAM shows a number of factors that influence users' decisions about when and how they use a new technology. There are five constructs in TAM that can influence users in using a technology, namely perceived usefulness, perceived ease of use, attitude, behavioral intention, and actual system usage [15]. In the TAM model, perceived benefits and perceived convenience are the basic factors determining the acceptance of technology use. In this study, the TAM model is not fully used, but only takes the perception of benefits as a factor influencing the interest in using Go-Pay services for Go-Jek customers. This variable is the basic factor that

is used as a reference for users when they first decide to use a technology. The benefits of using Go-Pay services are a benchmark that customers use as reasons for using Go-Pay service.

2.2. Mobile Payment

Mobile payment is an innovation from exchanging value or other payment instruments that can be used by consumers who tend to rely more on the sophistication of features from smartphones and consumer financial authorization [16]. Another definition states that a mobile payment system is made through a mobile device used to initiate, activate, and confirm payments in obtaining goods or services. So, it can be concluded that a mobile payment system is a payment transaction activity carried out with a mobile device, such as a tablet or smartphone. Mobile payment systems enable customers to purchase and pay for goods or services via mobile phones. Here, each mobile phone is used as the personal payment tool in connection with the remote sales. A phonecard-based payment system has the advantage over the traditional card-based payment in that the mobile phone replaces both the physical card and the card terminal as well. Payments can take place anywhere far away from both the recipient and the bank. Traditionally, in the real world, the most popular modes of payments are cash, cheques, debit cards, and credit cards. With the possibilities created by the Internet, a new generation of payments appeared, such as electronic payments, digital payments, and virtual payments. Now, with the growing penetration of the mobile phone and the development of m-commerce, the mobile payment will become an uncontested mode for paying for goods. Mobile payment methods currently in use or under trial may be classified according to the basis of payment. A payment transaction has been identified on the basis of multiple dimensions. A distinction between the different types of payments is on the basis of location, time, size, and medium. Mobile payments are typically differentiated by technology, transaction size, location (remote or proximity), and funding mechanism [17].

2.3. Go-Pay

Bank Indonesia Regulation No.18/40/PBI/2016 Article 1 no 7 defines that an electronic wallet is an electronic service for storing data on payment instruments, including payment instruments using cards and electronic money, which can also accommodate payment instruments. In regard to funds, to make payments, Go-Pay is an electronic wallet developed by the Go-Jek company to be used as a payment service while using the Go-Jek application. The Go-Jek company started its business from motorcycle transportation services, then developed its business network by offering various services [18]. Go-Pay is a form of FinTech innovation. Other services available in the Go-Jek application are Go-Ride, Go-Car, Go-Food, Go-Pulsa, Send, Go-Point, Go-Bills, Go-Box, Go, Mart, Go-Tix, and Go-Med.

2.4. Product Knowledge

Innovation and knowledge of mobile payments are some of the factors that influence the use of mobile payments [19]. Product knowledge is information obtained from a product, including product categories, brands, product attributes, product features, product prices, and product trust. Product knowledge refers to the information that users get from using the product [20]. In this case, the data obtained by the user will be considered first before deciding to use a product. The product is a physical, psychological, and symbolic attribute that is made to satisfy the needs and desires of customers [21]. A product is anything that helps a want or need through its use, consumption, or acquisition [22]. Meanwhile, a product is a set of tangible and intangible attributes, including packaging, color, price, manufacturer's prestige, and manufacturer's retailer, which the buyer may accept as an offering [23]. Product knowledge is needed as the basis for the success of a product, usually through the use or involvement in a product. Consumer knowledge on

the expectation of a product positively affects satisfaction because expertise will make the product more realistic. Consumers have different levels of product knowledge.

The research results [24] suggest that product knowledge is essential in making it easier for users to make mobile payments. On the other hand, [25] found that product knowledge had no significant effect on the use of electronic money. This can be due to the lack of information that causes a person's low interest in using a product and the culture of the Indonesian people who still feel comfortable using cash instead of electronic money.

2.5. Perceived Benefits

The perceived benefit is a primary determinant of technology user acceptance. Perceived benefits can be interpreted as a user's belief that using technology will bring benefits that can improve the user's performance [26]. It is further claimed that people will believe in using the latest technological products if the technology can complete their work more productively, faster, and better [27]. Furthermore, users will develop good attitudes and intentions toward mobile payment systems because they have higher advantages than other methods, such as cash and card payments [28]. The technology acceptance model of perceived benefits is the most significant and vital construct in influencing the actual system usage of information technology [29]. Based on the results of their research model, Abdullah et al. found that perceived benefits enable consumers to make better purchasing decisions [30]. They also claimed that perceived benefits are likely to influence online ordering intentions and decisions [30]. Furthermore, research was conducted by Renny et al discovering that the perceived benefit affects attitudes toward using airline ticket reservations [31].

The TAM model shows that perceived usefulness is the most significant construct in influencing the actual system usage of information technology. According to Priyono, the perception of benefits shows a subjective assessment of the usefulness offered by Go-Pay services in making it easier to get the services they want. So, the benefits of Go-Pay will be in line with the use made by Go-Jek customers. The higher the help of the Go-Pay payment service system, the higher the intensity of using Go-Pay services. Based on this, the perception of the benefits of Go-Pay services can be interpreted as the positive impact obtained by Go-Jek customers while using Go-Pay services [32].

2.6. Perceived Risk

Perception is how a person assesses and pays attention to objects around him. Risk is something that happens because an event does not occur as expected. Another definition of risk is a subjective opportunity for possible losses when deciding to use online transactions [33]. Furthermore, according to Abrahao, perceived risk is a belief that mobile service users will likely be exposed to risk. Perceived risk is also interpreted as a subjective assessment by a person of the likelihood of an accident event and how worried the individual is about the consequences or impacts of the event [34]. The security and confidentiality of information systems are reflected by the existence of management that can prevent, overcome, and protect the system from actions that can be detrimental, such as unauthorized use, intrusion, and information theft [35]. Maciejewski revealed that the risk of a wrong purchase, which accompanies the consumer, is an essential aspect of purchasing decision-making [36]. Furthermore, that risk affects decisions, and the order of the main risks perceived by consumers is financial risk, performance risk, and service risk [37]. Priyono's findings say that the perception of risk hurts the adoption of electronic payment technology. This shows that most users make payment transactions when the situation is favorable and tend to avoid risk, rather than take significant risks [5].

2.7. Usage Decision

The decision to use services, better known as purchase, is part of consumer behavior. The purchasing decision is an action or consumer behavior of whether to make a purchase or transaction or not [36]. In this case, the number of consumers in making decisions is one of the determinants of achieving the company goals. Purchasing decisions are consumer decisions that are influenced by the financial economy, technology, product culture politics, prices, locations, promotions, physical evidence people, and processes to form an attitude in consumers to process all information and draw conclusions in the form of responses that emerge from what products to buy [19]. Through their study on how individuals or groups choose to purchase and use, and how goods and services ideas satisfy their needs and desires, they defined purchasing decisions as part of consumer behavior [35]. Through their research, it can be concluded that the purchase decision is a series of processes for seeking information and evaluating the problem of needs through a particular product or brand, which then leads to a decision to make a transaction or purchase [36]. Furthermore, purchasing decisions are activities where consumers buy and consume a product or service to fulfill their needs and desires [36].

Research Paradigm

Based on the framework of thinking, it can be described in Figure 3 that the relationship of the independent variable and the dependent variable is as follows:

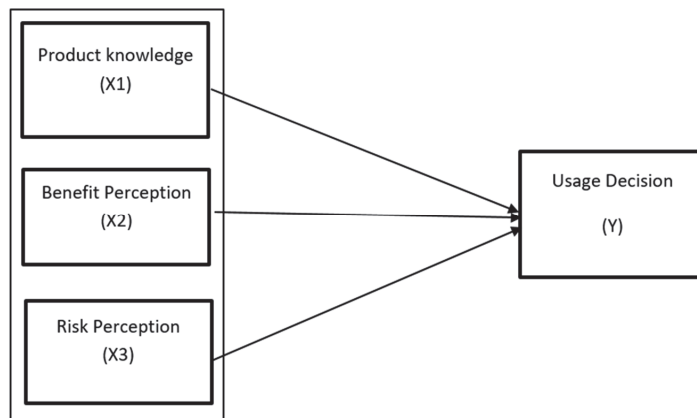


Figure 3. Research Paradigm.

- (1) X1 = Product knowledge influences usage decisions,
- (2) X2 = Perception of benefits affects the decision to use,
- (3) X3 = Risk perception affects the decision to use.

3. Materials and Methods

The current research involved research objects in the form of Indonesian students who had conducted transactions using Go-Pay at Warunk Upnormal Bandung, West Java, Indonesia. The research method will determine the strategy to achieve research objectives that have been set, and acts as a guide for researchers throughout the research process. With this design, a clear description of the relationship between variables, data collection, and data analysis is enabled, so that with a good design, researchers and other interested people have an idea of how the interrelationships between variables are, how to measure them, and so on [34]. Furthermore, the research technique used is the descriptive verification method. Meanwhile, convenience sampling and random sampling are used to obtain the research samples. Convenience sampling is a sampling technique based on chance [35]. In this case, the samples are any people the researcher met by chance who matched the

sample criteria: customers who used Go-Pay at Warunk Upnormal of Dipatiukur Bandung City, as many as 100 respondents. In this study, the data collection used by the researcher comprised online questionnaires to students or, with the convenience sampling technique, anyone who agreed to provide the required information to the researcher, either directly or indirectly, and who was registered as a student, aged 15–45 years old, used the GoPay e-wallet in payment transactions, and registered as an Indonesian citizen, could be used as a sample in this study if the respondent is suitable as a data source.

3.1. Data Collection

Data was collected through an online survey because people today, especially the young generation, tend to have their own smartphone and spend most of their time on it. Before the survey was conducted, researchers had developed a possible list of questions based on the research topic and evaluated each question together to determine the top 10 questions to ask the participants through Google survey form and shared via social network. To achieve an explicit and superior result, questions that consist of multiple choices, including both Indonesian Bahasa and English subtitles, had been planned so that they could obtain a better understanding and easy answering for major participants. The total number of respondents in the survey is 100 students, selected at random from different academic years. Furthermore, researchers also collected secondary data from publishing websites for reference and guidance purposes only.

3.2. Sampling Technique

This study also used a non-probability sampling technique, because not all samples have criteria that are in accordance with what the authors have specified. The type of sampling used by the author is accidental sampling. This study was measured using a Likert scale by determining the level of their agreeable answers to the questions raised. The questionnaire in this study provides 1–5 scale options as an alternative answer that will be used by respondents.

3.3. Data Processing

Furthermore, the data processing was conducted using Lisrel 8.80. To clarify the variables studied as formulated in the description above, the main problems studied are product knowledge (X1), perceived benefits (X2), risk perception (X3), and usage decisions (Y). The identification of the SEM model was done by calculating the degree of freedom from the SEM model. The value of the degree of freedom from the structural equation model (SEM) plays an important role in determining whether the process to estimate the parameters of the SEM can be carried out or not. The calculation of the value of degrees of freedom from the SEM is intended to find out whether each value of the estimated parameter of the SEM has a unique value/single solution. Based on the output of Lisrel, it is known that the degree of freedom from the SEM is 38. Since the degree of freedom is greater than 0, then the process for estimating the parameters of the SEM can be carried out. Such an SEM is called an over-identified model.

Testing the inner model will give the results of the relationship between constructs. Table 1 is the result of bootstrapping, which describes the estimation results of each 5% significance.

Table 1. Construct Reliability and Validity.

Construct	Loading Factor	Rho_A	AVE	Cronbach's Alpha	Composite Reliability
Product Knowledge	0.665	0.829	0.726	0.813	0.888
Perceived Benefits	0.889	1	1	1	1
Perceptions of Risk	0.856	0.731	0.775	0.713	0.775

Based on Figure 4, it is known that the latent variables in this study are product knowledge, perceived benefits, and perceived risk, which are exogenous latent variables. Meanwhile, the latent variable is decision, which is particularly an endogenous latent variable. The endogenous latent variable is characterized by an arrow that goes toward the latent variable. In other words, endogenous latent variables are influenced by other latent variables.

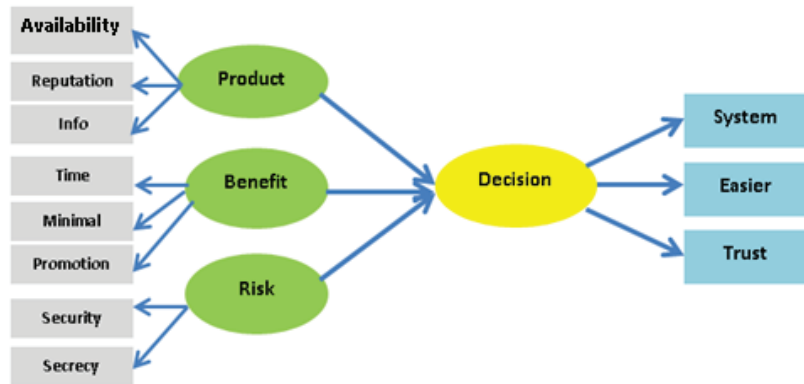


Figure 4. Structural equation model (SEM) diagram.

4. Results and Discussion

The identification of the SEM model was made by calculating the degree of freedom from the SEM model. The value of the degree of freedom from the structural equation model plays an important role in determining whether the process to estimate the parameters of the structural equation model can be carried out or not. The calculation of the value of degrees of freedom from the SEM is intended to find out whether each value of the estimated parameter of the SEM has a unique value/single solution. Based on the output of Lisrel, it is known that the degree of freedom from the SEM is 38. Since the degree of freedom is greater than 0, the process for estimating the parameters of the structural equation model can be carried out. Such an SEM is called an over-identified model.

4.1. Respondent Profile

To provide more comprehensive data, a discussion of the respondent's description was carried out by descriptive analysis of the respondent including gender, age, education level and status of e-wallet usage. Analysis based on the respondents' answers can be seen in Table 2.

Table 2. Descriptive statistic of respondents' e-wallets.

No	Description	Frequency	Percentage (%)
1	Gender		
	Man	34	34
2	Woman	66	66
	Age		
	15–25 years	41	41
	26–35 years	42	42
	36–45 years	17	17

Table 2. Cont.

No	Description	Frequency	Percentage (%)
3	Education Level		
	Junior High School	5	5
	Senior High School	10	10
	College	20	20
	Academy	5	5
	Bachelor	33	33
	Magister	20	20
4	Doctoral	7	7
	Duration of Using E-Wallets		
	>1 year	79	79
5	<1 year	21	21
	Reason of Use		
	Easy to Use	23	23
	Benefit Offer	53	53
	Low Risk	24	24

Based on Table 2, the profile of 100 respondents in the research of intentions to use electronic wallets at Warunk Upnormal, Bandung, West Java was dominated by women (66%) and men (34%) aged 26–35 years (42%) with an undergraduate education level/bachelor (33%). Most of the respondents' reasons for using an e-wallet are not dominated by the cause of benefit offerings (53%), because respondents have used an e-wallet for more than one year (79%). People use e-wallets for transactions on almost all purchases (23%) on the grounds that e-wallets are practical, easier, faster without having to carry cash, can be used anywhere, and avoids risk (24%), as well as that they are many of the choices of merchants.

4.2. Structural Equation Model

When the results of the identification of the structural equation model show that the parameters of the SEM can be estimated, then further estimation of the parameters of the structural equation model can be achieved through various techniques (Table 3). However, based on Lisrel's output, which shows the estimation model used in estimating the parameters in this study, the maximum likelihood (ML) was used.

Table 3. Test results using the overall structural equation model (SEM).

Overall Model Fit Test Size	Benchmark Value for Model Fit	Model Fit to Data	
Probability of χ^2 count	0.12	≥ 0.05	Yes
RMSEA	0.055	≤ 0.08	Yes
NFI	0.97	≥ 0.90	Yes
NNFI	0.99	≥ 0.90	Yes
CFI	0.99	≥ 0.90	Yes
IFI	0.99	≥ 0.90	Yes
RFI	0.95	≥ 0.90	Yes
RMR	0.026	≤ 0.05	Yes
SRMR	0.045	≤ 0.05	Yes
GFI	0.92	≥ 0.90	Yes
AGFI	0.86	$0.8 \leq \text{AGFI} < 0.90$	Yes (Marginal Fit)

Based on Figure 5, it is known that the error value of each question is smaller than the value of the relation so that research using the structural equation model (SEM) can be continued. In addition, the overall SEM model test can also be used to see in its entirety whether the use of the structural equation model is suitable for the sample data. This test was carried out by comparing the sample covariance matrix and the estimated covariance matrix using a structural equation model. There were three types of measures to test

whether the use of the structural equation model as a whole fits the data (good fit). Those are absolute fit measures, incremental fit measures, and parsimony fit measures. Based on Lisrel’s output for absolute fit measures, incremental fit measures, and parsimony fit measures, the results showed that the use the structural equation model as a whole has a good ability in terms of matching sample data (good fit). In other words, the estimated covariance matrix using the structural equation model is not statistically different from the sample data covariance matrix.

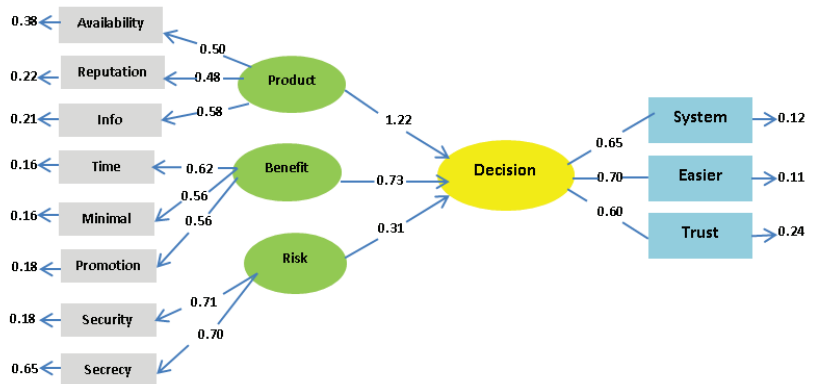


Figure 5. Structural equation output results.

The overall SEM model test showed that the SEM model as a whole is able to match the data (good fit). Meanwhile, the measurement model test showed that the measurement model has good convergent validity and discriminant validity. Furthermore, it was supported by the structural model test.

Based on Lisrel’s output in Figure 6, the following structural equations are formed:

$$\text{Usage Decision} = 1.22 \text{ PP} - 0.73 \text{ PM} + 0.31 \text{ PR} + e$$

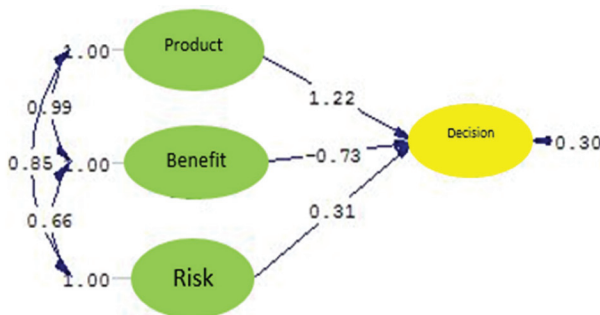


Figure 6. Structural model test results.

The structural equations above are also presented in the following Lisrel output (Figure 6).

The following will be interpreted for each of these structural equations in Figure 7.

Structural Equations

$$\text{Keputusa} = 1.22 \cdot \text{P.Produk} - 0.73 \cdot \text{P.Manfaa} + 0.31 \cdot \text{P.Risiko}, \text{Errorvar.} = 0.30, R^2 = 0.70$$

(1.99)	(1.48)	(0.71)	(0.15)
2.61	-0.49	2.44	2.98

Figure 7. Output structural equations of Lisrel.

For Structural Equation

The path coefficient of the latent variable of product knowledge is 1.22. A positive path coefficient value indicates that the latent variable of product knowledge has a positive effect on satisfaction. The statistical value of the test for the path coefficient of the product knowledge latent variable is $t = 2.61$. The table value with the significance level is $\alpha = 5\%$. Therefore, it can be concluded that the effect that occurs between the latent variable of product knowledge and the latent variable of the decision is statistically significant at a significance level of 5% with $tt = 2.61$ $t\alpha = 5\%$ t table = 1.985. This means that the more customers know the features in their Go-Pay service, the faster they will make a decision to use Go-Pay services.

The path coefficient of the perceived benefit latent variable is -0.73 . A negative path coefficient value indicates that the latent variable of perceived benefits has a negative effect on the decisions. The statistical value of the test for the path coefficient of the product knowledge latent variable is $t = -0.49$. The table value with the significance level is $\alpha = 5\%$. Therefore, it is concluded that the effect that occurs between the perceived benefit latent variable and the decision latent variable is not statistically significant at the 5% significance level with $tt = -0.49$ $t\alpha = 5\%$ t table = 1.985. This means that the more customers understand the benefits they will get in using Go-Pay services, they will be more interested in making decisions to use Go-Pay services.

Furthermore, the path coefficient of the risk perception latent variable is 0.31. A positive path coefficient value indicates that the risk perception latent variable has a positive effect on decisions. The statistical value of the test for the path coefficient of the risk perception latent variable is $t = 2,98$. Meanwhile, the table value with the significance level is $\alpha = 5\%$. Therefore, it is concluded that the effect that occurs between the latent variable of risk perception and the latent variable of decision is statistically significant at a significance level of 5% with $tt = 2.98$ $t\alpha = 5\%$ t table = 1.985. This means that the more customers understand the risks they will accept in using Go-Pay services, they will be more interested in using Go-Pay services.

The coefficient of determination based on Lisrel's output (Figure 4) is 0.70. This value can be interpreted as 70% of the total variation (total variation) of the latent decision variables can be explained by the structural equation, and the remaining 30% is explained by other variables (R^2).

5. Discussion

5.1. The Effect of Product Knowledge on Usage Decisions

The test results in this study prove that product knowledge has an effect on usage decisions. This means that all information that consumers have about the product can be easily understood by consumers. Product knowledge is defined as a collection of various kinds of information about products [24]. This knowledge includes product categories, brands, product terminology, product attributes and features, product prices and product beliefs. Consumer product knowledge is basically determined by the level of consumer familiarity with the product. Consumer knowledge is all information that consumers have about various kinds of products and other information related to its function as a consumer. Understanding consumer knowledge is very important for marketers. Information about what to buy, where to buy, and when to buy will depend on consumer knowledge. Consumer knowledge will influence purchasing decisions, and even repeat purchases. When

consumers have more knowledge, they will be better at making decisions, more efficient, more precise in processing information, and able to recall information better

The results of research by Kim, Mirusmonov, and Lee [12] suggest that product knowledge is an important factor in facilitating users in making mobile payments. On the other hand, Parastiti and Mukhlis [37] found that product knowledge has no significant effect on use of electronic money. This could be due to the lack of information, thus causing a person's low interest in using a product, as well as the culture of the Indonesian people who still feel comfortable using cash instead of electronic money.

5.2. *The Influence of Perceived Benefits on Use Decisions*

The test results in this study prove that the perceived benefits affect the decision to use. This means that usefulness in information technology or finance is the benefits obtained and expected by users in carrying out their activities [27]. Perceived usefulness is defined as where someone believes that using a system can improve their performance. Interpreting the perception of usefulness is the subjective profitability of potential users who use a particular application to facilitate their activities. Research by Kim, Mirusmonov, and Lee [10], and Wardhani [35] and Priyono [3], show that the perception of benefits has a positive and significant effect on the use of technology electronic payment. Perception of benefit is a subjective probability of potential users using a particular application to facilitate the performance of their work. Perception of benefits shows that respondents rate electronic money as providing high benefits, meaning that consumers, in this case users, feel that electronic money provides various advantages in the form of high benefits, such as providing speed and accuracy in transactions, the ability to be used for all forms of transactions of small value or value, used with a high frequency, being practical and easy to use for transactions, and more efficient than cash, thereby having a positive effect on interest in electronic money.

5.3. *The Influence of Risk Perception on Use Decisions*

The test results in this study prove that the perception of risk affects the decision to use. This is accepted, meaning that risk perception is proven to influence decisions, wherein risk perception is the subjectivity of losses when obtaining a result [28]. Perceived risk is an outcome that is felt when a person is unable to predict a predetermined decision, where an uncertainty will be felt, and the consequences obtained are an important dimension in risk perception.

Risk is a perception of a violation of uncertainty and undesirable consequences in carrying out an activity. The risk that individuals tend to see when conducting online transactions is when there is uncertainty about the possible outcome of the transactions made.

Priyono [3] said that the perception of risk had a negative effect on adoption of electronic payment technology, different from the research conducted by Tham et al. [37] that product risk, convenience risk, and return policy risk have a significant and positive impact on intention to use online payment technology. Consumers also believe that there is a risk of controversy and they will be unable to submit if the products or services received do not fulfill the criteria. The lack of trust in online payment judgments is vetoed in some cases where switching programs occur. This may be due to online shopping delays in accepting products [37].

6. Conclusions

Based on the analysis and interpretation that have been described previously, it can be concluded that the latent variables of product knowledge and risk perception have a positive effect on user satisfaction. Meanwhile, the latent variable of perceived benefits has a negative and insignificant effect on the usage decision. Based on the conclusions of the study, it is recommended that companies in their activities must always pay attention to the factors that cause someone to decide to use the products or features offered by the

company, because decisions are an important element before a consumer becomes loyal to the products. For this reason, the control and evaluation of the products or features offered are very important. Another factor that should also be considered is the demographics of the product users or feature offered.

This study provides useful information to retailers with e-wallet methods as payment activities. Previous studies show that many retailers are still facing some risks in using e-wallets as a payment method, and this will affect the transaction and performance of the retailers. It is hoped that the findings can help retailers to formulate strategies to reduce risks in the e-wallet environment, especially security risks for better e-wallet services. It is important for e-wallet providers to understand the awareness level of customers, particularly the youngsters, since they are the target audience for every new technology. Female respondents are having more intention to use an e-wallet when compared to males. It is also found that the benefit offering is the largest reason to use e-wallets among students. The advertisement and discounts/offers should be made in the social media networks which will capture young people into usage. Relating to the level of education, most consumers are the undergraduates—nearly half of the total participants—and the other half have diplomas, are in high schooler, and are college students. Almost half of the participants are significantly likely to use an e-wallet in retail shops such as Warunk.

Within undergraduate students, the digital wallets are mainly complimented as a trendy, newly dimensional service; moreover, e-wallets are considered to innovative, while the last quarter of total participants also had commendation for the idea of e-wallets. As a result, e-wallets have the potential to become substantially well-known and largely used among students. Additionally, according to the survey's result, there are benefit offerings that attract most respondents, so the provider must be concerned with the creativity in offering benefits to balance the curiosity and knowledge of consumers who continue to grow rapidly. These results also increase knowledge for international e-wallet providers in penetrating the market, knowing that there is a market for young people in Bandung city, Indonesia, for those with a bachelor's education background. This can be a business opportunity for them and for future research; it can be explored how female students have more interest in using e-wallets than males, and it can be explored why the benefit offerings invite students to use an e-wallet more than their ease of use.

The Go-Jek company needs to provide more education to Go-Pay customers, not only providing information about the benefits that will be obtained, but also providing information about the risks and weaknesses of the Go-Pay payment system. This is because, in this study, students who are Go-Pay customers do not care about the risks and weaknesses of the Go-Pay payment system. This is done so that customers can anticipate an unforeseen condition that can cause losses for them. Go-Jek companies can provide education by adding information or descriptions that are entered into the help center menu on the Go-Jek application regarding the risks, weaknesses, and solutions that help customers feel the risks and weaknesses of the payment. This is used so that customers know and understand the Go-Pay payment system better.

The limitations that exist in this study are first in terms of respondents where, in this study, the respondents were random; secondly, all constructs from the technology acceptance model (TAM) were not used, so that further research could use respondents for a wider audience and also include other constructs in the TAM.

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Article

Modeling Awareness as the Crux in Solar Energy Adoption Intention through Unified Theory of Acceptance and Use of Technology

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Abstract: Non-renewable energy depletion has prompted stakeholders to advocate alternatives, such as solar energy to pursue sustainability. However, the acquisition rate of solar service is unconvincing despite various initiatives; thus, we are seeking for a more focused remedy. This study is therefore motivated to investigate elements influencing the intention to adopt solar energy, underpinned by a unified theory of acceptance and use of technology. A self-administered questionnaire through a purposive sampling method was employed, targeting working adults who own a home or intend to purchase one in the future. Homeowners residing in condominiums, apartments, or any shared building or property were excluded. Partial least squares structural equation modelling was used for data analyses. Findings reveal that awareness positively influences performance expectancy, effort expectancy, and facilitating condition. Additionally, performance expectancy and facilitating conditions foster an intention to adopt solar energy. This research contributes pivotal insights into solar energy purveyors to invoke awareness amongst Malaysia's society while reiterating performance expectancy, effort expectancy, and facilitating conditions towards solar energy adoption.

Keywords: awareness; intention to adopt; solar services; sustainability; UTAUT; PLS-SEM

MSC: 62H15

1. Introduction

The sustainable use of energy has been a key challenge amongst many countries. Malaysia's rampant usage of scarce viable energy, such as coal, crude oil, natural gas, and fossil fuel, has led to resource exhaustion, which could lead to further detrimental implications if not addressed immediately. An extensive dependence on fossil fuels has triggered

global shifts towards other forms of renewable energy, particularly solar. Each country has different renewable energy sources owing to geographical location. Consequently, many initiatives have been drafted by governments to encourage consumers to adopt renewable energy sources with solar energy adoption positioned as key to sustaining the Earth. These initiatives were also formalised in the year 2015 by 193 member countries, hence the birth of United Nation's 2030 Agenda for Sustainability Development comprising 17 goals, where Goal seven pertains to affordable and clean energy [1–3]. Subsequent initiatives, namely the Green Deal, Horizon Europe, and the European Urban Agenda, have mooted sustainable and livable futures where clean energy transition and sustainable area transition must be fair, inclusive, and abandons nobody [4].

Malaysia, a member of United Nations, is located in Southeast Asia and encompasses Sabah, Sarawak, and Peninsular Malaysia. The country's total area is approximately 330,000 km² and blessed with a tropical climate. Particularly, the country enjoys tropical weather throughout the year because of its proximity to the equator. Although Malaysia benefits from sunshine throughout the year, the use of solar energy as an alternative form of energy remains low in the country as compared to European countries who are governed by four seasons, yet able to enhance sustainability efforts through renewable energy [2,3]. In fact, technology advancement, especially the Internet of Things (IOT), which promotes smart cities by connecting various devices such as power plants and residential houses is seen to lay a strong opportunity for solar energy adoption [5] but in Malaysian soil, despite embracing technological advancement and smart cities, solar energy adoption remains inconsequential. Therefore, this calls for further investigations on solar energy adoption intention.

Prior studies that have examined solar energy adoption in Malaysia remain inconclusive. Practitioners have often cited that such issues as minimal government incentives, weak demand, limited public–private partnerships, and poor consumer acceptance prevent the extensive use of solar energy. However, academicians have suggested that solar energy can be a viable substitute, thus performance expectancy (PE), effort expectancy (EE), and awareness could influence its adoption [6,7]. In fact, solar energy adoption would be a precursor to internalizing renewable energy especially in the electric car, a key to curb CO₂ emission where charging stations could be powered up with solar energy. To achieve this, the Malaysian society must be aware of solar technology and its benefits. A literature survey on renewable energy (Appendix B) was conducted. It a nutshell, it has revealed the benefits of renewable solar energy, thus awareness programmes are to be the uppermost ingredient to kick start understanding of the benefits of solar energy.

The present study is set on [8], as bases to examine the elements that impact adoption of solar energy amongst consumers in Malaysia. Particularly, elements such as awareness, performance expectancy (PE), effort expectancy (EE), facilitating condition (FC), and social influence (SI) are examined in relation to solar energy adoption intention amongst Malaysians.

2. Materials and Methods

Solar energy has been recognised as a potential alternative energy source [6,7]. Traditional energy sources are seen as detrimental to environmental sustainability, thereby severely impacting the Earth owing to the expanding energy demand [9–11]. Solar remains as the prime source for unlimited and free energy [12] specifically in Malaysia, which is at a full advantage because of its location near the equator, where sun rays are nearly present throughout the year. Despite the advantages, embracing solar energy is exigent and clouded with high initial challenges coupled with the switching costs from conventional fossil fuel to solar power. Nevertheless, this situation promises various long-term benefits energy [12].

A major factor that prevents solar energy from being used extensively in Malaysia is the awareness that this energy source is a viable substitute for traditional sources; thus, lack of awareness could further hinder behavioural intentions. As such, green awareness

is considered a vital component of successful green initiatives [13,14]. The literature has suggested that the possibilities of green adoption are high when appropriate awareness is administered towards such initiatives [10].

Studies have reiterated that, amongst recent theories acquainted to behavioural intention, UTAUT has the strongest predictive and explanatory power that is applaudable for its resiliency being operationalised across multifold fields. Ref. [15] developed the Unified Theory of Acceptance and Use of Technology (UATUT) by condensing and merging eight technology acceptance and use models [8,16], that conceived four core factors, namely, PE, EE, SI, and FC, in predicting intention.

Intention to adopt refers to people’s subjective probability that they will perform a behaviour [17]. Thus, UTAUT has been accepted irrefutably for its abundance of merits amongst behavioural intention studies. Although the first decade of UTAUT’s inception attracted related studies on information technology and systems [13,18] other disciplines subsequently gained traction [8,19,20].

UTAUT has also been used in the context of examining the adoption of green initiatives [21–23]. Studies have likewise used UTAUT in examining solar energy adoption [10,24]. Ref. [25] conveyed three broad types of integration/extension in fortifying UTAUT’s generalisability, among which is the inclusion of exogenous predictors to UTAUT predictors.

The present study takes a cue from the preceding and subsequent propositions of [8], in which various exogenous, endogenous, and intervening variables are to be incorporated to add to UTAUT’s radius, and examines the significance of awareness towards PE, EE, and FC in the context of solar power adoption. Consequently, these variables, in addition to SI, are tested towards rendering impact on the intention to adopt solar energy. Four items were operationalised to measure the intention to adopt, of which, three were adapted from [10] and one from [17]. The overall research framework is depicted in Figure 1.

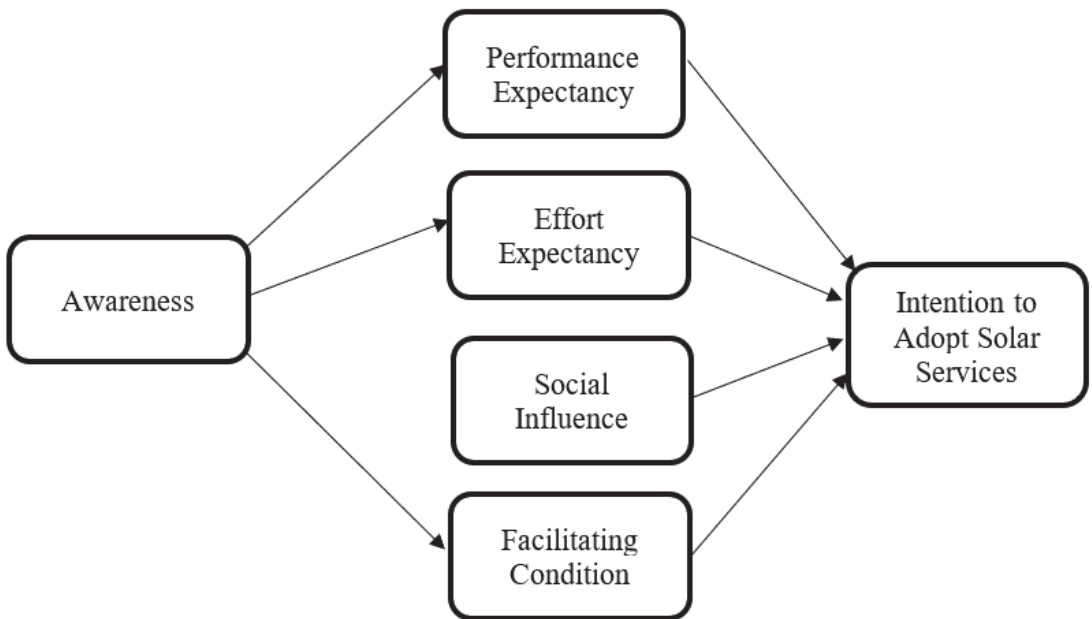


Figure 1. Schematic diagram of research model and its exogenous and endogenous variables.

2.1. Awareness

Generally, awareness relates to the state of being informed and alert [26]. In this context, green awareness is defined as a concern for environmental issues that influences

people's decision-making and behavioural intentions [27]. Similarly, ref. [10] defined awareness in relation to technology adoption as the users' magnitude of consciousness towards new technology, its benefits, drawbacks, and use.

Awareness can also be termed as a personal ability to recognise and focus on the existence of certain phenomenon, objects, products, or services in addition to being the omnipresent knowledge from continuous contact [9,11]. Ref. [7] conducted research involving undergraduate university students in Pakistan and reported awareness as an important element in green behaviour [10]. Ref. [28] study did obtain similar findings whereas [29] used UTAUT in the mobile banking environment of Saudi Arabia to investigate the role of awareness as antecedent to PE and EE. Their findings suggested its significance towards PE and EE. In the case of Malaysia, ref. [30] Ramayah et al. (2012) used the Theory of Planned Behaviour (TPB) and found that awareness plays a vital role in adopting recycling behaviour amongst university students.

Ref. [31] revealed the scarcity of research on solar energy adoption amongst developing countries. In Malaysia's context, the low acquisition of solar energy, despite various initiatives by the government calls for investigations on green awareness towards building expectations, invokes intentions to adopt solar energy, which is the best predictor of actual behaviour [11]. Therefore, the present study adopts green awareness from [10], of which four items are operationalised to measure green awareness towards rendering its impact on three variables of UTAUT in the context of solar energy adoption.

H1. *Awareness has a positive effect on PE.*

H2. *Awareness has a positive effect on EE.*

H3. *Awareness has a positive effect on FC.*

2.2. Performance Expectancy (PE)

PE did initially explain the magnitude of beliefs among individuals with regards to employing a system and its corresponding gains [15]. This definition has received global reception for having the flavour of gains from performance, which is a central element to organisations and individuals. Therefore, observing PE as widely operationalised across various studies and contexts through adaptations is no longer surprising. Ref. [32] skewed PE's definition towards the scale, a system that will assist users in uplifting their job performance. PE is also defined as the magnitude of individual perception about how a particular technology will enhance work output [8,16,25]. Ref. [33] operationalised UTAUT in a solar water heater system (SWHS) amongst Libyan households by matching the reduced electricity bills as benefits whilst striving for use of natural resources.

Ref. [24] propose that PE is a yardstick about beliefs households have towards user-friendliness and safety of rooftop solar usage. Other studies have also remarkably proven PE's role towards behavioural intention [19,34,35]. PE is seen to stamp its mark further on behavioural studies when [36] propagated PE as the most powerful force in acquiring user adoption; numerous studies have confirmed this notion [37–39]. The present study adopts the PE definition of [25] and four items from [32] towards measuring PE. Thus, the following hypothesis is formulated:

H4. *PE has a positive effect on intention to adopt solar services.*

2.3. Effort Expectancy (EE)

EE relates to the degree of simplicity accompanying with the use of technology [8,25,32]. Ref. [24] operationalised EE in measuring the extent by which individuals feel comfortable in using the system. Ref. [22] argued the existence of EE to be closely related to ease of use, being part of the Technology Acceptance Model whereas from a marketing perspective, EE is seen to express views on customers concern towards simplicity of using certain services. Meanwhile, in the renewable energy segment such as solar energy, EE can be viewed as how

easy/effortless solar energy can be used. After PE, EE is observed as one of the strongest influencers towards behaviour intention.

This observation has been confirmed through a series of research on EE's relationship towards intention, which would reiterate EE's position. Ref. [40] studied location-based service amongst smartphone users and found that EE recorded a B-value of 0.3 next to PE, which had a B-value of 0.42. A similar pattern was observed among other research outcomes [25,35,39]. Ref. [41] conducted research on users of Phablet, which is a hybrid product that combines PC and a smartphone's functionality and found that EE occasionally overpowers PE. The aforementioned study showed that EE has the highest positive value, thereby playing a dominant role in causal networks relative to other UTAUT variables; namely habits, hedonics, and price values, being operationalised. EE has also been consistently leading to behaviour intention when tested in various industries [42,43]. The present study adopts the definition of [25] and operationalises five items to measure EE: four adapted from [32] and one from [24]. Thus, the following hypothesis is presented:

H5. *EE has a positive effect on intention to adopt solar services.*

2.4. Social Influence (SI)

SI depicts the magnitude of consumer's perception about close family and contacts' belief that he/she should utilise a specific technology [25], thereby suggesting that society or social network have an impact on individuals. Ref. [32] operationalised 'similar definition in usage of new system.' Ref. [37] conducted research tailored to a social networking application (app) and suggested that consumers have the tendency to embrace similar apps with a reference group to be in contact and communicate. Thus, SI could play a vital role in relation to technology adoption.

SI is operationalised by numerous UTAUT researchers, thereby expanding its boundaries to diverse cultures and industries. These studies include [43] in the Internet banking of Fiji, ref. [19] in the mobile learning segment of Saudi Arabia followed by [34] in the smartphone industry of India.

SI has been vital in the renewable energy sector, particularly in influencing the significant impact to behavioural intention [21,22,24]. The choices people make are generally influenced by another human being, thereby demonstrating and affirming the significance of SI in the UTAUT model. Therefore, the current study operationalises the definition of [25] and adapts five items, i.e., four from [32] and one from [24] hence leading to the following hypothesis:

H6. *Social Influence has a positive effect on intention to adopt solar services.*

2.5. Facilitating Condition (FC)

FC primarily refers to support and assistance available towards a system/technology from the perspective of end-users. Numerous studies have examined FC and revealed some interesting discoveries. Ref. [20] argued that FC is in actual fact similar to perceived behavioural control in TPB and may not necessarily lead to actual usage. Ref. [25] explained FC as the perception consumers have towards support and resources in order to exhibit a behaviour, which relates to the actual usage of system/technology and stressed that FC may render its influence on intention and usage.

Ref. [19] investigated mobile learning systems amongst university students and found that FC contributes significantly towards intention. In the same study, availability of resources, which had a similar definition to FC, has a significant relationship with actual usage. Despite the contrary and colourful nature of FC, numerous studies have successfully operationalised FC in the behavioural intention context by defining it as the degree of belief in overall infrastructure, ranging from organisational to technical infrastructure towards fostering system usage [32,35]. The current research operationalises the definition of [25] and measures FC using five items, three of which were adapted from [32] and two from [44]. Thus, the following hypothesis is developed:

H7. *FC has a positive effect on intention to adopt solar services.*

2.6. Methods

Present research developed a questionnaire from validated studies. PE, EE, FC, and SI were adopted from the combined research of [24,32,44] and awareness was adopted from [10]. Intention items were adopted from [10,17] (refer to Appendix A). A self-administered questionnaire was developed as well. Cooperation was solicited through a purposive sampling method because the study investigated the intention to adopt solar services. The target group comprises working adults in Malaysia who own a home or intend to purchase one soon. Homeowners residing in condominium, apartments, or any shared building or property were excluded from this survey. A total of 400 respondents were approached, out of which 273 responses were received; nevertheless, only 272 responses were used for the final data analysis owing to missing values in one response.

The profile of the respondents showed that approximately 60% were females, 70% were aged 35 and above, and the majority hold at least a bachelor’s degree. A total of 76% were working full time, while the remainder were contract workers or self-employed. The majority were earning approximately RM 3000–RM 5000, 37% of whom were earning above RM 5000. The profile of our sample is representative of the population of the Malaysian population as according to the census report of the Department of Statistics Malaysia (DOSM), in terms of gender it is about a 50-50 split followed by age with 69.8% of working age and similar percentage for the working group (15–64 years). For income level it differs from city to city, the mean household income was RM 7901 in 2019 with a median of RM 5873, the income of a majority of the respondents in our sample is about RM 3000–RM 9000 a month [45].

3. Data Analysis and Results

Data analysis was done through variance based SmartPLS 3.3.6 [46], which is a second-generation analytical tool. The threat of method bias due to single source data collection was addressed in this study using the suggestion of [47] by testing the full collinearity. All the variables were regressed against a common variable. Single source data have no bias if $VIF \leq 3.3$. The analysis yielded a VIF of below 3.3, refer Table 1, hence there was no threat of single source bias in this study.

Table 1. Full Collinearity.

	Awareness	Effort Expectancy	Facilitating Condition	Intention	Performance Expectancy	Social Influence
VIF	1.830	2.151	2.766	1.676	1.929	1.809

3.1. Measurement Model

The two main criteria used for testing the goodness of measures are validity and reliability. Reliability is a test of how consistently a measuring instrument measures whatever concept it is measuring, whereas validity is a test of how well an instrument that is developed measures the particular concept it is intended to measure. This research tested the convergent validity, refer Table 2, which is the degree to which multiple items that measure the same concept are in agreement. As suggested by Hair et al. [48], factor loadings, composite reliability, and average variance extracted were assessed for convergence validity. The loadings for all items exceeded the recommended value of 0.6. Composite reliability is a test of how consistently a measuring instrument measures whatever concept it is measuring; all exceeded the recommended value of 0.7. The average variance extracted, were all greater than 0.5.

Table 2. Measurement Model: Convergent validity.

Construct	Items	Loadings	Cronbach	rhoA	CR	AVE
Awareness	AW1	0.862	0.909	0.911	0.936	0.786
	AW2	0.926				
	AW3	0.884				
	AW4	0.873				
Effort Expectancy (EE)	EE1	0.809	0.894	0.898	0.923	0.708
	EE2	0.874				
	EE3	0.903				
	EE4	0.909				
	EE5	0.693				
Facilitating Condition (FC)	FC1	0.663	0.819	0.839	0.873	0.580
	FC2	0.816				
	FC3	0.787				
	FC4	0.796				
	FC5	0.734				
Intention to Adopt	ITA1	0.895	0.905	0.905	0.933	0.778
	ITA2	0.875				
	ITA3	0.914				
	ITA4	0.843				
Performance Expectancy (PE)	PE1	0.894	0.866	0.881	0.910	0.717
	PE2	0.879				
	PE3	0.885				
	PE4	0.717				
Social Influence (SI)	SI1	0.824	0.805	0.810	0.867	0.570
	SI2	0.863				
	SI3	0.780				
	SI4	0.616				
	SI5	0.660				

Next, analysis proceeded to test the discriminant validity. The discriminant validity of the measures (the degree to which items differentiate among constructs or measure distinct concepts) was assessed by [49] using the HTMT ratio. Table 3 shows that all HTMT ratios were less than the HTMT_{0.85} criterion, thereby confirming that the measures were distinct. Both assessments show that the measures used in this study are both valid and reliable.

Table 3. Measurement Model: Discriminant Validity (HTMT Ratio).

	1	2	3	4	5	6
Awareness	-					
Effort Expectancy	0.636	-				
Facilitating Condition	0.684	0.732	-			
Intention	0.544	0.532	0.636	-		
Performance Expectancy	0.445	0.663	0.731	0.588	-	
Social Influence	0.491	0.646	0.784	0.520	0.590	-

3.2. Structural Model

The assessment of normality was done using WebPower’s multivariate normality [50]. Mardia’s multivariate skewness was 4.776 ($z = 216.497, p < 0.01$) and kurtosis was 60.632 ($z = 10.632, p < 0.01$), thereby indicating that the data were not multivariate normal. Thus, the researchers conducted bootstrapping with 5000 re-samples [48] to generate *t*- and *p*-values. Upon checking for multicollinearity, the results were 1.948 (EE), 2.379 (FC), 1.817 (PE) and 1.795 (SI). Thus, indicating that multicollinearity was not a serious issue in this study.

The values of R^2 were 0.161 ($Q^2 = 0.111$) for PE, 0.331 ($Q^2 = 0.228$) for EE, and 0.377 ($Q^2 = 0.282$) for intention to adopt solar services. Awareness was positively related to PE ($\beta = 0.401, p < 0.01$), EE ($\beta = 0.575, p < 0.01$), and FC ($\beta = 0.606, p < 0.01$), with the effect strongest for FC (refer Table 4). Thus, H1, H2, and H3 are supported.

Table 4. Structural Model.

Hypothesis	Relationship	Std Beta	Std Error	t-Value	p-Value	BCI LL	BCI UL	f ²
H1	Awareness → PE	0.401	0.061	6.529	0.000	0.300	0.492	0.192
H2	Awareness → EE	0.575	0.045	12.829	0.000	0.495	0.645	0.494
H3	Awareness → FC	0.606	0.040	15.274	0.000	0.532	0.659	0.582
H4	PE → Intention	0.238	0.083	2.869	0.002	0.102	0.364	0.050
H5	EE → Intention	0.116	0.082	1.426	0.077	−0.041	0.232	0.011
H6	SI → Intention	0.088	0.070	1.256	0.105	−0.009	0.213	0.007
H7	FC → Intention	0.281	0.081	3.479	0.000	0.130	0.402	0.053

This research proceeded to assess the effect of the four predictors on the intention to adopt solar services. PE ($\beta = 0.238, p < 0.01$) and FC ($\beta = 0.281, p < 0.01$) were significant predictions of adoption. EE and SI were insignificant. H4 and H7 were supported, whereas H5 and H6 were not supported.

Given that PLS is a prediction-oriented analytical tool, the out-of-sample prediction was assessed using PLS-Predict. The 10-fold and 10-repetition cross-validation procedure was used. Table 5 presents the results. Firstly, the assessment of Q^2 for the latent variable prediction of intention to adopt; Q^2 was 0.252, which was higher than 0 [51]. Thus, this research proceeded to assess the prediction of measurement items. Given that all PLS-LM values were negative, the model has high predictive power.

Table 5. PLS Predict.

	PLS		LM		PLS-LM		Q ² _Predict
	RMSE	MAE	RMSE	MAE	RMSE	MAE	
ITA1	0.842	0.669	0.853	0.682	−0.011	−0.013	0.180
ITA2	0.893	0.688	0.897	0.714	−0.004	−0.026	0.225
ITA3	0.838	0.676	0.841	0.687	−0.003	−0.011	0.224
ITA4	0.954	0.755	0.974	0.785	−0.020	−0.030	0.153

4. Discussion

The research findings show that awareness plays a vital role in fostering PE, EE, and FC. Given the nature of previous UTAUT research, which recorded a similar enthusiasm on awareness, most of these studies were relatively skewed to a non-green domain [29,36]. As such, the use of UTAUT to examine individual’s adoption intentions in green domains is seen as relevant. Thus, the outcome of the present research would be a guiding principle to green researchers, particularly amongst researchers employing UTAUT in solar energy. Research on UTAUT, currently, is largely confined to technology adoption, mainly, e.g., e-wallet, digital platforms, and even contact tracing applications. Limited work has been done in the area of solar technology. Awareness proved its mettle again in the green context, thereby rendering a significant effect towards intention in the renewable energy segment [10,17] and recycling behaviour [30], as well as impressing its position on green research despite the scarcity of studies on PE, EE, FC, and awareness. Our findings suggest awareness of a particular technology, is a natural precursor to its final adoption.

Awareness is unprecedented for its ability to foster PE, EE, and FC, as documented in the current study, and to catalyse behavioural change [7] that is extremely tenable towards behavioural intention and the adoption of green technology [11]. Moreover, awareness resiliency, which is tested across many disciplines, and its agility, which is refined to various dimensions [36], reflect the fundamental essence of awareness. Therefore, awareness should

be the core in inculcating green intention/behaviour. The reason is that the benefits of going green and sustainability can be exceptionally ingrained with awareness at the centre stage.

PE also revealed significant influence on the intention to adopt solar technology. A similar outcome was observed in [24] research on solar technology amongst households in Bangalore and Delhi, India. This outcome was also echoed correspondingly in the research of [52] on the Internet of Things-based smart metre intention amongst households in two important cities of Malaysia (Malacca and Putrajaya). By contrast, ref. [32] concluded that PE is not significant towards the intention to adopt in a small private online class amongst undergraduate accounting students in Indonesia. Nevertheless, PE is expected to persevere in the green context. Thus, a significant impact is expected to resurface amongst developing countries, bearing fruits from recent initiatives done towards inculcating green behaviour. Ref. [21] studied the intention to adopt green information systems in Malaysia and divided PE into two dimensions (human infrastructure and administrative policies). This research found that both dimensions were significant in rendering its effect on intention, thereby reflecting strongly about the role of PE. Moreover, PE is known to have a tenable impact on the intention for scoring the highest beta value observed across multiple studies in various fields [16,17,29]. Therefore, data in the current study imply that using solar technology will improve performance, particularly for its usefulness, which is depicted by the high indicator reliability of 0.894.

As mentioned, EE relates to the degree of simplicity accompanying the use of technology [8,25,32]. EE does not lead to the intention to adopt in the current study. The unexpected outcome stands in stark contrast with retrospectively documented empirical research and is relatively startling, specifically when EE has strong predictive power [41]. EE rendered on many occasions generates significant impact towards behavioural intention, particularly on recent studies conducted after 2017, in the green context [21,24,52] or non-green field [34,37,43]. There could be two possibilities in our view that explains this finding. One could argue that EE is tightly coupled with awareness. In our case, it is suggested that the non-significant nature of EE was also occasionally observed such as in [32] in an online learning setting, and this pattern may prevail in Malaysia due to a limited affinity with solar technology amongst Malaysian households, thereby impacting their ability to gauge solar-related technologies. Therefore, the government and private businesses should collaborate and strategise plans to provide hands-on experience to consumers to familiarise themselves with solar technology services. Consumers with such experience will have a different mindset on solar technology usage, which could contribute positively to the adoption process. On the other hand, in relation to a model that predicts adoption intentions of any form of technology, EE is often related to the notion of the effort required to use a particular technology. Effort in the context of using solar, could be a trivial matter, or even non-consequential given post installation seamless use, perceived by potential users.

H6 is not supported. SI did not influence intention to adopt. This unexpected verdict from a green viewpoint stands in stark contrast with other documented empirical outcomes, as seen in [24], where SI rendered significant impact on intention to adopt solar technology among Indian households. A similar outcome was observed in [21] where SI, which is termed as institutional pressure, was seen to significantly influence green IS diffusion. Thus, the non-significant outcome in the present study could be caused by the urbanites' behaviour in the Malaysian Klang Valley. Households have great inclination to be independent regarding decision-making matters and are not lured away by those who are close and important in their circle of contact; such households are similar to Indonesian undergraduate accounting students that belong to Generation Y's age cohort, who are fundamentally independent and maintain individualism [32].

FC, which gravitates along with support and assistance towards a technology, is significant in rendering its influence on solar technology intention. The outcome is expected, particularly when solar services remain in the infant stage in Malaysia. Thus, prospective users would probably need the necessary support and aid. A similar outcome was seen in [35] research on crowdfunding intention, apart from [21] which divided FC into two

dimensions (IS infrastructure and knowledge accessibility) of which both dimensions were found to be significant towards green IS diffusion intention. Although the existence of PE and EE may dilute FC's influence on the intention to adopt, present research would partially concur with this notion after realising FC's significance despite experiencing PE's significance, backdropped by EE's insignificance. Numerous studies have differed and remained steadfast, thereby achieving significant PE, EE, and FC [18,35,43]. The existence of insignificant FC is underscored by the insignificant PE and EE [32], thereby intensifying the existing juxtaposition surrounding FC. Such a scenario may prevail, possibly owing to the position of FC, which was occasionally tested to intention and, in many instances, tested towards actual usage [16,34,39,43]. Therefore, FC is an important factor to be maintained in the UTAUT model, which is reiterated by [44] conceptual research on Malaysian SMEs. Ref. [44] exploratory factor analysis diluted and removed EE but not FC, which was maintained in the modified UTAUT model. Conditions that facilitate the adoption of technology is again a natural precursor to an intention–predictive model, as proven in this study as well.

5. Conclusions

The present research provides impetus on the intention to adopt solar technology whilst enriching UTAUT's body of knowledge. It also declares the crux of behavioural intention in considerable means and affix awareness, which should be internalised as the pillar towards solar technology adoption, thereby enforcing its role to accelerate the dissemination of solar technology's benefits to the core. This conclusion was imperatively arrived upon seeing awareness rendering its significant impact to PE, EE, and FC. PE and FC's positions are further fortified in responding to the incumbent researchers, who had mixed and inconclusive outings on reflecting UTAUT's exogenous variables towards fostering the adoption of solar technology.

The current research could also lay a strong foundation for solar technology proponents and act as a guiding principle to Malaysian policymakers. The Ministry of Education could embed green/solar awareness in the curriculum and attain cognitive consciousness, emulating successful countries, such as Sweden, Germany, Indonesia, and Portugal, which have mandated renewable energy as part of their educational systems. Moreover, the Malaysian Ministry of Science, Technology, and Innovation together with relevant departments and agencies, could cohesively present cutting-edge opportunities to enhance participation amongst green ecosystem members. Such an effort would increase additional demand and create green entrepreneurs, particularly in solar technology fraternity and contributes enormously towards achieving affordable and clean energy as stipulated in the United Nation's Sustainable Development Goal Number Seven, thus investing in solar and accomplishing equitable energy productivity while corroborate access to unwavering, reasonable, sustainable, and modern energy to mankind.

The current study was conducted in Klang Valley's Kuala Lumpur and Selangor. These two urbanised cities may not reflect the perceptions of other households, particularly from the rural setting. Correspondingly, 50% of the respondents were degree holders, which may not represent the actual composition of the Malaysian educated lot. Thus, future studies may include households from other states of Malaysia, in addition to corporations. Moreover, the awareness inclusion in UTAUT theory may be extended by incorporating perceived cost as the moderator towards the intention to adopt solar technology in organisations, specifically post COVID-19 pandemic, when business communities have to bear the brunt of business impediments.

Earth's sustainability has been given utmost attention lately. The reception is disheartening at the Malaysian front because of the low renewable energy usage of 2% compared with the targeted 20% usage by 2025, which is a tall order for Malaysians. Thus, this research would aid in achieving the intended outcome, commencing with the intention towards the quest to eventually achieve usage.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of MULTIMEDIA UNIVERSITY (Approval number: EA3152021. Date: 17 September 2021).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. Questionnaire

Construct	Item	Source
Awareness	<ol style="list-style-type: none"> 1. I am sufficiently knowledgeable about solar energy source. 2. I am familiar with technology elated to solar energy. 3. I know the necessities of using solar technology at my residential. 4. I can easily identify solar energy source and related technology. 	[10]
Performance Expectancy	<ol style="list-style-type: none"> 1. Solar technology will be useful in my daily routine. 2. Using solar technology will allow me to complete tasks faster. 3. Using solar technology will improve my productivity. 4. Using solar technology will improve y electricity consumption. 	[32]
Effort Expectancy	<ol style="list-style-type: none"> 1. I understand how to use solar technology. 2. Being skilled in using solar technology will be easy for me. 3. I would find solar technology easy to use. 4. I think that learning to operate solar technology would be easy for me. 5. Maintaining a solar panel will be easy for me 	[24,32]
Social Influence	<ol style="list-style-type: none"> 1. The person who influence my behaviour thinks that I should use solar technology. 2. People who are important to me think that I should use solar technology. 3. My peers and family encourage me to use solar technology. 4. The government supports the use of solar technology in our daily life. 5. I consistently ask a friend about his/her experience with a new product/technology before I buy. 	[24,32]
Facilitating Condition	<ol style="list-style-type: none"> 1. I have the resources needed to use solar technology. 2. I have the necessary knowledge to use solar technology. 3. A special person could help me if I have trouble using solar technology. 4. Using solar technology will fit into my lifestyle. 5. I intend to receive necessary training to use solar technology. 	[32]
Intention to adopt	<ol style="list-style-type: none"> 1. I will attempt to use solar technology at my home in the future. 2. I strongly recommend others to use solar technology. 3. I intend to use solar technology in my home to supply a part of my required energy. 4. I intend to purchase a solar technology storage system for my household in three to five years. 	[10,17,44]

Appendix B. Literature Survey

No	Authors	Country	Key Takeaways/Findings
1	Factors driving Indian consumer's purchase intention of rooftop solar.	India	Environmental concern, social beliefs, hedonic motivation, performance expectancy, price value, self-efficacy, and effort expectancy
2	Solar energy adoption in rural China: A sequential decision approach.	China	Awareness on subsidy policy, awareness on solar technology
3	Factors influencing Malaysian consumers' intention to purchase green energy: The case of solar panel.	Malaysia	Perceived cost and maintenance, product knowledge and experience, social influence, and product benefits
4	How we did it. The founder of UBI group on leading a transition to renewable energy in Africa.	Africa	Climate, experts, awareness, expensive in short run but more sensible, cheaper in the long run
5	Analysis on the current situation of solar energy in Shannan area of Tibet and suggestion for popularization.	Tibet	Solar power generation to play leading role in the energy sector by the end 21st century. Lack of broad social recognition, lack of professionals, and analytics.
6	Energy audit on solar energy switching.	India	Solar energy can save monthly electricity bills up to 33%
7	Solar dried traditional African vegetables in rural Tanzania: Awareness, perceptions and factors affecting purchase decision.	Tanzania	Most households resort to open sun-dried food due to lack of awareness on solar dried traditional African vegetables.
8	Public willingness assessment in utilising solar energy in Malaysia: A household perspective.	Malaysia	Awareness of solar energy, self-effectiveness, environment, neighbours, and energy benefits.
9	Public acceptance of solar energy: A perspective of households in Malaysia.	Malaysia	Aware about solar but did not practice it hence initiatives and awareness need to realign.
10	Optimal utilization of electrical energy of solar photovoltaic system using internet of things.	India	Solar power utilization reduces usage of fossil fuel-based power
11	Solar charger for electric vehicle.	India	Solar power as the power source to charge electric vehicle's battery.
12	Willingness to utilise solar energy in Malaysia: A case of Gen Z	Malaysia	Policy makers to strengthen the initiatives to increase awareness.
13	A novel solar-powered milk cooling refrigeration unit with cold thermal energy storage for rural application.	India	Solar energy with thermal energy storage is effective for operating the milk chilling unit for two seasons: winter and summer. For monsoon season, the system requires additional source of power. Solar milk chiller resulted in 91.15% lesser CO ₂ emission.
14	Prioritization of renewable solar energy to prevent energy insecurity: An Integrated role.	Pakistan	Mass, money supply and ratio are important. Two districts are more suitable (Barkhan & Baluchistan). Solar energy provides cheaper electricity.
15	Effect of climate change to solar energy potential: a case study in the Eastern Anatolia region of Turkey	Turkey	New fossil-fired power plant should not be built. The number of existing ones should be reduced. Renewable energy projects should be budgeted and encouraged.

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Article

Human Factor Index Measurement Using an ISM-SEM-Fuzzy Approach

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Abstract: In recent years, there has been a trend toward automation and data exchange in manufacturing processes through industrial cognitive computing, the Internet of Things (IoT), and artificial intelligence. However, the human–machine interface plays a role in establishing a smart manufacturing system in any industry. It is necessary to develop a comprehensive model to identify the risk factors that contribute to the loss of human performance and productivity and evaluate the workplace for its compliance and agility toward safe human–machine systems. In this study, a model is proposed that can be used as a measurement tool to design ergonomic workplaces in the automotive industry. Several criteria have been classified under four enablers: physiological factors, psychological factors, environmental factors, and safety factors. These were identified through a literature review. The proposed model integrates the applications of structural equation modeling (SEM), interpretive structural modeling (ISM), and the multigrade fuzzy approach. ISM was employed to demonstrate the applicability of the model to depict various ergonomic enablers considered in the ergonomic measurement. SEM was used to validate the ergonomic measurement model statistically. Physiological factors were found to be highly correlated with ergonomic practices. Physiological and psychological factors were also highly correlated. The use of the multigrade fuzzy approach was demonstrated to determine the human factor index for an automotive component manufacturing industry. The proposed model can enable management to evaluate the various risk factors that hamper the ergonomic level of a company and thereby allow the company to harness the benefits of ergonomics to enhance safety and productivity.

Keywords: human factor index measurement; multigrade fuzzy approach; interpretive structural modeling (ISM); structural equation modeling (SEM); automotive industry

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1. Introduction

A manufacturing organization is a convoluted human–machine–environment organization system [1]. Although the primary objective of such systems is to provide continuous improvements in quality and productivity, thereby increasing profits, meeting this objective largely depends on the wellness of employees and their willingness to actively engage in production activity [2]. Worker fatigue and work-related musculoskeletal Disorders (WMSDs) can lead to losses in overall productivity and efficiency [3]. WMSDs also accounted for 4.1 million early deaths in 2015, an increase of 46% since 2000 [4]. WMSDs have contributed to almost 400,000 injuries, costing industries over USD 20 billion per year. In 2019, 9440 cases of work-related musculoskeletal disorders (WMSDs) were reported in Korea, representing an increase of 2725 cases (40.6%) from the 6715 cases reported in the previous year. The cases accounted for approximately two thirds (67.3%) of all occupational diseases in that year [5]. The study of ergonomics plays a pivotal role in the design and development of conducive working environments that optimize the wellbeing of operators, thus increasing productivity safely [6]. Recently, Indian manufacturing industries have undertaken initiatives to redesign their workplaces to overcome various occupational injuries and musculoskeletal disorders (MSD) [7].

Recent studies have explored the applications of ergonomic tools such as the Strain Index (SI), the National Aeronautics and Space Administration Task Load Index (NASA TLX), the Occupational Repetitive Actions Index (OCRA), the Rapid Upper Limb Assessment (RULA), the Ovako Working posture Analysis System (OWAS) checklist, and the Rapid Entire Body Assessment (REBA) to improve occupational health and safety in the areas of machine design, task design, the working environment, and facility design. These tools and techniques to derive benefits based on the theory of ergonomics require considerable time and energy to implement. Present methods of evaluating postural risk are based on observational techniques that requires an ergonomic analyst to observe the work in real-time or from recorded video to manually segment the relevant body parts and evaluate the risk associated with the posture [8]. Due to human error, however, these techniques produce results with low consistency and repeatability, both of which can be reduced or eliminated by using advanced technologies [9]. All the risk assessment methodologies are used to evaluate the physiological level of risk that was associated with performance of the job.

This study aims to develop a human factor index measurement tool that includes physiological, psychological, environmental, and safety risk considerations based on how these risks are interrelated. Moreover, the use of several indicators in a study requires that these indicators themselves be understood and are easily measurable. However, these limitations have not been addressed in many studies. The remainder of this paper is organized as follows: Section 2 presents the research background in the areas of ergonomic risk evaluation and assessment. The proposed methodology for workplace ergonomic assessment is described in Section 3. The conceptual framework and analysis are presented in Section 4. Finally, the results of this study are reported in Section 5.

2. Research Background

Ergonomic risks in manufacturing sectors can cause serious injuries and impact the health and quality of life of workers [10]. This can contribute to losses of quality and productivity. Different self-reporting methods such as rating scales, questionnaires, checklists, and interviews have been used in the past to study ergonomic risks [11]. An effective rapid-screening instrument was developed by Keyserling et al. [12] to identify the exposure of workers to risky postures in cyclical jobs. Shikdar et al. [1] developed the “ErgoTech” self-assessment software package to evaluate the ergonomic improvement potential of production systems in the manufacturing industry. The application of this tool enabled production managers to recognize ergonomic improvements in the workplace successfully. David [11] reported the use of several tools to assess the exposure to risk based on self-reports, observational methods, and direct measurements. Laring et al. [13] proposed the Ergo SAM tool, which can be used to optimize the workplace in terms of the production time and physical load on the operator. This tool facilitates the detection of high musculoskeletal loads early in the planning process.

The most widely used methods for ergonomic assessment are the Occupational Safety and Health Administration (OSHA) checklist and the standard Nordic MSD questionnaire. The standard Nordic MSD questionnaire has been used in applications such as furniture manufacturing [14] and LCD manufacturing [15]. The OSHA checklist has been used for the analysis of semiconductor manufacturing [16]. The main weakness of these self-reporting approaches is that the results are not always reliable, which can lead to biased interpretations.

Observational methods such as the OWAS and the Strain Index (SI) involve direct observation of the worker and the consequent tasks. Sonne et al. [17] devised an office risk assessment tool, Rapid Office Strain Assessment (ROSA), to measure risks related to computer work. This tool provides a report to the user detailing the need for modification of discomfort associated with office work. Poochada and Chaiklieng [18] demonstrated the use of the ROSA to evaluate the presence of risk elements for job-related MSD in a call center office. The RULA method has been used to assess the risk of work-related upper

limb disorders [19,20]. The OCRA method has been used to evaluate upper limb disorders; the risk factors considered are repetition, strength, incorrect postures, and lack of rest intervals [21]. REBA has been effectively used to analyze the exposure related to the upper and lower limbs [22]. Chander and Cavatorta [23] proposed the postural ergonomic risk assessment (PERA) method to assess the postural ergonomic risk of short cyclic assembly jobs. The drawbacks of these observational methods are high intra- and inter-observer inconsistency due to the data collection, which is generally performed through subjective opinion or simple judgment from videos/pictures, and a lack of accuracy. To overcome these limitations, Maman et al. [24] and Plantard et al. [25] recommended the use of sensors attached to the worker's body to collect data directly; however, this is difficult to implement in real-world situations. Li et al. [26] proposed an improved physical demand analysis (PDA) by integrating risk assessment tools such as REBA, RULA, and NIOSH; the proposed method enables ergonomic risk identification and evaluation and proactively mitigates the risk to workers by providing modified work. The four main ergonomic risks identified in the case study were static whole-body posture, heavy material handling, sensory risks, and awkward body postures. Bortolini et al. [27] developed a motion analysis system (MAS) for the ergonomic analysis of operators during assembly tasks based on Motion Capture (MOCAP) technology with ad hoc software. The applicability of the MAS was discussed through a case study of a water pump assembly workstation. Using a deep learning algorithm to predict RULA scores, Nayak et al. [5] created an automated, RULA-based posture evaluation system. This will help to reduce the amount of time necessary for postural evaluation while also producing highly reliable RULA scores that are similar to the results obtained using the manual method.

In this study, an exhaustive literature review was conducted based on the factors considered for ergonomic evaluation and the area of study, and the results are summarized in Table 1. The literature review indicated that research on ergonomic assessments has often considered physiological and/or psychological factors. Parsons, K.C. [28] discussed the great deal of work on the effects of light, noise, vibration, and thermal environments on the health, comfort, and working efficiency. Health, safety, and environment (HSE) at the operational level will strive to eliminate injuries, adverse health effects, and damage to the environment; enhance worker productivity, provide improved worker safety (physical and mental), and job satisfaction [29]. However, significant factors such as environmental and safety factors that could influence "the ergonomic conducive level" of the industry have been neglected in most previous studies. Moreover, there appears to be a lack of amalgamation of ergonomic assessment tools for better prediction of ergonomic levels in any manufacturing industry. Hence, there is a need to develop a comprehensive evaluation model for workplace ergonomic assessments. This study proposes a conceptual model that facilitates the determination of a human factor index for workplace ergonomic measurements. The application of the model is demonstrated using analytical tools such as interpretive structural modeling (ISM), structural equation modeling (SEM), and a multi-grade fuzzy approach to determine the ergonomic performance in the Indian automotive industry. ISM methodology typically helps to create a well-defined visible model from poorly articulated unclear mental model of experts. Since the factors cannot be directly measured, the structural equation modelling (SEM) methodology is typically used to analyze the structural relationship between factors for establishing either a theoretical or a predictive relationship.

Table 1. Summary of the literature review.

Authors	Factors Considered in the Ergonomic Evaluation							Area of Study		
	Physiological Factors	Psychological Factors	Environmental Factors	Safety Factors	Technological and Organizational Factors	Other Factors	Process/Technology	Workplace	Equipment	
Keyserling et al. (1992) [12]	✓	×	×	×	×	×	×	✓	×	
Parsons (2000) [28]	×	✓	×	×	×	×	×	×	×	
Sen and Das (2000) [30]	×	×	×	×	×	×	×	×	✓	
Grzybowski (2001) [31]	✓	✓	✓	✓	✓	×	×	✓	×	
Shikdar et al. (2002) [1]	×	✓	✓	✓	×	×	×	✓	×	
Laring et al. (2005) [13]	✓	×	×	×	×	×	×	✓	×	
Sonne et al. (2012) [17]	×	×	×	×	×	×	×	✓	×	
Maldonado et al. (2015) [32]	✓	×	✓	×	✓	×	✓	×	✓	
Borah (2015) [33]	✓	×	×	×	×	×	×	×	×	
Matos and Arezes (2015) [34]	✓	×	×	×	×	×	×	✓	×	
Poochada and Chaiklieng (2015) [18]	✓	×	×	×	×	×	×	✓	×	
Chander and Cavatorta (2017) [23]	✓	✓	×	×	×	×	×	✓	×	
Li et al. (2019) [26]	✓	×	✓	✓	×	×	×	✓	×	
Bortolini et al. (2020) [27]	✓	×	×	×	×	×	×	✓	×	
<i>Model presented in this study</i>	✓	✓	✓	✓	×	×	×	✓	×	

3. Methodology

This study aims to determine a human factor index for ergonomic workplace assessment in automotive industries, as shown in Figure 1.

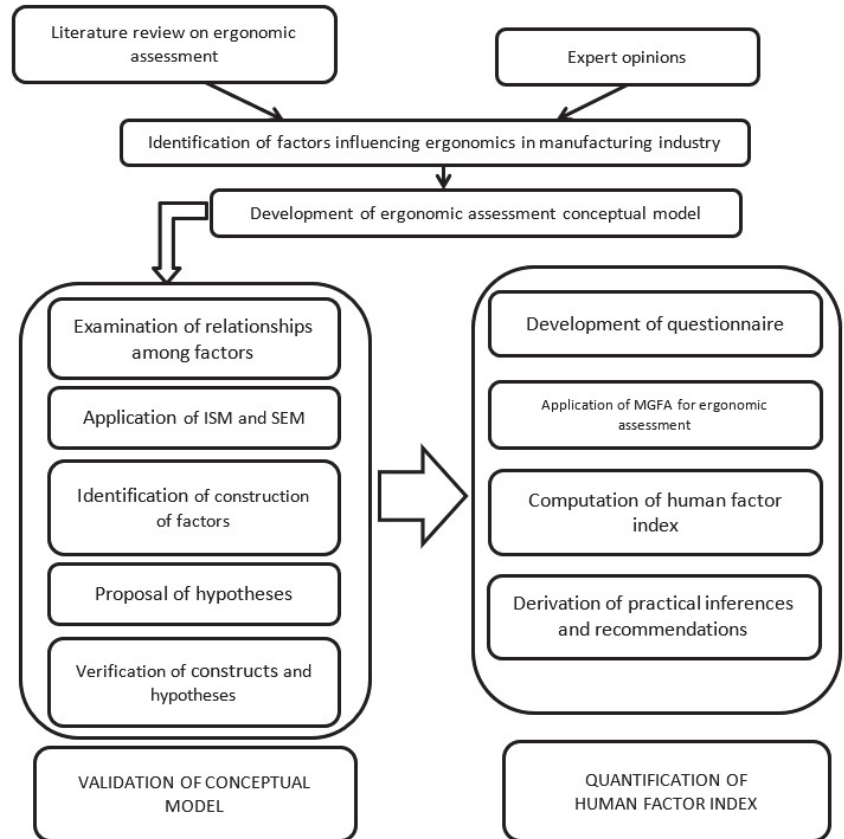


Figure 1. Proposed research scheme for ergonomic assessment.

A total of 379 documents were obtained from the core collection database on 30 March 2020. Of the 379 articles, 365 were journal articles, and 14 were review articles. A literature review of workplace ergonomic assessments and expert opinions obtained from the automotive industry enabled us to identify the list of factors to be considered in this study. The factors, criteria, and variables to be included in the ergonomic measurement model were carefully selected. ISM was used to identify and describe the relationships among the factors. The comprehensive model constructed from ISM was verified using partial least squares (PLS)-based SEM. SEM-based statistical analyses do not allow for a comprehensive inference of the interconnectivity relationship. Therefore, to determine the direction of the relationships among factors, ISM was used. In this study, SEM was applied to a first-order four-factor structure for fifteen performance variables. After the theoretical model was verified using SEM, an ergonomic quantification tool was developed using the multigrade fuzzy approach. A demonstration of the proposed model in a workplace ergonomic measurement study was carried out in the Indian automotive industry. The computation of the human factor index facilitates evaluation of the “ergonomic conducive level” of the industry.

4. Ergonomic Assessment Model

The conceptual framework for the design of the ergonomic measurement tool is presented in Table 2. The ergonomic assessment model is divided into three stages. The first stage comprises 4 factors, the second stage contains 15 ergonomic criteria, and the third stage entails 40 ergonomic variables [35].

Table 2. Conceptual framework for ergonomic assessment.

Factors	Criteria	Variables	Sources	
Physiological factors (PHY)	Biomechanical aspects (phy1)	Access to machine and clearance	Maldonado et al. (2013) [32]	
		Horizontal/vertical reach	Maldonado et al. (2013) [32]	
		Adjustability of design	Maldonado et al. (2013) [32]	
		Postural comfort of design	Maldonado et al. (2013) [32]	
		Physical work/endurance and design	Maldonado et al. (2013) [32]	
	Usability (phy2)	Compatibility of design and control	Maldonado et al. (2013) [32]	
		Physical distribution of controls	Maldonado et al. (2013) [32]	
		Visual workplace design	Maldonado et al. (2013) [32]	
		Error tolerance	Maldonado et al. (2013) [32]	
		human-machine function allocation of design	Maldonado et al. (2013) [32]	
	Energy expenditure (phy3)	Worker movement	Borah (2015) [33]	
		Material handling	Saleem et al. (2003) [36]	
		Basal metabolic rate	Vianna and quaresma (2013) [37]	
	Psychological factors (PSY)	Work-rest schedule (psy1)	Body heat	Keyserling et al. (1992) [12]
			Heart rate	Keyserling et al. (1992) [12]
Work and rest periods			Keyserling et al. (1992) [12]	
Human skills and training capability (psy2)		Skill level compatibility	Maldonado et al. (2013) [32]	
		Training level compatibility	Maldonado et al. (2013) [32]	
Human error (psy3)		Training	Sanders and mccormick (1993) [38]	
		Design of equipment	Sanders and mccormick (1993) [38]	
		Worker selection	Sanders and mccormick (1993) [38]	
Communication (psy4)		Information flow	Sanders and mccormick (1993) [38]	
		Speech intelligibility	Sanders and mccormick (1993) [38]	
Environmental factors (ENV)	Temperature/climate (env1)	Acclimatization	Åstrand et al. (1986) [9]; parsons (2000) [28]	
		Limits of tolerance	Åstrand et al. (1986) [9]; parsons (2000) [28]	
	Noise (env2)	Sound intensity	Parsons (2000) [28]	
		Sound categories	Parsons (2000) [28]	
	Housekeeping (env3)	Maintenance	Parsons (2000) [28]	
		Level of cleanliness	Parsons (2000) [28]	
	Illumination (env4)	Nature of light	Parsons (2000) [28]	
		Light distribution	Parsons (2000) [28]	
	Motion (vibration) (env5)	Interference with activities	parsons (2000) [28]	
		Motion sickness	Parsons (2000) [28]	
Safety factors (SAF)	Personal safety (saf1)	Personal protective equipment	Botti et al. (2017) [39]	
		Safety training	Karwowski (2007) [40]	
	Organizational safety (saf2)	Hazards	Botti et al. (2017) [39]	
		Regulations and norms	Siemieniuch and sinclair (2014) [41]	
	Risk management (saf3)	Risk assessment	Sonne et al. (2012) [17]	

4.1. Identifying Relationships among Factors: ISM Approach

This study aimed to explore the use of ISM to recognize the associations among the factors that affect the ergonomic assessment of an industry.

ISM is used as a tool in decision making, in which a group of factors affecting the application of a system are identified in an organized manner. ISM utilizes the practical experience of professionals currently working in the area to develop a multilevel organizational model that emphasizes the key aspects involved in the application of a specific system [42]. These features make this a more suitable tool for the present study.

The working mechanism of the ISM technique is as follows [42].

A circumstantial relationship between the factors and the structural self-interaction matrix (SSIM) of factors is developed. This matrix indicates the pairwise association among the factors analyzed, as presented in Table 3. To indicate the direction of the association between two factors (i and j), the following symbols are defined:

- V denotes that factor i affects factor j;
- A denotes that factor j impacts factor I;
- X denotes that factors i and j affect each other;
- X denotes that factors i and j are unrelated.

Table 3. Structural self-interaction matrix (SSIM).

	PHY	PSY	ENV	SAF
PHY	1	V	A	A
PSY		1	A	A
ENV			1	X
SAF				1

The SSIM is developed using expert opinions and is improved to create a reachability matrix by changing each entry in the SSIM into binary digits 1 and 0.

The initial reachability matrix is derived from the SSIM matrix. After checking the transitivity, the final reachability matrix is obtained, and the final reachability matrix is partitioned into different levels by listing the factors in the antecedent set, intersection set, reachability set, and partition level, as presented in Table 4.

Table 4. Level partitions for ergonomic contributory factors.

Factors	Reachability Set	Antecedent Set	Intersection Set	Level
PHY	PHY, PSY	PHY, ENV, SAF	PHY	I
PSY	PSY	PHY, PSY, ENV, SAF	PSY	
ENV	PHY, PSY, ENV, SAF	ENV, SAF	ENV, SAF	
SAF	PHY, PSY, ENV, SAF	ENV, SAF	ENV, SAF	
PHY	PHY	PHY, ENV, SAF	PHY	II
ENV	PHY, ENV, SAF	ENV, SAF	ENV, SAF	
SAF	PHY, ENV, SAF	ENV, SAF	ENV, SAF	
ENV	ENV, SAF	ENV, SAF	ENV, SAF	III
SAF	ENV, SAF	ENV, SAF	ENV, SAF	

A directed graph of the interactions listed in Table 4 is then drawn. The ISM model thus constructed is shown in Figure 2.

The model shown in Figure 2 is subsequently used for SEM analysis.

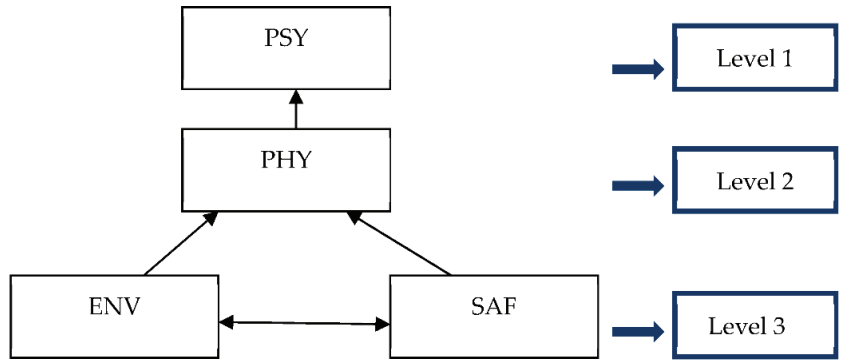


Figure 2. ISM model.

4.2. SEM Validation of the Relationships among Factors

SEM analyzes the hypotheses for unmeasurable variables by considering independent and dependent variables using statistical analysis [42]. The theoretical model obtained from the ISM was validated using PLS-SEM. After a careful literature review, a questionnaire was used in discussions with experts working in the automotive industry. The questionnaire was administered via email to 150 experts from different firms. At the end of the survey, 101 complete and usable responses were received from 40 automotive manufacturing firms. This represents a response rate of 67.30%, which is sufficient for this empirical study [43]. This sample size is adequate for evaluating the hypotheses developed in this study [43]. Our respondents consisted of an ergonomics engineer, head supply chain managers, maintenance engineers, operations managers, and risk assessment specialists. Of the respondents, 67% were between 27 and 50 years of age, and only 12% were over 50 years of age. The model representation of the factors, along with the tests of the hypotheses considered in this study, are shown in Figure 3.

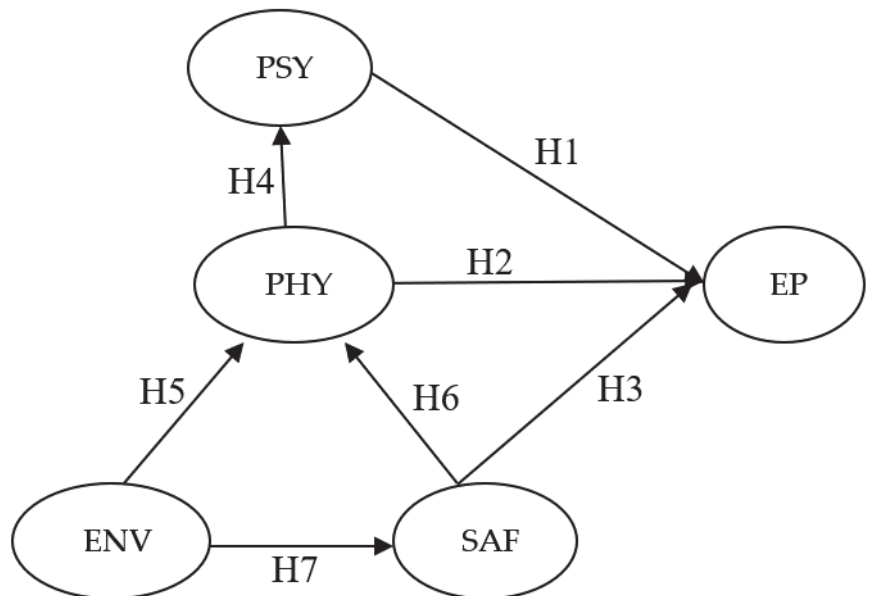


Figure 3. Representations of factors and tests of hypotheses.

The hypotheses tested in this study are described below:

Hypothesis 1 (H1). *Psychological factors and the ergonomic assessment are correlated.*

Hypothesis 2 (H2). *The ergonomic assessment and physiological factors are correlated.*

Hypothesis 3 (H3). *The ergonomic assessment and safety factors are correlated.*

Hypothesis 4 (H4). *Psychological factors and physiological factors are correlated.*

Hypothesis 5 (H5). *Environmental factors and physiological factors are correlated.*

Hypothesis 6 (H6). *Safety factors and physiological factors are correlated.*

Hypothesis 7 (H7). *Environmental factors and safety factors are correlated.*

The convergent validity was evaluated by assessing Cronbach's α , the average variance extracted (AVE), and the composite reliability, which is used to analyze the level of correlation/convergence of different variables of the same construct. The composite reliability is greater than the acceptable limit of 0.7 for all constructs, and the convergent validity [44] of the constructs is confirmed if the AVE is greater than or equal to 0.50. Moreover, the Cronbach's α value for the ergonomic factors is above 0.5, and hence, the factors are found to be reliable, as indicated in Table 5.

Table 5. Construct validity.

Construct	Composite Reliability	AVE	Cronbach's α
Ergonomic Practice	0.887	0.728	0.827
Physiological Factors	0.886	0.723	0.805
Psychological Factors	0.805	0.500	0.727
Environmental Factors	0.846	0.500	0.798
Safety Factors	0.767	0.687	0.767

In this study, discriminant validity measures were evaluated using a confirmatory factor analysis. It can be found that correlation values of factors such as physiological, psychological, environmental, and safety were less than the square root of the AVE [45]. Hence, it was found that the factors considered in this model have discriminant validity, as indicated in Table 6.

Table 6. Discriminant validity.

Construct	Ergonomic Practice	Physiological Factors	Psychological Factors	Environmental Factors	Safety Factors
Ergonomic Practice	0.853				
Physiological Factors	0.151	0.850			
Psychological Factors	0.192	0.457	0.707		
Environmental Factors	0.771	0.480	0.457	0.701	
Safety Factors	0.135	0.647	0.629	0.471	0.829

The bootstrapping test (Table 7) was performed using the PLS-SEM to determine the t -test values. Based on the bootstrapping results presented in the Table 7. Materials and the hypothesis testing, all of the hypotheses were supported by the survey results ($p < 0.05$).

Table 7. Bootstrapping results.

Construct	Indicator	Original Sample	Sample Mean	Standard Deviation	<i>t</i> -Statistic
Ergonomic Practice	EP1	0.968	0.887	0.205	4.713
	EP2	0.897	0.812	0.242	3.701
	EP3	0.666	0.608	0.273	2.44
Physiological Factors	PHY1	0.742	0.739	0.041	17.985
	PHY2	0.907	0.907	0.014	66.47
	PHY3	0.892	0.893	0.021	43.195
Psychological Factors	PSY1	0.291	0.283	0.171	1.705
	PSY2	0.782	0.783	0.038	20.652
	PSY3	0.652	0.638	0.082	7.917
	PSY4	0.928	0.924	0.018	51.241
	PSY5	0.721	0.717	0.059	12.143
Environmental Factors	ENV1	0.399	0.423	0.169	2.36
	ENV2	0.772	0.725	0.16	4.81
	ENV3	0.723	0.674	0.166	4.352
	ENV4	0.81	0.788	0.095	8.548
	ENV5	0.845	0.815	0.09	9.431
	ENV6	0.551	0.518	0.125	4.392
Safety Factors	SF1	0.923	0.923	0.012	77.955
	SF2	0.889	0.89	0.02	44.844
	SF3	0.647	0.634	0.076	8.509

The standard errors and *t*-test values are listed in Table 8.

Table 8. Ergonomic measurement model *t*-test results.

Hypothesis Number	Hypothesis	Entire Sample Estimate	Mean of Subsamples	Standard Error	<i>t</i> -Statistic
H1	PSY-EP	0.455	0.481	0.042	10.87
H2	PHY-EP	0.879	0.878	0.018	49.652
H3	SAF-EP	0.11	0.131	0.012	9.167
H4	PHY-PSY	0.948	0.948	0.009	107.55
H5	ENV-PHY	0.48	0.507	0.043	11.128
H6	SAF-PHY	0.927	0.926	0.016	58.634
H7	ENV-SAF	0.471	0.5	0.044	10.781

Based on the “*t*” statistic, it can be inferred that there is a significant correlation between each of the verified factors and the ergonomic practices. Among these, the physiological factors have very high correlation with the ergonomic practices in the manufacturing industry, with a “*t*-stat” result of 49.652. It is also observed that there is a significant correlation between psychological and physiological factors, with a “*t*-stat” value of 107.55.

4.3. Determination of Human Factor Index Measurement

The ergonomic factors and their relationships, which were validated using the ISM-SEM approach, are considered to measure the human factor index using a multigrade fuzzy approach. The multigrade fuzzy approach overcomes the drawbacks associated with conventional crisp approaches. The major advantage of using the multigrade fuzzy method is that the average weights are multiplied by the responses given by experts for each variable. This method avoids fluctuations in the values, and extreme responses and their biases are neutralized as constant weights in the calculation. Fuzzy approaches provide a useful tool to deal with problems in which attribute phenomena are imprecise and vague. Most ergonomic measurements are characterized by ambiguity and multiple possibilities. The scoring of existing techniques is always criticized because the scales used to score

ergonomics have limitations. In this context, a multigrade fuzzy approach was used to evaluate ergonomics in the automotive industry.

The application of the multigrade fuzzy approach was validated through a case study. The case study was conducted in an original equipment manufacturer (Sarang Auto Parts Pvt. Ltd., Chennai, India) located in Chennai, India. This organization produces a shaft lower link, nut-driving pinion, bearing lock, rod hydraulic lift connection, and support reverse cluster. They manufacture the following parts under the broad category of automotive components: electrical parts, drive transmission and steering parts, nut-driving pinion, bearing locks, rod hydraulic lift connections, shaft power take-off (PTO) drives, shaft lower links, support reverse clusters, and shaft front PTOs.

The human factor index (HFI) of a workplace is represented by the multiplication of the weight (W) and assessment factor (F).

$$\text{HFI} = W \times F$$

The assessment has been divided into five scales because every ergonomic factor involves the fuzzy determination $I = (10, 8, 6, 4, 2)$. “Excellent”, “good”, “fair”, “poor”, and “very poor” ergonomic levels correspond to scores of 8–10, 6–8, 4–6, 2–4, and 0–2, respectively. Four experts (L_1, L_2, L_3, L_4) were involved in the ergonomic evaluation discussion. The weightages assigned for each enabler is 0.4 for physiological factors (HFI_1), 0.2 for psychological factors (HFI_2), 0.2 for environmental factors (HFI_3), and 0.2 for safety factors (HFI_4). The physiological factors include the following criteria, including biomechanical aspects (HFI_{11}), usability (HFI_{12}), and energy expenditure (HFI_{13}). The weightages assigned for each criterion are 0.5, 0.25, and 0.25, respectively. Similarly, the distribution of fuzzy weighting to the ergonomic attributes, criteria, and enablers is summarized in Table 9.

4.3.1. Primary Assessment Calculation

The calculations pertaining to biomechanical aspects are shown below.

$$W_{11} = [0.2 \quad 0.2 \quad 0.2 \quad 0.2 \quad 0.2]$$

$$F_{11} = \begin{bmatrix} 7 & 9 & 8 & 7 \\ 8 & 8 & 8 & 7 \\ 8 & 8 & 8 & 8 \\ 6 & 9 & 8 & 7 \\ 9 & 8 & 9 & 8 \end{bmatrix}$$

The index pertaining to biomechanical aspects is given by $\text{HFI}_{11} = W_{11} \times F_{11}$.

$$\text{HFI}_{11} = (7.6, 8.2, 8.4, 7.4)$$

Similarly, the index for each criterion is calculated and listed below.

$$\text{HFI}_{12} = (8.4, 8, 8.4, 7.8)$$

$$\text{HFI}_{13} = (7, 7, 6, 6.5)$$

$$\text{HFI}_{21} = (8.5, 7.25, 8.25, 8.25)$$

$$\text{HFI}_{22} = (8.5, 9, 9, 9)$$

$$\text{HFI}_{23} = (8.25, 7, 7.75, 7.75)$$

$$\text{HFI}_{24} = (9, 8.5, 9, 8)$$

$$\text{HFI}_{31} = (7.5, 8, 8, 6.5)$$

$$\text{HFI}_{32} = (7.5, 8, 8, 7.5)$$

$$\text{HFI}_{33} = (6, 6, 6.5, 5.5)$$

$$\text{HFI}_{34} = (8, 7.5, 8, 7.5)$$

$$\text{HFI}_{35} = (9, 8, 9, 8)$$

$$\text{HFI}_{41} = (7.5, 8, 6, 5.5)$$

$$\text{HFI}_{42} = (9, 8, 9, 8)$$

$$\text{HFI}_{43} = (8.5, 8, 8.5, 8.5)$$

Table 9. Fuzzy index.

Enabler	Criteria	Attributes	L ₁	L ₂	L ₃	L ₄	W _{jk}	W _{ij}	W _i		
HFI ₁	HFI ₁₁	HFI ₁₁₁	7	9	8	7	0.2	0.5	0.4		
		HFI ₁₁₂	8	8	8	7	0.2				
		HFI ₁₁₃	8	8	8	8	0.2				
		HFI ₁₁₄	6	9	8	7	0.2				
		HFI ₁₁₅	9	8	9	8	0.2				
	HFI ₁₂	HFI ₁₂₁	9	8	9	9	0.2	0.25			
		HFI ₁₂₂	9	9	9	8	0.2				
		HFI ₁₂₃	7	5	6	6	0.2				
		HFI ₁₂₄	8	9	9	8	0.2				
		HFI ₁₂₅	9	9	9	8	0.2				
	HFI ₁₃	HFI ₁₃₁	6	5	6	5	0.25	0.25			
		HFI ₁₃₂	6	5	6	7	0.25				
		HFI ₁₃₃	8	9	6	9	0.5				
	HFI ₂	HFI ₂₁	HFI ₂₁₁	8	6	7	7	0.25		0.25	0.2
			HFI ₂₁₂	8	7	8	8	0.25			
HFI ₂₁₃			9	8	9	9	0.5				
HFI ₂₂		HFI ₂₂₁	9	9	9	9	0.5	0.25			
		HFI ₂₂₂	8	9	9	9	0.5				
HFI ₂₃		HFI ₂₃₁	8	9	9	8	0.25	0.25			
		HFI ₂₃₂	9	7	8	8	0.5				
		HFI ₂₃₃	7	5	6	7	0.25				
HFI ₂₄		HFI ₂₄₁	10	8	9	9	0.5	0.25			
		HFI ₂₄₂	8	9	9	7	0.5				
HFI ₃		HFI ₃₁	HFI ₃₁₁	8	8	8	7	0.5	0.15	0.2	
			HFI ₃₁₂	7	8	8	6	0.5			
	HFI ₃₂	HFI ₃₂₁	8	8	8	8	0.5	0.15			
		HFI ₃₂₂	7	8	8	7	0.5				
	HFI ₃₃	HFI ₃₃₁	6	7	7	6	0.5	0.4			
		HFI ₃₃₂	6	5	6	5	0.5				
	HFI ₃₄	HFI ₃₄₁	8	8	8	8	0.5	0.15			
		HFI ₃₄₂	8	7	8	7	0.5				
	HFI ₃₅	HFI ₃₅₁	9	8	9	8	0.5	0.15			
		HFI ₃₅₂	9	8	9	8	0.5				
HFI ₄	HFI ₄₁	HFI ₄₁₁	7	7	3	4	0.5	0.33	0.2		
		HFI ₄₁₂	8	9	9	7	0.5				
	HFI ₄₂	HFI ₄₂₁	9	8	9	8	0.25	0.33			
		HFI ₄₂₂	9	8	9	8	0.25				
		HFI ₄₂₃	9	8	9	8	0.5				
	HFI ₄₃	HFI ₄₃₁	8	8	8	9	0.5	0.34			
		HFI ₄₃₂	9	8	9	8	0.5				

4.3.2. Secondary Assessment Calculation

The index pertaining to physiological factors is calculated as shown below.

$$\begin{aligned} \text{HFI}_1 &= W_1 \times F_1 \\ W_1 &= [0.5, 0.25, 0.25] \\ \text{HF}_1 &= \begin{bmatrix} 7.6 & 8.4 & 8.2 & 7.4 \\ 8.4 & 8 & 8.4 & 7.8 \\ 7 & 7 & 6 & 7.5 \end{bmatrix} \\ \text{HFI}_1 &= [7.65 \quad 7.95 \quad 7.69 \quad 7.92] \end{aligned}$$

Similarly, the indexes for other enablers are calculated below.

$$\begin{aligned} \text{HFI}_2 &= (8.56, 7.93, 8.5, 8.25) \\ \text{HFI}_3 &= (7.2, 7.125, 7.55, 6.625) \\ \text{HFI}_4 &= (8.335, 8, 7.88, 7.345) \end{aligned}$$

4.3.3. Tertiary Assessment Calculation

Finally, the total HFI is calculated as shown below.

$$\begin{aligned} W &= [0.4 \quad 0.2 \quad 0.2 \quad 0.2] \\ F &= \begin{bmatrix} 7.65 & 7.95 & 7.69 & 7.92 \\ 8.56 & 7.93 & 8.5 & 8.25 \\ 7.2 & 7.125 & 7.55 & 6.625 \\ 8.335 & 8 & 7.88 & 7.345 \end{bmatrix} \\ \text{HFI} &= W \times F \\ \text{HFI} &= [7.879 \quad 7.791 \quad 7.862 \quad 7.612] \end{aligned}$$

The HFI is the average of (7.879, 7.791, 7.862, 7.612), which is equal to 7.786.

$$\text{HUMAN FACTOR INDEX} = 7.786 \in (6, 8)$$

A human factor index of 7.86 was determined using a multigrade fuzzy approach, which means that the organization is ERGONOMIC.

5. Results and Discussion

The observations made in this study are presented below.

A cross-impact matrix multiplication applied to classification (MICMAC) analysis was used to study the dependence power and driving power of the variables considered in the study [46]. The results indicate that two independent performance variables, namely, the safety factors and environmental factors, show a strong driving power and weaker dependence power. Hence, these were identified as the “key factors” in this ergonomic assessment study. In addition, it was found that the dependent variables, i.e., the physiological and psychological factors, are weak trainers and depend strongly on one another. The results of the MICMAC analysis are shown in Figure 4.

The fit indices for the current case were determined as follows: a value of 0.91 is found for the goodness of fit, indicating that the model is a good fit [47]. The normed-fit index value was 0.70. A value as low as 0.80 is recommended for this index [47]. The relative/normed χ^2 ratio (χ^2/df) value was 10.45. The Cronbach’s α for the ergonomic performance variables was acceptable and indicates that the variables are reliable.

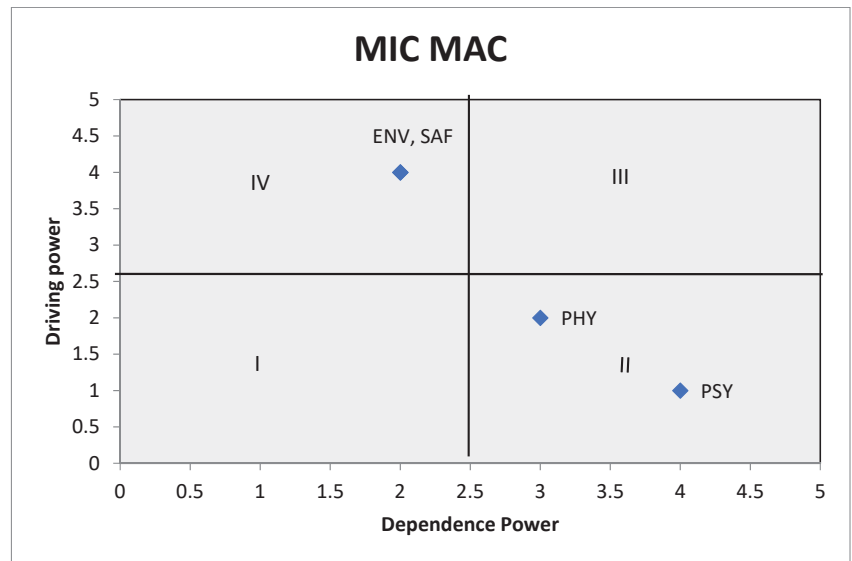


Figure 4. MICMAC analysis.

The ergonomic assessment was performed using the multigrade fuzzy approach. A human factor index of less than 5 indicates that the organization cannot be considered a good candidate to implement an ergonomic work environment that would contribute to better quality and maximum productivity [3]. The human factor index of 7.786 determined for the automotive industry case in this study reveals that the industry is a suitable candidate for operating in a good ergonomic environment. However, it was found that there is scope for improving the work environment of the organization.

It was found that a major gap is perceived for the criterion “biomechanical aspects”. This is followed by “housekeeping”, “temperature/climate”, and “energy expenditure”. Management can take measures to improve the ergonomic conditions, such as the use of material handling equipment to prevent the manual movement of materials, equipment designs that would allow for comfortable reaches and posture, the use of personal protective equipment while working, application of the 5S (sort, set in order, shine, standardize, sustain) scheme to improve the housekeeping facilities, and providing proper a work–rest schedule for workers to sustain a normal heart rate and basal metabolic rate.

6. Conclusions

Ergonomic risks and bad work postures can lead to various types of MSDs and worker fatigue, which hamper the efficiency of manufacturing organizations and lead to a loss in productivity. This study aims to provide insight into the modeling and analysis of ergonomic risk factors in the Indian automotive industry. A combined ISM, SEM, and multigrade fuzzy approach was proposed to determine the human factor index for ergonomic evaluation of industries. The ISM model reveals the driving and dependence among the ergonomic factors, which enables managers to understand the interrelation among ergonomic factors in the automotive component sector. Moreover, management should also consider the dependence among factors in the ISM. Therefore, survey data were analyzed using VPLS software. The SEM-PLS technique was used to verify the seven hypotheses. Furthermore, evaluating the various ergonomic performance factors using the multigrade fuzzy approach facilitated an understanding of the contribution of these factors to safety and productivity improvement. A case study demonstrated the practicability of implementing these approaches in an industrial situation. Manual computation using

a multigrade fuzzy approach is time-consuming and error-prone, and a computerized decision-support system (DSS) can be developed. The application of an integrated model for ergonomic assessment is not limited to the manufacturing industry and can be extended to evaluation in industries such as the software and healthcare. In addition to that, several other forms of ergonomic risk factors such as technological factors and process factors can be added to the measurement model to obtain more robust results.

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Article

Internal Motivations, External Contexts, and Sustainable Consumption Behavior in China—Based on the TPB-ABC Integration Model

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Abstract: Population expansion and the depletion of the planet's natural resources make it necessary to look at human consumption behavior in sustainable development. The purpose of this study is to investigate the influence factors, the influence paths, and the decision-making mechanisms of Chinese consumers' sustainable consumption behavior through the TPB-ABC integration theory. Based on survey data from 534 consumers in Dongying, China, this study used the partial least squares structural equation model (PLS-SEM) to analyze the main factors that influence the three sections of sustainable consumption behaviors, which are green purchase behavior, green transportation behavior, and recycling and resource conservation behavior. Decision-making mechanisms are discussed concerning impact pathways. The results prove that three internal motivations and two external contexts are intimately linked to customers' behavioral decisions, with external contexts indirectly shaping individual attitudes. Furthermore, the factors that influence various types of sustainable consumption practices differ. Specifically, green purchase behavior and green transportation behavior are mainly influenced by attitude variables, and negative contexts mainly influence recycling and resource conservation behavior. Finally, the study suggested corresponding policy recommendations to promote sustainable consumption.

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Keywords: sustainable consumption behavior (SCB); internal motivations; external contexts; the TPB-ABC integration model; partial least squares structural equation model (PLS-SEM)

1. Introduction

Environmental degradation caused by inappropriate consumption patterns of human beings is one of the most severe problems facing people today [1–3]. The search for sustainable consumption patterns has become a topic of widespread concern in countries worldwide [4,5]. In 2015, the United Nations Sustainable Development Summit officially adopted 17 Sustainable Development Goals (SDGs) [6], the blueprint for achieving a better and more sustainable future. Those are envisioned as universal goals relevant to developed and developing countries [7]. Among them, SDG 12 ensures sustainable consumption and production (SCP) patterns. This makes sustainable consumption a more important topic to be studied to help achieve the SDGs. Therefore, how to effectively promote sustainable consumption and harness the power of consumers to contribute to sustainable economic, social and environmental transformation are also issues worth studying.

Sustainable consumption is not about consuming less but consuming differently [8]. SCP is the integration of production, consumption, disposal and recycling processes [9] rather than focusing only on the quantity consumed. Especially in developing countries, sustainable consumption patterns should avoid reducing growth and undermining economic and social demand but rather increase social and economic prosperity by creating new markets and adopting appropriate policies and incentive structures, as well as stimulating better use of technology [10].

China has become the second-largest economy, with GDP per capita exceeding \$10,000 for two consecutive years in 2019 and 2020 [11]. The booming service sector, driven by continued consumption upgrades, reflects Chinese consumers' increased demand for high-quality consumption [12]. The sustainable consumption market in China has unleashed vast consumer potential. More and more Chinese consumers are waking up to sustainability awareness and are actively practicing sustainable lifestyles [13]. Therefore, it is essential to research sustainable consumption behavior in emerging markets in China. Dongying, a prefecture-level city in Shandong Province, joined the UNEP Partnership for Action on Green Economy (PAGE) program in 2016. As the first city in China to be selected for PAGE, Dongying actively summarizes, introduces, and disseminates the city's sustainable development practices to the international community through the UN platform, providing developing countries with experiences and examples to follow [14].

Current research on sustainable consumption behavior has concentrated on two theoretical approaches: environmental psychology and environmental sociology [15]. The former approach mainly considers the influence of internal subjective factors on individual behavior. For example, ecological attitudes, behavioral perceptions, self-efficacy, and other internal factors can form the consumer's self-motivation, promoting sustainable consumption behavior [16]. The latter considers the interactions between micro individuals and external context systems and argues that individuals' ideas and behavioral choices depend on the level of social and technological development [17]. Undeniably, the existing studies provide strong explanatory power for the reasons for implementing consumers' sustainable consumption behaviors and offer corresponding insights into promoting sustainable consumption.

However, a review of the previous literature reveals that existing studies have mainly analyzed the influencing factors of sustainable consumption behavior from a single perspective of internal motivation [18] or external contexts [19], lacking a systematic exploration of the decision-making mechanism of sustainable consumption behavior from a multidimensional perspective. In addition, some studies measured different types of sustainable consumption behaviors and aggregated them into one variable [20,21], the measurement that assumed different types of sustainable consumption behaviors occurred simultaneously and synchronously. In fact, different behaviors have very different requirements in terms of cost, capacity, and convenience [20], which may result in the same individual having different attitudes and behaviors toward different types of sustainable consumption.

Accordingly, based on the Theory of Planned Behavior (TPB) [22] and Attitude-Behavior-Context (ABC) theory [19], the study attempts to construct a theoretical framework (Figure 1) that includes internal motivations and external contexts to explore the influencing factors and the decision-making mechanism of sustainable consumption behaviors and analyze the heterogeneity among different types of sustainable consumption behaviors [23,24]. This will further provide a multidimensional approach to promoting consumption behavior's sustainable transformation. It may help inform policies for a sustainable transformation of consumer behavior in developing countries.

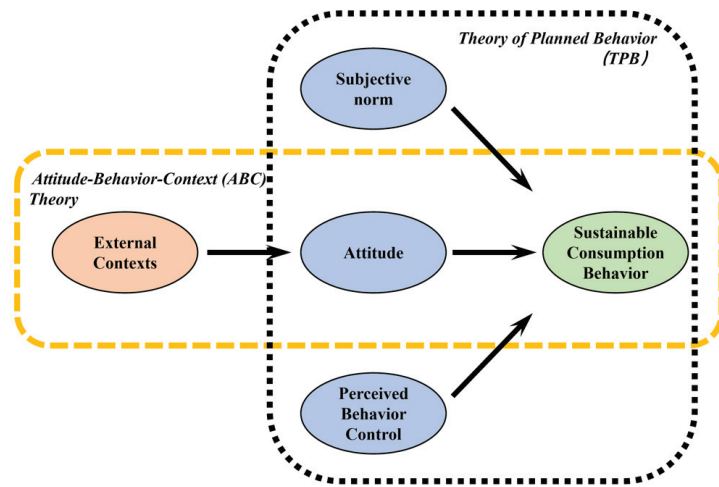


Figure 1. The theoretical framework of the TPB–ABC integration model; Source: authors.

2. Literature Review and Hypothesis Development

2.1. The TPB–ABC Integration Model

The Theory of Planned Behavior (TPB) proposed by Ajzen et al. in 1991 is a well-established theory of the “attitude–behavior” relationship [22]. It has good explanatory and predictive power for the mental decision-making process of goal-oriented behavior. According to TPB, an individual’s volitionally controllable behavior results from three internal motivational factors: attitude, subjective norm, and perceived behavioral control [25].

With the development of related research, TPB is considered insufficient to fully explain the complete mechanism of behavior implementation [26]. Since people face various external constraints and limitations when making behavioral decisions, internal motivations are not the only consideration. To improve the research, external contexts have been gradually incorporated into the study of sustainable consumption behavior [27]. The Attitude-Behavior-Context (ABC) theory is the leading theory used to examine the influence of external contexts on sustainable consumption behavior, which states that behavior (Behavior, B) is the result of the joint action of attitude variables (Attitude, A) and contextual factors (Context, C), and considers contextual factors as a crucial factor in determining whether an individual performs the behavior [19]. Many studies confirmed that adding contextual factors can make the model of consumer behavior explanation more complete [28–30].

A growing number of scholars attribute consumer behavior to the combined influence of internal motivations and external contexts, and the TPB–ABC integration model has emerged [31,32]. Wang et al. [33] explored the positive effects of policy instruments, as external contexts, on attitudes and environmental behavior by analyzing the results of a questionnaire survey of 1145 residents in Shanghai. Integrating TPB and ABC theories, Feng and Hua [34] demonstrated that internal motivations and external contexts are essential variables in predicting recycling behavior.

2.2. Sustainable Consumption Behavior (SCB)

Sustainable consumption refers to a natural, environmentally friendly, frugal, and healthy lifestyle that consumers fulfill under a more ecological and social development premise [35]. From the perspective of behavior, sustainable consumption behavior (SCB) is about the purchase of green products and the choice of green services and includes the use and recycling of products, with the fundamental purpose of protecting resources and the environment [36]. Therefore, SCB can also be seen as a category of personal environmental

behavior [37]. In summary, this study defines sustainable consumption behavior as having three sections: green purchase behavior, green transportation behavior and recycling and resource conservation behavior, which correspond to the acquisition, use and disposal of commodities, services, public goods and other means of subsistence by consumers.

2.3. Internal Motivations

SCB is both a consumption choice and an expression of internal motivations in individual behavior [38], consisting of attitudes (AT), subjective norms (SN) and perceived behavior control (PBC) [18]. Internal motivations influence people's behavioral decisions when they are faced with multiple available choices. It is also the most profound and fundamental psychological source that determines an individual's behavior [39]. Therefore, how individuals practice SCB is closely related to their internal motivations [40].

2.3.1. Attitude (AT)

Attitude is an essential internal motivational variable for SCB [41]. The sustainable consumption attitude refers to consumers' general and stable feeling or position toward SCB. The results of most empirical studies prove that a positive attitude has a facilitating effect on green product purchases [42], household recycling behavior [43], green transportation [44] and other SCB [45]. Based on the above discussion, the following hypotheses have been postulated:

H1a. *AT is positively related to green purchase behavior (PUR).*

H1b. *AT is positively related to green transportation behavior (TRAN).*

H1c. *AT is positively related to recycling and resource conservation behavior (REC).*

2.3.2. Subjective Norm (SN)

The TPB model's second determinant of behavior is SN [22]. It is defined as the perceived social pressure to perform or not to perform the behavior [46]. The purpose of this factor is to analyze the role of social pressure on an individual's decision to behave in a particular way, including the subject's specific perception of this passively imposed public opinion pressure and the subjective willingness to conform to this public opinion expectation [47,48]. Norm activation theory (NAT) has been applied to explain SCB, arguing that the direct antecedent of individuals' implementation of SCB is subjective norms [49–51]. A series of studies by social psychologists such as Schultz [52], Nolan [53] and Goldstein [54] have shown that individuals engage in SCB significantly more often when they are told that the vast majority of people or their surrounding neighbors are engaging in similar behaviors than when the benefits of environmental protection are simply promoted. Based on the above discussion, the following hypotheses have been postulated:

H2a. *SN is positively related to green purchase behavior (PUR).*

H2b. *SN is positively related to green transportation behavior (TRAN).*

H2c. *SN is positively related to recycling and resource conservation behavior (REC).*

2.3.3. Perceived Behavioral Control (PBC)

PBC reflects the role of past experiences and expected hindrances in influencing individuals' specific behavioral decisions [22]. Hines et al. [41] used meta-analysis to synthesize previous research on SCB and indicated that consumers who have PBC believe that they can influence the environment and are more inclined to adopt SCB.

PBC can be divided into two components: self-efficacy [55] and perceived controllability [56]. The former refers to the conviction that one could successfully perform a specific behavior based on the consumer's perceived effectiveness and knowledge of SCB. The latter is the individual's assessment of the impact of these factors in facilitating or hindering

specific behaviors [22]. Higher perceived behavioral controllability promotes SCB based on a survey of 626 consumers [57]. The findings of Kim et al. using structural model equations suggest that the higher the perceived behavioral controllability of consumers, the higher the likelihood of actually engaging in SCB [58]. Based on the above discussion, the following hypotheses have been postulated:

H3a. *PBC is positively related to green purchase behavior (PUR).*

H3b. *PBC is positively related to green transportation behavior (TRAN).*

H3c. *PBC is positively related to recycling and resource conservation behavior (REC).*

2.4. External Contexts

External contexts refer to individuals' objective factors when adopting a particular behavior [59]. Specifically, external contexts include advertising, government regulations, legal and institutional factors, material incentives and costs, technological constraints and the availability of infrastructure to support the behavior [60,61]. The external contexts, as the external environment faced by individual psychological factors, can create opportunities and generate constraints for forming personal attitudes and behaviors [19]. Many scholars found in their practical studies that external contexts play a significant role in promoting or hindering the implementation of SCB [19,62]. According to the promotion and inhibition of external contexts on individual behavior, this study divided the external contexts into positive contexts and negative contexts [21].

2.4.1. Positive Contexts (PC)

External contexts can positively influence the likelihood of individuals engaging in SCB [61]. According to Nudge Theory, policies can effectively drive individuals to make decisions in the direction that the government expects to be beneficial for the welfare of the whole society [63]. Policy regulations and measures positively influence people's SCB [64–66]. Financial incentives can also positively impact the SCB of the population. It was found that households that received financial incentives saved more on household electricity than those in the control group [67]. Cameron showed that if the government subsidy was equivalent to a 15% cost reduction, it could lead to 3% of households engaging in conservation and recycling behavior [68].

Since financial incentives are insufficient to positively guide SCB in the long term [69], guidance-based external contexts that intervene in SCB, such as advertising and communication education, are receiving increasing attention. Through humanistic communication, persuasion and presentation, advertising and education can improve consumers' awareness and understanding of SCB, facilitating its implementation of SCB. Publicly oriented advertising and education significantly impact SCB [70,71]. Based on the above discussion, the following hypotheses have been postulated:

H4a. *PC is positively related to green purchase behavior (PUR).*

H4b. *PC is positively related to green transportation behavior (TRAN).*

H4c. *PC is positively related to recycling and resource conservation behavior (REC).*

2.4.2. Negative Contexts (NC)

According to the ABC model, negative contextual factors increase if individuals perceive that performing a behavior is time-consuming, costly, or requires overcoming many difficulties [19]. Gifford [72] suggested that negative contextual factors such as the effort, monetary costs, facility availability, etc., required to engage in SCB may prevent such behaviors from occurring or turn them into impossible tasks. Miao and Wei [73] further confirmed the constraints of time and effort required to engage in SCB by excluding

motivation and awareness. Negative contexts can be considered an important influence on SCB [74]. Based on the above discussion, the following hypotheses have been postulated:

H5a. NC is negatively related to green purchase behavior (PUR).

H5b. NC is negatively related to green transportation behavior (TRAN).

H5c. NC is negatively related to recycling and resource conservation behavior (REC).

2.5. Internal Motivations as Mediators

Although internal motivations can predict SCB to some extent, such as green food purchase [75], energy conservation [76] and commodity recycling [77], many studies also confirmed the existence of inconsistencies between internal motivations and SCB [78,79]. Thus, other conditions may inhibit the transformation from internal motivations to behavior, resulting in an internal factors–behavior gap in SCB. Several studies confirmed from different perspectives that external contexts might influence the relationship between internal motivations and behavior. In other words, the effect of internal motivations on specific behaviors may depend on the strength of the external contexts [80], especially the constraints such as the effort, cost, or time required to adopt the behavior [19,81]. Based on the above discussion, the following hypotheses have been postulated:

H6. PC is positively related to AT.

H7. NC is negatively related to AT.

H8a. AT mediates the relationship between PC and PUR.

H8b. AT mediates the relationship between PC and TRAN.

H8c. AT mediates the relationship between PC and REC.

H9a. AT mediates the relationship between NC and PUR.

H9b. AT mediates the relationship between NC and TRAN.

H9c. AT mediates the relationship between NC and REC.

In summary, this study constructs a hypothesis model of consumer sustainable consumption behavior influence paths based on the TPB–ABC integration theory and sustainable consumption practices in Dongying, China, as shown in Figure 2.

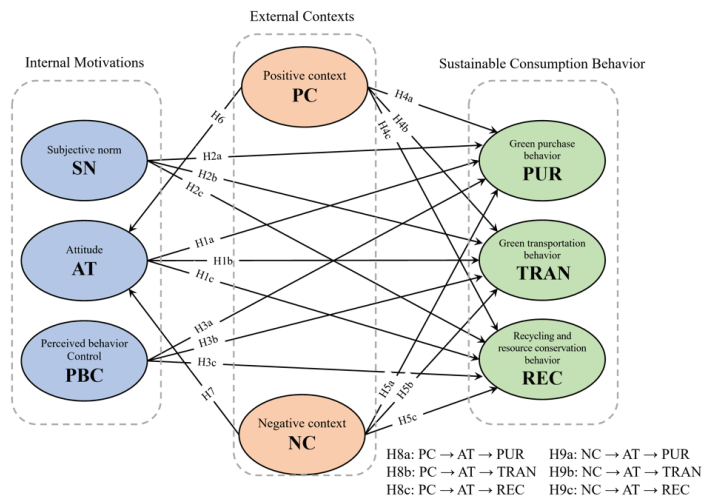


Figure 2. The hypothesis model of consumer sustainable consumption behavior influences paths.

3. Material and Method

3.1. Questionnaire Design

Based on the hypothesis model, a questionnaire on the factors influencing sustainable consumption behavior was designed using focus group discussions, on-site collection, expert evaluation and representative interviews. The pre-survey was first conducted in a street (subdistrict) in Dongying and a university in Beijing. The questionnaire was adjusted and improved for the formal survey regarding the pre-survey results to accurately and fully reflect the subjective views and practices of the respondents. The formal questionnaire contains eight latent variables, including positive context (PC), negative context (NC), attitude (AT), subjective norm (SN), perceived behavioral control (PBC), green purchase behavior (PUR), green transportation behavior (TRAN) and recycling and resource conservation behavior (REC), with each latent variable consisting of three measurement items. The measurement items were adapted from existing literature to ensure the scale's content validity. The specific items and their sources are shown in Table 1. All items were measured using a three-level scale (1 = disagree, 2 = neither agree nor disagree, 3 = agree). In addition to the 24 items above, individual characteristics such as gender, age, education level and monthly income were also included in the questionnaire, which consisted of a total of 32 items.

Table 1. Measurement item design of latent variables and observed variables.

Latent Variables	Measurement Items (Observed Variables)	Source
Positive context (PC)	Advertising and communication education makes me tend toward sustainable consumption. (PC1)	[70]
	Government regulations make me tend toward sustainable consumption. (PC2)	[82]
	Financial incentives make me tend toward sustainable consumption. (PC3)	[66]
Negative context (NC)	The high cost prevents me from implementing sustainable consumption. (NC1)	[83]
	Time-consuming prevents me from implementing sustainable consumption. (NC2)	[84]
	Lacking convenient infrastructure facilities prevents me from implementing sustainable consumption. (NC3)	[83]
Attitude (AT)	I think sustainable consumption is beneficial. (AT1)	[85]
	I think sustainable consumption is sensible. (AT2)	[84]
	I am willing to adopt sustainable consumption practices. (AT3)	[86]
Subjective norm (SN)	My family and most people important to me believe that sustainable consumption is the right thing to do. (SN1)	[85,87]
	My neighbors are active in sustainable consumption. (SN2)	[87]
	I agree that most celebrities I respect and admire are active in sustainable consumption. (SN3)	[88]
Perceived behavioral control (PBC)	I can make my own decisions about sustainable consumption. (PBC1)	[89]
	I can afford to take sustainable consumption. (PBC2)	[89]
	I have the knowledge and information for sustainable consumption. (PBC3)	[88]
Green purchase behavior (PUR)	I tend to buy second-hand items. (PUR1)	[70]
	I tend to buy energy-efficient appliances. (PUR2)	[70]
	I tend to buy green and organic food. (PUR3)	[70]
Green transportation behavior (TRAN)	I prefer public transportation. (TRAN1)	[90]
	I prefer to walk for short distances. (TRAN2)	[90]
	I prefer to adopt new energy vehicle. (TRAN3)	[90]
Recycling and resource conservation behavior (REC)	I am willing to implement waste separation. (REC1)	[91]
	I am willing to recycle used appliances. (REC2)	[92]
	I am willing to recycle used clothes. (REC3)	[91]

3.2. Data Collection

Dongying has a good policy environment and facility base for sustainable consumption and has committed to actively practicing sustainable development since joining the PAGE program of the UN in 2016. As a result, it was selected as a study area. In January 2018, our research team conducted a formal field survey among permanent residents in Dongying. The data was collected through a questionnaire survey. The formal survey adopted the Probability Proportionate to Size (PPS) Sampling method to select the sample. The specific sampling process was as follows. PPS was used to identify each district (two districts based on each district's share of the city's population), street (three per sample district, based on each street's share of each district's population) and community (two per sample street, based on each community's share of each street's population) drawn from the city. Communities were drawn using a random number table, resulting in the selection of 12 communities in the city. At the community level, systematic sampling was used to select household samples (sample size of no more than 45 per community, but calculated with a sample size of 55 in the systematic sampling process in case of blanking) and selected the members in the selected households whose birthday were closest to June 30th to answer the questionnaire face-to-face. A total of 586 questionnaires were collected, of which 552 were valid, with a return rate of 94.36%. After removing the missing values, a new database comprising 534 samples was obtained. The measurement software used in the data collation process for this study was R (version 4.2.0).

Four demographic variables commonly used in behavioral research—gender, age, education level and monthly income—were selected as sample characteristics (Table 2). The ratio of male to female respondents in the sample was approximately 4 to 6 (216:318). The age structure of the respondents shows a slightly aging trend, with 28.46% of the sample aged 55 and above, including 14.79% aged 65 and above, with most of the sample concentrated between 35 and 54 years old, with 28.84% aged 35 to 44 and 24.16% aged 45 to 54. 18.54% of the sample was under 34 years old. The age distribution of the sample is generally consistent with the distribution in Dongying. 17.23% of respondents had middle-high education or below (20%), more than one-third (38.58%) attended high school education, and 4 out of 10 respondents held college-level (21%) or university-level education (20%). A total of 0.94 percent attended post-graduate education or higher. In terms of monthly income, nearly three-quarters (74.16%) of the respondents had a monthly income between RMB 3000–8000, with only 2.43% of respondents earning more than RMB 10,000 per month. The overall distribution of education and monthly income is generally consistent with the actual situation of Dongying residents.

Table 2. Description of sample structure characteristic.

Variable	Type	Frequency	Proportion (%)
Gender	Male	318	59.55
	Female	216	40.45
Age	18–24	10	1.87
	25–34	89	16.67
	35–44	154	28.84
	45–54	129	24.16
	55–64	73	13.67
	>65	79	14.79
Education	Middle high or lower	92	17.23
	High school	206	38.58
	College	126	23.60
	University	105	19.66
	Post-graduate or higher	5	0.94
Monthly income (RMB)	<3000	40	7.49
	3000–5000	223	41.76
	5000–8000	173	32.40
	8000–10,000	85	15.92
	>10,000	13	2.43

3.3. Methodology

Partial Least Squares Structural Equation Modeling (PLS-SEM) [93–95] was adopted in this study, which does not require the data to obey a multivariate normal distribution and has significant advantages in dealing with complex models with a large number of explanatory variables and multiple correlations between variables [93]. Compared to covariance-based structural equations modeling (CB-SEM), PLS-SEM offers considerable convenience and flexibility in forecasting and is more useful in practical fields where application and practical forecasting control are valued. Since the sample data obtained from this investigation does not strictly obey a normal distribution and many variables in the study model and the relative complexity of the relationships involved, this study uses PLS-SEM for an exploratory study.

4. Findings

The data analysis procedures were modeled on the two-step reporting method suggested by Anderson and Gerbing [96], where the measurement model (relationship between each latent variable and related observed variables) was first evaluated. Then the structural model (association between latent variables) was assessed and analyzed. The software used for the data analysis was SmartPLS (version 3.3.9), developed by Ringle et al. in 2015 [97].

4.1. Measurement Model

In the PLS-SEM measurement model analysis, the main focus is on testing its reliability and validity. Reliability is the trustworthiness or stability of the values obtained from a test and is an indicator of the consistency of the measurement. The reliability tests were measured using three indicators: Cronbach's alpha, Composite reliability and Eigenvalues (Eig). The Cronbach's alpha indicator was introduced by Cronbach [98] in 1951 to respond to the internal consistency between measurement questions. According to the criteria proposed by Nunnally [99], a value of 0.7 or above for Cronbach's alpha is considered to be of high reliability in general exploratory studies. Composite reliability is another metric to assess the reliability of each measurement model. Composite reliability greater than 0.7 [100] is generally acceptable. As shown in Table 3, the Cronbach's alpha values for the measurement model range from 0.702 to 0.886, and the composite reliability values range from 0.835 to 0.930, all of which are above 0.7, which indicates that the internal consistency reliability of the scale indicators of the measurement model is acceptable. The eigenvalues (Eig) of the correlation matrix are another criterion indicating the appropriateness of the measured variable in reflecting the corresponding latent variable [95,101]. According to Sanchez [95], if the first eigenvalue in the correlation matrix is higher than 1 and the second eigenvalue is lower than 1, each group of indicators is in a unidimensional space. The measured variables in the measurement model all reflect the latent variables well. According to the results in Table 3, the first eigenvalues of the measurement models ranged from 1.886 to 2.448, and the second eigenvalues ranged from 0.419 to 0.686, indicating that the measured variables in all eight measurement models were a good reflection of these relevant latent variables.

Validity assessments focus on the measurement model's convergent validity and discriminant validity. As suggested by Anderson and Gerbing [96], convergent validity can be tested with validating factor analysis to determine whether each question item converges to the variable to be measured. According to Rumanti et al. [102], a measured variable is considered to have considerable explanatory power for a latent variable if the standardized factor loadings of the measured variable all exceed 0.7 or more. Furthermore, according to Ringle et al. [103] and Sanchez [95], the average variance extracted (AVE) value for all constructs needs to be above a threshold of 0.5 to satisfy the criterion of convergent validity of the latent variable. As shown in Table 3, the loadings for all measured variables ranged from 0.745 to 0.946, indicating a high degree of correlation between all measured variables and their associated latent variables; the average variance extracted for all constructs ranged from 0.628 to 0.816. For example, the AVE value for AT is 0.816, which means that AT1,

AT2 and AT3 explain 81.6% of the variance in the AT variable. Therefore, the convergent validity of this measurement model is acceptable.

Table 3. Reliability and convergent validity test of the measurement model.

Construct Identifier	Items	Outerloadings	Cronbach's Alpha	Composite Reliability	Eig 1st	Eig 2nd	AVE
PC	PC1	0.849	0.729	0.847	1.948	0.600	0.649
	PC2	0.782					
	PC3	0.785					
NC	NC1	0.855	0.820	0.891	2.212	0.530	0.731
	NC2	0.822					
	NC3	0.887					
AT	AT1	0.933	0.886	0.930	2.448	0.419	0.816
	AT2	0.946					
	AT3	0.826					
SN	SN1	0.824	0.746	0.854	1.991	0.541	0.662
	SN2	0.847					
	SN3	0.768					
PBC	PBC1	0.862	0.843	0.905	2.286	0.448	0.761
	PBC2	0.895					
	PBC3	0.859					
PUR	PUR1	0.824	0.721	0.843	1.929	0.634	0.642
	PUR2	0.822					
	PUR3	0.757					
TRAN	TRAN1	0.855	0.702	0.835	1.886	0.686	0.628
	TRAN2	0.774					
	TRAN3	0.745					
REC	REC1	0.784	0.774	0.868	2.070	0.574	0.687
	REC2	0.869					
	REC3	0.832					

As suggested by Hair et al. [93], discriminant validity was mainly assessed through cross-loadings and the Fornell–Larcker criterion. Cross-loadings refer to the contribution of a question item to other latent variables, and discriminant validity is considered acceptable when the indicator's loadings on the relevant constructs are more significant than all its loadings on the other constructs. As shown in Table 4, using the PC to construct an example, the loading values of PC1, PC2 and PC3 with the latent variable positive context (CC) were 0.849, 0.782 and 0.785, which were all greater than 0.5 and significantly exceeded the cross-loadings values with other latent variables such as negative context (NC) and perceived behavioral control (PBC). This indicates that the model has good discriminant validity among the latent variables. Meanwhile, according to the Fornell–Larcker criterion [104], when the square root of the AVE of each construct is greater than the correlation coefficient between the latent variable and the other variables, the discriminant validity of the measurement model distinction is acceptable. In this model, the square root of AVE on the main diagonal of Table 5 is much higher than the non-diagonal values. Therefore, the discriminant validity between the latent variables in this model is good.

Table 4. Cross-loadings values for each block of indicators.

	AT	NC	PBC	PC	PUR	REC	SN	TRAN
AT1	0.933	−0.221	0.252	0.238	0.408	0.258	0.163	0.317
AT2	0.946	−0.224	0.237	0.244	0.430	0.261	0.156	0.335
AT3	0.826	−0.225	0.174	0.217	0.287	0.225	0.088	0.259
NC1	−0.254	0.855	−0.304	−0.156	−0.236	−0.341	−0.142	−0.085
NC2	−0.164	0.822	−0.406	−0.160	−0.167	−0.213	−0.086	−0.087
NC3	−0.195	0.887	−0.424	−0.072	−0.164	−0.264	−0.074	−0.115
PBC1	0.203	−0.256	0.862	0.201	0.271	0.179	0.070	0.290
PBC2	0.243	−0.397	0.895	0.131	0.196	0.217	−0.012	0.216
PBC3	0.204	−0.484	0.859	0.122	0.291	0.228	−0.034	0.205
PC1	0.224	−0.122	0.166	0.849	0.250	0.236	0.151	0.147
PC2	0.213	−0.174	0.156	0.782	0.203	0.212	0.207	0.166
PC3	0.185	−0.070	0.098	0.785	0.273	0.141	0.179	0.143
PUR1	0.361	−0.169	0.276	0.263	0.824	0.292	0.114	0.236
PUR2	0.297	−0.215	0.243	0.204	0.822	0.256	0.184	0.176
PUR3	0.349	−0.163	0.184	0.249	0.757	0.252	0.153	0.126
REC1	0.172	−0.230	0.205	0.154	0.227	0.784	0.036	0.034
REC2	0.241	−0.271	0.205	0.191	0.243	0.869	0.055	0.113
REC3	0.260	−0.306	0.186	0.252	0.345	0.832	0.094	0.085
SN1	0.157	−0.135	−0.012	0.211	0.155	0.061	0.824	0.182
SN2	0.103	−0.097	0.014	0.161	0.178	0.093	0.847	0.162
SN3	0.115	−0.059	0.029	0.167	0.112	0.029	0.768	0.158
TRAN1	0.308	−0.130	0.222	0.153	0.197	0.092	0.165	0.855
TRAN2	0.248	−0.026	0.224	0.205	0.185	0.077	0.167	0.774
TRAN3	0.247	−0.111	0.204	0.080	0.152	0.059	0.156	0.745

Table 5. Discriminant validity matrix (Fornell–Larcker criterion).

	AT	NC	PBC	PC	PUR	REC	SN	TRAN
AT	0.903							
NC	−0.246	0.855						
PBC	0.247	−0.433	0.872					
PC	0.258	−0.152	0.175	0.806				
PUR	0.421	−0.227	0.294	0.300	0.802			
REC	0.275	−0.329	0.238	0.246	0.334	0.829		
SN	0.153	−0.122	0.011	0.221	0.185	0.078	0.814	
TRAN	0.339	−0.111	0.274	0.188	0.226	0.097	0.205	0.792

Note: Values (bold) on the diagonal represent the square root of the AVE while the off-diagonals are correlations.

4.2. Structural Model

In the structural model analysis section, first, the validity of the structural model was assessed using R^2 (predicted effect value) and Q^2 (predicted correlation) [96]. In terms of the overall model fit, the R^2 of the general model was 0.731, indicating that the latent variables explained 73.1% of consumers' sustainable consumption behavior, which was greater than 50%, proving that the model assumptions were reasonable and the model fit was good. The Q^2 values for the four endogenous latent variables ranged from 0.084 to 0.157, which met the criterion of >0 , indicating that the structural model was valid.

Furthermore, according to the Goodness of Fit (GoF) formula ($GoF = \sqrt{communality \times \bar{R}^2}$) proposed by Tenenhaus et al. [105], this metric is used to indicate the degree of fit between the simulation results and the actual measurements. Studies have shown that GoF values above 0.26 are considered to have good applicability in areas such as social and behavioral sciences [106]. The GoF value for this model was calculated to be 0.356, indicating a good model fit.

In order to assess the coefficients and significance of each path proposed in the research model, the paths were recalculated after 5000 replicate samples were taken based

on the Bootstrapping method. The model validation results are shown in Table 6 and parameter paths of the hypotheses in the model are shown in Figure 3. Overall, 12 of the 17 hypotheses for direct effects were supported. There was a significant positive effect of AT on PUR ($\beta = 0.312, p < 0.000$), TRAN ($\beta = 0.262, p < 0.000$) and REC ($\beta = 0.312, p < 0.001$). Hypotheses H1a, H1b and H1c were all supported. SN has a significant positive effect on both PUR ($\beta = 0.095, p < 0.017$) and TRAN ($\beta = 0.160, p < 0.000$) but not on REC ($\beta = -0.012, p < 0.793$). Hypotheses H2a and H2b were supported, but H2c was not supported. PBC also had a significant positive effect on both PUR ($\beta = 0.170, p < 0.001$) and TRAN ($\beta = 0.233, p < 0.000$) and no significant effect on REC ($\beta = 0.068, p < 0.157$). Hypotheses H3a and H3b were supported but H3c was not. PC had a significant positive effect on PUR ($\beta = 0.162, p < 0.001$), REC ($\beta = 0.159, p < 0.001$) and AT ($\beta = 0.226, p < 0.000$), but no significant effect on TRAN ($\beta = 0.057, p < 0.268$). NC had a significant positive effect on REC ($\beta = -0.237, p < 0.000$) and AT ($\beta = -0.212, p < 0.000$) had a significant negative effect, but no significant effect on PUR ($\beta = -0.040, p < 0.347$) and TRAN ($\beta = 0.083, p < 0.095$). Therefore, H4a, H4c, H5c, H6 and H7 were all supported and H4b, H5a and H5b were not supported.

Table 6. Hypothesis testing of the structural model.

Hypotheses	Path	Estimate	Standard Error	T-Value	p Value	95%CI	Results
H1a	AT → PUR	0.312	0.053	5.886	0.000	[0.206, 0.412]	Supported
H1b	AT → TRAN	0.262	0.043	6.129	0.000	[0.182, 0.350]	Supported
H1c	AT → REC	0.161	0.050	3.235	0.001	[0.061, 0.256]	Supported
H2a	SN → PUR	0.095	0.040	2.388	0.017	[0.020, 0.176]	Supported
H2b	SN → TRAN	0.160	0.044	3.642	0.000	[0.078, 0.248]	Supported
H2c	SN → REC	-0.012	0.044	0.262	0.793	[-0.097, 0.075]	Not Supported
H3a	PBC → PUR	0.170	0.052	3.275	0.001	[0.068, 0.273]	Supported
H3b	PBC → TRAN	0.233	0.048	4.824	0.000	[0.139, 0.329]	Supported
H3c	PBC → REC	0.068	0.048	1.415	0.157	[-0.025, 0.162]	Not Supported
H4a	PC → PUR	0.162	0.050	3.237	0.001	[0.066, 0.261]	Supported
H4b	PC → TRAN	0.057	0.052	1.108	0.268	[-0.043, 0.157]	Not Supported
H4c	PC → REC	0.159	0.046	3.475	0.001	[0.070, 0.250]	Supported
H5a	NC → PUR	-0.040	0.043	0.940	0.347	[-0.124, 0.041]	Not Supported
H5b	NC → TRAN	0.083	0.050	1.668	0.095	[-0.015, 0.178]	Not Supported
H5c	NC → REC	-0.237	0.049	4.842	0.000	[-0.333, -0.141]	Supported
H6	PC → AT	0.226	0.053	4.225	0.000	[0.117, 0.325]	Supported
H7	NC → AT	-0.212	0.037	5.724	0.000	[-0.279, -0.135]	Supported

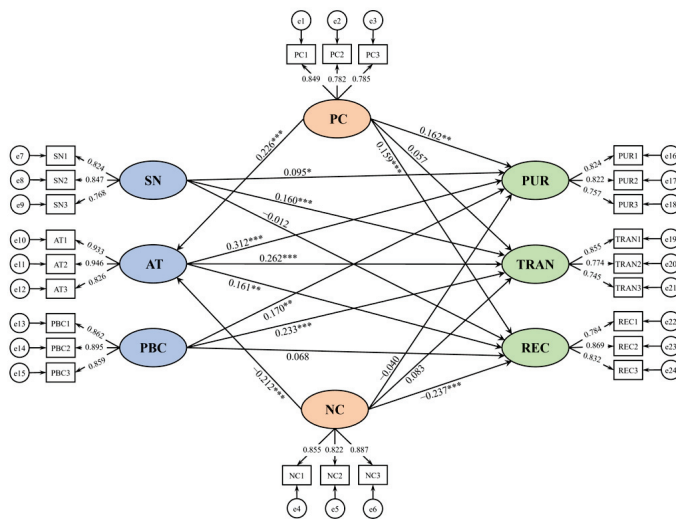


Figure 3. Parameter path of the structural equation model standardized path coefficient estimates (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

The mediation effect (indirect effect) was also calculated using the Bootstrapping method after 5000 replicate samples. As shown in Table 7, the results demonstrated that the mediation effect of PC has a significant positive impact on the relationships between AT and PUR ($\beta = 0.071, p < 0.001$), TRAN ($\beta = 0.059, p < 0.003$) and REC ($\beta = 0.036, p < 0.012$). NC has a significant negative impact on the relationships between AT and PUR ($\beta = -0.066, p < 0.000$), TRAN ($\beta = -0.055, p < 0.000$) and REC ($\beta = -0.034, p < 0.008$). Thus, all six hypotheses regarding mediation effects (H8a, H8b, H8c, H9a, H9b, H9c) were supported.

Table 7. The path coefficient result of mediating effect model.

Hypotheses	Path	Estimate	Standard Error	T-Value	p value	95%CI	Results
H8a	PC → AT → PUR	0.071	0.021	3.370	0.001	[0.032, 0.113]	Supported
H8b	PC → AT → TRAN	0.059	0.020	2.991	0.003	[0.025, 0.102]	Supported
H8c	PC → AT → REC	0.036	0.015	2.501	0.012	[0.010, 0.067]	Supported
H9a	NC → AT → PUR	-0.066	0.016	4.228	0.000	[-0.098, -0.037]	Supported
H9b	NC → AT → TRAN	-0.055	0.016	3.526	0.000	[-0.090, -0.028]	Supported
H9c	NC → AT → REC	-0.034	0.013	2.637	0.008	[-0.062, -0.011]	Supported

5. Discussion

This study divides sustainable consumption behavior into three sectors: green purchase behavior, green transportation behavior and recycling and resource conservation behavior. The influence paths of internal motivations and external contexts are investigated on different sustainable consumption behaviors. Meanwhile, the validity of the TPB-ABC integrated model as a research model to explain consumers' sustainable consumption behavior is confirmed, which is in line with the conclusion of previous studies [31,32,34].

As mentioned earlier, these three sectors of sustainable consumption behaviors are all positively or negatively influenced by both internal motivation and external contexts, but the paths of influence are different. For green purchase behavior, SN, AT and PBC of internal motivation positively influence behavior, with AT considered the most critical determinant ($\beta = 0.312$). This indicates that consumers' subjective preferences for green purchase behavior directly influence their implementation of this behavior. This is in line with Tan's study [107]. PC in external contexts can directly contribute to the formation of green purchase behavior. However, the effect of NC on consumers' green purchase behavior was not statistically significant. Therefore, it can be inferred that advertising, government regulations and financial incentives are positively associated with green purchase behavior. Still, high cost, time consumption and lack of infrastructure are indirect constraints on green purchase behavior. The results also suggest that attitude plays a mediating role in the relationship between external context and behavior. In other words, PC indirectly motivates green purchase behavior by promoting the formation of consumer attitudes towards sustainable consumption. Although NC does not directly limit green purchase behavior, the attitude is susceptible to the negative influence of NC, thus limiting the occurrence of green purchases. A possible explanation is suggested by the low-cost hypothesis [108]. The smaller the perceived negative context in which the behavior is engaged in a given situation, the greater the likelihood that attitudes will be transformed into actual behavior.

The second section of sustainable consumption in this study is green transportation behavior. According to the measurement results, external contexts do not directly influence green transportation behavior, unlike green purchases. Still, PC and NC can have a modestly positive and negative influence on green travel, respectively, with attitude

as a mediator. This is consistent with behavioral reasoning theory (BRT) findings that consumers use positive or negative psychological processes or paths to make consumption decisions [18]. The reasonable reason is that the advertising, policy regulation and economic incentives for green transportation in China are developing reasonably with a better social atmosphere forming. At the same time, public transportation in China is cheap and timesaving, so the constraints on green transportation might not come from the external context. Therefore, the indirect effect of the external context on green transportation is mainly caused by subjective attitudes. In addition to AT, the other two internal motivations, SN and PBC, also positively impact green transportation.

The significant effects of PC ($\beta = 0.159$) and NC ($\beta = -0.237$) on recycling and resource conservation behavior suggest that, on the one hand, the policy context, advertising and economic incentives of recycling and resource conservation directly promote consumers to perform this behavior in China. On the other hand, waste separation facilities are not complete, and consumers still have to overcome many constraints, such as time and effort, when implementing waste separation. Unlike the first two sections, neither SN nor PBC significantly affects recycling and resource conservation among internal motivations. The above findings are corroborated by the relevant studies of Meng et al. [109].

6. Conclusions

Promoting the transformation of consumers' consumption patterns is a crucial breakthrough in promoting sustainable development. Unlike previous studies, this study constructs a theoretical framework that includes both internal motivations and external contexts to explain the decision-making mechanism of consumers' sustainable consumption behaviors. The conclusions show that, in general, attitudes significantly influence the implementation of sustainable consumption behaviors, while attitudes are positively and negatively affected by positive and negative contexts, respectively. The strength of the effects of each influencing factor on different sectors of sustainable consumption behaviors varied slightly. For green purchase and green transportation behaviors, the impact of internal motivations is higher than the external contexts' and becomes the most important influencing factor. In contrast, consumers' recycling and resource conservation behaviors are more influenced by external contexts. In addition, attitudes are partially mediated between external contexts and sustainable consumption behaviors.

The theoretical implications of this study are reflected as follows. First, two critical variables influencing sustainable consumption behavior, internal motivations and external contexts, are verified. Consumers' sustainable consumption behavior can be effectively motivated by internal motivations; at the same time, when consumers perceive that external contexts have positive or negative effects on their behavior, they will increase or decrease their sustainable consumption behavior accordingly. Second, this study extends the theory of planned behavior (TPB) and Attitude-Behavior-Context (ABC) theory to sustainable consumption. By developing to the micro and macro levels and systematically exploring the factors influencing sustainable consumption behavior, the theories become more effective in explaining the implementation process of consumers' sustainable consumption behavioral decision-making mechanisms.

The findings of this study have the following implications for urban authorities to develop measures to motivate citizens to implement sustainable consumption behaviors. Firstly, relevant authorities should work to reduce or eliminate negative contexts that prevent consumers from participating in sustainable consumption behaviors. For example, relevant authorities should strive to improve the appropriate infrastructure, such as increasing the number of sorting bins recycling service staff to make it more convenient for consumers to participate in sustainable consumption behavior. Secondly, the government and companies should provide incentives or promotional strategies to reduce the high costs of sustainable consumption, such as reducing taxes or lowering the prices of environmentally friendly products. Finally, the internal drivers of consumers cannot be ignored, as some negative contexts for sustainable consumption behavior are long-standing

and objective. Therefore, in such a realistic situation, policymakers should take some effective measures to foster consumers' attitudes toward sustainable consumption, such as strengthening publicity and education to enhance their level of perceived behavioral control. By improving sustainable consumption attitudes, the adverse effects of negative situations that are difficult to overcome in the short term can be reduced. An internal driving mechanism for sustainable consumption can be formed over a long time.

The limitations of the study are as follows. Firstly, because of the limited number of influencing factors identified in this study, the behavioral decision-making mechanism established can only partially explain the occurrence of sustainable consumption behavior, which can be discussed in more depth in future studies. Secondly, the research methodology also needs improvement. Although the sample was randomly selected from the residents of Dongying and the findings are close to the actual situation, as a study of Chinese consumers, this study's sample size and representativeness are still limited. Thirdly, due to the difficulty of obtaining actual observed data on individual sustainable consumption behavior, this study assesses consumers' sustainable consumption behavior based on the self-report measure commonly used in the previous literature. Thus, it cannot effectively avoid the measurement error caused by the inconsistency between the subjective reports of respondents' behavior and their actual objective behavior.

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Article

Agricultural Development’s Influence on Rural Poverty Alleviation in the North Buton Regency, Indonesia—The Mediating Role of Farmer Performance

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Abstract: Low productivity and farmer business competitiveness are central issues for agricultural development and rural poverty alleviation. This study aimed to determine the influence of agricultural development on rural poverty alleviation. Data were obtained from farmers’ groups in the North Buton Regency in 2019 using questionnaires and analyzed using AMOS. The results showed that agricultural development improves farm business performance and influences rural poverty alleviation. Farm business performance leads to rural poverty alleviation. The influence of agricultural development on rural poverty alleviation was magnified when supported by improved farm enterprise performance. Therefore, agricultural development is the flagship program for poverty alleviation of rural farmers in the North Buton Regency.

Keywords: agricultural development; farm business performance; farmer resources; poverty alleviation; rural infrastructure facilities

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1. Introduction

Poverty alleviation and income distribution disparity are fundamental problems and a primary goal of development policy (Asian Development Bank (ADB) 2012; Bappenas 2014; United Nations 2011). This is because poverty reduces the community’s quality of life and the productivity of human resources (Alkire 2007; Barro and Lee 2013). The conditions create a chain of cause and influence known as the poverty cycle (Gao et al. 2020). This cycle may continue because low-income people cannot access education, health, and adequate food (Ajayi et al. 2011; (Asian Development Bank (ADB) 2012); United Nations 2011).

Government agencies have implemented poverty reduction initiatives, but poverty in the North Buton Regency still exists. This is because the policies have not been influential enough to reduce poverty. Murdiansyah (2014) claimed that poverty reduction might be influenced by reliance on macroeconomic growth, charity, inattentiveness to the indicators, poverty characteristics, and a lack of sustainability in implementing policy centralization and uniformity.

The Statistics Central Bureau stated that the population of the North Buton Regency in 2019 was 62,197 people, of which 14.26% were poor. This causes the regency to have the highest percentage of poor people in Southeast Sulawesi Province. The statistical data showed that poverty is an acute problem. This necessitates a faster and more appropriate approach to poverty alleviation in the regency. One of the poverty reduction program strategies is rural agricultural development. Most poor people live in rural areas, with their income coming mainly from the agricultural sector and other traditional economic activities (Bappeda Buton Utara 2019).

The North Buton Regency has 6 districts, 59 villages, 8 sub-districts, and 3 transmigration settlement units. A total of 62,088 people mostly work as subsistence farmers in the food crops, plantations, and traditional fishing sub-sectors. Potential resources for non-irrigated rice fields, gardens, and fields are 2332 ha, 15,279 ha, and 14,894 ha, respectively, while 10,321 ha are uncultivated (Bappeda Buton Utara 2019). Moreover, the

agricultural land is fertile, and the work ethic of farmers is high. Based on data related to the potential of agricultural resources and most of the population living as farmers, agricultural development is necessary to increase its production and farmers' income, as well as lift the population out of poverty.

The infrastructure development of roads, bridges, docks, and village markets is insufficient. Farmers cannot increase production, which is limited to the sub-district area. Furthermore, external economic forces are not included, the community's economy is limited to production, and the technology used is traditional. The system for implementing business activities is traditional subsistence, because farmers lack farming skills. Therefore, the production, quality, and selling prices reduce the farmers' income and increase poverty.

Infrastructure facilitates the marketing of agricultural production, fertilizers, and medicines to increase farm productivity. It also facilitates the accessibility of field agricultural extension workers (PPL) in fostering and training farmers to improve their farming skills, increasing their production and work ethic. Moreover, infrastructure facilitates the farm laborers' accessibility, enabling farmers to obtain labor from land processing to post-harvest to increase agricultural productivity in rural areas. It also enhances the marketing of agricultural production at high selling prices and the low cost of transporting its products to the marketing center. This increases farmers' income and economic growth in rural areas.

Robbins and Coulter (2016) stated that strengthening farmer resources increases ability, promotes willingness, and makes farmers independent in improving their farming performance. According to Sedarmayanti (2017), farmer empowerment improves the ability to carry out farming business, developing its infrastructure facilities and easy access to knowledge, technology, and information; strengthening farmer institutions; and increasing production. As a result, it increases farmers' income and tackles poverty in rural areas.

Hasan et al. (2017) showed that agricultural land in the rural area of the North Buton Regency is fertile, with indicators that without fertilization, it could produce a high production. Farmers have a high work ethic, indicating that they work about 8–10 h daily on the farm. The production, quality, and selling price of agricultural production are low, reducing farmers' income and increasing poverty. This contradicts the economic theory, which states that when the land for farming is fertile and the farmers' work ethic is high, agricultural productivity and farmers' income increase (Todaro and Smith 2015).

Karimuna et al. (2009) showed that agricultural productivity growth in rural areas in the North Buton Regency has a large role for conventional input factors. For instance, land, labor, and livestock, which optimize conventional input factors, increase rural farmers' income. Modern input factors, such as machinery, advanced chemical technology, and genetics, increase agricultural productivity insignificantly. This finding contradicts Rozelle and Swinnen (2004), who stated that the development of innovation and modern technology increases agricultural productivity and farmers' income. Furthermore, agricultural technology promotes the improvement of welfare and alleviates the poverty of the rural population.

Soraya (2018) showed that rural farmers in the North Buton Regency have actual and potential resources related to ownership of an institutional relationship network, friendship, and mutual sympathy. They also have relations forming a social work group, such as cooperation in the agricultural sector and a high farmer work ethic. However, the social capital built from community culture has not impacted agricultural productivity and rural farmers' income. This contradicts the sociological theory of agriculture that social and cultural aspects have economic value that could be institutionalized based on mutual knowledge and recognition. It is the ability to work together to face problems and achieve group goals that results in increasing agricultural productivity and the rural farmers' income (Coleman 1998; Syahra 2003).

The vital role of agricultural development in the North Buton Regency was shown by its 29.64% contribution to the Gross Domestic Product (GDP) in 2019. The agricultural sector employed 42.52% of labor in the same year. These facts are in line with Edward

and Sumner (2015), who stated that agricultural development creates opportunities, boosts income generation, and alleviates rural poverty. Therefore, this study aimed to determine:

1. The influence of agricultural development on improving farming performance in the North Buton Regency,
2. The influence of agricultural development on rural poverty alleviation in the North Buton Regency, and
3. How the increase of farming performance alleviates rural poverty in the North Buton Regency.

Many studies were conducted on agricultural development in Indonesia (Christiansen et al. 2011), but none linked farm enterprises' performance to agricultural development for poverty alleviation. Therefore, this study contributes significantly to literature in this field. The variables of agricultural development, farm business performance, and poverty alleviation were measured using a subjective approach (Cummins 2000).

2. Methodology

2.1. Population and Sample

The study population comprised 78 people from all villages in the North Buton Regency. A total of 10 villages were selected randomly as samples distributed across six sub-districts. This size was based on Byrne (2010), stating that the typical sample size in SEM studies is 12% of the total population. This study randomly took 10 farmers of each village, resulting in 100 respondents.

2.2. Variables

4. Exogenous or independent variables were agricultural development (X), development of rural agricultural infrastructure facilities (X1), and farmers' human resource development (X2), linked to farm enterprises' performance (Y1) and poverty alleviation (Y2).
5. Endogenous variables included farm business performance (Y1) and poverty alleviation (Y2), influenced by agricultural development (X).
6. The moderate variable of farm enterprises' performance (Y1) mediates the influence of agricultural development (X) on rural poverty alleviation (Y2) in the North Buton Regency.

2.3. Data Analysis

Data were analyzed using Structural Equation Modeling (SEM), selected as the model of this multivariate study (Creswell 2009). SEM consists of one exogenous variable of agricultural development and two endogenous variables of farm enterprises' performance and poverty alleviation. The relationship between variables is shown in Figure 1. The data were analyzed by descriptive and inferential statistics with the following estimating model:

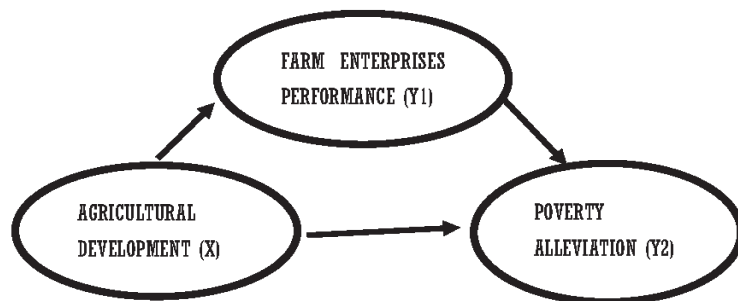


Figure 1. Relationship between Variables.

The analysis model of this study refers to Byrne (2010) as follows:

7. The measurement model analysis shows the validity and reliability of each indicator in measuring the variables (Ferdinand 2014)
8. The Confirmatory Factor Analysis (CFA) tests whether indicators measure variables based on the loading factor value. Agus and Sagir (2001) stated that a loading factor value (λ) ≥ 0.2 is valid in measuring variables.
9. The SEM model indicators measurement refers to the criteria of Santoso (2011), as shown in Table 1:

Table 1. Goodness-of-Fit Index.

No.	Goodness-of-Fit Index	Cut of Value
1.	Degree of Freedom (Df)	Positive
2.	Chi-Square	Expected to be small
3.	Probability (P)	>0.05
4.	CMIN/DF	≤ 3.00
5.	The goodness of Fit Index (GFI)	Close to 1
6.	Adjusted Goodness of Fit Index (AGFI)	Close to 1
7.	Root Mean Residual (RMR)	Close to 0
8.	Normed Fit Index (NFI)	Close to 1
9.	Comparative Fit Index (CFI)	Close to 1
10.	Tucker–Lewis Index (TLI)	Close to 1
11.	ParsimonyRatio (PRATIO)	Between 0 and 1
12.	Root Mean Square Error of Approximation (RMSEA)	>0.08

2.4. Procedure of the SEM Analysis

The analysis was conducted using the following steps (Byrne 2010; Hair et al. 2017) in Table 2.

Table 2. Steps of the Measurement Model Analysis.

Step 1	Identify individual construct
Step 2	Develop and specify the model of measurement
Step 3	Test the measurement model (<i>measurement model analysis</i>)
Step 4	Check the validity of the model; valid or invalid
Step 5	Test the structural model
Step 6	Set the ultimate structural model

3. Results

3.1. Formation of the Indicators Variable

3.1.1. Agricultural Development

Agricultural development is influenced by the development of the rural agricultural infrastructure facilities (X1) and rural farmers' resources (X2) variables (Asian Development Bank (ADB) 2012; Monchuk 2014; United Nations 2011; Koutsampelas and Polycarpou 2013). Therefore, the construct formation of each variable is as follows:

Rural Agricultural Infrastructure Facilities Development

The development of rural agricultural infrastructure facilities showed four constructs with a high loading factor that improve farm business performance. Therefore, it impacts the poverty alleviation of rural farmers, as shown in Figure 2.

The results in Figure 2 show that constructing roads, dams, reservoirs, bridges, and piers and expanding agricultural land and the availability of fertilizers and medicines in rural areas increase agricultural production. This was indicated by the regression coefficients of 0.82, 0.81, 0.74, and 0.80. The first positive effect was enhanced agricultural production facilities and infrastructure, enabling farmers to increase their farming land productivity. The second impact was improved accessibility of agricultural field instructors (PPL) in providing counseling to improve farmers' farming skills and work ethics and

increase their farming business production. The third effect was increased accessibility of laborers, enabling farmers to carry out farming activities easily, from land processing to post-harvest.

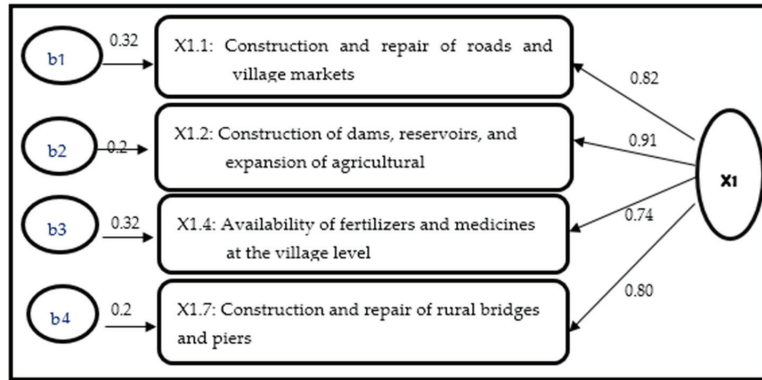


Figure 2. Final Indicators for the Development of Rural Infrastructure Facilities.

Rural Farmer Resource Development

The rural farmer resource development variable with the highest loading factor was used in the final measurement model. The loading factor value varied from 0.74 to 0.82. The rural farmer resources variable’s development improved farm business performance, affecting poverty alleviation. Figure 3 shows the final measurement of the rural farmer resource development construct.

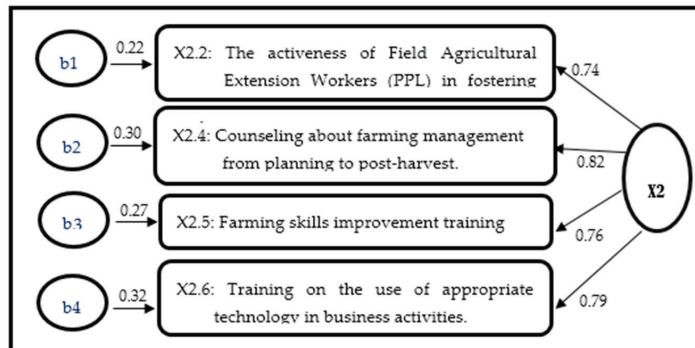


Figure 3. The Final Indicator of the Rural Farmer Resource Development.

The results in Figure 3 show that agricultural extension workers foster and train farmers and improve farm management. They contribute to improving farming skills and increasing agricultural production in the North Buton Regency, as shown by the positive regression coefficients of 0.74, 0.82, 0.76, and 0.79. The production also increases due to agricultural intensification and extensification programs supported by rural infrastructure development. This increases farmers’ accessibility to capital and information resources, increasing production at reasonable prices at the farmer-level. The result is improved farm business performance and farmers’ income.

3.1.2. Improved Farm Business Performance

The modified analysis showed that increased farm business performance was included in the four indicators with the highest loading factors of Y1.3, Y1.4, Y1.6, and Y1.9. Therefore,

the observable construct with the most significant loading factor was used in the last measurement. The analysis for rural agricultural infrastructure facilities and rural farmer resource development showed the path model for improving farm business performance, as presented in Figure 4.



Figure 4. Final Indicators of Improved Farm Business Performance.

Figure 5 shows that rural infrastructure and farmer resource development increase farm performance in the North Buton Regency. This was shown by the increased quality of farm production and the market share of agricultural production, with regression coefficients of 0.80 and 0.89, respectively. Furthermore, the effect was shown by increased farmer groups and farming skills, as well as the price of agricultural production, with regression coefficients of 0.86 and 0.90, respectively. Therefore, agricultural development through infrastructure and farmer resource development significantly improves farm business performance. This was indicated by increased production, farmers' income, and rural poverty alleviation.

3.1.3. Poverty Alleviation

The construct fit test for all indicators showed that the path coefficient significantly exceeded the recommended regression weight of 0.50 (Hair et al. 2017). The four indicators represented the overall variation of the poverty alleviation variable. Therefore, the poverty alleviation construct could be valid (Hair et al. 2017). The variable analysis for each construct that affects rural poverty alleviation is seen in the path coefficients in Figure 5:

The results showed that improving farming performance alleviates rural poverty. The variable indicator showed that farmers provide three meals daily for all members with a regression coefficient of 0.90. They buy cooking utensils, chairs, cupboards, and televisions with a regression coefficient of 0.90 and 0.91. Every year, farmers buy one new pair of clothes for all family members, indicating that the income is also increasing, as shown by the regression coefficient of 0.82. Furthermore, infrastructural development reduces transportation costs for agricultural production and increases farmers' accessibility to capital resources and production inputs. The development also facilitates the accessibility of extension workers (PPL), increasing production. There is an additional investment, increasing market demand and farmers' income and alleviating poverty for the rural population of the North Buton Regency.

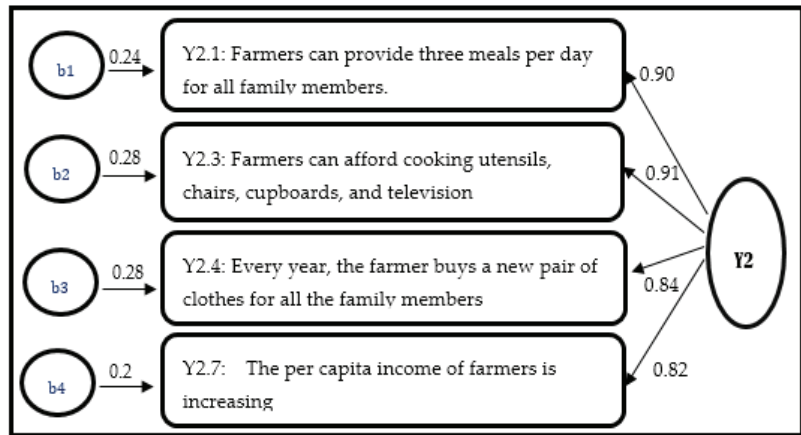


Figure 5. Final Indicators of Rural Poverty Alleviation.

3.2. Structural Modelling

3.2.1. The Influence of Agricultural Development on Improving Farm Business Performance

Agricultural development by improving rural agricultural infrastructure facilities and farmers’ resources significantly improves farm business performance, with a path coefficient of 0.94. Figure 6 shows how rural farm business performance is affected by agricultural development through rural agricultural infrastructure facilities (X1) and rural farmer resource development (X2).

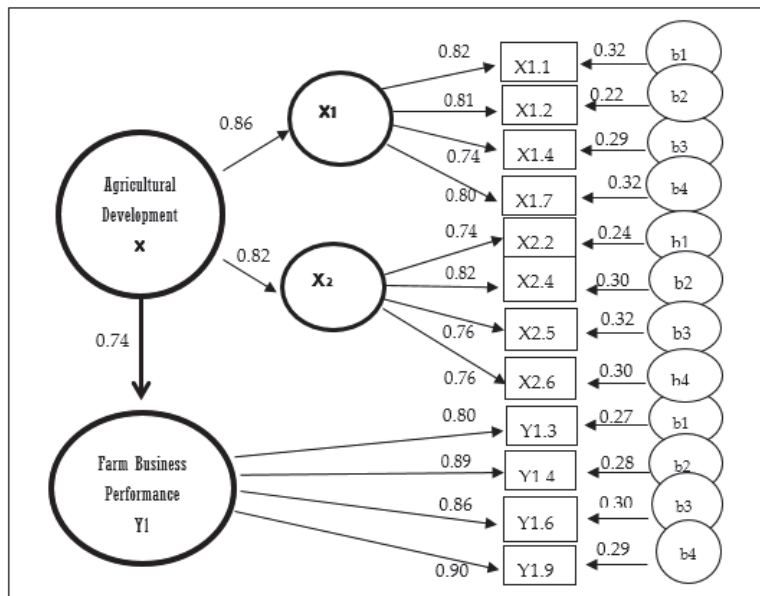


Figure 6. Structural Model for the Influence of Agricultural Development on Improving Farming Business Performance.

Previous studies found that agricultural infrastructure development and farmers’ human resources improve farming performance (Clark 2005). This study also found that

the agricultural development constructs improve farm business performance with a path coefficient of 0.74. Statistical values relating to goodness-of-fit are given in Table 3.

Table 3. Goodness-of-Fit Agricultural Development on Farm Business Performance.

Measures of Goodness-of-Fit		Result	Limit Value	Fit?	Fit Level
Chi-square	χ^2	22.54			
Probability	P	0.019	≥ 0.01	✓	Good
Normed chi square	χ^2/df	2.06	< 3.0	✓	Good
The goodness of Fit Index	GFI	0.96	≥ 0.90	✓	Good
Adjusted Goodness of Fit Index	AGFI	0.92	≥ 0.90	✓	Good
Tucker–Lewis Index	TLI	0.98	≥ 0.95	✓	Good
Comparative Fit Index	CFI	0.99	≥ 0.95	✓	Good
Standardized Root Mean Square Residual	SRMR	0.02	≤ 0.05	✓	Good
Root Mean Square Error Approximation	RMSEA	0.07	≤ 0.08	✓	Good

Source: Processed data.

Many studies pointed to the crucial role of human resources quality in alleviating poverty. They showed the influence of investment in rural farm infrastructure facilities on reducing rural poverty (Clark and Alkire 2008).

3.2.2. The Influence of Agricultural Development on Poverty Alleviation

Agricultural development positively alleviates rural poverty, with a path coefficient of 0.76. Figure 7 shows the influence of agricultural development on rural poverty alleviation.

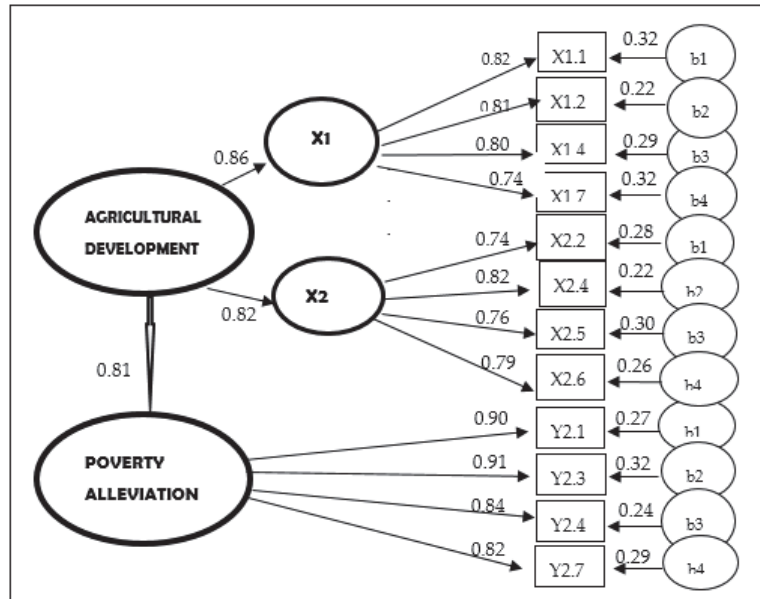


Figure 7. The Influence of Agricultural Development on Rural Poverty Alleviation.

From Figure 7, the agricultural development variable significantly affected rural poverty alleviation in the North Buton Regency, with a path coefficient of 0.76. The fit index in Table 4 shows that all fit indices were good, meaning that the dimensions of the development of agricultural infrastructure facilities and farmers’ human resource development alleviate poverty.

Table 4. Goodness-of-Fit of the Influence of Agricultural Development on Poverty Alleviation.

Measures of Goodness-of-Fit		Results	Limit Value	Fit?	Fit Level
Chi-square	χ^2	17.12			
Probability	P	0.019	≥ 0.01	✓	Good
Normed chi square	χ^2/df	2.48	< 3.0	✓	Good
The goodness of Fit Index	GFI	0.95	≥ 0.90	✓	Good
Adjusted Goodness of Fit Index	AGFI	0.91	≥ 0.90	✓	Good
Tucker–Lewis Index	TLI	0.97	≥ 0.95	✓	Good
Comparative Fit Index	CFI	0.98	≥ 0.95	✓	Good
Standardized Root Mean Square Residual	SRMR	0.03	≤ 0.05	✓	Good
Root Mean Square Error Approximation	RMSEA	0.08	≤ 0.08	✓	Good

Source: Analysis results.

The findings show that enhancing the quality of human resources highly determines poverty reduction. A positive extension to farmers using modern farming reduces poverty levels (Cervantes-Godoy and Dewbre 2010). Moreover, studies suggested that increasing investment in rural agricultural infrastructure reduces rural poverty (Clark and Alkire 2008). The construction of village roads and agricultural production facilities significantly impact farm business productivity and the selling price of farm goods.

3.2.3. The Influence of Improved Farm Business Performance on Poverty Alleviation

Improving infrastructure facilities in rural areas lowers the transportation cost of agricultural produce to marketing hubs. Agricultural production facilities obtained at low prices and the increasingly effective agricultural extension raise the production and quality of agricultural production. They also increase the selling price of rural farm business production, this improves agricultural business performance and increases the per capita income of rural farmers, reducing poverty. The structural model of the relationship between the latent variables: farm business performance (Y1) and poverty elevation (Y2) with the manifest variable is shown in Figure 8.

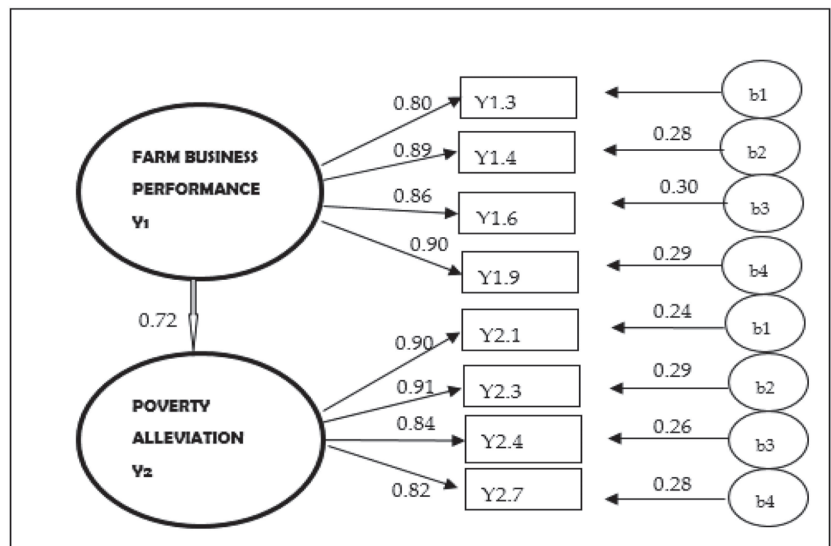


Figure 8. Structural Model for the Influence of Improved Farm Business Performance on Rural Poverty Alleviation. Source: Processed data.

Figure 5 shows the influence of improved farm business performance on rural poverty alleviation in the North Buton Regency, with a path coefficient value of 0.81. The fit index in Table 5 shows that all fit indices were good, meaning that improving the farm business performance alleviates rural poverty.

Table 5. Goodness-of-fit of Farm Business Performance and Poverty Alleviation.

Measures of Goodness-of-Fit		Results	Limit Value	Fit?	Fit Level
Chi-square	χ^2	22.67			
Probability	P	0.019	≥ 0.01	✓	Good
Normed chi-square	χ^2/df	2.30	≤ 3.0	✓	Good
The goodness of Fit Index	GFI	0.96	≥ 0.90	✓	Good
Adjusted Goodness of Fit Index	AGFI	0.92	≥ 0.90	✓	Good
Tucker–Lewis Index	TLI	0.97	≥ 0.95	✓	Good
Comparative Fit Index	CFI	0.98	≥ 0.95	✓	Good
Standardized Root Mean Square Residual	SRMR	0.03	≤ 0.05	✓	Good
Root Mean Square Error Approximation	RMSEA	0.07	≤ 0.08	✓	Good

Source: Processed data.

Increasing productivity through agricultural intensification and extensification supported by infrastructure development facilitates farmers' accessibility, fertilizer and medicine marketing, and reasonable prices. Additionally, increasing farmer resources to improve farming skills and work ethic increases agricultural production and the farmers' income and alleviates poverty.

Alkire (2007) stated that poverty is likened to a dead knot and tangled thread with no end. For instance, poverty caused by low agricultural productivity has implications for the low farmers' income. It causes a lack of consumption costs, malnutrition, vulnerability to diseases, low education level, labor productivity, and capital investment. This circle would continue to rotate and last until the poverty chain is removed. One factor determining breaking the rural poverty chain is the government's intervention through agricultural infrastructure development policies. The policies could help increase agricultural productivity and the farmers' incomes and eradicate poverty.

3.3. Final Structural Model Formation

The structural model of agricultural development against poverty alleviation by improving farm business performance consisted of two exogenous, two endogenous, and 16 observed variables. Exogenous variables were the construction of agricultural infrastructure facilities and farmers' human resources development. Rural farmers' human resources impact farm business performance, affecting poverty alleviation. The structural relationship between the three latent variables: farm business performance (Y1), agricultural development (X) and poverty elevation (Y2) with their manifest variables is shown in Figure 9.

The goodness-of-fit indices for the structural model showed a GFI value of 0.87 and an AGFI value of 0.83. The RMSEA value was 0.09, higher than the recommended limit value of 0.08, and the SRMR value of 0.03 showed a good fit. Agricultural development through infrastructure and farmer resource development significantly and positively influences farm business performance. This was indicated by increased agricultural production, farmers' income, and reduced rural poverty in the North Buton Regency. Table 6 shows the goodness-of-fit index of structural models.

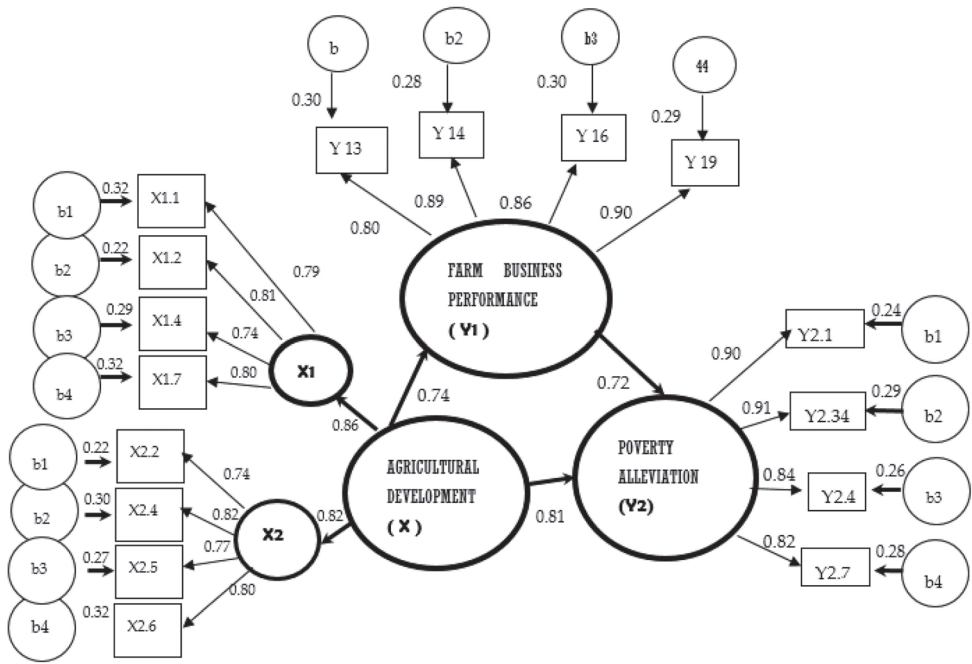


Figure 9. The Final Structural Model for how Agricultural Development Influences Rural Poverty Alleviation through Improved Farm Business Performance.

Table 6. Final goodness-of-fit for the agricultural development’s influence on poverty alleviation through improved farm business performance.

Measures of Goodness-of-Fit		Result	Limit Value	Good Fit?	Fit Level
Chi-square	χ^2	108.03			
Probability	P	0.022	≥ 0.01	✓	Good
Normed chi-square	χ^2/df	2.671	< 3.0	✓	Good
The goodness of Fit Index	GFI	0.95	≥ 0.90	✓	Good
Adjusted Goodness of Fit Index	AGFI	0.95	≥ 0.90	✓	Good
Tucker–Lewis Index	TLI	0.96	≥ 0.95	✓	Good
Comparative Fit Index	CFI	0.96	≥ 0.95	✓	Good
Standardized Root Mean Square Residual	SRMR	0.03	≤ 0.05	✓	Good
Root Mean Square Error Approximation	RMSEA	0.06	≤ 0.08	✓	Good

4. Hypothesis Test

4.1. Direct Test

Based on the hypothesis test in the SEM model, agricultural development influences rural poverty alleviation by improving farm business performance. Table 7 summarizes the hypothesis test of the direct influence between variables.

Table 7. Data Analysis Results.

Path	Path Coefficient	Prob.	Status	Description
Agricultural Development → Farm Business Performance	0.74	0.019	Sig	Accepted
Agricultural Development → Poverty Alleviation	0.81	0.011	Sig	Accepted
Farm Business Performance → Poverty Alleviation	0.72	0.019	Sig	Accepted

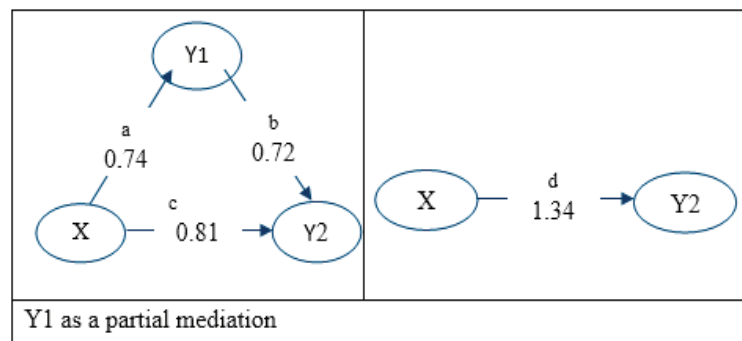
4.2. Mediating Influence of Farm Business Performance (Indirect Influence)

Agricultural development's influence on rural poverty alleviation in the North Buton Regency through the mediation of farm business performance was analyzed using the path coefficient difference approach (Solimun 2012).

The mediating variable on farm business performance was identified by comparing the influence of agricultural development on rural poverty alleviation without a mediating variable to the one involving a mediating variable (Hair et al. 2017).

The results in Figure 10 show the influence of agricultural development on rural poverty alleviation:

- The direct influence of agricultural development (X) on rural poverty alleviation was (Y_2) = $c = 0.81$
- The indirect influence of agricultural development (X) on rural poverty alleviation was (Y_2) = $a \times b = 0.74 \times 0.72 = 0.53$.
- The total influence of agricultural development (X) on rural poverty alleviation was (Y_2) = $d = c + a \times b = 0.81 + 0.53 = 1.34$.

**Figure 10.** Mediating Variable Test.

The influence of agricultural development on rural poverty alleviation is more significant when supported by improved farm business performance. This was indicated by the difference in the path coefficient, where the direct influence of agricultural development on poverty alleviation was 0.52. When the influence was made through improved farm business performance, the path coefficient rose to 0.95 or 95%. Therefore, this result shows that agricultural development significantly influences poverty alleviation mediated by improved farm business performance in the North Buton Regency.

5. Conclusions and Recommendations

5.1. Conclusions

Agricultural development mediated by the construction of rural infrastructure facilities and the development of farmers' resources improves farm business performance. The development mediated by agricultural infrastructure facilities and rural farmers' resources

affects rural poverty alleviation. Furthermore, improving the agricultural business performance significantly influences rural poverty alleviation in the North Buton Regency. This means that agricultural development directly and indirectly influences rural poverty alleviation.

5.2. Recommendation

Improved farm business performance could indicate agricultural development. Therefore, a policy plan should be established that positions agriculture as a superior sector in economic growth and as a critical tool for alleviating rural poverty in the North Buton Regency. A rural poverty alleviation strategy could be stimulated by constructing infrastructure, such as roads, bridges and piers, village markets, dams, and convexes. This should continue with rural farmers' resource development by activating field agricultural extension workers (PPL), improving agricultural business skills starting from business planning to post-harvest, and training farmers on agricultural processing. The purpose is to increase agricultural business performance and alleviate rural poverty. The rural residents' social capital could be a source of strength and valuable resources in agricultural development for poverty alleviation. Furthermore, the trust between community components facilitates communication and rural agricultural development planning. The social networking of farmers by agricultural organizations and individual networks supports the movement of collectivity actions for agricultural development and rural poor people empowerment. Similarly, norms and institutions are rural areas' policies and value systems that control and maintain rural agricultural development. Since social capital could leverage agricultural performance, it should be sustained, favoring the rural areas' agricultural development and poverty alleviation in the regency.

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Article

Exploring Information and Communication Technologies as Driving Forces in Hotel SMEs Performance: Influence of Corporate Social Responsibility

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Abstract: This paper aims to analyze whether Corporate Social Responsibility (CSR) can be considered as a mediator variable on the relationship among Information and Communication Technologies (ICT) adoption and SMEs performance in the hotel industry due to the lack of general consensus on the direction of this relationship. Furthermore, future expectations about the economic cycle might be a determining factor in business decision-making. Therefore, we also analyze whether these expectations influence hotel managers to adopt CSR strategies and, indeed, influences on the hotel's performance. To this end, partial least squares structural equation modeling (PLS-SEM) is applied to a sample of 117 Spanish hotel SMEs. These results have practical implications in considering ICT adoption as a source of competitive advantage that will facilitate the implementation of CSR practices in hotels, thus improving firm performance.

Keywords: corporate social responsibility; future expectations; ICT adoption; hotel performance; partial least square structural equation modelling (PLS-SEM)

MSC: 62P20

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1. Introduction

The hospitality industry remains one of the most dynamic sectors closely linked to the development of new technologies [1,2]. Rapid development of information and communication technology (ICT) has brought about a radical change in the conditions of the hotel market, as it provides these companies with new tools for management and for adding value to their customers' experience [3]. The literature on the influence of ICT on firm performance is extensive and shows a significant positive influence [4–6], especially in SMEs [7,8]. However, in the hotel sector, this relationship is not so evident [9]. Some researchers argue that ICT adoption is a factor of competitive advantage [10], enabling increased hotel performance [11]. On the other hand, other authors consider that ICT adoption is not directly aimed at improving hotel performance, but that these innovative systems are aimed at improving customer service and increasing the number of services offered, which will increase production costs and consequently decrease firm performance [12].

ICT adoption is also seen as an essential tool for the development of socially responsible business practices [13], as it provides new tools that allow organizations to implement socially responsible projects that improve their relationship with the environment and their stakeholders [14]. Therefore, this type of technology has become very important in the hotel industry, as this industry has been continuously criticized for its lack of environmental consideration in the development of its activities [15].

In this context, several systematic gaps remain in the literature about the relationship between ICT adoption and SMEs performance in the hospitality industry, as the results obtained in past research are controversial and there is no general agreement on the direction of this relationship [9]. Consequently, this paper considers this research gap and analyzes the indirect effect of ICT adoption on hotel SMEs performance through Corporate Social Responsibility (CSR) in order to find out whether CSR can be considered as a transcendental tool that defines the meaning of this relationship.

On the other hand, future expectations about the economic cycle is a determining factor in business decision-making, as it allows managers to predict what the future situation of their organisation will be [16]. Consequently, it is important for companies to incorporate these future projections into their business models [17]. However, despite its importance, the effects of future expectations of the macroeconomic business environment have hardly been studied in the literature, and even less so in the hotel sector. Therefore, the next purpose of this study is to analyze whether or not the consideration of future expectations of the macroeconomic business environment influences hotel managers to adopt CSR strategies.

Therefore, the next research questions are posed: Does ICT adoption influence hotel SMEs performance? Is this relationship mediated by CSR? Do future expectations influence the adoption of CSR-related strategies? Does CSR influence hotel SMEs performance? To address these research questions, under a double confirmatory and predictive perspective, a Partial Least Squares Structural equation modeling (PLS-SEM) was applied to a sample of 117 hotel SME companies in Spain.

The introductory section is followed by Section 2, which theoretically develops the hypotheses. Section 3 presents methodological aspects and Section 4 presents results. Finally, Section 5 discusses these results and presents the main conclusions.

2. Literature Review

In order to survive in the current competitive era of globalization, SMEs have relied on ICT adoption to compete with large companies [18,19]. As the main driver of development and innovation in the modern world, ICTs have emerged as a key factor of development and innovation. The literature on the influence of ICTs on performance is extensive and shows a significant positive influence [4–6], especially in SMEs [7,8]. However, in the hotel sector, this relationship is not so evident. Some researchers argue that ICT adoption is a competitive advantage factor [10], as it enhances the consumer experience [20], which can increase hotel performance [11]. However, other authors do not identify ICT adoption as a critical success factor in achieving exceptional firm performance [21]. This is because they consider that ICT adoption may not increase hotel performance [9,22], as the adoption of ICT is not directly aimed at improving productivity, but these innovative systems are intended to improve customer service and increase the number of services offered [12]. In addition, investments in technologies stimulates the company to improve product quality, which will increase production costs and consequently decrease firm performance [12]. With these considerations, we develop our first research hypothesis as follows:

Hypothesis 1 (H1). *ICT adoption improves SMEs performance in the hospitality industry.*

ICT adoption is also seen as an essential tool for the development of socially responsible practices in business [13], as it provides new tools that enable organisations to implement socially responsible projects that improve their relationship with the environment and their stakeholders [14]. It should be emphasized that the hotel industry is continually criticized for its lack of environmental consideration in the development of its activities [15]. Thus, the implementation of practices that promote CSR in hotels is a constant concern in the current empirical literature [23]. Thus, hotel establishments as a whole are incorporating environmental and social standards as essential instruments of business strategy [24]. In this context, ICT adoption are of great importance, as they

facilitate the implementation of CSR-related strategies and enable these initiatives to be carried out effectively [13,25].

Using ICT, hotel SMEs can access the necessary resources to implement and disseminate their CSR practices. Thus, through the Internet, they will be able to know the demands of their stakeholders much better and communicate to society the CSR actions they carry out, thus improving their reputation. Also, considering that energy consumption generates significant environmental challenges [26], through the use of ICTs, hotel SMEs will be able to calculate their carbon footprint and implement actions to reduce it. Moreover, hotel SMEs can monitor and control energy services such as lighting, heating, ventilation, or air conditioning through Building Management Systems. This technology guarantees their operation at efficiency and savings levels. Therefore, by applying this technology, hotel SMEs can improve their environmental contribution by reducing their impact on the environment.

Based on the above, we propose the following research hypothesis:

Hypothesis 2 (H2). *ICT adoption has a positive effect on the implementation of CSR practices by SMEs in the hotel industry.*

The environmental problems caused by the hotel sector have led researchers in recent years to show great interest in analysing the influence of CSR on the performance of hotels [27–29]. The implementation of CSR practices has been shown to improve firm performance [30,31] because CSR will promote the good reputation of the company [32], making it more attractive in the labour market, which will attract more investors [33], increase its profitability [34], reduce operating cost [35] and market values [36]. Against this background, one of the most important debates in the hotel industry is the analysis of this relationship [30]. The fundamental question addressed by researchers in this field is whether or not the performance of companies in this sector that are actively engaged in CSR initiatives outperforms other hotel companies that do not show the same degree of implementation [37]. We therefore put forward the following research hypothesis:

Hypothesis 3 (H3). *The implementation of CSR practices has a positive impact on SMEs performance in the hospitality industry.*

More and more companies are incorporating ICT for sustainable development into their business practices [38]. This is because ICT adoption can facilitate the implementation of CSR practices and their dissemination by promoting the three key dimensions of sustainability (people, environment and benefits) in hotel companies [13]. All this, in turn, will generate certain sustainable competitive advantages, which will make it more attractive in the market, because it will promote good reputation [32], and attract more investors [33], which will lead to an increase in yields [34]. Therefore, part of the impact of ICT adoption on firm performance would be transmitted through CSR [29]. However, this mediating effect has not yet been examined in the hotel sector. Consequently, we formulate the following research hypothesis:

Hypothesis 4 (H4). *The implementation of CSR practices mediates on the relationship among ICT adoption and SMEs performance in the hospitality industry.*

Future expectations about the economic cycle might influence the organisational decision-making, as it allows managers to predict what the future situation of their company will be [16]. It is important for companies to incorporate future projections into their business models [17], as trends in production, consumption, investment, etc. generate uncertainty in their business process [39]. On the other hand, to properly assess the viability of an enterprise, stakeholders require information on every significant aspect of their operations, in addition to data on the company's financial situation, determine if other material aspects of the undertaking's business have been considered, especially with regard to the

strategies put in place to deal with the economic, social and environmental dimensions of the business [40]. In this context, future expectations about the sector of activity in which the company operates are considered to be of great relevance [41]. However, despite their importance, the effects of Future expectations about the macroeconomic business environment have barely been studied in the literature, especially in the hotel sector.

Based on previous research, we can relate the expected adjustment in the economy to the performance of hotel SMEs. In periods of economic uncertainty, the tourism sector, including hotel companies, is one of the first to suffer negative consequences. As a result, many customers decide to postpone or cancel their travel plans [42,43]. Thus, the economic crisis that began in 2007 severely impacted international tourism, causing a significant decline in international tourism [42]. In line with this, Song et al. [44] have demonstrated that economic conditions are the most important factor in determining the demand for hotel rooms in Hong Kong. In recent years, Ozdemir et al. [45] have shown how COVID-19 has had a large negative impact on US hotel revenues.

Therefore, it is hypothesized:

Hypothesis 5 (H5). *Future expectations about the macroeconomic business environment influence the implementation of CSR practices by SMEs.*

Figure 1 reflects the research model developed to test our hypotheses. The model aims to determine the mediating effect of the implementation of CSR practices on the influence of ICT adoption on hotel SMEs performance and whether CSR is influenced by future economic expectations.

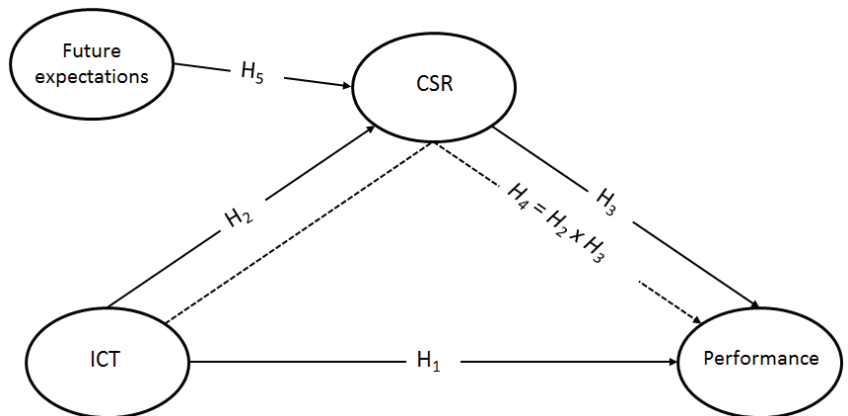


Figure 1. Conceptual model and hypotheses.

3. Methodology

3.1. Sample

This paper focuses on the Spanish hospitality industry. The population of this study is formed by a group of SMEs Spanish Hotel firms from all over Spain selected randomly from the SABI database. The fieldwork was carried out during the first quarter of 2018. A total of 150 companies SMEs were requested to take part in the investigation. The final sample was made up of 117. So, the response rate was 78 per cent. The following strata were established based on the size: micro companies are those with less than ten employees, small companies are between ten and forty-nine employees, and medium-sized companies are those with fifty and two hundred and forty-nine employees. Table 1 shows the composition of the selected companies, and the survey’s technical data are presented in Table 2.

Table 1. Sample distribution.

Total of Companies		Micro Sized Companies		Small Sized Companies		Medium Sized Companies	
Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
117	100.00%	30	25.64%	72	61.4%	15	12.82%

Table 2. Fieldwork technical sheet.

Study Universe	4306 hotel companies in Spain
Geographical area	Spain
Method of collected data	Structured questionnaire by telephone to managers
Sample unit	Managers
Sample	117 companies
Level of participation	78%
Measurement error	9.27
Confidence level	95%, $z = 1.96$; $p = q = 0.5$
Sampling procedure	Simple random sampling
Type of population	Finite sample

According to Nitzl et al. [46], using the software G*Power 3.1.9.5 for a model like this, with four constructs and four relationships between them, if the average effect size is assumed to obtain a power of 0.80, an effect size of 0.15 and an alpha level of 0.05, the minimum sample required is 76 cases [47]. Therefore, our sample exceeds the threshold number of observations needed to estimate the proposed model with confidence, and then we can identify significant relationships.

Empirical research was conducted through a questionnaire that was given directly to general managers of the hotels. This research decided to choose general hotel managers for the survey because they are the people who have a global view of how organizations are changing in response to the introduction of ICT and, more importantly, CSR. Normally, they are responsible for hotel strategic development, including business strategy and ICT and CSR alignment [48].

To minimize the social acceptance bias, in conducting the survey, the anonymous nature of the responses has been ensured [49]. Similarly, to exclude the existence of no response bias, the sample was divided into two groups: a first group with 83.2% of the first responses and the remaining responses in the second one. The ANOVA test for all the variables found no significant differences between the two groups. Finally, a pre-test was carried out in 20 hotels in order to ensure that the questionnaire was easily understandable.

As a result of the data having been collected from a single source and that this could be a potential source for common method bias [50,51], the results on variance inflation factors (VIF), which will be shown later, were analyzed. These results are smaller than 3 (the highest value obtained in this model is 1.04). Based on this result, it can be affirmed that there is no problem arising from the common method bias [52,53].

3.2. Variables

Since none of the defined constructs is directly observable, measurement scales consisting of a number of indicators were developed. Table 3 presents the indicators chosen for each construct.

3.2.1. ICT Adoption

In order to measure how ICT are adopted in the hospitality industry, a latent variable with five indicators adapted from previous research was created [54–56]. These indicators were measured on a scale ranging from 1 (minimum importance) to 5 (greatest importance).

3.2.2. CSR

In line with Gallardo-Vázquez et al. [57], CSR was assessed by a latent variable with seven indicators formulated from the most current and important theories relating to CSR's

social, economic, and environmental activities [58–60]. The indicators of the CSR dimension were measured on a scale ranging from 1 (absolutely disagree) to 5 (absolutely agree).

Table 3. Constructs and dimensions used in the research.

Construct	Indicator	Description
ICT adoption	ICT 1	Own website
	ICT 2	E-commerce platform
	ICT 3	Active presence in social networks
	<i>ICT 4</i>	<i>CRM programs for customer management</i>
	ICT 5	ERP applications for integrated production management
CSR	CSR 1	CSR policy dissemination
	CSR 2	Social and economic aims
	CSR 3	<i>Activities to reduce energy consumption</i>
	CSR 4	Effective recycling measures
	CSR 5	<i>Image and reputation of the company</i>
	CSR 6	Transparency
	CSR 7	Work with local suppliers and raw materials
Future expectations	FUT	Confidence and expectations in the economic environment
Performance	PERF 1	Product quality
	PERF 2	Internal processes
	PERF 3	Customer satisfaction
	PERF 4	Adaptability
	PERF 5	Growth
	PERF 6	Profitability

The indicators in italics were not included in latent variables due to convergent and/or discriminant criteria of PLS path modeling. All the measures were Likert-type scales.

3.2.3. Future Expectations

This time, hotel managers were directly asked to rate their confidence and expectations about the immediate future on a scale ranging from 0 (very bad) to 10 (very good).

3.2.4. Performance

Hotels performance was evaluated with a scale created from previous research [61–63]. We have considered the financial dimension (three items) and the non-financial dimension (five items), in which the company's position with respect to its competitors is contrasted, which allows us to measure business success better than with accounting information [62]. A scale that ranges between 1 (absolutely disagree) and 5 (absolutely agree) was used to measure the items of the two established dimensions.

3.3. Statistical Procedure

This study adopted a confirmatory and explanatory approach [64]. For this purpose, using SmartPLS 3.3.2 software (SmartPLS GmbH, Boenningstedt, Germany) [65], the statistical technique of partial least squares (PLS), a variance-based structural equation modelling (SEM) [66], was used to validate the hypotheses developed in our model.

PLS-SEM was chosen for the following reasons: First, this model contains first-order composite type A, and a definitional relationship between the latent variables and their items is assumed in this model [64]. For this reason, PLS-SEM is considered the most appropriate static method to be applied when the latent variables are composites [67]. Second, this technique is the most appropriate to apply in a theory approach, such as that in the present research. The reason is based on the possibility of estimating multiple relationships between the variables [68], especially if they involve mediation. Moreover,

it accounts for measurement errors in the constructs [69]. Third, PLS-SEM is also recommended in situations where a large sample size is not available [70]. As recommended by Henseler et al. [71], a bootstrapping technique with 10,000 subsamples was used to verify the hypotheses.

4. Results

We have assessed our PLS model in three stages: (1) Overall model, (2) measurement model and (3) structural model, in line with [72].

4.1. Overall Model: Test of Goodness-of-Fit (GoF)

Following Henseler et al. [73], since our research has a confirmatory purpose, we began the analysis of the estimated model using PLS-SEM to test various measures of overall goodness of fit (Gof). Table 4 shows the results of these tests.

Table 4. Test of model fit.

	Estimated Model		Saturated Model	
	Value	HI99	Value	HI99
SRMR	0.080	0.108	0.080	0.106
d_{ULS}	1.091	1.593	1.078	1.532
d_G	0.398	0.469	0.397	0.466

Standardized root mean square residual (SRMR). Unweighted least squares discrepancy (d_{ULS}). Geodesic discrepancy (d_G).

In the first place, the standardized root mean square residual (SRMR) index shows a value of 0.08, which is at the limit proposed by Hu and Bentler [72,73]. In addition, we performed several model fit tests (SRMR, d_{ULS} , d_G) using bootstrap-based inference statistics. Table 4 shows how under the bootstrap-based 99% (HI99) percentile, the discrepancy between the empirical and the model-implied correlation matrix is not significant [74]. Therefore, in view of the findings, it is possible to state that the model’s general goodness of fit is successful [75].

4.2. Measurement Model Assessment

In order to assess the measurement model of all reflective first-order constructs, the reliability and convergent validity of the constructs were verified. For this purpose, we estimated the factor loadings, Cronbach’s Alpha, composite reliability, the Dijkstra-Henseler rho ratio, and the average variance extracted (AVE) [68,76,77]. The results are shown in Table 5. For this purpose, we have followed the recommendations established by Valls Martínez et al. [78]. Following the popular rule of thumb [79], the individual reliability of the items was assessed through the standardized factor loadings. All factor loadings except two were found to be above the recommended factor loading of 0.707 [80]. Regarding the two values below the recommended factor, their values are higher than 0.63. Therefore, the reliability of the single items is considered to be adequate [81].

The constructs reliability was evaluated by calculating Cronbach’s alpha coefficients and composite reliability through Dijkstra–Henseler’s and Jöreskog’s indices. As described in Table 5, Cronbach’s alpha and CR values ranged between 0.741 and 0.895. Hence, all the values satisfied the minimum criterion value established on 0.70 [52]. Thus, the scale can be considered reliable. In addition, in order to test the convergent validity of the scales, the average variance extracted (AVE) was examined. The results show that the AVE coefficient for the constructs is greater than 0.5, supporting the convergent validity of the reflective scales [82].

Table 5. Descriptive statistics, reliability and validity of measures.

	Mean	SD	Loading	T ***	Q _B ²	α	ρ _A	ρ _C	AVE
ICT adoption						0.741	0.774	0.830	0.552
ICT 1	4.197	1.397	0.716	4.451					
ICT 2	2.368	2.381	0.679	3.158					
ICT 3	3.376	2.050	0.837	4.916					
ICT 5	2.137	2.418	0.730	3.550					
CSR						0.807	0.831	0.866	0.567
CSR 1	3.667	0.978	0.773	11.413	0.044				
CSR 2	3.709	0.925	0.736	10.694	0.046				
CSR 4	3.855	0.857	0.637	4.911	0.057				
CSR 6	3.949	0.846	0.871	26.222	0.032				
CSR 7	4.179	0.791	0.727	8.572	0.062				
Future expectations									
FUT 1	6.375	1.582			0.022				
Performance						0.860	0.863	0.895	0.588
P23 1	3.897	0.851	0.800	9.685	0.137				
P23 2	3.744	0.786	0.755	10.586	0.168				
P23 3	4.009	0.734	0.757	9.529	0.148				
P23 4	4.017	0.762	0.782	16.155	0.132				
P23 5	3.906	0.837	0.775	10.257	0.165				
P23 6	3.786	0.875	0.729	9.710	0.105				

Significance and standard deviations (SD) performed by 10,000 repetition Bootstrapping procedure. Q_B²: cross-validated redundancies index performed by a nine-step distance-blindfolding procedure. α: Chronbach’s alpha; ρ_A: Dijkstra–Henseler’s composite reliability; ρ_C: Jöreskog’s composite reliability; AVE: Average Variance Extracted; ***: All loadings are significant at the 0.001 level.

Moreover, the predictive relevance of endogenous constructs was evaluated through the Q² statistical test (a cross-validated redundancy index), using the blindfolding technique [83]. Table 5 shows that all values are greater than zero, which confirms the strong explanatory qualities of the model proposed [84].

With the aim of ensuring discriminant validity, according to the Fornell-Larcker criterion [79], the correlations between each pair of constructs were checked to ensure they did not exceed the square root of the AVE of each construct. Similarly, the level of the heterotrait-monotrait (HTMT) between each two constructs was tested. The results in Table 6 show how the values vary between 0.040 and 0.573. Hence, the values do not exceed the maximum allowable value of 0.85 [85]. Therefore, the results offer evidence of discriminant validity.

Table 6. Discriminant validity.

	I	II	III	IV	Sq AVE
I: ICT adoption	1.000	<i>0.256</i>	<i>−0.037</i>	<i>0.196</i>	0.743
II: CSR	0.197	1.000	<i>0.219</i>	<i>0.537</i>	0.753
III: Future expectations	0.040	0.244	1.000	<i>0.179</i>	1.000
IV: Performance	0.122	0.573	0.169	1.000	0.767

Sq AVE: square root of AVE, HTMT ratio over the diagonal (italics) and construct correlations below the diagonal.

Deeming that the measurement of future economic expectations is limited by the heterogeneity and subjectivity of each hotel manager’s assessment, this could generate an unobserved heterogeneity problem in our model. To rule out the existence of such a problem, we have run the FIMIX procedure in PLS [86]. For this purpose, 5000 iterations and 10 replicates have been set up. Considering an effect size of 0.15, a statistical power of 80% and the sampling length, three segments have been set up. After running FIMIX-PLS with SmartPLS, the results cannot determine the appropriate number of segments. Based on this, we can conclude the non-existence of an unobserved heterogeneity problem [87].

4.3. Structural Model Assessment

We started the structural model assessment by ensuring that multicollinearity is not an issue in this model. With this aim, the variance inflation factor (VIF) was analyzed. Table 7 shows that VIF ranged from 1.001 to 1.038. These results do not exceed the cutoff established in 3.0 [82]. Consequently, it can be affirmed that multicollinearity is not a problem in this model, and this enables us to proceed further.

Table 7. Structural model assessment.

Structural Paths	Path	t	f ²	95CI	VIF	H	Supported
Direct effects					VIF		
ICT adoption → Performance	0.034	0.279	0.001	[−0.183; 0.218]	1.038	H ₁	No
ICT adoption → CSR	0.200	2.266 *	0.044	[0.089; 0.344]	1.001	H ₂	Yes
CSR → Performance	0.487	6.022 ***	0.303	[0.360; 0.626]	1.038	H ₃	Yes
Future expectations → CSR	0.227	2.498 **	0.056	[0.074; 0.374]	1.001	H ₅	Yes
Indirect effects					VAF		
ICT adoption → CSR → Performance	0.097	2.057 *		[0.040; 0.184]	74.046	H ₄	Yes
Future expect. → CSR → Performance	0.110	2.187 *		[0.035; 0.200]			

R² adjusted [99% CI in brackets]: performance: 0.245 [0.160; 0.411]; CSR: 0.088 [0.044; 0.207]. Blindfolding Q² index as shown in Table 5; standardized path values reported; f²: size effect index; 95CI: 95% Bias Corrected Confidence Interval; VIF: Inner model Variance Inflation Factors; VAF: Variance Accounted Formula x 100 represents the proportion mediated. Significance, t-Student, and 95% bias-corrected CIs were performed by 10,000 repetition bootstrapping procedure; *: p < 0.05; **: p < 0.01; ***: p < 0.001.

To evaluate the structural paths by estimating the significance and the size of path coefficients (β), a bootstrap (10,000 resamples) that produces standard errors and t-statistics to assess the statistical significance of the path coefficients was developed [82].

The results are shown in Table 7 and Figure 2. Our results suggest that the direct impact of ICT adoption on performance is not significant (β = 0.034). Hence, H₁ is rejected. Additionally, an indirect effect through CSR is found in this relationship (β = 0.097 *). Next, the variance that accounted for (VAF) [82] was evaluated. VAF determines the size of the indirect effect in relation to the total effect. In this sense, the indirect effect of ICT adoption on performance is about 74%. Therefore, the results suggest that CSR fully mediate this relationship, and H₄ is supported. Furthermore, the impact of ICT adoption on CSR is positive and significant (β = 0.200 *), verifying H₂. In relation to the effect of future expectations on CSR, the path value (β = 0.227 **) shows a positive and significant influence. Hence, H₅ is supported. Finally, with regard to the effect of CSR on performance, the results give a positive and significant effect (β = 0.487 ***), supporting H₃.

Regarding the effect of future expectations on performance through CSR, our results show an indirect positive and significant effect (β = 0.110 *).

The hypotheses testing continues with the analysis of two metrics: the coefficient of determination (R²) and the effect size (f²). The R² indicates how much variance in the dependent variables is explained by the independent variables [88]. The results by R² of the endogenous variables indicate that the model has an explanatory power, especially in the case of performance [89]. For its part, the f² shows the capacity of exogenous variables in predicting R² in endogenous variables. Following Cohen [47], we have the effect sizes (f²) to evaluate the contribution of each exogenous construct to the R² values of an endogenous latent variable. The findings showed that CSR causes a significant impact on performance. Taken as a whole, the findings demonstrate that the model established in this research has the appropriate structural properties and adequate explanatory power.

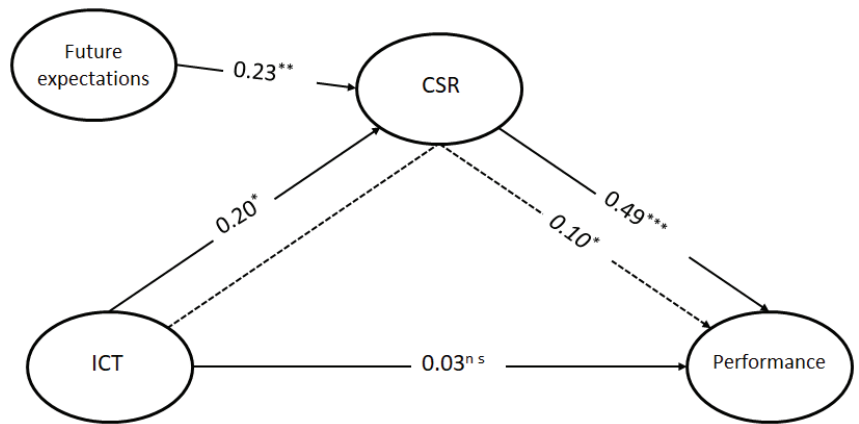


Figure 2. Results. Standardized Paths reported (R^2 -adjusted in brackets). ***: $p < 0.001$; **: $p < 0.01$; *: $p < 0.05$; ^{ns}: Not significant. Source: authors.

5. Discussion and Conclusions

Over the last few years there has been a strong interest in performance analysis in hotels. Numerous studies have attempted to analyze the impact of ICT adoption and CSR on these hotel companies. However, the mediating role of CSR in the relationship between ICT adoption and performance has been insufficiently examined in the hotel sector so far. Moreover, the recent economic recession caused by COVID-19 has highlighted the importance of considering future expectations in business development. Therefore, this study adds further evidence to these studies, highlighting the importance of CSR practices in hotels, as their effect on ICT adoption will affect SMEs performance. Similarly, this study represents a relevant contribution to the previous studies of [16,17] by incorporating future expectations about the business cycle into the environmental decision-making of hotels.

First, in line with some of the literature [9,22], our results show that there is no significant influence of ICT adoption on SMEs performance because the installation of ICT is not directly aimed at improving productivity, since these innovative systems are intended to improve customer service and increase the number of services offered [12]. In addition, investments in technologies stimulate the company to improve product quality, which will increase production costs and consequently decrease SMEs performance [12]. However, a positive and significant influence on CSR has been found. This finding was certainly expected based on previous research [90,91]. ICT adoption facilitates the implementation of CSR practices and their diffusion more effectively. Hence, this increases the CSR practices of hotel SMEs. Then, through ICT adoption, this will enable hotel SMEs to meet the needs of their stakeholders and improve their brand image through their strategies for protecting and improving the environment. This will be possible using the best available practices and technological innovation to minimize the negative effects of their activities on the environment.

An additional significant attribute of the relationship assembled in this model is that CSR produces a deep impact on hospitality SMEs’ performance. The findings are in line with those of previous research that argue that CSR increases the performance of hotel companies [92,93]. Furthermore, resource-based theory suggests the implementation of CSR practices will give them competitive advantages, which will improve their performance [61,94]. However, at present, the mediating effect of CSR on the relationship between ICT adoption and hotel performance has not been analyzed in sufficient details. Therefore, our empirical results provide new evidence in the hotel sector that although ICT adoption does not have a direct effect on SMEs performance, CSR acts as a full mediator in this relationship.

Finally, a noteworthy result concerns the effect of connecting future expectations and CSR. However, despite its importance, the effects of Future Expectations on the macroeconomic business environment have hardly been studied in the literature, and even less so in the hotel sector. Therefore, our results contribute to the literature by showing that poor future expectations lead to a strong contraction of CSR investments.

This research offers different theoretical contributions as well as some implications. From a theoretic perspective, this study has contributed to shed light on the lack of evidence for the effects of ICT adoption and CSR practices on the performance of hotel SMEs hotel companies. Furthermore, this research establishes, for SMEs in the hospitality industry, the indirect effect of ICT adoption on performance through the mediating relationship of CSR. Moreover, our findings provide some insights into how future expectations influence CSR.

This research has relevant implications for managers and policymakers who encourage hospitality companies not to reduce or even increase CSR practices, despite the present difficulties that the sector is facing due to the effects of COVID-19 in recent years, and more currently to other aspects that are damaging the economy of European countries such as the Russia-Ukraine conflict and the economic-financial crisis.

These results have practical implications for managers and owners of hotel SMEs by considering ICT adoption as a source of competitive advantage that will facilitate the implementation of CSR practices in hotels, which will improve SMEs performance. Furthermore, our results show that for CSR implementation in hotels to be efficient, it must be done considering the expectations of the macroeconomic environment. Consequently, this research suggests to hotel managers the possibility of allocating part of their available resources to invest in ICT. This will benefit both their company and society. This paradigm shift should serve to encourage hotel managers to develop strategies related to ICT adoption that enable them to incorporate environmental and social standards as essential instruments of their business strategy. Thus, our results offer a new vision that can be seen as an opportunity for hotels to initiate a process of strategic change by considering future expectations and orienting their technological activities to increase its CSR activities. This strategic reorientation will undoubtedly enable hotel SMEs to improve their ability to adapt to the rapidly changing environment in which they operate. Furthermore, this new approach will allow hotel SMEs to increase their firm's performance.

Furthermore, the findings provide policymakers with evidence that CSR practices not only contribute to the improvement of society through sustainable development, but also that they are capable of generating value for the hospitality industry. Therefore, it is crucial that governments develop policies aimed at encouraging sustainable management by companies through the implementation of CSR practices, which in turn will contribute to increasing the performance of these companies and hence to the generation of employment and wealth for society. Thus, governments should offer incentives or subsidies and encourage an increase in the social commitment of companies in the sector through a series of legislative changes that encourage CSR practices [95]. This would provide a reduction in two of the major barriers to CSR: the lack of resources and public support [96], as well as alleviating the negative effects of the poor economic outlook. This research has a number of limitations which could reveal new lines of research. Firstly, the generalizability of these results includes a focus on a country, a company size (SMEs) and an industry (hospitality). Consequently, these results cannot be applied to other regions and sectors [97]. It would be of interest for future studies to address these questions in other geographical areas and in other sectors so that it would be possible to compare them with the results obtained [61]. Furthermore, this study is limited by the application of cross-sectional data. Therefore, it would be advisable to carry out a longitudinal study to analyze the effects of time on the developed model [98]. Concerning time, since the data were collected in 2018, this poses a limitation in our research. It could be very useful to repeat the research with post-pandemic data. In this way, it would be possible to check how the situation has changed as a consequence not only of the effects of the pandemic of COVID-19 but also of the effects of the Russia-Ukraine conflict and the economic-financial crisis [99]. Finally, it would also be

worthwhile to use data from quantitative sources rather than a single source to assess the opinions of SME hotel managers [100,101].

In general, this study found that negative future expectations will lead to a strong contraction of CSR investment. The adoption of ICT has no direct impact on corporate performance in SMEs, but CSR plays a full intermediary role in this relationship. That is, CSR improves the performance of the hotel SMEs business, which not only supports the assumptions of previous studies but also points out a new direction for the next development of the hotel industry. This paper promotes the implementation and more effective dissemination of corporate social responsibility practices, encourages enterprises to attach importance to social responsibility, and thus increases social welfare.

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Article

Economic and Organizational Impact of COVID-19 on Colombia's Tourism Sector

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Abstract: The global COVID-19 crisis has strongly affected tourism. In an emerging economy like Colombia's, however, the pandemic's effects may differ from those experienced in more advanced countries. Building on prior studies, this investigation aims to determine the economic and organizational impact of COVID-19 on the tourism sector in the areas of lodging, travel agencies, clubs, and restaurants by identifying indicators relevant to the business tourism sector. We contrast data obtained empirically from a survey administered to a sample of 289 Colombian tourism SMEs. The model, developed with structural equations, enables identification of the factors with the greatest influence. The results indicate a high impact on sales and personnel expenses, leading to a decrease in management and innovation capability. In the gradual recovery process, internal measures taken by business owners to face the crisis have been more effective than measures taken by the government. Moreover, firms have prioritized financial strategies and innovation in marketing and services.

Keywords: COVID-19; strategies; structural equations; economic and organizational impact; tourism

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1. Introduction

In an emerging economy with deficiencies in its companies' competitiveness and a low percentage of exports, the global COVID-19 crisis may affect economic development more strongly than in more advanced countries [1]. Figures from the World Bank and the International Labor Organization agree that tourism is the sector most affected globally, with a decrease in global GDP of approximately USD 2.4 billion and job losses of up to 80% [2,3]. Due to this impact, tourism has come to be considered a precursor of economic development in many countries.

Colombia's situation in early 2020 differed from that of other Latin American countries and intensified in April and May 2020. Reductions in gross revenue reached 63.4% in Latin American firms. The United Nations [4,5] reports that tourism production in Colombia fell USD 6.79–1.62 and the sector's participation in the nation's GDP decreased from 5% in 2019 to 2% in 2020.

To tackle the pandemic's negative effects on the tourism-based economy, we analyze the causal relationships identified by several authors [6–8], including business situation or positioning prior to the COVID-19 crisis and its influence on business management [9,10]. We also include organizational strategic management—specifically, orientation to establishing financial goals and strategies, relationship to customers, and monitoring of organizational objectives and their contribution to enduring the crisis [11–13]. Further, our review of business studies indicates, as relevant factors, processes of technology-based innovation and development to manage the economic and financial effects of COVID-19 [14–16]. However, none of the studies published to date contrast either all the variables proposed as a whole or the research on factor correlation.

The goal of this study is to determine the economic and organizational impact of the COVID-19 crisis on Colombia's tourism in the subsectors of lodging, travel agencies,

food and beverage, and tourism clubs to explain how significant business situations and organizational strategies are in facing crises. Our methodological design includes variables to measure the economic impact of the COVID-19 crisis, such as revenue variations, investment in reactivation, payroll recovery, remote work, amount of public aid, and ongoing impact up to December 2021.

We administered a structured survey to a stratified sample of 289 small- and medium-sized enterprises (SMEs) dedicated to tourism in Colombia, based on firms obtained from the Orbis database. Structural equation modeling was used to analyze the responses and test the causal effects among the variables for business situations when facing the impact of the COVID-19 crisis and the organizational strategic management and investment in technological innovation development. The variables were analyzed based on 25 factors linked to five hypotheses. Since this approach sought to confirm the strength of the relationships among the variables analyzed, we applied confirmatory factor analysis (CFA).

The statistical results confirm four of the five hypotheses proposed. The findings indicate a high impact on sales and number of workers in 2020. These two measures were linked most closely to the crisis and the business situation at the end of 2021, when recovery was still underway. The results also showed that financial management of firms that performed strategic management was less severely impacted than financial management of firms that did not. Further, although investments in innovation and technology decreased initially, these factors were subsequently strategic for supporting firms' reactivation and have become the most significant source of recovery, even beyond public aid.

This article is organized as follows. Next, we perform a theoretical review of the most important research antecedents. We then describe the methodological design, from data collection to analytical procedure and presentation of the results. Subsequently, we discuss the results and contrast them with similar studies. Finally, we present the conclusions.

2. Literature Review

2.1. Economic Impact of COVID-19 on SMEs and Tourism

The effects of COVID-19 on the tourism industry are evident in the decrease in approximately USD 2.4 billion in the sector's global GDP [2]. In Latin America, tourism represented 10% of exports in goods and services [4]. In Colombia, tourism's contribution to GDP decreased from 5% in 2019 to 2% in 2020. Expected revenue from the global tourism sector decreased from USD 712 to 396 billion and from USD 6.79 to 1.62 billion in Colombia. The number of international tourists fell globally by 73% in 2020, while the number arriving in Colombia fell 70% [5]. Job losses, thus, reached 80% [3].

The pandemic's main consequence for tourism is decreased demand for services, due to perception of risk and reduction in purchasing capacity [17–20]. In Colombia, this situation led to a 63% decrease in hotel revenue in November 2020 [21], which affected employment and productivity [22], as tourism is a significant source of economic development in many countries [23,24]. Tourism is also considered the sector most severely affected by the COVID-19 pandemic [25–29].

The pandemic's devastating effects on global tourism [30] have led to studies with varied approaches that focus on employment [31–33], human resources [34], fall in prices [35,36], and decrease in consumption and reserves [20,37–40]. Other topics researched include decline in revenue [41,42], decrease in profits per share [43] or profitability [44], and disadvantage to SMEs and less solvent firms [45,46].

Still, other studies explore public support to mitigate the crisis [47–51], finance and marketing strategy [52] support based on strategic groups [53,54], corporate social responsibility [55–58] technological innovation [59], leadership styles [60,61], and learning and knowledge transfer [62,63]. All these studies have contributed to understanding of the crisis caused by the COVID-19 pandemic.

2.2. Business Situation

Although the business situation caused by the pandemic has been studied from the perspective of revenue and number of workers [10,64], factors related to the pandemic's influence on the economic activities of accommodation, travel agencies, and food and beverage outlets are also relevant to calculating economic effects. Studying the impact on each activity enables us to understand whether business size, type of client, or other factors influence the way companies face different crises and the level of this impact on their economy [65,66].

Previous studies on business situation and the COVID-19 crisis have shown that the variables hotel size and infrastructure [67], customers and competition [68], SME revenue according to size [10], and declining payrolls are relevant factors in mitigating the economic impact of the pandemic [41]. Like ours, these studies were based on surveys and apply structural equations.

2.3. Strategic Management

Some studies of strategic organizational management [69,70] incorporate variables, such as planning and management for crisis recovery. The authors of [71] evaluated variables, such as development of policies and reformulation of strategies to reorganize tourism firms facing the effects of the crisis. The authors of [72] analyzed the relationship between the strengths and weaknesses of organizational performance during the period of the pandemic's greatest impact and found increased weakness in management.

Refs. [12,73], in contrast, studied the role of variables on strategies for managing financial performance (measured by profitability), liquidity, and debt–capital ratio in economic recovery of tourism companies and demonstrated the importance of this management. Ref. [74] studied liquidity risk management and financial flexibility as fundamental factors in times of crisis. Other financial strategies studied were deferral of capital payments, reduction in market expenditure to recover liquid assets [75,76], financial restructuring, and new sources of financing.

2.4. Innovation and Development

Among the innovative strategies firms implemented to cope with the COVID-19 pandemic, refs. [77,78] identified factors, such as differentiation of products and channels in the digital market (including social media). Their studies demonstrate the effectiveness of these measures. Other indicators have also been used to measure advances in digitalization and use of innovative knowledge as strategies to adapt to changes caused by the crisis. Digitization is the measure most recommended [79,80].

Other studies evaluated the consideration of innovation in business models as a measure to mitigate the effects of the COVID-19 crisis [15,81]. Additional research studying resilience and investment in reactivation demonstrates that technology and innovation capacity contribute to sustainability in tourism SMEs [16,59,82].

3. Materials and Methods

Based on this theoretical development, we propose the following hypothesis for the data analysis:

Hypothesis 1: *The business situation of tourism SMEs in Colombia may influence the economic indicators caused by the COVID-19 crisis.*

Hypothesis 2: *The COVID-19 crisis has affected the strategic management of tourism SMEs in Colombia.*

Hypothesis 3: *Innovation and development in tourism SMEs have been decisive, although conditioned by the COVID-19 crisis.*

Hypothesis 4: Depending on the business situation of tourism SMEs, these firms promoted innovation and development, which contribute to improving the business situation.

Hypothesis 5: Innovation and development practices support organizational management of tourism SMEs.

Figure 1 presents the theoretical approach and the relationships between the variables.

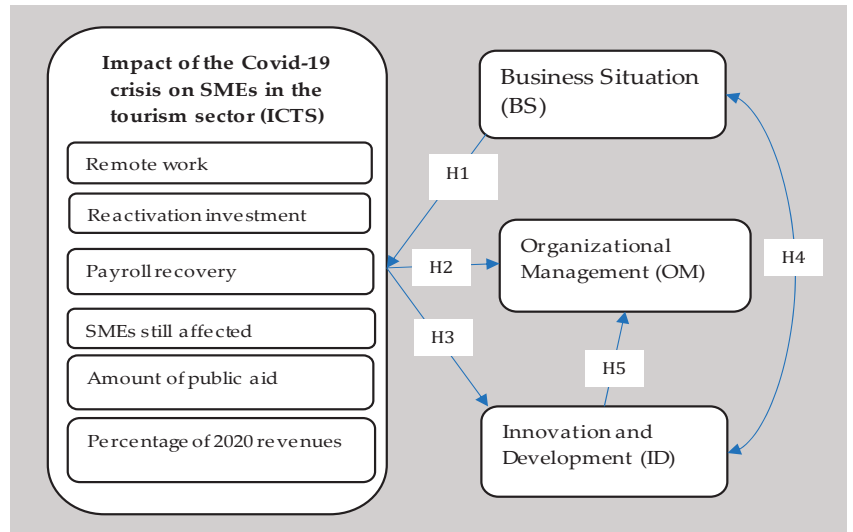


Figure 1. Theoretical model.

This study developed a structural equations model following following [60,82–86]. The model relates the variables for measuring economic impacts of the COVID-19 crisis on the business situation (and vice versa), organizational management strategies, and investment in innovation and technological development. The data were obtained from a survey (see Appendix A) [62,87,88] with responses measured on a Likert scale, following [88]. Sales and other financial data were extracted from the Orbis database.

To categorize the item “Tourism subsector” according to relative importance of each subsector, we assigned 1 to the subsector with the lowest representativeness or number of companies in the population and 4 to the subsector with the highest number of companies in the population. The items “Number of workers”, “Sales volume”, and “Productive capacity” were categorized by ranges adapted to a scale of 1 to 5, where 1 is greatly decreased and 5 is greatly increased. Appendix B presents the ranges and criteria for all the items’ categorization.

The population of tourism firms in Colombia obtained from Orbis was 4766. Of this total, 1177 firms may be considered small or medium sized, following revenue criteria for firm size in Colombia, defined by Decree 957 of 2019. We used the following equation to calculate the sample:

$$n = \frac{N * Z^2 * p * q}{d^2 * (N - 1) + Z^2 * p * q}$$

where:

N = population = 1177

Z = 95% confidence level = 1.96

p = expected probability of success = 0.5

q = probability of failure = 0.5

d^2 = precision (maximum admissible error) = 0.05

We, thus, obtained a sample size of 289, as shown in Table 1.

Table 1. Population and sample.

Activity	Population	Sample
Lodging	437	107
Travel agencies	186	46
Recreation clubs and agrotourism	69	17
Prepared food and beverage	485	119
Totals	1177	289

Note: Population and sample stratified by tourism subsectors.

The data were collected through an online form. Eighteen questionnaires were found to be incomplete or to have been completed by firms that did not belong to the tourism sector, leaving useful data from 271 SMEs. Sample size, calculated based on a 95% confidence level and 5% margin of error, showed this sample to be valid.

We applied CFA following [36,38] to test the theoretical constructs proposed for the causal relationship of COVID-19 pandemic impact to firms in the tourism sector. The analysis was based on these firms' business situation and the effects on organizational and economic-financial structure and innovation and development processes, as specified in Table 2. In this table, we added, in the fourth column, authors who have researched the different items and variables.

Table 2. Dimensions of the variables.

Variable	Items	Factors	Authors
Business situation (BS)	Item 1 BS1	Tourism subsector	Neise T., Verfurth P., Franz M.
	Item 2 BS2	Number of workers	Melnyk S., Schoenherr T., Verter V. et al.
	Item 3 BS3	Sales volume	Marjanski, A., Sulkowski, L.
	Item 4 BS4	Main clients	Markovic S., Koporcic N., Arslanagic-Kalajdzic M. et al.
Organizational management (OM)	Item 5 OM1	Formulation of income budget	Haqbin, A., Shojaei, P., Radmanesh, S.
	Item 6 OM2	Expenditure budget	O'Toole C., McCann F., Lawless M. et al.
	Item 7 OM3	Financial goals (type)	Ganlin P., Qamruzzaman M., Mehta A. et al.
	Item 9 OM4	Cost identification	Hrivnák M., Moritz P., Chreneková M.,
	Item 10 OM5	Productive capacity	Doerr S., Erdem M., Franco G. et al.
Innovation and development (ID)	Item 11 ID1	Investment in product development	Anggadwita, G., Martini E., Hendayani R., Adam N., Alarifi G.
	Item 12 ID2	Marketing investment	Polas M., Raju V.—Rakshit S., Mondal S., Islam N. et al.
	Item 13 ID3	Investment in process improvement	Rakshit S., Islam N., Mondal S. et al.
	Item 17 ID4	Number of years (with I + D)	Yuniarty S. I., Abdinagoro S. et al.
Impact of the COVID-19 crisis on SMEs in the tourism sector (ICTS)	Item 18 ICTS1	Remote work	Park S., Lee S., Cho J.—Bargados, A. Félix A. G. and García N.—Piga, C. A., Abrate G., Viglia G., and de Canio, F.
	Item 20 ICTS2	Investment in reactivation	
	Item 21 ICTS3	Payroll recovery (as of December 2021)	Chen C. F., Wang Z., Tang X. L.
	Item 22 ICTS4	Still affected by the crisis	Le D. and Phi G.
	Item 24 ICTS5	Amount of public support	Sanabria J. M., Aguiar T. and Araujo Y.
	Item 25 ICTS6	Mehta K. and Sharma S.	

Note: The first three variables are first-order latent variables. The fourth is the criterion variable (impact of COVID-19 on SMEs in the tourism sector). On the right side, the factors that compose each variable are defined, followed by the authors supporting the variables.

This set of constructs comprises the five hypotheses to be contrasted with the empirical data. They are H1: The business situation of tourism SMEs in Colombia may influence the economic indicators caused by the COVID-19 crisis. H2: The COVID-19 crisis has affected

the strategic management of tourism SMEs in Colombia. H3: Innovation and development in tourism SMEs have been decisive, although conditioned by the COVID-19 crisis. H4: Depending on the business situation of tourism SMEs, these firms promoted innovation and development, which contribute to improving the business situation. H5: Innovation and development practices support organizational management of tourism SMEs. Table 3 presents the descriptive statistics for the variables.

Table 3. Statistical data on the items.

Items	Mean	Standard Deviation	Variance	Skewness	Kurtosis
Item 1 BS1: Tourism subsector	2.5129	1.35223	1.829	0.022	−1.81
Item 2 BS2: Number of workers	1.8561	1.11453	1.242	1.08	0.122
Item 4 BS4: Main clients	1.5391	0.58192	0.339	1.622	1.587
Item 5 OM1: Formulation of income budget	2.7269	1.22896	1.51	0.425	−0.83
Item 6 OM2: Expenditure budget	2.6863	1.1962	1.431	0.442	−0.761
Item 7 OM3: Financial goals (type)	2.8598	1.09995	1.21	0.449	−0.428
Item 9 OM4: Cost identification	2.6384	1.13946	1.298	0.396	−0.748
Item 10 OM5: Productive capacity	2.8081	1.08529	1.178	0.353	−0.571
Item 11 ID1: Investment in product development	2.4465	1.20113	1.443	0.861	−0.217
Item 12 ID2: Marketing investment	3.0037	1.05389	1.111	0.24	−0.685
Item 13 ID3: Investment in process improvement	1.8856	0.68579	0.47	0.774	1.805
Item 17 ID4: Number of years (with I + D)	2.2657	1.27493	1.625	1.057	0.055
Item 18 ICTS1: Remote work	2.5018	0.93838	0.881	0.198	−0.291
Item 20 ICTS2: Investment in reactivation	2.7565	1.10876	1.229	0.74	−0.327
Item 21 ICTS3: Payroll recovery (as of December 2021)	2.893	1.02902	1.059	0.401	−0.617
Item 22 ICTS4: Still affected by the crisis	2.8819	1.12253	1.26	0.504	−0.664
Item 24 ICTS5: Amount of public support	2.6753	1.32696	1.761	0.096	−1.403
Item 25 ICTS6: Percentage of revenue 2020 compared to 2019	2.9188	1.1159	1.245	0.451	−0.701

Note: Continuous variables were categorized using a Likert scale with values from 1 to 5.

4. Results

4.1. Exploratory Factor Analysis (EFA) and Reliability Tests

CFA methodology recommends verifying the viability of the proposed model through EFA [36]. We, therefore, confirmed the relationships among the variables—first, to determine whether the proposed model is identified and, second, to verify the factor loadings on each of the variables. Table 4 presents the results.

Table 4. Consistency and internal validity, average variance extracted (AVE), and composite reliability.

Variable	Factors	Factor Loadings	AVE	CR	
Business situation	Tourism subsector (BS1)	0.71	0.67	0.65	0.85
	Number of workers (BS2)	0.77		0.68	
	Sales volume (BS3)	−0.03		0.00	
	Main clients (BS4)	0.72		0.70	
Organizational management	Formulation of income budget (OM1)	0.73	0.86	0.95	0.75
	Expenditure budget (OM2)	1.00		0.99	
	Financial goals (type) (OM3)	0.86		0.85	
	Cost identification (OM4)	1.01		0.95	
	Productive capacity (OM5)	0.70		0.74	
Innovation and development	Investment in product development (ID1)	0.82	0.99	0.64	0.99
	Marketing investment (ID2)	0.64		0.69	
	Investment in process improvement (ID3)	0.78		0.64	
	Number of years (with I + D) (ID4)	0.80		0.65	

Table 4. Cont.

Variable	Factors	Factor Loadings		AVE	CR
Impact of the COVID-19 crisis on SMEs in the tourism sector	Remote work (ICTS1)	0.70	0.95	0.69	0.95
	Investment in reactivation (ICTS2)	0.84		0.70	
	Payroll recovery (as of December 2021) (ICTS3)	0.93		0.88	
	Still affected by the crisis (ICTS4)	0.97		0.93	
	Amount of public support (ICTS5)	−0.78		0.61	
	Percentage of revenue 2020 compared to 2019 (ICTS6)	1.00		1.00	

Note: Factor loadings should be above 0.7, AVE values above 0.5, and CR scores above 0.7.

The factor loadings show consistency among the factors observed and the variables, except for item 3 (sales volume), which could be collinear with other variables and whose factor loading is below the accepted minimum of 0.7 [88]. We, therefore, excluded item 3 from the model. The other items and factors show satisfactory factor loadings, demonstrating the model's internal consistency. All values over 0.5 were accepted for average variance extracted (AVE) [36] and these values range from 0.64 to 1.00. Composite reliability (CR) values are between 0.75 and 0.99—in all cases, above 0.7, indicating construct validity [82]. Next, we present the adjusted empirical model (Figure 2).

The following values were obtained in the adjusted model: Chi-square = 363, degrees of freedom = 126, standardized Chi-square = 2.88, root mean square error of approximation (RMSEA) = 0.021, Tucker–Lewis index TLI = 0.951, and incremental fit index IFI = 0.960 (these two indices should be ≥ 0.90). The indices for goodness of fit are incremental fit CFI = 0.960 and parsimony fit NFI = 0.940. According to theory, these values confirm the model's internal consistency, causal relationships among the variables, and good fit [82].

Next, the fact that the average of our six factors is associated with ICTS indicates that tourism business owners observed a high impact from the COVID-19 crisis. The tourism SMEs adopted remote work to reduce the impact on employment in the months of lockdown but could not sustain this measure economically over time. The measurement variable public aid to maintain payroll was crucial during the most critical months.

Item 3 (sales) in 2020 compared to 2019 measured the economic impact most precisely, showing a fall in income of 50% in over half the businesses that remained active; this calculation was obtained from the original revenue figures for 2019 and 2020, extracted from Orbis.

This item affected travel agencies in lower percentages. Many business owners had to assume the cost of reinvesting to reactivate their business to adapt to changes in technology and meet public-health requirements. Finally, the findings show that trends in both sales and payroll recovery in 2021 were factors determining whether firms were still affected by the pandemic compared to the most recent year under normal circumstances (2019). This factor strengthens indications that recovery is ongoing. Table 5 presents our evaluation of each hypothesis using the statistics obtained.

Table 5. Hypothesis contrast with structural model results.

Relationships	Regression Weights	Std. Dev.	t-Value	p-Value
The business situation of tourism SMEs in Colombia may influence the economic indicators caused by the COVID-19 crisis.	0.815	0.161	2.815	0.005
The COVID-19 crisis has affected the strategic management of tourism SMEs in Colombia.	0.839	0.057	4.162	0.000
Innovation and development in tourism SMEs have been decisive, although conditioned by the COVID-19 crisis.	1.105	0.019	5.568	0.003

Table 5. Cont.

Relationships	Regression Weights	Std. Dev.	t-Value	p-Value
Depending on the business situation of tourism SMEs, these firms promoted innovation and development which contributes to improving the business situation	F = -0.18 and 0.357	0.042	2.941	0.033
Innovation and development practices support organizational management of tourism SMEs.	4.905	1.635	4.67	0.004

Note: The regression weight obtained for the causal relationships corresponds to consolidation of the factors composing the observed endogenous variables relative to the unobserved variables.

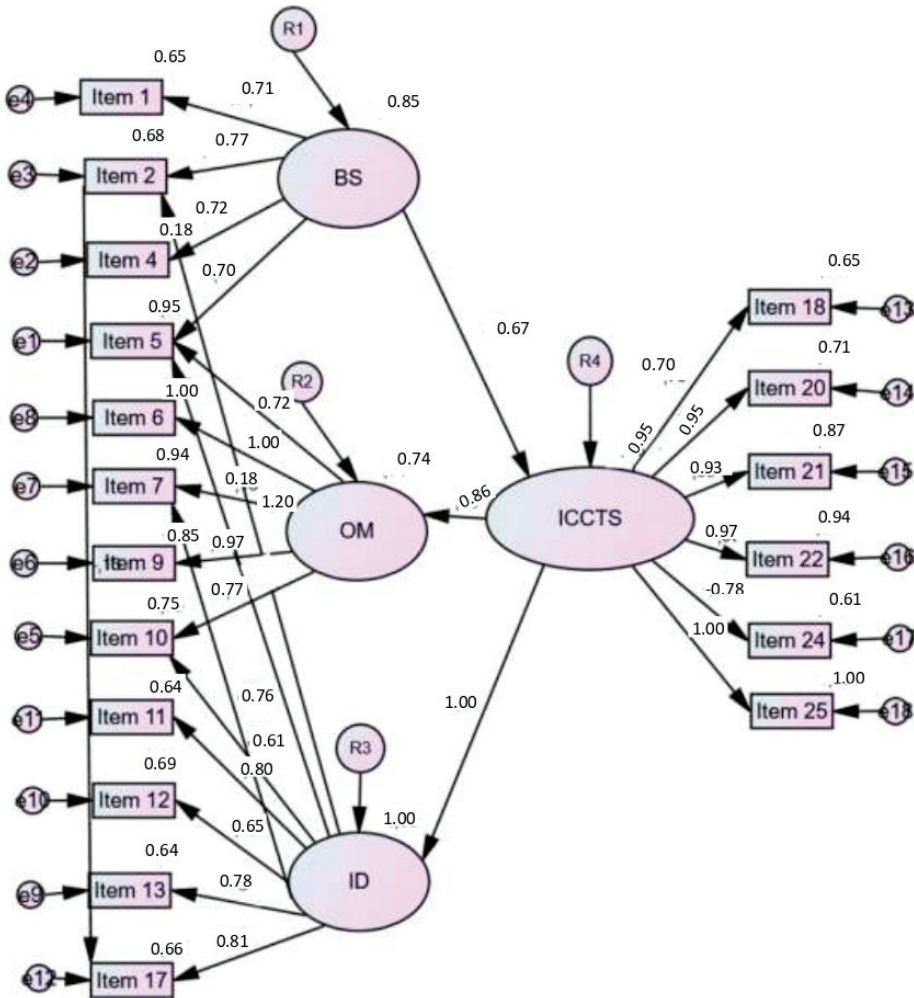


Figure 2. Adjusted model.

4.2. Business Situation (BS) When Facing the Economic Impact of the COVID-19 Crisis (ICCTS)

To test the validity of hypothesis 1 about how can the business situation of tourism SMEs in Colombia influences the level of economic impact caused by the COVID-19 crisis, we considered the weight of the regression obtained, 0.815 (Table 5), and the factor

loading, 0.67. Although this factor loading is below the commonly accepted threshold of 0.7, we included it because it showed a statistically significant relationship to the criterion variable ICTS through three of the factors observed. Similarly, the t-value obtained in the hypothetical relationship is far from 0, validating the alternative hypothesis proposed, and a p-value below 0.05 permits us to reject the null hypothesis.

The economic subsector (item 1) obtained a factor loading of 0.71 (Figure 2) and a regression weight of 0.491—statistically significant values. Analysis of the percentage incomes for 2020 compared to 2019 shows that travel agencies suffered the greatest economic impact of the pandemic, with a loss of 58% income, followed by the lodging sector with 52%, and food and beverage with 40%. Tourism clubs lost 32%. We calculated these losses from the sales figures for 2019 and 2020, extracted from Orbis, classified by subsector. The percentages do not include firms that closed in 2020.

The link between number of workers (item 2) and firm size showed a factor loading of 0.77 and a regression weight of -0.676 , demonstrating an inverse relationship. This finding indicates that, the larger the firm, the less severe the economic impact of the COVID-19 crisis. Sales volume (base year 2020) (item 3), did not, however, show a statistically significant factor loading. The reason may be the decrease in 2020 sales, which could exclude many companies from the SME category, as well as the incorporation into the market of new firms, for which we could not establish the degree of impact because they had no figures from previous years.

Main customers (item 4) produced a factor loading of 0.72 and a regression weight of 1.0. This result may be considered decisive for ICTs, as the statistical distribution of the variable highlights the fact that 65% of tourism SMEs sell their services primarily to consumers and families. Type of customer, thus, explains why the impact on sales was higher for these firms than for firms whose market focuses on other companies. Finally, the 11% that sell tourism services to public administrations experienced less impact from the pandemic.

4.3. How the COVID-19 Crisis Affected Strategic Management of Tourism SMEs

Through H2, we aimed to determine how organizational strategic management (OM) was affected by the COVID-19 crisis. The results of the CFA—factor loading 0.86, regression weight of 0.839 (Table 5)—confirm the validity of the construct proposed, indicating that organizational strategic management decreased due to the COVID-19 crisis. The following evaluates the factors composing the variable organizational strategic management.

SMEs' formulation and monitoring of the income budget obtained a statistically significant factor loading and regression weight. This item is, thus, considered significant within strategic management. For 2020, the frequency of responses showed that 52% of tourism entrepreneurs did not formulate a budget or did not follow up on proposed goals.

Cost and expenditure budget (item 6), factor loading, and regression weight were high, indicating the importance of cost management and monitoring during the crisis. Similarly, reduction in costs and expenditure was one of the crisis' most significant consequences for firms. The data obtained from the survey indicate that only 27% of business owners performed monthly or more continuous monitoring of organizational costs and expenditures.

Item 7 measures projection of financial goals and monitoring. As this item obtains a statistically low but acceptable factor loading and regression weight, we can consider it an aspect of management moderately affected by the pandemic. Frequency analysis of the responses showed that 59% of business owners formulate and monitor goals for profitability, operating margin, or all goals as a whole. Periodicity in formulation or monitoring financial goals was included in item 8 but discarded from testing of the model because it could not be identified.

Determining and monitoring fixed and variable costs (item 9) produced a statistically significant factor loading and regression weight. This finding supports the importance of management and identification for fixed and variable costs during the crisis to reduce the weight of operational leveraging. According to a previous frequency analysis (Appendix B),

54% of tourism SMEs did not identify or classify costs and this lack of management may have intensified the pandemic's impact on their firms.

Finally, for the variable OM, item 10 (productive capacity) obtained average but valid factor loading and regression weight, demonstrating that the COVID-19 crisis decreased tourism firms' productivity and caused infrastructure reductions in 44% of SMEs dedicated to tourism in Colombia.

4.4. Extent to Which Innovation and Development Processes (ID) Are Conditioned by the COVID-19 Crisis

H3 posed whether innovation and development in tourism SMEs were determining factors, although conditioned by the COVID-19 crisis. Factor loading and regression weight confirm this hypothesis. Both values are statistically significant, with the highest value for investment in product and service development. Further, also relevant was the number of years the firm had had an ID department. Third and fourth, tourism business owners considered investment in marketing and in process improvement as determining factors for enduring the effects of the crisis. The regression weights of these variables were high, confirming their strong influence on ID processes after the start of the pandemic. The results for recovery in 2021 indicate, however, the importance of innovating in services and marketing to achieve more efficient recovery.

4.5. Business Situation (BS) and Its Relationship to ID

Based on the business situation of tourism SMEs, H4 promotes ID and ID contributes to improving the business situation. Items for this hypothesis obtained statistically low factor loadings and regression weights, leading us to accept the null hypothesis and reject H4. The survey data, thus, show no significant relationship of business situation to ID processes, at least during the pandemic period.

4.6. How ID Influences Organizational Strategic Management

H5 proposed that ID practices support tourism SMEs' organizational management. Contrasting the hypotheses shows statistically significant factor loadings and regression weights, leading us to accept H5. The factors that support this construct indicate that ID contributes to formulation and monitoring of sales, cost, and expenditure budgets. ID, in turn, promotes achievement of financial goals and, thus, supports improvements in productive capacity in tourism SMEs.

5. Results Discussion

This study analyzed the economic impact of the COVID-19 crisis on the tourism sector in Colombia to explain the significance of business situation as these firms faced the crisis. The study also analyzed the implications of the pandemic for organizational strategic management and innovation and development processes. The results obtained through CFA show that the method used to analyze the data was appropriate, as it evaluated all the items and their relationships as a whole, enabling achievement of the proposed research goal. The results identify a strong impact on the economy of tourism firms, especially those with a smaller economic structure and less-developed business situations. In accordance with [10,89], smaller firms—those with fewer workers and a weaker customer base and economic and financial infrastructure—suffered more intense effects from the pandemic.

The statistical results support the theory. They indicate that both the business situation of tourism SMEs in Colombia and this situation's influence on the level of economic impact by the COVID-19 crisis required greater public assistance to firms through financing, subsidies, and job preservation, among other issues. This finding reinforces the work in [12,27]. Such aid must include accessible requirements, such as those proposed by [44,45,90], and recognize that firms have still not recovered fully from the effects of the crisis.

Like [29,30], our results show the main effect on tourism firms to occur in sales figures, which decreased, on average, 50% in 2020 compared to 2019. As a result, salaries decreased

up to 10% in some cases. The official figures also indicate that 25% of tourism SMEs closed [21]. In the tourism subsectors, economic impact was calculated relative to sales revenues (see Figure 3).

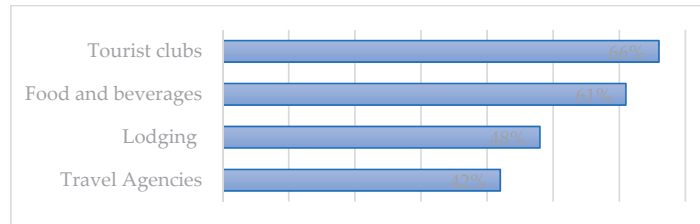


Figure 3. Average percentage revenue 2020/2019. Note: the figure is derived from the averages sales percentages for SMEs in each subsector in 2020 with respect to 2019. The above figure identifies the tourism subsector that experienced the largest decrease in sales during the first year of the pandemic.

Figure 3 shows that the firms most affected were travel agencies, followed by the lodging sector (a finding that coincides with [26]), and firms that sell food and beverages. Some of these results concur with [38]. The firms least affected were, thus, those whose main market is public administration and other firms, as the main customers of travel agencies and the hospitality sector are families and individuals. Hotels also showed a significant drop in sales in 2020, consistent with [18], but contradicting [85].

Analysis of the pandemic's effect on organizations' strategic management confirmed the veracity of H2; a decrease in tourism SMEs' economic capacity led to a decrease in payroll. At the same time, the companies used their productive capacity or operating leverage less, increasing the weight of fixed costs on operating results. All these conditions led to significant decreases in business infrastructure, in line with [69].

The statistical results obtained also reveal the importance of developing budgets and proposing goals and strategies. The results indicate that tourism SMEs that conducted such management experienced less negative impacts on their sales and hired personnel, as also found in [69].

ID showed clear decreases in investment, especially during suspension of economic tourism activity. These results agree with [91]. Creativity and resilience were fundamental to strategy, however, as travel resumed and borders opened, initiating progress toward recovery. These measurements concur with [15,92].

Based on the factor analysis, the results for the business situation, as measured prior to the pandemic, and for ID processes, analyzed through H4, do not appear to be significant. This finding affirms that changes in business situation during the pandemic could have led to decreases in tourism firms' ID, as stated by [16]. This finding contrasts with changes experienced during social distancing by other businesses grounded in digital resources for marketing and product and service innovation, as [93] proposes.

Finally, we analyzed the relationship between ID and strategic management through H5. The results are compatible with most current theories. For example, they align with the contribution of [94], which supports the hypothesis that innovation practices in business management and adaptability to changes contributed to firms' ability to endure the effects of the crisis, as well as to economic and financial recovery, in line with [95].

6. Conclusions

In pursuing our goal to determine the economic–organizational impact of the COVID-19 crisis on the tourism subsectors in Colombia, this study demonstrates that the main impact on tourism firms occurred in sales figures, with an average fall of 50% in 2020 compared to 2019. Similarly, suspension of trips and mandatory distancing led to inactivity in around 60% of tourism firms, generating a decrease in payroll of up to 10% in some cases. To this serious employment situation, we must add the closing of 25% of tourism firms, reported

by official statistics. These negative effects, reflected in the national economy, are still being felt.

One measure adopted to contain the effects of the pandemic was increased remote work. This measure was useful during lockdown to reduce the impact on employment, but it was not sufficient to sustain tourism firms economically, as the reduction in revenue required them to decrease their operating costs and expenditure. Public support contributed partially to mitigating the negative effects on SMEs' sustainability, but it was not enough.

The loosening of social distancing measures and possibility of travel initiated the reactivation process in the tourism sector. However, most firms had to make significant investments to reach their customers through ICT and to fulfill the public-health requirements.

Sales for 2021 show that recovery is still underway; the number of workers in the tourism sector has not returned to 100% of pre-COVID-19 employment. In firms' internal management, the economic and financial situation gradually affected decisions about investment and management, requiring managers to prioritize essential expenses. The pandemic, thus, had serious implications for organizational strategic management and ID processes at the beginning of lockdown. This study showed that management strategies in areas related to finance and innovation facilitated tourism's gradual recovery.

Contrasting the hypotheses as a whole showed a weaker relationship between tourism SMEs' business situation when facing the pandemic crisis and investment in ID. This finding shows decreases in investment during the most critical months but also suggests that firms opting for strategic use of technology and innovation in the market and services achieved greater advances in economic recovery.

Innovation and technology, thus, support strategic management of both finance and customers. This effect occurred through formulation and monitoring of budgets for sales and costs, measures that promote achievement of financial goals and productive capacity. This activity also made it easier for tourism SMEs to reach existing and potential customers.

The study findings recommend that tourism entrepreneurs continue to strengthen management towards recovery based on strategies that integrate the economic and financial area, customers, and sales with innovation and efficient marketing, while also providing attractive, efficient, and sustainable services. The findings also suggest projecting goals and formulating strategies from all perspectives on the tourism business, based on the strengths and needs for change that the pandemic revealed. Such strategies will achieve economic and employment recovery, while also contributing to environmental and social sustainability.

Among our study's limitations is the lack of information on firms that suspended activity or ceased economic activity definitively. Another limitation is recognizable bias in some responses, which may be due primarily to the fact that the respondents were financial managers and did not cover all areas of the firm. As future lines of research, we propose more in-depth analysis of strategies for recovery in the tourism sector and replication of the model in other emerging countries.

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Appendix A

Online Survey Form

General Information:

"Email"

"Sector"

"City"

"Department"

"Company name"

"TIN (Tax identification number)"

"Role in company of person completing the survey:"

Part I

"1. Activity (subsector)"

1. Tourism club
2. Travel agency
3. Lodging
4. Food and beverage

"2. Number of employees:"

1. 11–50
2. 51–100
3. 101–200
4. 201–500
5. Over 500 workers

"3. Sales volume (in thousands of USD in 2020)"

1. Under 1000
2. 1000–10,000
3. 10,001–50,000
4. 50,001–100,000
5. Over 100,000

"4. Your company's sales usually come primarily from:"

1. Public administrations
2. Consumers and families
3. Other companies
4. Consumers and families and other companies
5. Other

"5. Does the company prepare a sales budget (income)?"

1. No formula—decreased greatly
2. Annual—decreased
3. Intermediate—no change
4. Monthly—increased
5. Every period—increased greatly

"6. Does the company formulate a cost and expenditure budget?"

1. No formula—decreased greatly
2. Annual—decreased
3. Intermediate—no change
4. Monthly—increased
5. Every period—increased greatly

"7. Does the company set financial goals (types of goals)"

1. None—decreased greatly
2. Growth in economic structure (active)—decreased
3. Growth and performance—no change
4. Margin and performance—increased

5. All financial goals—increased greatly
- “8. How often does your company formulate and monitor financial goals?”
1. No formula—decreased greatly
 2. Annual—decreased
 3. Intermediate—no change
 4. Monthly—increased
 5. Every period—increased greatly

“9. Does the company identify fixed costs and production capacity?”

1. Does not identify—decreased greatly
2. Annual—decreased
3. Intermediate—no change
4. Monthly—increased
5. Every period—increased greatly

“10. How much does the company exploit installed production capacity (percentage)?”

1. (0–40%)—decreased greatly
2. (41–70%)—decreased
3. (71–90%)—no change
4. (91–100%)—increased
5. (>100%)—increased greatly

Part II

“11. Does the company invest resources in technology? Dedicated to: (Development of product/service)”

1. (0)—decreased greatly
2. (1–5 thousand USD)—decreased
3. (5–20 thousand USD)—no change
4. (20–50 thousand USD)—increased
5. (Over 50 thousand USD)—increased greatly

“12. Does the company invest resources in technology? Dedicated to: (Marketing)”

1. (0)—decreased greatly
2. (1–5 thousand USD)—decreased
3. (5–20 thousand USD)—no change
4. (20–50 thousand USD)—increased
5. (Over 50 thousand USD)—increased greatly

“13. Does the company invest resources in technology? Dedicated to: (Process improvement)”

1. (0)—decreased greatly
2. (1–5 thousand USD)—decreased
3. (5–20 thousand USD)—no change
4. (20–50 thousand USD)—increased
5. (Over 50 thousand USD)—increased greatly

“14. Does the company have a department for innovation and/or marketing? Dedicated to: (Product development)”

1. (0)—decreased greatly
2. (1–5 thousand USD)—decreased
3. (5–20 thousand USD)—no change
4. (20–50 thousand USD)—increased
5. (Over 50 thousand USD)—increased greatly

“15. Does the company have a department for innovation and/or marketing? Dedicated to: (Marketing)”

1. (0)—decreased greatly
2. (1–5 thousand USD)—decreased
3. (5–20 thousand USD)—no change

4. (20–50 thousand USD)—increased
5. (Over 50 thousand USD)—increased greatly

“16. Does the company have a department for innovation and/or marketing? Dedicated to: (Process improvement)”

1. (0)—decreased greatly
2. (1–5 thousand USD)—decreased
3. (5–20 thousand USD)—no change
4. (20–50 thousand USD)—increased
5. (Over 50 thousand USD)—increased greatly

“17. How long (years) has the company had a department of innovation, research, and development?”

1. —decreased greatly
2. (1–2 years)—decreased
3. (3)—no change
4. (4)—increased
5. (5 or more years)—increased greatly

Part III

“18. Are your workers able to perform their functions through telework or working from home? For what percent of their paycheck?”

1. 0—decreased greatly
2. (1–30%)—decreased
3. (31–60%)—no change
4. (61–80%)—increased
5. (81–100%)—increased greatly

“19. What percentage of the extra December paycheck did the company maintain in 2020, relative to a normal month of activity?”

1. (0–30%)—decreased greatly
2. (31–60%)—decreased
3. (61–80%)—no change
4. (81–100%)—increased
5. (>100%)—increased greatly

“20. If at any time the company reached 0% activity and had to resume activity, how much did it have to invest to reinitiate activity?”

1. (0)—decreased greatly
2. (1–5 thousand USD)—decreased
3. (5–10)—no change
4. (10–50)—increased
5. (Over 50 thousand USD)—increased greatly

“21. Did the company recover the extra December paycheck in 2021?”

1. Reduced it even more—decreased greatly
2. Did not decrease it further—diminished
3. Recovered 70–80% of the paycheck—no change
4. 100%—increased
5. >100%—increased greatly

“22. Do you think your company is still affected by the pandemic?”

1. Yes
2. No

“23. Has your company received some type of public aid due to the pandemic?”

1. Yes
2. No

“24. If you answered “yes” to the previous question, how much was the aid worth?”

1. (0)—decreased greatly
2. (1–10 million)—diminished
3. (10–50 million)—medium
4. (50–200 million)—increased
5. (Over 200 million)—increased greatly

Appendix B. Categorization of Factors

Variable	Factors	Measuring Ranges
Business situation (BS)	Tourism subsector	1 = Tourist clubs 2 = Travel agencies 3 = Lodging 4 = Food and beverage
	Number of workers	1 = 11–50 workers—greatly reduced 2 = (51–100)—decreased 3 = (101–200)—no change 4 = (201–500)—increased 5 = (Over 500 workers)—greatly increased
	Sales volume (thousand USD) The lower range of USD244 thousand; corresponds to the base value for SMEs in Colombia according to the sector (December 957 of 2019).	1 = (Under 1000)—greatly reduced 2 = (1000–10,000)—decreased 3 = (10,000–50,000)—no change 4 = (50,000–100,000)—increased 5 = (Over 100,000)—greatly increased
	Main clients	1 = Consumers and families 2 = Other companies 3 = Public administrations 4 = Others 5 = Consumers and families, other businesses
Organizational management (OM)	Formulation of income budget	1 = Not formulated—greatly diminished 2 = Annual—decreased 3 = Intermediate—no change 4 = Monthly—increased 5 = All periods—greatly increased
	Expenditure budget	1 = Not formulated—greatly diminished 2 = Annual—decreased 3 = Intermediate—no change 4 = Monthly—increased 5 = All periods—greatly increased
	Financial goals (type)	1 = None—greatly reduced 2 = Economic structure growth (assets)—decreased 3 = Growth and performance—no change 4 = Margin and yield—increased 5 = All financial goals—greatly increased
	Cost identification	1 = Not formulated—greatly diminished 2 = Annual—decreased 3 = Intermediates—no change 4 = Monthly—increased 5 = All periods—greatly increased
	Productive capacity	1 = (0–40%)—greatly diminished 2 = (41–70%)—decreased 3 = (71–90%)—no change 4 = (91–100%)—increased 5 = (>100%)—greatly increased

Variable	Factors	Measuring Ranges
Business situation (BS) Innovation and development (ID)	Tourism subsector Investment in product development (these values are annual)	1 = Tourist clubs 1 = (0)—greatly diminished 2 = (1–5 million)—decreased 3 = (5–20 million)—no change 4 = (20–50 million)—increased 5 = (Over USD50 million)—greatly increased
	Marketing investment	1 = (0)—greatly diminished 2 = (1–5 million)—decreased 3 = (5–20 million)—no change 4 = (20–50 million)—increased 5 = (Greater than USD50 million)—greatly increased
	Investment in process improvement	1 = (0)—greatly diminished 2 = (1–5 million)—decreased 3 = (5–20 million)—no change 4 = (20–50 million)—increased 5 = (Over USD50 million)—greatly increased
	Number of years (with I + D)	1 = (0)—greatly diminished 2 = (1–2 years)—decreased 3 = (3)—no change 4 = (4)—increased 5 = (5 years or more)—greatly increased
Impact of the COVID-19 crisis on SMEs in the tourism sector (ICTS)	Remote work	1 = 0—greatly diminished 2 = (1–30%)—decreased 3 = (31–60%)—no change 4 = (61–80%)—increased 5 = (81–100%)—greatly increased
	Investment in reactivation	1 = (0)—greatly diminished 2 = (1–5 million)—decreased 3 = (5–20 million)—no change 4 = (20–50 million)—increased 5 = (Over USD50 million)—greatly increased
	Payroll recovery (as of December 2021)	1 = It has reduced it even further—greatly diminished 2 = No, still diminished—decreased 3 = Recovered 70–80% of payroll—no change 4 = 100%—increased 5 = >100%—greatly increased
	Continues to be affected by the crisis Binary variable, Likert scale does not apply.	1 = Yes 2 = No
	Amount of public support	1 = (0)—greatly diminished 2 = (1–10 million)—decreased 3 = (10–50 million)—no change 4 = (50–200 million)—increased 5 = (Over USD 200 million)—greatly increased
Percentage of revenue 2020 compared to 2019	1 = (<=25%)—greatly diminished 2 = (26–50%)—decreased 3 = (51–75%)—no change 4 = (76–100%)—increased 5 = (>100%)—greatly increased	

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Article

How Do Consumer Innovation Characteristics and Consumption Value Shape Users' Willingness to Buy Innovative Car Safety Seats?

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Abstract: The intelligent innovation of child safety seats has brought new impacts and challenges to the Chinese market. Researchers in the car seat industry have been focusing on industry regulations and the abuse of car seats, but there is a lack of consumer-centered research. This study is the first to combine two theories of consumer subject-specific innovation (DSI) and the theory of consumption value (TCV). This study explores how consumer innovations influence consumers' purchase of innovative child safety seats through perceived value. The proposed research model was evaluated using a partial least squares structural equation model, and data analysis revealed that the model had good model fit, reliability, and validity. Consumer product innovation has a significantly better impact on willingness to buy than consumer information innovation. In this study, in the relationship between consumers of information innovation and purchase intention in the automobile seat industry, a new kind of parallel multi-mediating relationship between the social value, hedonic value, and novelty value of perceived products was proposed. The study's results address the need for more consumer research in the intelligent seating industry, as well as how to give researchers and marketing firms solutions and suggestions based on facts.

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Keywords: smart safety seat; domain-specific innovation; consumption value; partial least squares structural equation model (PLS-SEM); multiple parallel mediations

1. Introduction

China now has the most car ownership in the world due to its rapid economic development. As of the end of November 2022, there were 415 million motor vehicles in China overall, of which 318 million were automobiles, according to the most recent statistics provided by the Ministry of Public Security of China. More than 500 million people drive automobiles, including 463 million car owners [1]. The number of cars and drivers in China currently leads the world. However, child safety seats are not used nearly enough in China. According to the Blue Book of China Children's Road Traffic Safety (2018) [2], the death rate of children traveling in vehicles without child safety seats is eight times greater than that of children traveling in vehicles with child safety seats installed. Less than 10% of children in China use child safety seats, much lower than the nearly 90% penetration rate in Europe and the US. Sixty percent of traffic fatalities among children aged 1 to 14 occurred in the ten years from 2012 to 2021 among children under six. Such information was made public by Gao Yan, director of the Traffic Safety Technology Department of the Traffic Management Science Institute of the Ministry of Public Security [3]. Children who died in cars made up a more significant percentage of child traffic injury deaths, accounting for an average of 43.9% over the past ten years. An amount of 2954 kids between the ages of 1 and 15 lost their lives in traffic accidents, and 13,938 others were hurt, according to the China Road

Traffic Accident Statistics Annual Report (2017) [4]. It is critical to increase the use of child safety seats as a result.

There have been efforts made in every sphere of society to increase the use of child safety seats. For instance, some researchers have studied the data on child safety seats manufactured and exported from China [5]. In contrast, some designers have conducted research to enhance the functionality of child safety seats [6–8]. Some doctors have also studied the situation of newborn children using child safety seats [9–11]. Studies have also urged the government and law enforcement agencies to make laws and regulations more stringent [12–14]. The analysis of the deciding factors in purchasing child safety seats needs to be improved from the consumer's perspective.

The theory of consumption value (TCV) is a marketing theory that provides insights into the motivations of consumers' consumption behavior through consumption value [15]. Customers prefer to purchase goods that are perceived to have the highest value [16]. The theory of consumer value (TCV), developed by Sheth et al., provides a substantial theoretical and practical contribution by illuminating the rationale behind consumers' decisions to purchase specific products, product categories, and brands based on their perceived value [17]. TCV offers the chance to enlighten and enrich the knowledge of how a variety of goods and services are consumed, including food [18,19], clothing [20], health [21], education [22], travel [23], etc. This claim is supported by recent research, which shows that, in order to comprehend consumer behavior in the modern online and offline environments, perceived value tends to present consumption value [24,25]. TCV has made significant contributions to the theory and practice of motivating consumer behavior. There are no studies on the connection between consumer value and consumer behavior in the context of intelligent safety seats. This study's goals are to integrate and synthesize the knowledge based on TCV's research findings in the intelligent products field, conduct a more profound analysis of smart child safety seats, and make recommendations for future consumer studies.

China leads the world in producing child safety seats, turning out more than 15 million units annually. To meet consumer demand and increase the use of child safety seats by aligning with consumer values. Chinese manufacturers have developed a variety of "innovative" and functional product designs: the intelligent safety seat. Dehumidification and safety monitoring systems integrated into innovative safety seats are examples [26,27]. In addition, child safety seats that can adjust to a child's size automatically [28] and detect and alarm when a child has been left in a vehicle [29] are now commercially available. At the moment, there are no research studies on intelligent child safety seats, which are an innovative intelligent product in a particular field.

The adoption of new products by consumers has been extensively studied in the past, and several conventional research models have been put forth. For instance, TAM (the technology adoption model) [30], TAM2 (the enhanced technology acceptance model) [31], TPB (the planned behavior theory) [32], TRA (the rational action theory) [33], UTAUT (the unified theory of technology acceptance and use [34], and DSI (the domain-specific innovativeness) have been developed [35].

TAM, TAM2, TRA, TPB, and UTAUT typically study new science and technology. Researchers are more likely to use the DSI theory for research on innovative products in various fields and attempt to explain its utility to consumer research [36,37].

DSI has been found to be the most practical scale for assessing consumers' capacity for innovation in particular product categories in empirical studies conducted across the globe, including those conducted in the United States, Germany, and France [37–39].

The DSI structure has been found to positively influence consumers' willingness to try new products in earlier studies with related properties, though the influence coefficient is very small [38,39]. Because of this, some researchers have reformulated and put to the test the DSI structure, as well as its relationship to the characteristics of innovative products, and have investigated how these attributes affect consumers' intentions to buy new products [40,41].

Since there is no similar research in the intelligent child safety seat industry, we refer to Jeong, S. C. et al. [40,41]. We modified the research model to be more suitable for consumers of intelligent child safety seats.

Prior academic work has yet to, to our knowledge, successfully integrate domain-specific innovation theories into the theoretical structure of consumer value. This study aims to fill knowledge gaps by examining the relationship between innovation indicators in these areas and how consumers perceive the value of smart safety seats and whether they plan to purchase them.

The contributions of this study are as follows:

- (1) Extend the application of partial least squares structural equation modeling (PLS-SEM) to a new subject area.
- (2) Broaden the research perspective of consumer motivation.
- (3) The user portrait of new product promotion is analyzed from two perspectives: consumer product innovation and consumer information innovation.
- (4) People now have a new perspective on consumer behavior as a result of the integration of the theory of consumer value and the theory of innovation in particular fields.

This paper's remaining sections are organized as follows. The first section introduces the theoretical foundation of this study. The second section discusses the study's methodology, followed by the third section's study results. The fourth section provides suggestions for future research directions. The fifth section introduces the study's limitations and conclusions.

2. Theoretical Background and Hypothesis Development

2.1. Domain-Specific Innovation (DSI)

According to pertinent marketing research, consumer innovativeness, or the ability to use a new product more quickly than other consumers, is one of the most significant personality attributes influencing a consumer's decision to use or accept a new product [42,43]. According to the DSI structure, individuals who are consumer innovative in one category do not necessarily exhibit this behavior in other fields, which concentrates on aspects of human behavior related to innovation within a person's particular sphere of interest [44]. Thus, defined in the field of innovation performance more precisely forecasts the adoption of new products, leading to the development of innovation (domain-specific innovativeness) in specific areas, using innovative specific areas to forecast consumers' specific interest in the field of new products early adoption behavior and attitude [45]. Researchers worldwide have been adapting this model's structure to new fields and products in recent years [46–51]. However, many studies look at the product side of things, concentrating on the early degree of customers' adoption of new items while disregarding that some people only pay attention to the information about new products but do not necessarily buy them. Companies today need to pay closer attention to innovation centered on product details because of the dynamic nature of the business and technological landscapes and individual consumers' penchant for constant reinvention. Based on the two pillars of product and information, customer innovation in a given industry can be broken down into two categories: consumer information innovation and consumer product innovation [40].

2.2. Theory of Consumption Value (TCV)

TCV is a multifaceted method that evaluates consumption value from a behavioral standpoint and offers different kinds of perceived value [52]. TCV was first presented by Sheth et al. [17] in the Journal of Business Research article "Why We Buy What We Buy: A Theory of Consumer Value." By emphasizing the value of consumption to anticipate, characterize, and justify decision behavior, this theory illuminates the driving force behind consumer behavior. TCV offers a multidisciplinary perspective for examining consumer choice behavior since Sheth et al. [17] employed a wide range of disciplines, including economics, marketing, consumer behavior, sociology, and psychology, to establish their

theories and their values. The creators of the theory emphasize that only individual, deliberate, and free decision-making is applicable in practice.

When evaluating a marketing offer’s differences from competing offerings, consumers must consider all of the benefits and expenses involved. This is known as perceived value [16]. The complexity of perceived worth has been proposed by numerous scientists [53–56]. As a result, they suggest various dimensions to look at perceived value. For instance, the proposal of Chahal, Hardeep, Kumari, and Neetu (2012) for perceived value has a multidimensional structural character that is produced by 27 items spread over six dimensions that are significant for consumer value measurement. The dimensions include acquisition value, transaction value, efficiency value, aesthetic value, social interaction value, and self-gratification value [54].

According to Sweeney and Soutar (2001), the PERVAL scale—which is based on the utilitarian and hedonistic construction of this tendency—proposes emotional, social, quality, and price values as dimensions of consumption value [53]. Later, El-Adly, Mohammed, and Ismail (2019) offered a different typology for customer value that combined self-gratification value, aesthetic value, price value, prestige value, transaction value, hedonic value, and quality value [56].

More specifically, Sheth et al. [24] are devoted to answering the following questions: “Why do consumers choose to buy or not buy (or use or not use) particular products? Why do consumers choose one type over another, and why do consumers choose one brand over another?”. In order to answer these questions in TCV, we propose four kinds of consumer perceived value: perceived usefulness value (PUV), perceived social value (PSV), perceived hedonic value (PHV), and perceived novelty value (PNV).

2.3. Hypothesis Development

We combine a modified version of the DSI theory with the TCV theory to examine the behavioral intention of consumers to purchase innovative car safety seats. The model says that consumer information innovation, consumer product innovation, and perceived value will significantly impact people’s desire to buy innovative safety seats. As a mediating variable, perceived value affects the intended effect of consumer innovation in a specific field on consumers’ purchase of innovative car safety seats. Figure 1 shows the model without mediating variables, and Figure 2 shows the model with mediating variables.

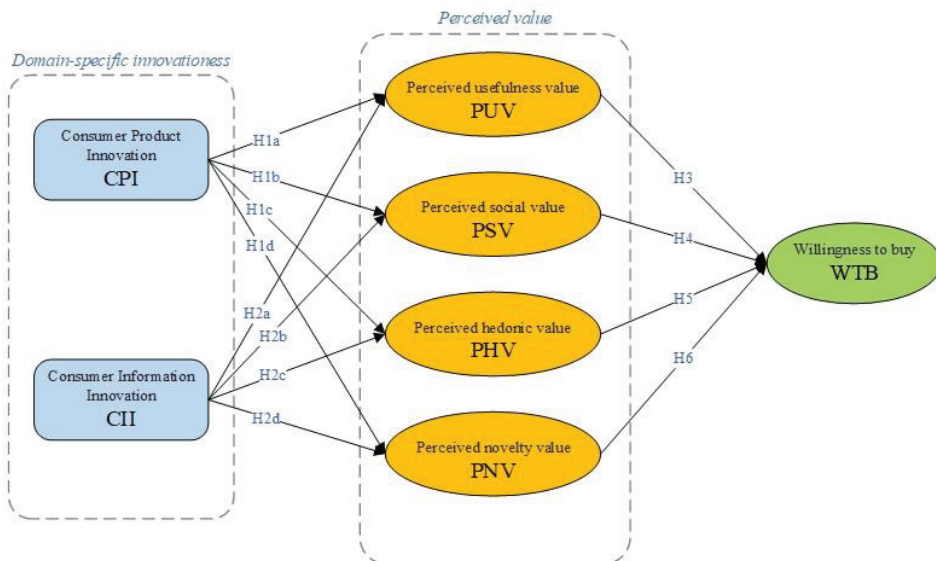


Figure 1. Research model A. (without mediator).

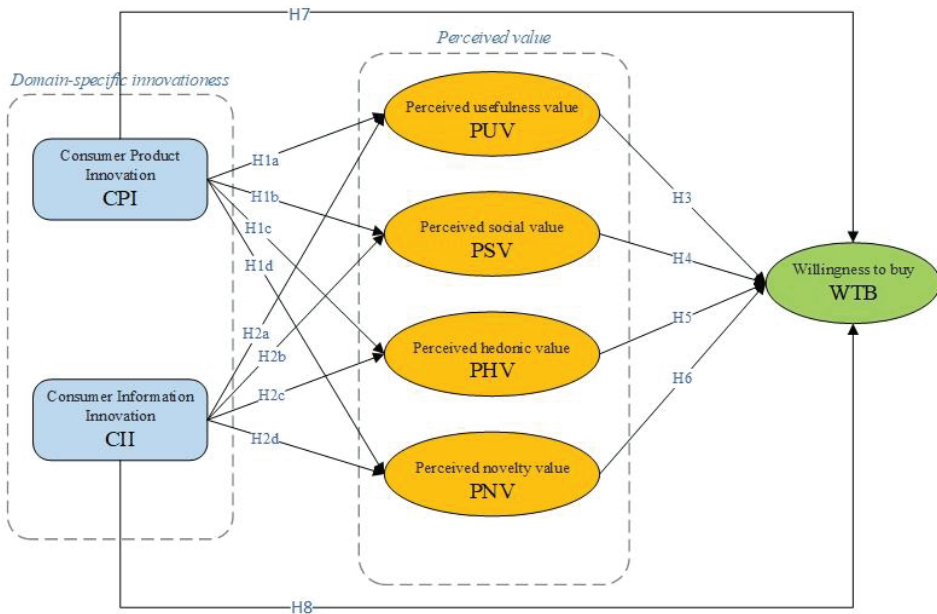


Figure 2. Research model B. (Perceived value as a mediator for CPI and WTB; Perceived value as a mediator for CII and WTB).

2.3.1. Consumer Product Innovation and Perceived Value

Consumer product innovation (CPI) measures how quickly a product's user base adopts new features and technologies relative to other products in the same market segment [57].

According to previous studies [58], consumers on the cutting edge of innovation tend to be curious. Customers such as them are receptive to new concepts and eagerly anticipate the arrival of innovative products. As a result, people with a high CPI may be more aware of the worth of new things, more possessive, and more prone to believe that material goods may bring them happiness [59]. Studies have shown that product innovation can increase the perceived value of customers [60].

H1a. Consumer product innovation (CPI) has a positive effect on perceived usefulness value (PUV).

H1b. Consumer product innovation (CPI) has a positive effect on perceived social value (PSV).

H1c. Consumer product innovation (CPI) has a positive effect on perceived hedonic value (PHV).

H1d. Consumer product innovation (CPI) has a positive effect on perceived novelty value (PNV).

2.3.2. Consumer Information Innovation and Perceived Value

Consumer information innovation (CII) refers to the propensity for consumers to be exposed to and receive information about new items before others in a specific product category, but not necessarily to acquire the new product. Expertly informed innovative consumers are eager to learn about innovative new products and desire access to them even if they do not possess them [61].

Previous research has studied a similar issue [62], defining and conceptualizing innovativeness as a person's desire to learn about a new product rather than purchase the thing. Moreover, Hartman et al. [63] consider this form of innovation one of the three unique dimensions of innovation. It shows that customers with a high CII score may hunt for information outside their personal knowledge base to review their memory and knowledge about the product or service gleaned from past experiences to make purchasing

decisions. They enjoy sharing more knowledge [64]. External search enables customers to acquire and preserve adequate information for decision-making [24]. Al-Rahmi, W. et al.'s investigation of students' intention to use e-learning systems found that information innovation can affect students' value-oriented perception [65].

H2a. *Consumer information innovation (CII) has a positive effect on perceived usefulness value (PUV).*

H2b. *Consumer information innovation (CII) has a positive effect on perceived social value (PSV).*

H2c. *Consumer information innovation (CII) has a positive effect on perceived hedonic value (PHV).*

H2d. *Consumer information innovation (CII) has a positive effect on perceived novelty value (PNV).*

2.3.3. Perceived Usefulness Value and Willingness to Buy

There is a link between consumer behavior and individual value, according to the theory of consumption value [24]. It is asserted that customers evaluate a product's relevance and desirability based on how those features relate to the individual consequences of product use. Similarly to this, the applicability and desirability of personal consequences are determined by their relationship to a consumer's values.

The usefulness value of products is defined as "the extent to which a person believes that the use of a certain system improves his/her work performance". The previous literature showed that college students perceived the usefulness of educational social network sites had a moderate impact on their willingness to use educational social network sites [66]. Studies have shown that consumers accept that the behavior intention of mobile banking in Malaysia is affected by perceived usefulness [67].

H3. *Perceived usefulness value (PUV) has a positive effect on users' purchase intention (WTB).*

2.3.4. Perceived Social Value and Willingness to Buy

Perceived value is essential to consumer satisfaction and behavior [68]. Numerous empirical studies have demonstrated the beneficial relationship between perceived value and customer action intentions [55,69–71]. In line with these findings, the perceived value of an innovative car safety seat may drive consumers to acquire this product.

Previous studies have found that social value may directly affect consumers' purchase intention for green products [72]. Jaleel, A. et al. evaluated the relationship between consumers' perceived value and behavioral intention in medical tourism services and found that perceived social influence and social value had a great impact on usage intention [73].

H4. *Perceived social value (PSV) has a positive effect on users' purchase intention (WTB).*

2.3.5. Perceived Hedonic Value and Willingness to Buy

Hedonic value refers to the feeling of pleasure, comfort, safety, comfort, and relaxation generated when using a particular brand. The inherent hedonic value of a brand can create brand personality attraction, which can influence consumers' perception of the attributes of products or services and meet their expectations. Hedonic value positively impacts consumers' behavioral intentions [74].

H5. *Perceived hedonic value (PHV) has a positive effect on users' purchase intention (WTB).*

2.3.6. Perceived Novelty Value and Willingness to Buy

Fazal-e-Hasan, S. et al. found that novelty can significantly improve consumers' intention to use intelligent retail technology [75]. Some scholars have found that customers want to experience new services, and the functions of these services should differ from the original ones. If customers' expectations of exploration and learning are met, consumers' usage intentions will increase [76]. A recent study by Adapa, S. et al. established a positive correlation between perceived novelty and use intent [77]. Therefore, we assume that:

H6. *Perceived novelty value (PNV) has a positive effect on users' purchase intention (WTB).*

2.3.7. Innovation in Specific Areas and Willingness to Buy

An example of DSI is consumers' propensity to be the first adopters of new offerings within a certain market segment [78]. While studies in various disciplines have looked into why and how consumers try new products [41,51,79,80], the bulk of the literature has focused on what motivates consumers to try new things in the first place. The idea of domain-specific consumer innovativeness is commonly utilized in diffusion theory to explain why and how people in a given social system accept and spread new products [81]. Evidence shows that individuals' propensity for innovation influences how quickly they adopt new technologies [82].

In this case, consumers in specific areas that may have certain products or services tend to show greater purchase willingness than those without such products or services. In other words, innovative consumers tend to have higher consumption propensity than conservative consumers [42]. Therefore, suppose:

H7. *Consumer product innovation (CPI) has a positive effect on users' purchase intention (WTB).*

H8. *Consumer information innovation (CII) has a positive effect on users' purchase intention (WTB).*

2.3.8. The Mediating Role of the Perceived Value

In general, innovators or early adopters of innovative products, who have a positive attitude towards innovation, assess value differently than most late consumers or laggards. The innate innovation ability of consumers stimulates innovators to perceive the added value of innovative products. High and positive perceived value drives innovators to adopt new products [83]. Perceived value plays a mediating role in the influence of social identity and social influence on the purchase intention of new products. Al-Jundi, S.A. et al. found that domain-specific innovation mediates between consumers' innate innovation and their intention to buy new products [41]. At the same time, Hong et al. proved that hedonic and utilitarian values mediate the influence of smartwatch consumers' innovation on their intention to continue [84]. Therefore, the following hypothesis is proposed:

H7a. *Perceived usefulness value (PUV) mediates the effect of consumer product innovativeness (CPI) on users' purchase intention (WTB).*

H7b. *Perceived social value (PSV) mediates the effect of consumer product innovativeness (CPI) on users' purchase intention (WTB).*

H7c. *Perceived hedonic value (PHV) mediates the effect of consumer product innovativeness (CPI) on users' purchase intention (WTB).*

H7d. *Perceived novelty value (PNV) mediates the effect of consumer product innovativeness (CPI) on users' purchase intention (WTB).*

H8a. *Perceived usefulness value (PUV) mediates the effect of consumer information innovativeness (CPI) on users' purchase intention (WTB).*

H8b. *Perceived social value (PSV) mediates the effect of consumer information innovativeness (CPI) on users' purchase intention (WTB).*

H8c. *Perceived hedonic value (PHV) mediates the effect of consumer information innovativeness (CPI) on users' purchase intention (WTB).*

H8d. *Perceived novelty value (PNV) mediates the effect of consumer information innovativeness (CPI) on users' purchase intention (WTB).*

3. Materials and Methods

3.1. Participants and Procedures

Through professional research organizations, a questionnaire survey is administered to clients of mother and child stores and the automobile sales service shop for Bentley in major developed cities (Shanghai, Beijing, and Hangzhou) in China as part of this study. The questionnaire for this study is posted on wenquan.com (China's largest website for questionnaire surveys), and a total of 1200 respondents were questioned utilizing a combination of convenience sampling and purposive sampling. The purpose of purposive sampling is to find out the parents with children and private cars and survey them. All of the respondents were parents of small children.

The research goals were established by carefully selecting samples from the smart child safety seats currently available on the Chinese market. Child safety seats with various smart technologies were ranked. The ForU smart child safety seat was chosen as a target to avoid the influence of individual preferences for specific features on willingness to pay. The intelligent child safety seat designed by the Shanghai Woyoo Electronic Technology Co., Ltd. was sold in 2018. ForU's smart child safety seat is the case for this study for the following reasons. First of all, the ForU intelligent child safety seat, which is currently sold in China, has a lot of functions and patents [85–106]. Secondly, the ForU smart child safety seat uses sensors to detect when a child is in the seat, alarms when the temperature rises, and turns on ventilation to help the child cool down. If the driver forgets the child in the vehicle, the mobile phone will notify and alarm the driver. The automated ISOFIX locking, heated, ventilated, and foldable smart child safety seat are all available. Additionally, the intelligent child safety seat has an APP that lets users control the backrest's angle and the heating and ventilation systems with their voice and phone. Thirdly, customers can easily purchase this sophisticated child safety seat from Bentley and Taobao stores' automobile sales service shops.

3.2. Questionnaire Design

The questionnaire consists of four parts. The first part is about the introduction of innovative child safety seats. The second part is the population and tourism information questionnaire, which investigated the demographic data, annual family income, and family travel frequency. The third part is the DSI scale, which is used to measure specific categories of consumer innovation [63,80,107]. The fourth part is the questionnaire TCV model. The scale was created by the TC.

The TCV model includes four subscales: perceived usefulness value, perceived social value, perceived hedonic value, and perceived novelty value [34,108–111]. All scales are 7-point Likert scales with 28 questions. According to the suggestion of bilingual professor Zhao Mei [112], the scale was first translated into Chinese according to the language expression, cultural background, and customs, and then it was translated back to English for proofreading with the original scale. Table A1 shows the questions for the questionnaire in Appendix A.

3.3. Data Collection

We conducted on-site trials of smart safety seats in shopping malls and auto 4S stores to understand consumers' feelings better. Consumers were required to fill out questionnaires after the trials. We have included a detailed introduction to the smart safety seat in the first section of the questionnaire for users who cannot enter the place to try out the smart safety seat. Consumers can clearly understand the smart safety seat's function, appearance, and characteristics thanks to these introductions. Respondents were required to complete the questionnaire.

Respondents were asked to complete the questionnaire online through Wechat or a browser. Professional research institutions that set the same IP address cannot submit the questionnaire repeatedly, and the same Wechat can only participate in the questionnaire once to improve the validity of the data. Wechat accounts and suspicious IP addresses have

been blocked. All respondents were informed that the information was private and would not be publicized. They voluntarily completed the questionnaire and were rewarded with 2 yuan (CNY) in exchange. We collected 1152 questionnaires between March and July 2022. We rescreened the data, removing questionnaires with the same score for all options, and obtained 1057 valid responses.

Table 1 provides an overview of the respondents' age, gender, educational background, household income, and frequency of trips with children. Of the respondents, 38.7% (409) were female, and 61.3% (648) were male, both of whom were parents of existing children. The majority, about 77.6%, were reported to be between the ages of 26 and 45. More than 90% had higher education. The largest proportion of households with an annual household income of RMB 100,000–300,000 yuan was 46.2%.

Table 1. Demographic profile of respondents (N = 1057).

Demographic Profile	Frequency	Relative Frequency (%)
Gender		
Female	409	38.7
Male	648	61.3
Age (years)		
≤25	198	18.7
26–35	598	56.6
36–45	222	21.0
>45	39	3.7
Education level		
10–12 years	98	9.3
College degree	190	18.0
Bachelor	664	62.8
Post-graduate degree/PhD	105	9.9
Annual household income (RMB)		
≤100,000 Yuan	185	17.5
100,000–300,000 Yuan	488	46.2
300,000–500,000 Yuan	248	23.5
>500,000 Yuan	136	12.9
Travel times (per month)		
0–10 times	662	62.6
11–30 times	395	27.4

3.4. Data Analysis

Using Smart PLS 2.0, partial least squares structural equation modeling was performed. Smart PLS's strengths lie in its flexibility [113]; it can be applied to the analysis of non-normal data or studies with small sample sizes, as well as to the analysis of more sophisticated multi-order latent variable models and the exploration of novel models [114,115]. The model is complicated since it is a second-order model with seven latent variables, and the data used in this study are not strictly normally distributed. This exploratory model has not been the subject of any prior research. The aforementioned considerations led to the choice of the partial least squares structural equation modeling method for this investigation.

The useful data were examined in three stages; the first two steps are analyzed according to the two-step method proposed by Anderson and Gerbing [116].

Step 1: Descriptive statistics were run on the population data. Regarding the scale, the correlation between latent variables and observable variables was used to assess measurement models. Reliability tests and validity tests were run on the data. The validity tests were further broken down into convergent and discriminant validity tests.

Step 2: Examine the structural equation model, which comprises the paths that latent variables take to interact with each other. Pay special attention to the regression weight

and significance level, as well as the amount of variance that these latent variables explain. Validity assessment of structural models using the blindfolding procedure was conducted.

Step 3: Out-of-sample prediction [117,118].

4. Results

4.1. Measurement Model

Table 2 is the descriptive statistics of respondents' answers to the Likert scale.

Table 2. Descriptive statistics.

	N	Min.	Max.	M	SD	Relative Frequencies (%)						
						1	2	3	4	5	6	7
CPI1	1057	1	7	4.77	1.17	0.76	1.42	8.33	32.54	33.21	14.19	9.56
CPI2	1057	1	7	4.53	1.19	0.57	2.93	15.42	29.90	33.11	11.73	6.34
CPI3	1057	1	7	4.68	1.15	0.38	1.42	10.88	34.44	31.79	12.58	8.51
CII1	1057	1	7	4.47	1.24	0.95	2.65	17.98	30.94	29.52	10.50	7.47
CII2	1057	1	7	4.51	1.27	1.42	3.50	14.76	30.75	29.61	12.68	7.28
CII3	1057	1	7	4.53	1.26	1.42	2.93	14.95	29.80	31.69	11.54	7.66
PUV1	1057	1	7	4.89	1.14	0.47	0.95	6.72	29.14	37.09	14.66	10.97
PUV2	1057	1	7	4.85	1.18	0.57	0.95	9.46	25.92	39.55	11.83	11.73
PUV3	1057	1	7	4.85	1.17	0.47	1.04	9.37	26.96	37.28	13.91	10.97
PUV4	1057	1	7	4.72	1.18	0.76	1.42	10.12	31.88	33.68	13.06	9.08
PSV1	1057	1	7	4.73	1.20	0.66	1.61	10.12	32.45	32.17	12.58	10.41
PSV2	1057	1	7	4.65	1.23	1.32	1.80	12.30	30.37	32.36	13.53	8.33
PSV3	1057	1	7	4.57	1.25	1.42	1.99	14.29	31.41	29.90	13.06	7.95
PHV1	1057	1	7	4.61	1.24	1.04	2.18	13.62	30.56	30.84	13.53	8.23
PHV2	1057	1	7	4.79	1.21	0.57	1.80	10.03	29.04	33.87	13.91	10.79
PHV3	1057	1	7	4.73	1.20	0.76	1.42	10.50	31.22	33.11	13.25	9.74
PNV1	1057	1	7	4.77	1.20	0.38	1.80	10.69	28.48	35.38	12.49	10.79
PNV2	1057	1	7	4.44	1.24	1.32	2.93	16.93	31.69	29.52	11.26	6.34
PNV3	1057	1	7	4.71	1.18	0.57	2.18	10.41	29.80	34.63	14.19	8.23
WTB1	1057	1	7	4.85	1.19	0.57	0.95	8.99	28.67	36.23	12.39	12.20
WTB2	1057	1	7	4.79	1.23	0.66	1.89	9.65	28.86	35.19	11.83	11.92
WTB3	1057	1	7	4.70	1.18	0.76	1.51	10.22	32.07	34.63	11.64	9.18

Note: N = number; Min. = Minimum value; Max. = Maximum value; M = Mean value; SD = standard deviations; CII = consumer information innovation; CPI = consumer product innovation; PHV = perceived hedonic value; PNV = perceived novelty value; PSV = perceived social value; PUV = perceived usefulness value; WTB = willing to buy; 1 = completely disagree; 2 = disagree; 3 = partially disagree; 4 = neutral; 5 = partially agree; 6 = agree; 7 = completely agree.

Table 3 displays the findings of the investigation of reliability. It can be seen that Cronbach's α of the seven latent variables is between 0.841 and 0.896, which are all higher than the benchmark value of 0.70. The composite reliability values are between 0.904 and 0.933, which were higher than 0.70, indicating that the reliability of the questionnaire is good, and the collected data are reliable. All item factor loadings should be more than 0.70, as per the Fornell and Larcker criteria [119], and the AVE for each construct was greater than 0.50 [120]. As can be seen in Table 3, the data for this model all met the requirements, indicating strong convergent validity.

Discriminant validity was tested using the Fornell-Larcker criterion [119], which is a measure of the expected level of "difference" between items for different factors. To test the discriminant validity of the model, the AVE of each factor was compared with the correlation square. The value on the diagonal is the square root of the AVE, and the other values are the correlation coefficients between the factors, which are considered to have good discriminant validity when the AVE is greater than the correlation coefficient between the factor and the other factors. From Tables 4 and 5, it can be seen that the model has good discriminant validity.

Table 3. Reliability and convergent validity test of the measurement model.

Construct	Items	Loadings	Cronbach	CR	AVE	R ²
Consumer information innovation (CII)	You enjoy learning about new information technology.	0.910	0.892	0.933	0.822	
	Compared to your contemporaries, you are often more sensitive to knowledge about novel things.	0.900				
	You tend to be more interested than your peers in the capabilities and applications of new information technology.	0.910				
Consumer product innovation (CPI)	Compared to your peers, you typically own more smart products.	0.913	0.883	0.927	0.81	
	You frequently purchase new smart devices before your peers.	0.876				
	You typically opt to purchase the newest smart devices.	0.911				
Perceived hedonic value (PHV)	Using the smart child safety seat would be fun during car trips.	0.899	0.877	0.924	0.803	0.637
	Using the smart child safety seat would be enjoyable.	0.888				
	Using the smart child safety seat would make me and my kids very happy during car trips.	0.901				
Perceived novelty value (PNV)	The Smart child safety seat is a new and refreshing device.	0.893	0.841	0.904	0.759	0.641
	Smart child safety seats are unique in this.	0.829				
	I think using a smart child safety seat is a novel experience.	0.891				
Perceived social value (PSV)	I should use smart child safety seats, according to people that matter to me.	0.880	0.86	0.914	0.781	0.626
	Those who have the power to affect my behavior believe I should employ smart child safety seats.	0.878				
	People whose viewpoints I respect want me to use smart child safety seats.	0.892				
Perceived usefulness value (PUV)	I think the smart child safety seat would be good for my driving.	0.905	0.896	0.928	0.763	0.643
	I could go to my destination more safely if I used the smart child safety seat.	0.859				
	The smart child safety seat would make it easier for me to go where I am.	0.879				
	I could reach my destination faster if I used the smart child safety seat.	0.851				
Willing to buy (WTB)	If I can afford it, I would prefer to buy a smart child safety seat	0.901	0.872	0.921	0.796	0.797
	I intend to use smart child safety seats in the future.	0.885				
	I would want to try the smart child safety seat.	0.891				

Note: loadings = factor loading; Cronbach = Cronbach's alpha; CR = construct reliability; AVE = average variance extracted, a measure of convergence among observable variables reflecting a latent variable; R² = coefficient of determination [121]. CII = consumer information innovation; CPI = consumer product innovation; PHV = perceived hedonic value; PNV = perceived novelty value; PSV = perceived social value; PUV = perceived usefulness value; WTB = willing to buy.

4.2. Structural Model

Evaluate the three research models proposed by the authors according to the research of Hair et al. [115,122]. The hypotheses are tested under these three different conceptual models, and the influences of independent and mediating variables on dependent variables are analyzed.

Table 4. Cross-loadings values for each block of indicators.

	CII	CPI	PIV	PNV	PSV	PUV	WTB
CII1	0.910	0.753	0.662	0.665	0.686	0.626	0.650
CII2	0.900	0.781	0.658	0.667	0.662	0.636	0.654
CII3	0.910	0.757	0.669	0.653	0.654	0.646	0.658
CPI1	0.736	0.913	0.722	0.727	0.696	0.748	0.739
CPI2	0.789	0.876	0.707	0.698	0.699	0.689	0.711
CPI3	0.750	0.911	0.700	0.714	0.703	0.722	0.717
PHV1	0.679	0.715	0.899	0.772	0.762	0.741	0.740
PHV2	0.641	0.706	0.888	0.783	0.736	0.775	0.751
PHV3	0.645	0.699	0.901	0.755	0.746	0.761	0.775
PNV1	0.631	0.718	0.771	0.893	0.728	0.772	0.772
PNV2	0.648	0.646	0.712	0.829	0.690	0.661	0.670
PNV3	0.632	0.705	0.762	0.891	0.713	0.752	0.748
PSV1	0.632	0.687	0.741	0.712	0.880	0.755	0.739
PSV2	0.651	0.692	0.736	0.724	0.878	0.729	0.707
PSV3	0.668	0.680	0.735	0.724	0.892	0.708	0.701
PUV1	0.623	0.736	0.747	0.746	0.728	0.905	0.767
PUV2	0.591	0.686	0.727	0.719	0.701	0.859	0.742
PUV3	0.625	0.716	0.770	0.752	0.749	0.879	0.744
PUV4	0.613	0.655	0.716	0.710	0.713	0.851	0.709
WTB1	0.629	0.721	0.772	0.737	0.726	0.784	0.901
WTB2	0.640	0.713	0.740	0.775	0.720	0.749	0.885
WTB3	0.662	0.714	0.746	0.735	0.722	0.735	0.891

Table 5. Discriminant validity matrix (Fornell and Larcker criterion).

	CII	CPI	PIV	PNV	PSV	PUV	WTB
CII	0.907						
CPI	0.842	0.900					
PHV	0.731	0.789	0.896				
PNV	0.730	0.792	0.859	0.871			
PSV	0.736	0.777	0.835	0.815	0.884		
PUV	0.702	0.800	0.847	0.838	0.827	0.874	
WTB	0.721	0.803	0.843	0.839	0.810	0.848	0.892

Note: Values (bold) on the diagonal represent the square root of the AVE, while the off-diagonals are correlations.

4.2.1. Research Model A. (without Mediator)

Each path coefficient's statistical significance was evaluated using t-tests, and as noted before, bootstrapping (5000 sub-samples) was utilized to do so.

Table 6 shows the results of direct effects analysis show that the direct effects are significant. The results of the indirect effect analysis show that the indirect effect is significant.

As seen in Figure 3 and Table 6, CPI had a significant positive effect on PUV ($t = 17.950$, $p < 0.001$), PSV ($t = 12.116$, $p < 0.001$), PHV ($t = 13.867$, $p < 0.001$), and PNV ($t = 1.690$, $p < 0.001$). CII had a significant positive effect on PUV ($t = 2.159$, $p < 0.05$), PSV ($t = 6.065$, $p < 0.001$), PHV ($t = 4.765$, $p < 0.001$), and PNV ($t = 4.655$, $p < 0.001$) also had a significant positive effect, but it was significantly weaker than the CPI effect on them. PUV ($t = 6.537$, $p < 0.001$), PSV ($t = 3.330$, $p < 0.01$), PHV ($t = 4.673$, $p < 0.001$), and PNV ($t = 5.938$, $p < 0.001$) all had significant positive effects on WTB.

The value of the coefficient of determination R^2 , which also explains the variance of the regression model, is in the range of [0, 1], and the closer it is to 1, the more the independent variable can explain the variance of the dependent variable, and the larger the value, the better [123]. According to Hair, "0.25 is weak, 0.50 is moderate, and 0.75 is the model's substantial explanatory power" [115]. Table 6 shows that PUV, PSV, PHV, and PNV are moderate, and WTB is strong.

Table 6. Hypothesized relationships for all effects.

Hypotheses	Path	Estimate	Standard Error	T-Value	p Value	95%CI	f ²	Supported
Direct effects								
H2c	CII→PHV	0.232 ***	0.049	4.765	0.000	[0.132; 0.324]	0.043 ^a	Yes
H2d	CII→PNV	0.215 ***	0.046	4.655	0.000	[0.122, 0.303]	0.037 ^a	Yes
H2b	CII→PSV	0.281 ***	0.046	6.065	0.000	[0.188, 0.370]	0.062 ^a	Yes
H2a	CII→PUV	0.096 *	0.045	2.159	0.031	[0.011, 0.187]	0.008	Yes
H1c	CPI→PHV	0.594 ***	0.043	13.867	0.000	[0.508, 0.675]	0.283 ^b	Yes
H1d	CPI→PNV	0.611 ***	0.042	14.690	0.000	[0.529, 0.692]	0.303 ^b	Yes
H1b	CPI→PSV	0.540 ***	0.045	12.116	0.000	[0.453, 0.626]	0.227 ^b	Yes
H1a	CPI→PUV	0.719 ***	0.040	17.950	0.000	[0.635, 0.794]	0.421 ^c	Yes
H5	PHV→WTB	0.240 ***	0.051	4.673	0.000	[0.138, 0.338]	0.053 ^a	Yes
H6	PNV→WTB	0.253 ***	0.043	5.938	0.000	[0.173, 0.341]	0.066 ^a	Yes
H4	PSV→WTB	0.145 **	0.044	3.330	0.001	[0.061, 0.232]	0.025 ^a	Yes
H3	PUV→WTB	0.312 ***	0.048	6.537	0.000	[0.217, 0.405]	0.102 ^a	Yes
Indirect effects								
	CPI→PSV→WTB	0.079 **	0.026	3.049	0.002	[0.030, 0.132]		Yes
	CPI→PHV→WTB	0.143 ***	0.033	4.338	0.000	[0.080, 0.209]		Yes
	CPI→PUV→WTB	0.225 ***	0.037	6.125	0.000	[0.155, 0.298]		Yes
	CPI→PNV→WTB	0.154 ***	0.028	5.555	0.000	[0.102, 0.211]		Yes
	CII→PHV→WTB	0.056 **	0.017	3.246	0.001	[0.025, 0.093]		Yes
	CII→PNV→WTB	0.054 ***	0.015	3.622	0.000	[0.028, 0.086]		Yes
	CII→PSV→WTB	0.041 **	0.013	3.062	0.002	[0.016, 0.069]		Yes
	CII→PUV→WTB	0.030 *	0.015	1.976	0.048	[0.003, 0.062]		Yes

Note: Path significance: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. The levels of significance for the f^2 statistic are as follows: ^a > 0.02 (little effect), ^b > 0.15 (moderate effect), and ^c > 0.35 (large effect) [115].

In addition to the R^2 values, the size effect f^2 , is used [115]. There are three different effect values: small (greater than 0.02), medium (greater than 0.15), and large (greater than 0.35) [115]. As seen from Table 6, the f^2 value of H1a is equal to 0.421, reflecting the strong influence of consumer product innovation on perceived useful value. The effect of consumer information innovation on perceived useful value is negligible ($f^2 = 0.008$).

In Table 6 and Figure 3, the structural model's validity was evaluated using R^2 (a measure of predictive accuracy). The R^2 of WTB was 0.797%, indicating that the latent variables explained 79.7% of the purchase intention, which was greater than 50% and demonstrates that the model's assumptions are reasonable. The model fit well [115].

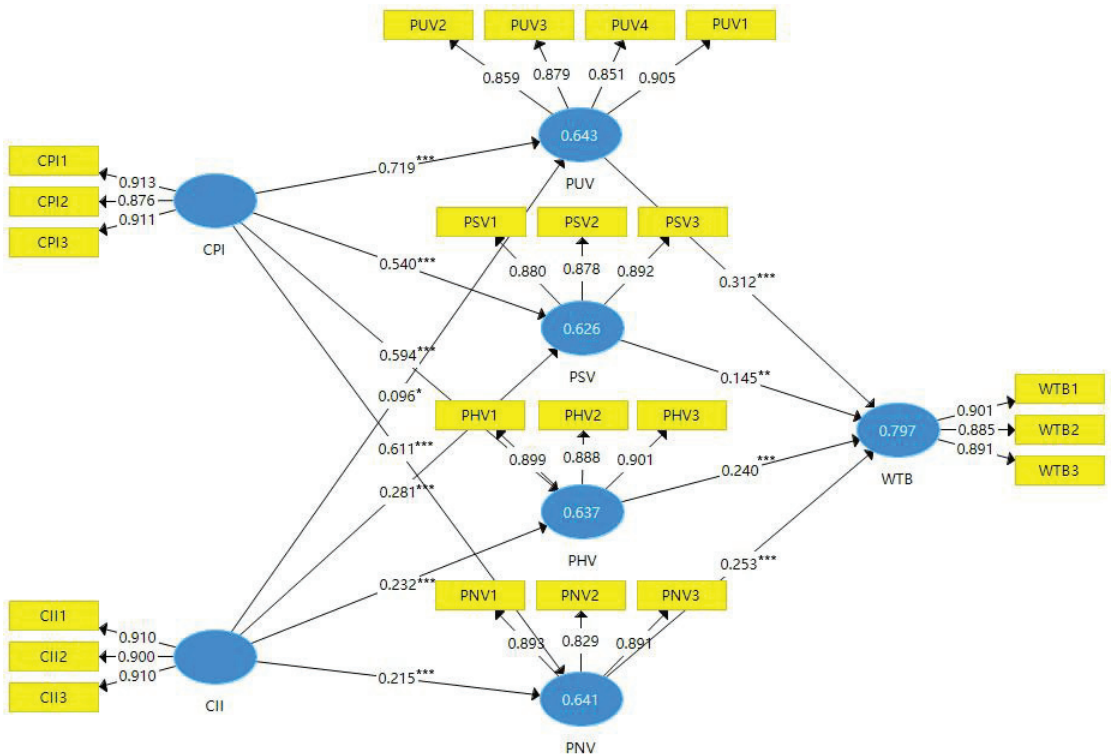


Figure 3. Findings of structural model analysis. (Note: *** denote 0.1% significance levels; ** denote 1% significance levels; * denote 5% significance levels).

From Table 7, it can be concluded that $Q^2 > 0$ indicates that the structural model is valid [124].

Table 7. Cv-communality (Q^2 for measurement blocks).

Construct	Q^2
PHV	0.508
PNV	0.483
PSV	0.485
PUV	0.487
WTB	0.630

Note: Q^2 = predictive relevance.

According to Wetzels et al. [124], the goodness of Match (GoF) values greater than 0.1 indicate small, 0.25 and 0.36 indicate medium, and GoF values greater than 0.36 indicate largely. The GoF value can be used to examine the model fit, and when the GoF value is higher than 0.36, the model has good applicability [124]. According to GoF’s calculation formula: $GoF = \sqrt{\text{communality} \times R^2}$ [125]. $GoF = \sqrt{0.519 \times 0.669} = 0.589$. This model’s GoF value was calculated to be 0.589, indicating a decent fit.

4.2.2. Research Model B. (Perceived Value as a Mediator for CPI and WTB; Perceived Value as a Mediator for CII and WTB)

Each path coefficient’s statistical significance was evaluated using t-tests, and as noted before, bootstrapping (5000 sub-samples) was utilized to do so. The results are shown in Figure 4.

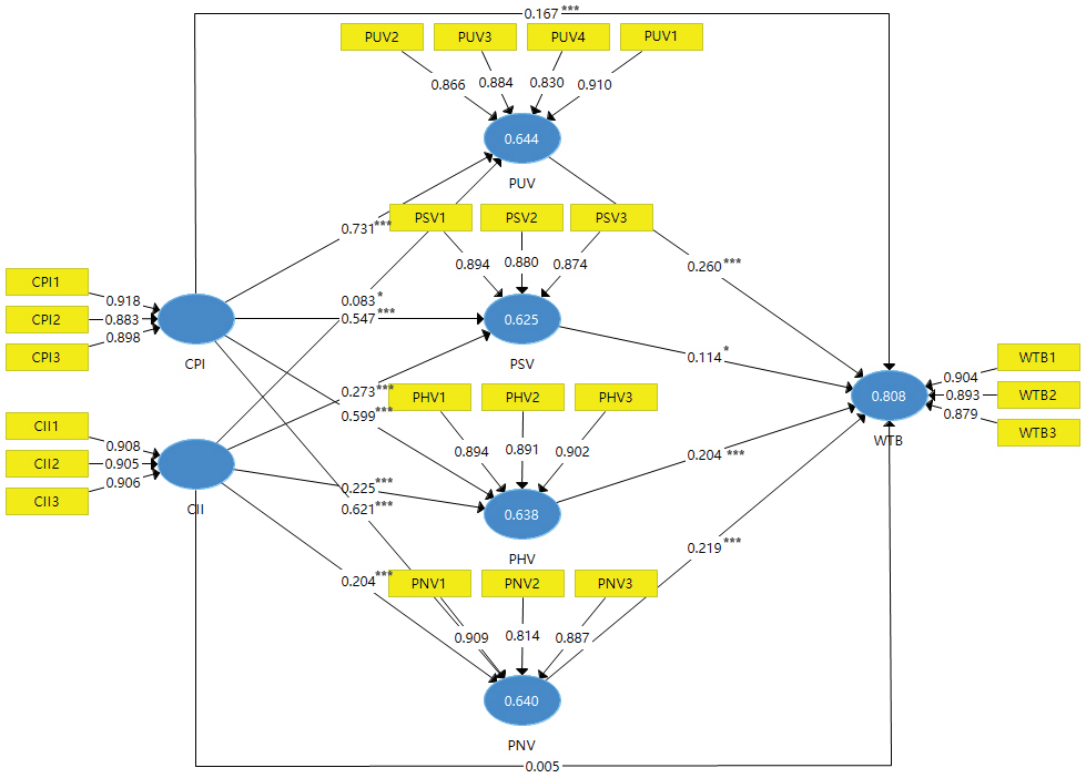


Figure 4. Findings of structural model A analysis. (Note: *** denotes 0.1% significance levels; * denotes 5% significance levels.).

Table 7 shows the hypothetical relationships for all effects of study model B.

Analysis results show that the total effect, as well as the CPI of WTB total allow effect, are remarkable. The direct effects of CII on PHV, PNV, PSV, and PUV were significant. The direct effect of PHV, PNV, PSV, and PUV on WTB was significant. The direct effect of CPI on WTB is significant. The indirect effect analysis shows that CPI→PSV→WTB had a significant effect, the indirect effect of CPI→PNV→WTB was significant, the indirect effect of CPI→PUV→WTB was significant, and the indirect effect of CPI→PHV→WTB is significant. Therefore, according to the literature of James, L. and Brett, J. [80], the author will further study whether PHV, PNV, PSV, and PUV have partial mediating effects on CPI and WTB.

Table 8 analyzes the mediating effect of PUV on CPI and WTB, the mediating effect of PSV on CPI and WTB, the mediating effect of PHV on CPI and WTB, and the mediating effect of PNV on CPI and WTB. According to the literature published by Hair et al. [114], it can be known that VAF represents the percentage of indirect effect and total effect. As a rule of thumb, VAF values are divided into three levels: VAF < 20% indicates no mediation effect, 20% ≤ VAF ≤ 80% indicates partial mediation effect, and VAF > 80% indicates complete mediation effect. It can be inferred from the value of VAF that PUV partially mediates CPI and WTB. PSV, PHV, and PNV have no mediating effect on CPI and WTB.

Table 8. Hypothesized relationships for all effects (research model B).

Hypotheses	Path	Estimate	Standard Error	T-Value	p Value	95%CI	f ²	Supported
Direct effects								
H2c	CII→PHV	0.231 ***	0.049	4.721	0.000	[0.132; 0.324]	0.043 ^a	Yes
H2d	CII→PNV	0.215 ***	0.046	4.661	0.000	[0.122, 0.303]	0.037 ^a	Yes
H2b	CII→PSV	0.281 ***	0.046	6.118	0.000	[0.190, 0.371]	0.062 ^a	Yes
H2a	CII→PUV	0.096 *	0.044	2.177	0.030	[0.009, 0.180]	0.008	Yes
H8	CII→WTB	0.006	0.040	0.141	0.888	[-0.073, 0.086]	0.000	No
H1c	CPI→PHV	0.594 ***	0.044	13.578	0.000	[0.507, 0.677]	0.283 ^b	Yes
H1d	CPI→PNV	0.611 ***	0.042	14.650	0.000	[0.529, 0.692]	0.303 ^b	Yes
H1b	CPI→PSV	0.540 ***	0.045	11.982	0.000	[0.449, 0.624]	0.227 ^b	Yes
H1a	CPI→PUV	0.719 ***	0.040	17.974	0.000	[0.637, 0.792]	0.421 ^c	Yes
H7	CPI→WTB	0.170 ***	0.046	3.677	0.000	[0.083, 0.265]	0.029 ^a	Yes
H5	PHV→WTB	0.210 ***	0.049	4.307	0.000	[0.114, 0.302]	0.041 ^a	Yes
H6	PNV→WTB	0.211 ***	0.042	4.957	0.000	[0.131, 0.295]	0.046 ^a	Yes
H4	PSV→WTB	0.110 *	0.044	2.505	0.012	[0.023, 0.195]	0.014	Yes
H3	PUV→WTB	0.262 ***	0.048	5.416	0.000	[0.164, 0.353]	0.070 ^a	Yes
Indirect effects								
	CPI→PSV→WTB	0.059 *	0.025	2.411	0.016	[0.013, 0.111]		Yes
	CII→PHV→WTB	0.049 **	0.016	3.067	0.002	[0.023, 0.086]		Yes
	CPI→PUV→WTB	0.188 ***	0.036	5.206	0.000	[0.119, 0.263]		Yes
	CII→PNV→WTB	0.045 **	0.014	3.289	0.001	[0.023, 0.077]		Yes
	CII→PSV→WTB	0.031 *	0.013	2.355	0.019	[0.008, 0.060]		Yes
	CPI→PHV→WTB	0.125 ***	0.030	4.133	0.000	[0.067, 0.186]		Yes
	CPI→PNV→WTB	0.129 ***	0.027	4.834	0.000	[0.081, 0.184]		Yes
	CII→PUV→WTB	0.025	0.013	1.956	0.051	[0.004, 0.054]		No
Total effects								
	CII→WTB	0.156 ***	0.033	4.559	0.000	[0.061, 0.252]		Yes
	CPI→WTB	0.672 ***	0.036	13.833	0.000	[0.581, 0.757]		Yes

Note: Path significance: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. The levels of significance for the f^2 statistic are as follows: ^a > 0.02 (little effect), ^b > 0.15 (moderate effect), and ^c > 0.35 (large effect) [115].

Table 9 shows that the results of the total effect analysis showed that the total effect of CII on WTB was significant. The direct effect analysis showed that CII significantly

impacted PHV, PNV, and PSV. The direct effect of PHV, PNV, and PSV on WTb was significant. The direct effect of CII on WTb was insignificant. The indirect effect analysis showed that CII→PHV→WTb had a significant indirect effect. The indirect effect of CII→PNV→WTb was significant. The indirect effect of CII→PSV→WTb was significant. Therefore, according to James, L. and Brett, J.'s research [126], the equation is tested by the coefficient *c* to distinguish between full and partial mediation. If the indirect effects are significant, but the coefficient *c* is not significant, it belongs to perfect mediation. PHV, PNV, and PSV were judged to mediate CII and WTb fully. The results are shown in Table 10.

Table 9. Mediation Tests for Parallel-Sequential Multiple Mediator Models (CPI→WTB).

Path	Estimate	T-Value	95%CI	VAF	Final Decision
H7a: Mediation of PUV (CPI→PUV→WTB)				28.03%	Partial Mediation
CPI→PUV	0.719 ***	17.974	[0.637, 0.792]		
PUV→WTB	0.262 ***	5.416	[0.164, 0.353]		
CPI→PUV→WTB (Indirect effects)	0.188 ***	5.206	[0.119, 0.263]		The hypothesis Is supported.
CPI→WTB (total effects)	0.672 ***	13.833	[0.581, 0.757]		
H7b: Mediation of PSV (CPI→PSV→WTB)				8.78%	No Mediation
CPI→PSV	0.540 ***	11.982	[0.449, 0.624]		
PSV→WTB	0.110 *	2.505	[0.023, 0.195]		
CPI→PSV→WTB (Indirect effects)	0.059 *	2.411	[0.013, 0.111]		The hypothesis is not supported.
CPI→WTB (total effects)	0.672 ***	13.833	[0.581, 0.757]		
H7c: Mediation of PHV (CPI→PHV→WTB)				18.60%	No Mediation
CPI→PHV	0.594 ***	13.578	[0.507, 0.677]		
PHV→WTB	0.210 ***	4.307	[0.114, 0.302]		
CPI→PHV→WTB (Indirect effects)	0.125 ***	4.133	[0.067, 0.186]		The hypothesis is not supported.
CPI→WTB (total effects)	0.672 ***	13.833	[0.581, 0.757]		
H7d: Mediation of PNV (CPI→PNV→WTB)				19.20%	No Mediation
CPI→PNV	0.611 ***	14.650	[0.529, 0.692]		
PNV→WTB	0.211 ***	4.957	[0.131, 0.295]		
CPI→PNV→WTB (Indirect effects)	0.129 ***	4.834	[0.081, 0.184]		The hypothesis is not supported.
CPI→WTB (total effects)	0.672 ***	13.833	[0.581, 0.757]		

Note: Path significance: *** $p < 0.001$; * $p < 0.05$.

Table 10. Mediation Tests for Parallel-Sequential Multiple Mediator Models (CII→WTB).

Path	Estimate	T-Value	95%CI	Supported	Final Decision
H8a: Mediation of PUV (CII→PUV→WTB)				No	No mediation
CII→PUV(a) (direct effects)	0.096 *	2.177	[0.009, 0.180]		
PUV→WTB (b) (direct effects)	0.262 ***	5.416	[0.164, 0.353]		
CII→PUV→WTB (Indirect effects)	0.025	1.956	[0.004, 0.054]		
CII→WTB (c') (direct effects)	0.006	0.141	[-0.073, 0.086]		
CII→WTB (c) total effects	0.156 ***	4.559	[0.061, 0.252]		
H8b: Mediation of PSV (CII→PSV→WTB)				Yes	Full mediation
CII→PSV (a) (direct effects)	0.281 ***	6.118	[0.190, 0.371]		
PSV→WTB (b) (direct effects)	0.110 *	2.505	[0.023, 0.195]		
CII→PSV→WTB (Indirect effects)	0.031 *	2.355	[0.013, 0.111]		
CII→WTB (c') (direct effects)	0.006	0.141	[-0.073, 0.086]		
CII→WTB (c) total effects	0.156 ***	4.559	[0.061, 0.252]		
H8c: Mediation of PHV (CII→PHV→WTB)				Yes	Full mediation

Table 10. Cont.

Path	Estimate	T-Value	95%CI	Supported	Final Decision
CII→PHV (a) (direct effects)	0.231 ***	4.721	[0.132; 0.324]		
PHV→WTB (b) (direct effects)	0.210 ***	4.307	[0.114, 0.302]		
CII→PHV→WTB (Indirect effects)	0.049 **	3.067	[0.023, 0.086]		
CII→WTB (c') (direct effects)	0.006	0.141	[-0.073, 0.086]		
CII→WTB (c) total effects	0.156 ***	4.559	[0.061, 0.252]		
H8d: Mediation of PNV (CII→PNV→WTB)				Yes	Full mediation
CII→PNV(a) (direct effects)	0.215 ***	4.661	[0.122, 0.303]		
PNV→WTB (b) (direct effects)	0.211 ***	4.957	[0.131, 0.295]		
CII→PNV→WTB (Indirect effects)	0.045 **	3.289	[0.023, 0.077]		
CII→WTB (c') (direct effects)	0.006	0.141	[-0.073, 0.086]		
CII→WTB (c) total effects	0.156 ***	4.559	[0.061, 0.252]		

Note: Path significance: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

5. Discussion

This study explores the characteristics of consumers who are willing to purchase innovative car seats. Through the study of model A, the hypothesis of this study has been confirmed. Direct effect analysis shows that both consumer product and information innovation have significant effects on perceived value. Truong, Y. Previously found that consumers' innovation ability would positively influence perceived value [109]. The results of this study show that perceived value (perceived product's usefulness, social value, hedonic value, and novelty value) has a significant positive impact on consumers' purchase intention. The previous article has a similar conclusion that the intention to use will be positively affected by perceived usefulness [66,67]. Hedonic value positively impacts consumers' behavioral intentions [74]. Jaleel, A. et al. found that perceived social influence and social value significantly impact usage intention [73]. A recent study by Adapa et al. established a positive correlation between perceived novelty and use intent [77].

In the total effect analysis of this study, consumer product and information innovation positively impact consumers' willingness to buy innovative car seats. This result is consistent with the opinions of articles in other industries. Lee, K. et al. studied whether product innovation significantly impacts the intention to buy smartphone products. The research results show that product innovation significantly positively impacts the intention to buy mobile phone products [127].

By studying model B, the following results are obtained. Perceived product usefulness plays a partial mediating role between consumer product innovation and purchase intention. Perceived social value, hedonic value, and novelty value have no mediating effect on consumer product innovation and purchase intention but only an indirect effect. The impact of consumer product innovation on purchase intent is still much explored in other industries. Saputra M. et al. studied the mediating role of green customer value. The research results show that green customer value has been proven to partially mediate between green product innovation and purchase intention [60].

Model B confirmed the following results. A product's perceived social value, hedonic value, and novelty value fully mediate between consumer information innovation and purchase intention. Researchers are investigating the public acceptance of self-driving cars. Research results show that perceived value fully mediates between consumer innovation and public acceptance of innovative products [128]. Hong et al. [85] proved that hedonic value and utilitarian value play an intermediary role in smartwatch consumers' innovation and use intention.

This study also found that the perceived usefulness of products had no mediating or indirect effect between consumers' information innovation and purchase intention. In the previous study, Abdurrahman C. and Umur A. explored the adoption of smart home

devices [129]. The results show an insignificant relationship between innovation and perceived usefulness in specific domains.

According to the findings above, CPI has a significantly better effect on perceived value than CII [80,130], which means that consumers with a high CPI are more likely to perceive the value of an intelligent safety seat and may be more willing to pay for it than those with a high CII.

5.1. Theoretical Contribution

The research model proposed in this study is based on the work of Jeong, S. C. et al. [40,41]. This study further demonstrates that consumers of innovative products and those of innovative information can both positively perceive the novelty and social value of innovative products. The research findings of Jeong, S. C. et al. [40,41] indicate that all of the perceived innovative characteristics of wearable technology positively impact the intention to purchase wearable devices. This study also supports our original assertion that purchasing cutting-edge car seats depends on perceived product value. Furthermore, this study examined the multiple parallel mediating effects of perceived product social value, hedonic value, and novelty value on consumer information innovation and purchase intention of intelligent child safety seats [131]. The analysis also discovered a partial mediating relationship between perceived usefulness and consumers' willingness to purchase innovative child safety seats. The unique and significant theoretical contributions of this study are those mentioned above.

This study defines the DSI structure from consumer product innovation and information innovation. Its relationship with perceived value is examined, followed by the relationship between perceived value and the intent to purchase new products. In prior studies of a similar nature, DSI structure positively influenced the intention to try new products, but the influence coefficient was minimal [84,132,133]. This study introduced TCV structure rather than directly relating DSI structure to purchase intention in model A. This is so because forward-thinking customers will prefer a new product if it can help them achieve their goals or uphold their values rather than just accepting it out of the blue. The findings support our hypothesis that consumers who use innovative products have a favorable impact on perceived value and a strong desire to buy new goods. In light of the evolving business and technological environment, as well as the challenges that contemporary businesses face in terms of individual innovation capabilities, researchers and practitioners need to pay more attention to product-centric consumer innovation capabilities. This result aligns with studies conducted in different fields [134–136].

By examining the impact of perceived value on the intention to purchase smart safety seats, we were able to confirm the importance of the TCV model. This study demonstrates the importance of considering the product's social value, novelty, and alignment with consumers' values, in addition to its features and benefits when studying consumers' propensity to purchase new products [137,138]. Give reasons for and details on how specific users adopt new technologies. It might be a good substitute for the technology acceptance model. Future research may focus on where these two theories on technology adoption converge.

In model B, we investigate the mediating effects of perceived value on both CPI and purchase intention, as well as CII and purchase intention. According to the findings, which are consistent with earlier studies [84,132,133], CPI has a small but significant direct impact on purchase intention. CII had no direct effect on purchase intention, and it is not discussed in the Jeong, S. C. et al. study, nor has it been reported in the literature to date. The results of this study show that perceived product usefulness have a partial mediating effect between CPI and purchase intention, and perceived product social value, hedonic value, and novelty value have multiple parallel mediating effects between CII and purchase intention. These findings suggest that consumers with high CPI may be more inclined to purchase novel products that offer them practical benefits, such as enhancing their work productivity and streamlining the use process. Customers with high CII are more concerned with how well a

new product's novelty, hedonic, and social values align with their own values. Customers with high CII will be more likely to purchase the new product if it matches; otherwise, they may choose not to do so.

Additionally, this study broadens the literature on which this theory is based. This study supported the theory of innovation diffusion in the context of smart safety seats, in contrast to earlier studies that concentrated on the fields of smart wearable technology, online medical applications, and online banking [40,51,139]. We identified the value characteristics of smart safety seats. We confirmed the positive and significant relationship between smart safety seats and purchase intention based on the attributes, consequences, and values of smart safety seats.

Finally, this study confirms the DSI and TCV theories that focus on the intelligent safety seat as the research object. We defined the value of smart seat technology using TCV theory and looked at its relationship to purchasing intent. We also suggest extending the theory by incorporating DSI into this framework. Prior studies have concentrated on the relationship between consumer innovation and adoption behavior [82,140]. Additionally, this study broadens the literature on which this theory is based. This study supported the theory of innovation diffusion in the context of smart safety seats, in contrast to earlier studies that concentrated on the fields of smart wearable technology, online medical applications, and online banking [40,51,139]. We determined the perceived value of innovative safety seats according to the consumer value of innovative safety seats. We verified the significant positive relationship between the perceived value and the purchase intention of innovative safety seats.

Previous research has merged TCV theory with other theories. For example, Dhir et al. (2020) blend the TCV theory with the flow theory and theory of planned behavior. To create comprehensive methods for creating ongoing engagement for mobile instant messaging apps [141].

Carlson et al. (2019) integrated service dominating logic with TCV theory. To investigate how consumer participation in brand communities on the perception of values [142], Wu et al. (2017) coupled the expectation–confirmation theory with the TCV theory to compare the repurchase intention of online versus physical music goods [143].

As far as we know, this is the first paper to meld TCV and DSI perspectives.

Considering the potential contribution and use of TCV in some studies, a hybrid approach must be applied in future TCV studies. These methods provide researchers with flexibility and the ability to apply optimal strategies to answer research questions. Due to the improved effect of quantitative research techniques on research validity, the mixed method ensures the robustness of research results [144]. Therefore, this method can provide more abundant results for researchers to study consumption value from the perspective of pragmatism and is also conducive to studying the consumption value of TCV from the overall perspective. TCV can maintain more adequate results for many consumption value problems with complex relationship structures that need further study. Therefore, hybrid research helps analyze the potential relationship between values and to understand the independence of values. In the future, we will further enrich TCV's existing explanatory capabilities using a hybrid approach to provide detailed, comprehensive, complementary, and holistic knowledge for a deeper understanding of the role of value in consumer behavior.

In the child safety seat industry, there is no previous research article using the partial least squares structural equation model. This study extends the application of PLS-SEM to a new subject area and contributes to the continued development of PLS-SEM.

5.2. The Actual Contribution

The study's findings address a gap in consumer research in the market for intelligent car safety seats and provide researchers and marketing companies with concrete recommendations and fixes. The results of this study are anticipated to assist designers and

promoters of intelligent child safety seats in thinking outside the box when formulating new design and marketing strategies.

The study first confirms that, as consumers' assessments of the worth of new products rise, so does their willingness to pay for them. Businesses are therefore compelled to learn more about their target market's ideal outcomes and values to incorporate them into upcoming products. Additionally, sellers must emphasize a new product's accessibility, compatibility with customers' values, and uniqueness when it first enters the market. These can increase consumers' willingness to pay for new goods by boosting their perception of the worth of those goods [145].

In addition, based on the empirical results in the previous section, this study confirms that if the perceived usefulness value of the product is high, then consumers with product innovation characteristics will be more likely to buy innovative car seats. Consumers with information innovation characteristics will have a strong purchase intent if they believe an innovative product has high social value, hedonic value, and novelty. By empirically verifying these propositions, this study significantly contributes to a broader study of the child safety seat industry; This will lead to a better understanding of the various emerging psychological factors influencing consumer behavior toward child safety seats.

This study supports the strategic planning and marketing initiatives of manufacturers, designers, brands, and marketing firms in the innovative child safety seat market. Companies must devise strategies, seek out and communicate with product innovators, ascertain their functional needs, and upgrade products to satisfy those needs to launch innovative car safety seats successfully. In order to better understand the opinions of information innovators regarding the social value, hedonic value, and novelty value of products, businesses can conduct surveys and focus group discussions. They can then attempt to align the brand value with these viewpoints.

It is important to note that this study's conclusions and ramifications do not just apply to the market for innovative car safety seats. We anticipate that more researchers will apply this theory to other industries and further explore and develop the theoretical model to generalize these findings and their implications to other newly developed intelligent product industries.

6. Conclusions

Researchers in the car seat industry have been focusing on industry regulations and the abuse of car seats, but there is a lack of consumer-centered research. Therefore, to bridge the gap between the car seat industry and product marketing research, this study explores the influence of consumers with product innovation characteristics and information innovation characteristics on their purchase intentions, respectively. The research shows that consumers with innovative products are more likely to buy new products. In addition, in this research in the car seat industry information on the innovation of the relationship between the consumers and purchase intention, this paper proposes a new perception of the product of social values, hedonic value, and novel parallel multiple mediation relationship of value. Therefore, a parallel multiple mediation model is analyzed using the PLS-SEM method based on variance. In addition, this study emphasizes discovering and understanding the behavior of innovators. Intelligent child safety seat marketers of the future should focus on innovators in the product space, as these people have considerable influence on smart seat purchasing decisions. We built and tested a research model to confirm that consumer innovation positively impacts the perceived value of intelligent safety seats and, in turn, consumers' propensity to purchase these products.

In addition, this study was conducted in a particular cultural context (namely, China), which enjoys a unique identity and prominence in the entire car seat industry as the world's largest producer and exporter of car seats. This research provides significant theoretical, methodological, and contextual contributions to the overall body of knowledge.

As with all studies, this one had some limitations. In order to ensure that the study is rigorous, we took all possible measures to overcome these errors. However, the question-

naire used in this study has the limitations of general self-assessment questionnaires. Future studies can further improve the scale structure by adding supplementary evaluations from others or integrating additional behavioral, psychological, and physical indicators for comprehensive evaluation. In addition, as mentioned above, due to the limited scope of this study, our sample is only from the innovative child safety seats in China, which is only a part of the innovative child safety seats in the world. Therefore, it is recommended that more similar studies be conducted in the child safety seat industry in other countries to verify the claims made in this study in different and broader contexts. The future research direction is to further study the predictability of this model [119] and the relationship between consumer identity and brand [146].

7. Patents

The materials used in this research have been patented as follows: [86–106].

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Appendix A

Table A1. Measuring Instrument.

DSI	Derived from
Consumer product innovation (CPI) Compared to your peers, you typically own more smart products.You frequently purchase new smart devices before your peers.You typically opt to purchase the newest smart devices.	[63,80,107]
Consumer information innovation (CII) You enjoy learning about new information technology.Compared to your contemporaries, you are often more sensitive to knowledge about novel things.You tend to be more interested than your peers in the capabilities and applications of new information technology.	[63,80,107]
TCV	
Perceived usefulness value (PUV) I think the smart child safety seat would be good for my driving. I could go to my destination more safely if I used the smart child safety seat. The smart child safety seat would make it easier for me to go where I am. I could reach my destination faster if I used the smart child safety seat.	[34]
Perceived social value (PSV) I should use smart child safety seats, according to people that matter to me. Those who have the power to affect my behavior believe I should employ smart child safety seats. People whose viewpoints I respect want me to use smart child safety seats.	[34]

Table A1. Cont.

DSI	Derived from
Perceived hedonic value (PHV) Using the smart child safety seat would be fun during car trips. Using the smart child safety seat would be enjoyable. Using the smart child safety seat would make me and my kids very happy during car trips.	[108]
Perceived novelty value (PNV) The smart child safety seat is a new and refreshing device. Smart child safety seats are unique in this. I think using a smart child safety seat is a novel experience.	[110]
Willing to buy (WTB) If I can afford it, I would prefer to buy a smart child safety seat. I intend to use smart child safety seats in the future. I would want to try the smart child safety seat.	[111]

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Review

LGCM and PLS-SEM in Panel Survey Data: A Systematic Review and Bibliometric Analysis

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Abstract: The application of Latent Growth Curve Model (LGCM) and Partial Least Square Structural Equation Modeling (PLS-SEM) has gained much attention in panel survey studies. This study explores the distributions and trends of LGCM, and PLS-SEM used in panel survey data. It highlights the gaps in the current and existing approaches of PLS-SEM practiced by researchers in analyzing panel survey data. The integrated bibliometric analysis and systematic review were employed in this study. Based on the reviewed articles, the LGCM and PLS-SEM showed an increasing trend of publication in the panel survey data. Though the popularity of LGCM was more outstanding than PLS-SEM for the panel survey data, LGCM has several limitations such as statistical assumptions, reliable sample size, number of repeated measures, and missing data. This systematic review identified five different approaches of PLS-SEM in analyzing the panel survey data namely pre- and post-approach with different constructs, a path comparison approach, a cross-lagged approach, pre- and post-approach with the same constructs, and an evaluation approach practiced by researchers. None of the previous approaches used can establish one structural model to represent the whole changes in the repeated measure. Thus, the findings of this paper could help researchers choose a more appropriate approach to analyzing panel survey data.

Keywords: bibliometric; SLR; panel survey data; longitudinal survey; Latent Growth Curve Model (LGCM); PLS-SEM

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1. Introduction

Over the past few decades, various survey studies have been conducted using different types of survey designs. Many of them used cross-sectional survey design that is able to measure variation in the individuals of a population [1–4] at one point in time. However, in recent years, the development from cross-sectional to panel survey studies can be seen to escalate [5–7] in longitudinal studies. The panel survey data has been used widely in several areas such as education, medicine, psychology, behavior, and many more [8–10]. This type of study allows the researcher to measure variation at the individual level repeatedly on the same sample of units at different points of time. Through panel survey data, the trend and factors influencing those changes can also be observed.

From a methodological perspective, there are several methods that can be used to analyze cross-sectional survey data types. The most commonly used methods are based on Structural Equation Modelling (SEM). SEM offers two methods which are (i) covariance-based SEM (known as CB-SEM), and (ii) variance-based SEM (known as Partial Least Square (PLS-SEM)) method. These methods are often used to identify multiple statistical

relationships simultaneously through visualization and model validation. It is more suitable for complex models compared to the traditional method such as Multiple Linear Regression and Analysis of Variance (ANOVA). CB-SEM and PLS-SEM have their own strengths and weaknesses depending on the data structures and assumptions of the methods.

While in the panel survey data, a method based on the CB-SEM framework known as Latent Growth Curve Model (LGCM) is commonly being used compared to the PLS-SEM. The LGCM has gained its popularity largely in behavioral sciences research. This method is widely used in many areas including social behavioral research, psychology, clinical, developmental, educational research, learning and memory, and personality [11–16]. The LGCM has the advantage of analyzing the developmental trajectory of a single person and capturing individual variations over time. This means the method can assess the changes in intra-individual (within the individual) as well as inter-individual (between individuals) variation. It can also identify the important predictor variables that contribute to the individual's growth change over time. Although LGCM listed several advantages, this method can still be improved as highlighted by [11,17,18]. Among the issues concerned are statistical assumptions, reliable sample size, number of repeated measures, and missing data. Despite its limitation, this method is still the choice of researchers for analyzing panel survey data compared to the PLS-SEM.

On the other hand, PLS-SEM only gained popularity in analyzing cross-sectional survey data but not in panel survey data. In a cross-sectional survey study, the PLS-SEM showed good performance in handling non-normal data and small sample size. According to [9], PLS-SEM showed higher robustness in situations of non-normal data and small sample size. It also shows a better result with a small sample size when a model has many constructs and a large number of items [19–21]. However, the use of PLS-SEM in panel survey data seems to be seemingly underrated as cross-sectional survey data, even though the PLS-SEM is good in handling several highlighted issues such as statistical assumptions and reliable sample size in LGCM. The previous approaches for panel survey data using PLS-SEM were unable to establish one structural model to represent the whole changes in the repeated measure. Current approaches also cannot capture the individual trajectory, mean of the trajectory of the sample or entire group, the evaluation of individual differences in trajectories, and assess the potential incorporation of predictors of individual differences in trajectories. A review of the previous approaches of these path analyses in longitudinal studies does not consider systematic literature review methodology [22]. Thus, there is a need to review the current and existing PLS-SEM approaches using SLR and Bibliometric analysis for panel survey data in identifying the gap in existing methods for improvement.

Hence, this study aimed to explore the distributions and trends of LGCM, and PLS-SEM used in panel survey data. It highlights the gaps in the current and existing approaches of PLS-SEM practiced by researchers in analyzing panel survey data. It focuses on answering the following research questions; (i) What is the distribution and trend of LGCM and PLS-SEM in a panel survey study? (ii) What are the reasons for the lack of application of PLS-SEM in panel survey data? and (iii) What is the existing framework or procedure of PLS-SEM in analyzing the panel survey data? This study employs the integrated bibliometric analysis and systematic review because the way of reviewing the existing literature is more systematic, and more comprehensive compared to the classical literature review [23–25]. Through a systematic review, further investigation and identification of the reasons for the lack of application for PLS-SEM in panel survey data can be discovered. Exploration of the existing framework or procedure of PLS-SEM could help the researcher to identify the method for improvement in analyzing the panel survey data.

2. Related Work

2.1. Panel Survey Data

A panel survey is a type of survey method that involves the process of gathering data from the same sample over a period of time. It is one of the longitudinal study types that is conducted over an extended period of time. The data collected from this panel

survey are referred to as panel survey data. Panel survey data are commonly used to measure the behavior of people over time including their thoughts, attitudes, feelings, emotions, and many more [26–28]. It can measure the changes in behavior over time and examine the factors that influence that change. In the context of statistical methods, the LGCM and PLS-SEM are two methods that are used for analyzing the panel survey data. These two methods can handle this type of data since both can assess the measurement model (reliability and validity) and structural model. This is because these methods used Structural Equation Modeling as a basis of the framework and followed its criteria.

2.2. Latent Growth Curve Model

The latent Growth Curve Model (LGCM) created by [29,30] has grown to be a better method for addressing issues about individual behavior change and assessing the factors that contributed to the change simultaneously. The LGCM is a combination of the growth curve model (GCM) and structural equation modeling (CB-SEM). According to [31], the LGCM is a special case of confirmatory factor analysis (CFA) in CB-SEM and followed all underlying assumptions of CB-SEM. The growth of LGCM has become more popular in panel survey study since it can measure the changes in individuals and groups (known as trajectory) over time. Furthermore, it can also assess the factors that influence the trajectory.

2.3. PLS-SEM for Panel Survey Data

The PLS path modeling or PLS-SEM was created by [32,33] and some extensions were suggested by [34]. Over the last few decades, there have been numerous introductory articles on this methodology (e.g., [35–38]). However, in the panel survey studies, the application of this method is very limited compared to the cross-sectional studies [22]. This is because the exploration and the procedure of PLS-SEM for analyzing panel survey data are not consistent since it was used differently by the authors in several research articles [39–43].

3. Materials and Methods

This section explains the methodology used in this study. This study used an integrated systematic literature review (SLR) and bibliometric analysis for the review process [24,25,44].

3.1. Phase 1—Systematic Literature Review (SLR)

In the systematic review, the process of reviewing followed the review protocol, publication standard, or established guideline. The review protocol is equivalent to a research design in social sciences research. It is very important to decide which review protocol, publication standard, or established guideline is to be used at the beginning of the study [45]. This study adapted the established guideline by [46,47]. This established guideline was developed specifically for the education field. However, the guideline is suitable to be adapted in other fields, and it has been used in many other fields too. Based on this established guideline, this study started with the formulation of the research problems, followed by a systematic searching strategy (identification, screening inclusion, eligibility, and quality appraisal), data extracting, analyzing, and synthesizing (theme generation).

3.1.1. Formulating the Research Problems

The formulation of the research problems or the research questions for this study is based on the PICO [48,49]. PICO is used as a guideline to develop the research questions. PICO consists of three main concepts which are population or problem, interest, and context. In this study, the population can be described as panel survey data with several interests such as distributions and trends, limitations, and procedures. Then, this study described the context of statistical methods such as LGCM and PLS-SEM. Based on this concept, these research questions were created: “what are the distributions and trends of LGCM and PLS-SEM in a panel survey study?”, “what are the limitations of PLS-SEM in a panel

survey data?” and “what is the existing framework or procedure of PLS-SEM in analyzing the panel survey data?”.

3.1.2. Systematic Searching Strategies

In this stage, there are three main processes of searching strategies: (i) searching the literature (identification), (ii) screening the inclusion, and (iii) eligibility.

1. Searching the Literature (Identification)

Web of Science Core Collection (WoSCC) and Scopus are two bibliographic databases that are often regarded as the most comprehensive data sources for a variety of uses [50]. WoSCC was established around 2014 and previously known as the Web of Science (WoS) [51]. It was the first comprehensive international bibliographic database produced by Thomson Reuters in 1997. WoSCC consists of ten sub-databases and this study used eight sub-databases from the year 1992 to 2022. Among the sub-databases are Social Sciences Citation Index (SSCI), Science Citation Index Expanded (SCI-EXPANDED), Emerging Sources Citation Index (ESCI), Conference Proceedings Citation Index – Social Science & Humanities (CPCI-SSH), Arts & Humanities Citation Index (A&HCI), Conference Proceedings Citation Index – Science (CPCI-S), Book Citation Index – Social Sciences & Humanities (BKCI-SSH), and Book Citation Index – Science (BKCI-S). As a result, it eventually rose as the top choice of bibliographic database for bibliometric analyses, research appraisal, journal selection, and other duties [52]. In 2004, Elsevier introduced Scopus and established a solid reputation for dependability and earned a spot-on level with other comprehensive bibliographic databases over time [50,53]. Apparently, Scopus has a wider coverage, and thus it is useful for mapping a smaller research field as in the emerging topic of this study [54]. WoSCC and Scopus are also multidisciplinary and selective databases that are composed of a variety of specialized indexes, grouped according to the type of indexed content or by theme, [55]. Hence, both databases were employed as the bibliographic database for this study particularly to search for the right literature. For that reason, keywords are required to create the search string. In this study, the keywords were derived from the developed research questions as suggested by [56] as shown in Table 1. Based on this search string, a total of 3850 articles were retrieved automatically from the Scopus and WoSCC bibliographic databases. In addition, the stopping rule of searching the article is based on the rule of thumb as suggested by [57], where the search can stop when repeated search results are found in the same references, with no new results.

Table 1. Search string for the retrieved records.

Database	Search String
Scopus	TITLE-ABS-KEY(("panel survey" OR "longitudinal survey" OR "panel data" OR "longitudinal") AND ("partial least squares" OR "latent growth curve" OR "LGCM" OR "PLS Path" OR "PLS-SEM"))
WoSCC	TS=("panel survey" OR "longitudinal survey" OR "panel data" OR "longitudinal") AND ("partial least squares" OR "latent growth curve" OR "LGCM" OR "PLS Path" OR "PLS-SEM"))

2. Screening the Inclusion

In the screening process, the articles were refined based on five criteria in the bibliographic database: (i) timeline, (ii) language, (iii) document type, (iv) subject area, and (v) type of data. The details for each criterion are explained in Table 2. In this stage, 2640 articles met the criteria and qualified for the next process.

Table 2. Inclusion and Exclusion Criteria.

Database Criteria	Inclusion	Exclusion
Timeline	All records in Scopus and WoSCC databases.	Other databases.
Language	English.	Other languages.
Document Type	Article, Article review, and Conference.	Books and chapters in a book.
Subject area	Psychology, Social Sciences, Business, Management, Accounting, Mathematics, Economics , and Multidisciplinary, Behavioral Sciences	Other subject areas in bibliographic databases of Scopus and WoSCC.
Method	LGCM, PLS-SEM, and Partial Least Squares.	Multilevel Linear Growth Curve Model, Bayesian Growth Curve Model, Repeated Measure ANOVA, Generalized estimating equations, and Mixed effect regression.
Type of data	Longitudinal survey and panel survey data.	Cross-sectional data.

3. Eligibility

The eligibility process involved the review of the title, keyword, and abstract. [58] suggested that a researcher should review the conclusion if the information in the abstract cannot give the general picture of the article. The selection of articles is based on the inclusion criteria (Table 2) contained in either the title, keyword, or abstract. After this selection process, the articles were checked for duplication according to the title and the redundant articles were removed. Hence, 1726 articles were selected after the removal process.

3.2. Phase 2—Bibliometric Analysis

The bibliometrics method was first introduced in 1969 by a scholar named Pritchard. The term bibliometric is elaborated as an information and library sciences research area which employs a quantitative approach and analyzes the bibliographical data of among others, the year of publication, country of origin, authors, etc. [59]. The bibliometric method employs quantitative analysis of empirical data published in prior literature to study the trends of publication within various research domains. Furthermore, it enables researchers to examine the body of literature in their field of study and identify the major themes [54,60]. Using bibliometric analysis allows researchers to explore the trends, reader usage, citation pattern, knowledge base, author network, and significance of the subject [61]. Bibliometric analysis is often combined with science mapping techniques to visualize the intellectual structure of a particular research field [62]. Visualization requires visual tools such as VosViewer, Gephi, or Pajek, which have been used extensively in management and science research. In this study, bibliometric analysis was employed to analyze citation-based analysis, co-word analysis or keyword co-occurrence analysis, and co-authorship analysis, which are considered the most common ones using this method.

3.2.1. Data Extraction

The process of data extraction was followed by data requirements of bibliometric analysis such as the author's names, citations, titles, journals, DOI, references, abstracts, keywords, and author affiliations [46]. The data from each bibliographic database was extracted into an excel file and merged following the Scopus format. Then, data were exported into VOSviewer for constructing and visualizing the information. Next, the thresholds such as the minimum number of publications, citations, and occurrence of keywords were specified for analysis of science mapping.

3.2.2. Analyzing and Synthesizing the Data

The bibliometric analysis consists of two techniques which are performance analysis and science mapping. This study used performance analysis to determine the distribution and the trend of the publication related to the panel survey data. Besides that, the analysis of science mappings such as Co-authorship, Keyword Co-occurrence, Citation, and Co-citation Analysis was used to examine the relationships between the research constituents [46].

3.3. Phase 3—Content Analysis

In this phase, the procedure from SLR, which is quality appraisal, is used to select suitable articles for content analysis. The content analysis was used to generate the themes to explain the findings related to the PLS-SEM in panel survey data.

3.3.1. Quality Appraisal

In this stage, selected articles that are related to the PLS-SEM were chosen based on citation analysis in the bibliometric analysis. The total number of articles related to the PLS-SEM was 296, after the eligibility process. However, for the content analysis, only the top 100 most cited articles were included in the quality appraisal process. The quality appraisal is very important in the systematic literature review as suggested by [63]. In this process, the full articles were examined by the research team to select the most suitable articles that are related to the procedure of PLS-SEM in analyzing the panel survey data. After the quality appraisal process, 34 articles were selected for the final review (Figure 1, Table A1).

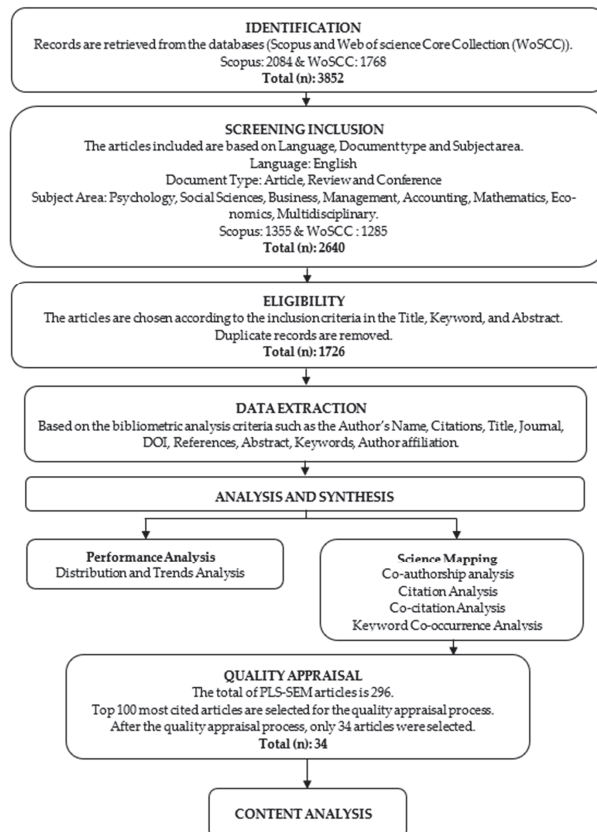


Figure 1. The Flow Diagram of Reviewing Process.

3.3.2. Theme Generation

In this stage, the theme was generated based on the 34 articles reviewed. The themes were classified into PLS-SEM approaches and their imitations, and the procedure of the approaches.

4. Results

This section discusses the distributions and trends of LGCM and PLS-SEM in panel survey data, the limitations of PLS-SEM in panel survey data, and the existing framework or procedure of PLS-SEM in analyzing the panel survey data. This discussion reflects the research questions stated in the early section.

4.1. Distributions and Trends

To answer the first research question, the discussion discovers the growth of publications, co-authorship, citation, co-citation, and co-occurrences of keywords.

4.1.1. Growth of Publications

Figure 2 shows the annual growth of publications related to the panel survey data that used the Latent Growth Curve Model (LGCM) and PLS-SEM as the main statistical methods in the analysis. These publications were retrieved from Scopus and Web of Science Core Collection (WoSCC) databases from 1986 to 2022. Based on the graph, the publications show an increasing trend from 2006 to 2022. Figure 2 also shows the annual growth of publications related to LGCM and PLS-SEM separately. Both annual growths of publications show an increasing trend from 2006 to 2022. However, LGCM is more outstanding compared to PLS-SEM as a statistical method to analyze panel survey data.

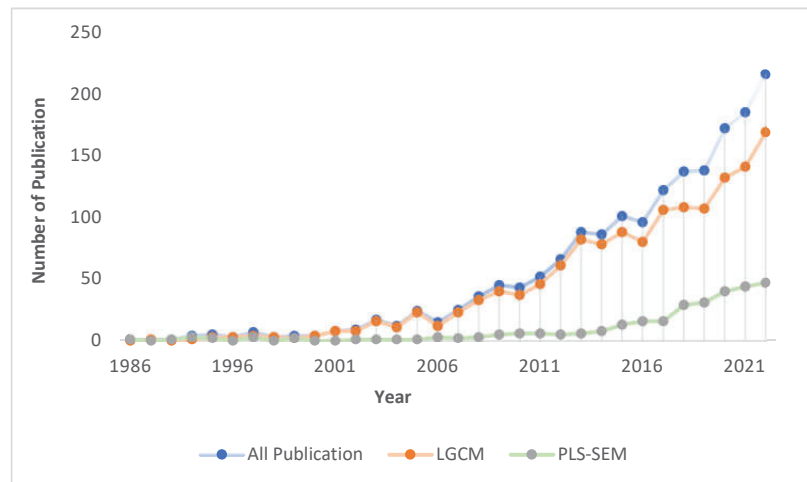


Figure 2. Annual growth of publications (Scopus & WoSCC databases, 1986–2022).

All 1726 retrieved articles were published in 638 different journals, with 2.71 articles per journal on average. Out of these 638 journals, 365 (57.21%) published only one article, 118 (18.59%) published two articles, and 115 (24.29%) published more than two articles. Table 3 shows the top ten journals contributing to the panel survey data. Based on the total citations, Development Psychology journal is the most cited journal with 4231 citations, followed by Structural Equation Modeling, and Psychology and Aging journal with 1267 and 1061 citations respectively. However, in terms of total publications, no journals show an outstanding performance since the number of publications is close to each journal.

Table 3. Top 10 journals contributing to the panel survey data.

Source (Journal)	Total Publications	Total Citations
Developmental Psychology	51	4231
Structural Equation Modeling	30	1267
Journal of Youth and Adolescence	29	930
PLoS ONE	28	498
Psychology and Aging	25	1061
Journal of Affective Disorders	25	234
Journal of Abnormal Child Psychology	22	1043
Journals of Gerontology	21	584
Frontiers in Psychology	20	200
Journal of Adolescence	19	741

4.1.2. Co-Authorship Analysis

The main purpose of co-authorship analysis is to examine the interactions among scholars related to the panel survey data. Based on the retrieved records, 4481 authors contributed 1726 articles in the panel survey data. Out of 4481, only 459 authors met the threshold of at least 2 publications and 25 citations. Figure 3 shows that the connection between clusters is small and only 8 clusters are connected to each other. This result indicates that the majority of productive authors are independent researchers and the cluster formed by the researchers working on the panel survey data is weak, and the scale of co-authorship cooperation is small and limited.

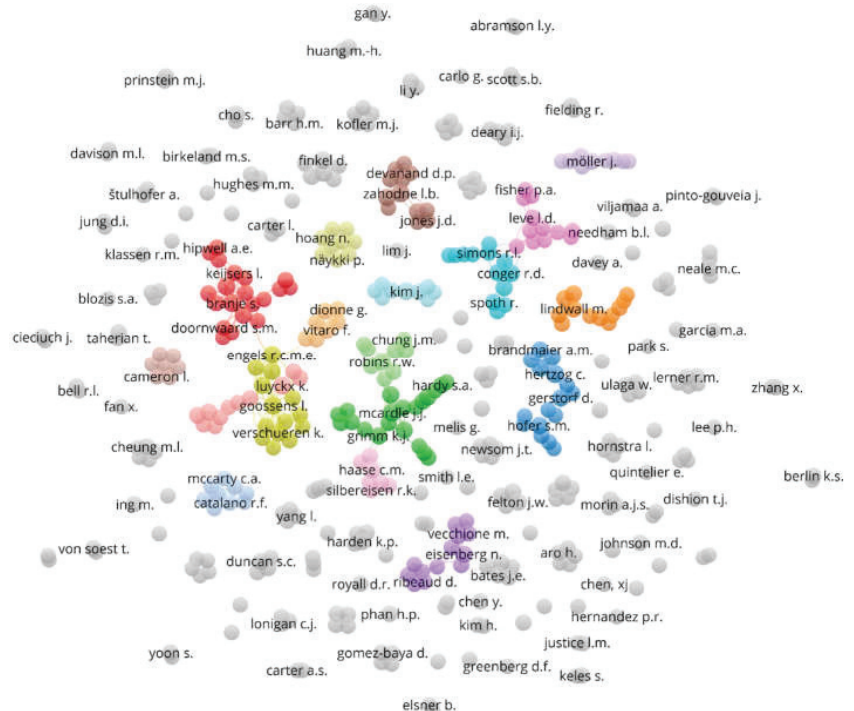


Figure 3. Co-authorship network map in the field of panel survey data.

4.1.3. Citation Analysis

The citation analysis was used to identify the most influential publications in the research field. The purpose is to gain an understanding of the intellectual dynamics of the research field. In this analysis, the most influential articles were selected based on the highest number of total citations and analyzed according to two statistical methods which are LGCM and PLS-SEM. Tables 4 and 5 show the lists of the top 5 most cited articles in LGCM and PLS-SEM. McArdle J.J and Epstein D. (1987) is the most cited article according to LGCM, with 653 total citations. While in PLS-SEM, Limayen M and Cheung C.M.K. (2008) is the most cited article with 369 total citations.

Table 4. The most cited articles related to LGCM.

Rank	Authors	Year	DOI	Citations
1	McArdle J.J., Epstein D.	1987	10.2307/1130295	653
2	Ge X., Lorenz F.O., Conger R.D., Elder Jr. G.H., Simons R.L.	1994	10.1037/0012-1649.30.4.467	625
3	Plutzer E.	2002	10.1017/S0003055402004227	549
4	McArdle J.J., Ferrer-Caja E., Hamagami F., Woodcock R.W.	2002	10.1037/0012-1649.38.1.115	401
5	Wang M.	2007	10.1037/0021-9010.92.2.455	388

Table 5. The most cited article related to PLS-SEM.

Rank	Authors	Year	DOI	Citations
1	Limayen M., Cheung C.M.K.	2008	10.1016/j.im.2008.02.005	369
2	Baer J.S., Sampson P.D., Barr H.M., Connor P.D., Streissguth A.P.	2003	10.1001/archpsyc.60.4.377	284
3	Wong V.W.-S., Tse C.-H., Lam T.T.-Y., Wong G.L.-H.	2013	10.1371/journal.pone.0062885	217
4	Dodge K.A., Malone P.S., Lansford J.E., Shari M., Pettit G.S., Bates.	2009	10.1111/j.15405834.2009.00528.x	210
5	Hennig-Thurau T., Henning V., Sattler H.	2007	10.1509/jmkg.71.4.001	208

In the context of relationships among publications, most of the authors work independently, which indicates a weak relationship. The relationships among authors according to the citations can be seen in Figure 4. The citation analysis for 1726 articles revealed that 494 articles met the threshold of 25 minimum number of citations of the document. The network visualization map shows that only a few clusters are connected to each cluster, even though those publications have the highest number of citations such as McArdle J.J. and Epstein D. (1987).

4.1.4. Co-Citation Analysis

Co-citation analysis of cited references was performed as well. By definition, the reference can be a co-citation if the two documents are cited together by another document [63]. As shown in Figure 5, each point represents the cited author, and the color of the points is according to the number of co-citations. A total of 88,731 cited authors were detected, and only 800 authors met the threshold in which the minimum citation of an author is 800. As seen in Figure 5, 800 authors formed 7 different clusters that provide information related to the co-citation of this study. Overall, most of the co-citations are related to statistical methods such as the Latent growth curve model, evaluation in structural equation modeling, evaluation in PLS-SEM, and procedure in the simulation study. The highest total link strength in co-citation analysis is Muthen and McArdle, and the article is related to the simulation study and latent curve analysis.

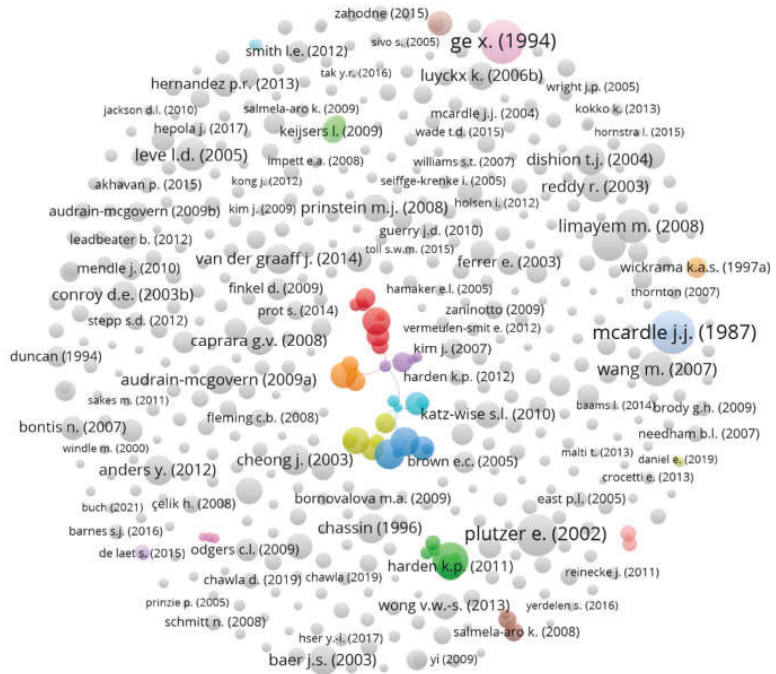


Figure 4. Network visualization map of citations based on the documents.

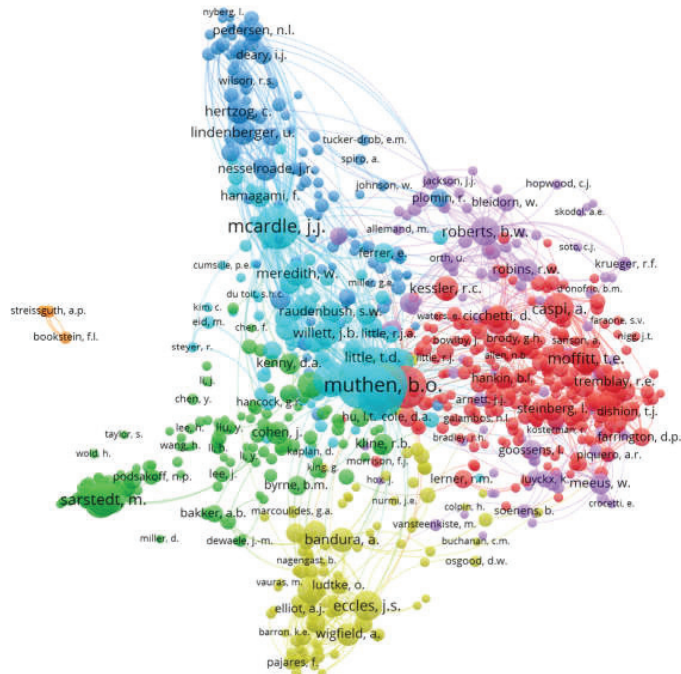


Figure 5. Network visualization map of co-citation of cited authors.

4.1.5. Keyword Co-Occurrence Analysis

The co-occurrence analysis focuses on the examination of the actual content of the publications based on the words derived from the author's keyword. This analysis can determine the trend of research topics in recent years. Figure 6 shows the network visualization map of the co-occurrence of keywords related to the panel survey data. Based on this analysis, 3875 keywords were retrieved from 1725 articles. However, there were only 49 keywords that met the minimum threshold of occurrences number of at least 10. As seen in Figure 6, 49 keywords formed 9 different clusters that provided information about the related topic of this study. The largest cluster was the red and green clusters which consisted of 11 keywords for each cluster. In addition, Table 6 shows the list of keywords as well as their co-occurrence frequencies in each cluster. In the context of the research topic, longitudinal study and adolescence showed the highest co-occurrences in this study with 292 and 169 repeated keywords, respectively. While in the context of statistical method, the Latent growth curve model was the most used in the analysis, with 294 co-occurrences keywords, followed by structural equation modeling, PLS-SEM, and partial least squares with 22, 14, and 11 respectively. Besides, the keywords in the same cluster shared a similar topic. Generally, most of the research topic for each cluster is related to mental health, psychology, child and adolescent development, and lifestyle.

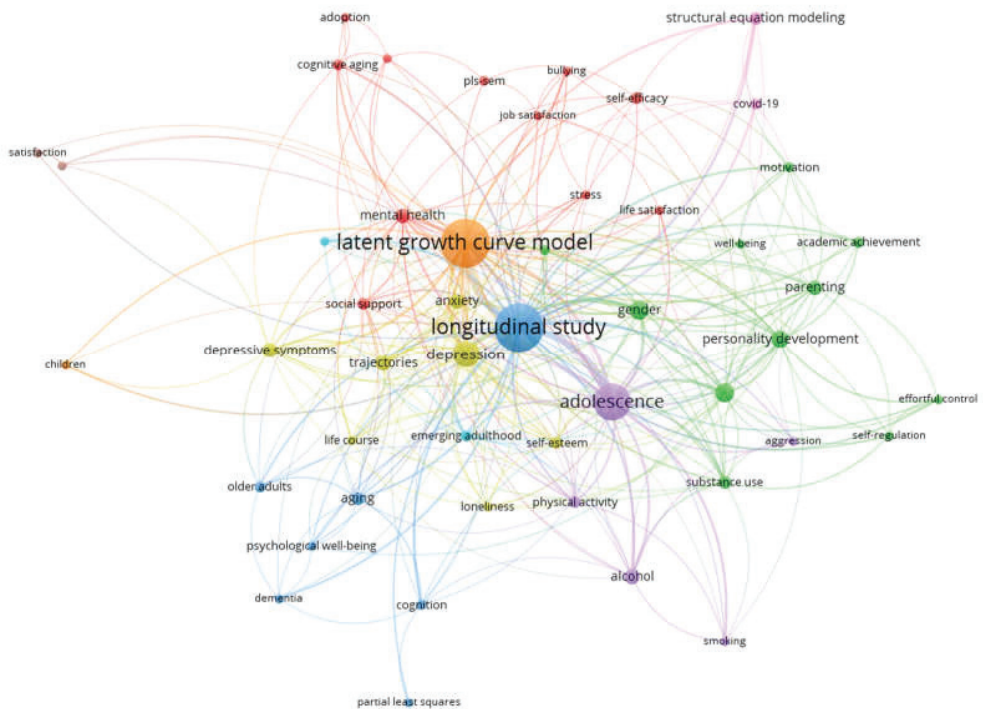


Figure 6. The network visualization map of co-occurrences of keywords.

To examine the trend of research topics in the recent year, an overlay visualization map was produced. Figure 7 shows the co-occurrences of the keywords according to the time (in years). Based on the overlay visualization map, there were a few research topics in recent years, such as mental health, life satisfaction, cognition, aggression, effortful control, children, social media, and COVID-19. In the context of statistical methods, PLS-SEM has been used in recent years to analyze the panel survey data.

Table 6. Co-occurrence of author keyword in panel survey data.

Cluster 1 (Red)	Cluster 2 (Green)	Cluster 3 (Blue)
Mental Health (27)	Developmental Trajectories (48)	Longitudinal Study (292)
Self-Efficacy (18)	Gender (47)	Aging (22)
Social Support (18)	Personality Development (38)	Older Adults (15)
Cognitive Aging (16)	Parenting (26)	Cognition (14)
PLS-SEM (14)	Substance Use (20)	Psychological Well-Being (12)
Adoption (12)	Academic Achievement (15)	Dementia (11)
Life Satisfaction (12)	Growth Curve Modeling (14)	Partial Least Squares (11)
Stress (12)	Motivation (14)	Cluster 6 (Light Blue)
Bullying (11)	Effortful Control (10)	Emerging Adulthood (16)
Education (11)	Self-Regulation (10)	Delinquency (12)
Job Satisfaction (10)	Well-Being (10)	Cluster 7 (Orange)
Cluster 4 (Yellow)	Cluster 5 (Purple)	Latent Growth Curve Model (294)
Depression (91)	Adolescence (169)	Children (10)
Trajectories (32)	Alcohol (32)	Cluster 8 (Brown)
Depressive Symptom (31)	Physical Activity (19)	Satisfaction (10)
Anxiety (28)	Aggression (10)	Social Media (10)
Self-Esteem (18)	Smoking (10)	Cluster 9 (Pink)
Life Course (12)		Structural Equation Modeling (22)
Loneliness (12)		COVID-19 (15)

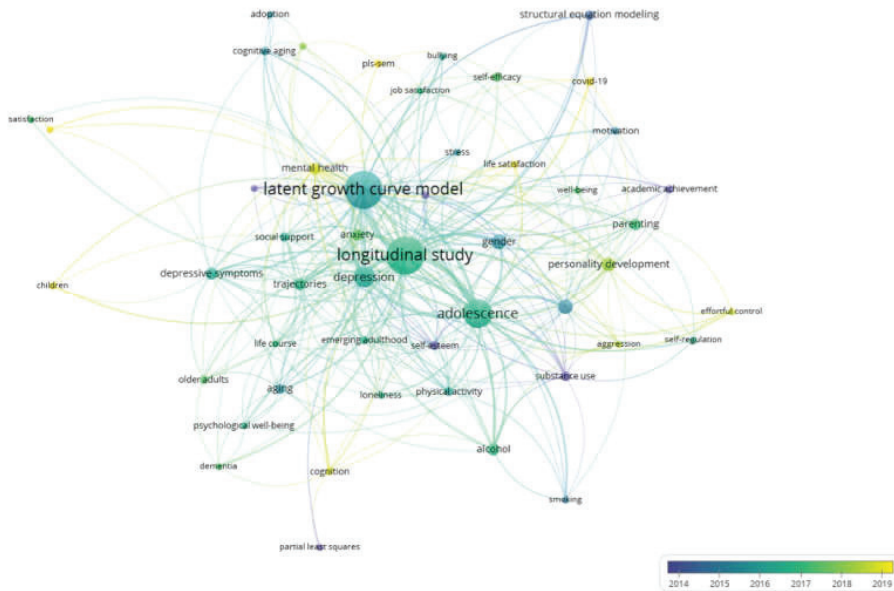


Figure 7. The overlay visualization map of keywords according to year.

Overall, bibliometric analysis has fulfilled the first research question related to the trend of the Latent growth curve model (LGCM) and PLS-SEM in panel survey data. The result shows that the distribution, trend, and application of LGCM are more outstanding than PLS-SEM in analyzing the panel survey data. To answer the next two research questions, content analysis was employed. Content analysis is focused on exploring the PLS-SEM in analyzing the panel survey data. The reason behind exploring the PLS-SEM in the panel survey data is due to the bibliometric analysis that shows the development of this method is not well developed, even though this method has good potential in handling panel survey data.

4.2. Themes Generation

To answer the other two research questions related to the limitations of PLS-SEM in panel survey data and the procedure of the existing approach of PLS-SEM in panel survey data, content analysis was employed. This section explains the details of content analysis on the PLS-SEM approach for panel survey data based on the selected top 100 most cited papers. The explanation of the content analysis is divided into two different themes: (i) identification of PLS-SEM approaches and their limitations, and (ii) procedures of the method.

4.2.1. Identification of PLS-SEM Approaches and Their Limitations

The exploration of the PLS-SEM approach is explained according to the evaluation of the measurement, and the structural model. Based on the reviewed articles, most of the researchers used the standard procedure to evaluate the measurement model as suggested by [64]. The measurement model involved the evaluation of indicator reliability, internal consistency reliability, convergent validity, and discriminant validity.

However, when evaluating the structural model, most of the top researchers use different approaches and procedures. As a summary, five approaches and procedures are identified to be used by researchers. The first approach is suitable for two periods of time and uses the different latent constructs at the pre-evaluation and post-evaluation named *pre- and post-approaches with different constructs*. The main purpose of this approach is to evaluate relationships between the exogenous variable at pre-evaluation, and the endogenous variable or outcome at post-evaluation. The relationship was evaluated using partial least squares (PLS) in the structural model. The second approach is known as the *Path Comparison approach*, and it is suitable for two periods of time. This approach uses the same latent construct at the initial (t_0) and end (t_1) of the evolution. This approach can measure the relationship of the latent construct using path analysis and the impact of time on the PLS model using a t-test. The third approach is named the *Cross-Lagged Panel Method (CLPM)*, and the main purpose is to measure the direction, strength, and cause-effect relationship among latent constructs over time. This method is also suitable for two periods of time and uses the same construct at time 1 and time 2. The fourth approach also involves two periods of time and measures the same latent constructs at pre-evaluation and post-evaluation named *pre- and post-approaches with the same constructs*. The difference between this method compared to the other three is regarding the latent score used to develop the PLS model. This method uses the differences in scores from time 1 and time 2 to develop the PLS model. The fifth approach is the *evaluation approach* which involves more than two waves of time and uses the same constructs for evaluating participants over time. The main purpose is to evaluate the direct and indirect effects over time. This approach uses path analysis to evaluate the direct effects between latent constructs and indirect effects over time using a bias-corrected confidence interval.

Though there are five different approaches of PLS-SEM in analyzing the panel survey data, these approaches still have limitations and spaces for improvement. The obvious limitation for models 1, 2, 3, and 4 is related to the number of waves for the study, since these approaches are only suitable for two periods of time. In addition, these four models focus on the pre- and post-evaluations and do not measure the evaluations of effects over time. Besides that, model 5 has the limitation in evaluating the growth of trajectory even though this method is capable of handling studies with more than two periods of time. This model does not have one structural model to represent the whole changes in the repeated measure. In addition, this model cannot capture an individual trajectory, the mean of the trajectory of the sample or entire group, the evaluation of individual differences in trajectories, and assess the potential incorporation of predictors of individual differences in trajectories. Furthermore, this model is not flexible to handle the latent constructs simultaneously as independent and dependent in the same model, allowing for complex representations of growth and correlations of change. Table 7 shows the summary of the five different approaches practiced by researchers in analyzing panel survey data.

Table 7. Summary of approaches practiced in analyzing a structural model.

Type of Model	Descriptions	Limitations	Authors
Model 1: Pre and Post approach with different construct.	<ul style="list-style-type: none"> • Two periods of time. • Pre and Post approach with different constructs. • Used path analysis. 	<ul style="list-style-type: none"> • Not suitable for more than two periods of time. • Cannot measure the evaluation of effect over time. 	[65–67]
Model 2: Path Comparison approach.	<ul style="list-style-type: none"> • Two periods of time. • Using the same construct at the first and the second time of survey. • Analyze two models separately according to time (t_0 and t_1). • Used path analysis. • Comparing these two models using a <i>t</i>-test. 	<ul style="list-style-type: none"> • Not suitable for more than two periods of time. • Cannot evaluate the changes in one structural model. 	[68]
Model 3: Cross-lagged approach.	<ul style="list-style-type: none"> • Two periods of time. • Using the same construct at the first and the second time of survey. • Used Cross-lagged approach. 	<ul style="list-style-type: none"> • Not suitable for more than two periods of time. • Cannot assess the growth trajectories. • Required a few assumptions. 	[69]
Model 4: Pre and Post approach with same construct.	<ul style="list-style-type: none"> • Two periods of time. • Used paired <i>t</i>-test for evaluating the differences between indicators (t_1 and t_2). • Evaluating the effect between changes of constructs based on the value of differences between indicators. • Used path analysis. 	<ul style="list-style-type: none"> • Not suitable for more than two periods of time. • Cannot assess the growth of trajectories. 	[43]
Model 5: Evaluation approach.	<ul style="list-style-type: none"> • More than two periods of time. • Measured direct effect and carry-over effect. • Used paired <i>t</i>-test, path analysis, and bias-corrected confidence interval. 	<ul style="list-style-type: none"> • Do not have one structural model. • Cannot assess model fit. • Cannot assess the whole changes in one structural model. • Cannot assess individual trajectories and factors influencing those changes simultaneously. 	[41,70,71]

4.2.2. Procedure of the Approaches

This section explains the details of the procedure for several PLS-SEM approaches practiced by the researchers in analyzing the panel survey data. The procedure of the approach is explained according to the data collection phase and analysis phase. Table 8 shows the summary of the procedure for five approaches in PLS-SEM to analyze the panel survey data.

Table 8. The procedure of the PLS-SEM approach in analyzing panel survey data.

Type of Model	Procedure	Articles
<p>Model 1: Pre and Post approach with different constructs.</p>	<p>Data collection phase:</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; margin-bottom: 5px;">Time 1: Participants' initial feedbacks will be evaluated.</div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; margin-bottom: 5px;">Time 2: Participants' full feedbacks will be evaluated using different constructs.</div> <p style="text-align: center;">↓</p> <p>Analysis phase:</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; margin-bottom: 5px;"> <p>Measurement Model</p> <ul style="list-style-type: none"> • Evaluate the reliability and validity of each construct. </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px;"> <p>Structural Model</p> <ul style="list-style-type: none"> • Develop one PLS model. </div>	[65–67]
<p>Model 2: Path Comparison approach.</p>	<p>Data collection phase:</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; margin-bottom: 5px;">Participants will be evaluated two times using the same construct.</div> <p style="text-align: center;">↓</p> <p>Analysis phase:</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; margin-bottom: 5px;"> <p>Measurement Model</p> <ul style="list-style-type: none"> • Evaluate the reliability and validity of each construct at time 1 and time 2. </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px;"> <p>Structural Model</p> <ul style="list-style-type: none"> • Develop two PLS models separately according to time. • Compare these two PLS models using t-test. </div>	[68]
<p>Model 3: Cross-lagged approach.</p>	<p>Data collection phase:</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; margin-bottom: 5px;">Participants will be evaluated two times using the same construct.</div> <p style="text-align: center;">↓</p> <p>Analysis phase:</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; margin-bottom: 5px;"> <p>Measurement Model</p> <ul style="list-style-type: none"> • Evaluate the reliability and validity of each construct for time 1 and time 2. </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px;"> <p>Structural Model</p> <ul style="list-style-type: none"> • Compare the mean scores between the constructs of time 1 and time 2. • Cause-effect relationships between constructs using cross-lagged panel. </div>	[69]

Table 8. Cont.

Type of Model	Procedure	Articles
<p>Model 4: Pre and Post approach with same construct.</p>	<p>Data collection phase:</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; margin-bottom: 5px;"> Participants will be evaluated two times using the same construct. </div> <p style="text-align: center;">↓</p> <p>Analysis phase:</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; margin-bottom: 5px;"> <p>Measurement Model</p> <ul style="list-style-type: none"> • Evaluate the reliability and validity of each construct for time 1 and time 2. </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px;"> <p>Structural Model</p> <ul style="list-style-type: none"> • Comparison of indicators from time 1 and time 2 using paired t-test. • Calculate the differences of indicators between time 1 and time 2. </div>	[43]
<p>Model 5: Evaluation Approach.</p>	<p>Data collection phase:</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; margin-bottom: 5px;"> Participants will be evaluated more than two times using the same construct. </div> <p style="text-align: center;">↓</p> <p>Analysis phase:</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; margin-bottom: 5px;"> <p>Measurement Model</p> <ul style="list-style-type: none"> • Evaluate the reliability and validity of each construct according to the time. </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; border-radius: 10px; padding: 5px;"> <p>Structural Model</p> <ul style="list-style-type: none"> • Develop one PLS model according to time. • Test the changes in path coefficients over time. • Test the changes in the level of construct using paired t-test. </div>	[41,70,71]

Model 1: Pre and Post Approach with Different Construct

This approach involves two phases of time in the data collection procedure. At time 1, the participants will be evaluated using the first set of questionnaires that consist of exogenous variables. The different sets of questionnaires that consist of the endogenous variable will be used for the second evaluation. In the analysis phase, the measurement and structural model will be evaluated. All the latent constructs will be evaluated based on reliability and validity. For the structural model, one PLS model will be established together with the path coefficients to perform the bootstrap resampling procedure to examine the significance of the paths.

Model 2: Path Comparison Approach

For this approach, the participants will be evaluated two times with the same questionnaire. In the measurement model, the reliability and validity for each construct at time 1 and time 2 will be developed separately. For the structural model, two PLS models will be developed separately according to the time (time 1 and time 2). Then, calculate the *t*-test using the formula suggested by [72] for comparing the corresponding path coefficient in both models. This analysis will examine the strength of the relationship between the paths over time.

Model 3: Cross-Lagged Approach

The procedure of this approach for the data collection phase and the measurement model evaluation is the same as Model 2. For the structural model, the analysis starts with the mean score comparison between latent construct time 1 and time 2. The purpose is to determine whether the mean score of the latent construct at time 2 will be higher than at time 1. Next, to determine the cause-effect relationship between latent constructs, the cross-lagged panel model will be employed.

Model 4: Pre and Post Approach with the Same Construct

The procedure of this approach for the data collection phase and measurement model evaluation is also the same as Models 2 and 3. For the structural model, the analysis starts with the comparison of the indicator of latent construct between time 1 and time 2 using paired *t*-test. If the result of the paired *t*-test has significant differences, then the new indicators are computed based on the differences between indicators at time 1 and time 2. Next, one PLS model will be developed based on the new indicators to determine the effects between change constructs.

Model 5: Evaluation Model

The data collection phase involves more than two periods of time with the same questionnaire. For the measurement model, the constructs will be evaluated according to the time. While in the structural model, the analysis starts by developing one PLS model for each period of time. In this stage, the direct effect and carry-over effect will be examined based on the path analysis. Then, to test the changes in the path coefficient over time, the bias-corrected confidence interval is computed. Next, paired *t*-test of the changes in the level of the construct over time is computed.

5. Discussion

Structural Equation Modeling (SEM) is one of the flexible methods for analyzing survey data. This method is used as a statistical tool for evaluating the relation between latent and observed variables [73]. SEM can be defined as a combination of several multivariate analysis techniques [74], such as path analysis [75] and the common factor or latent variable model [76]. Thus, this study reviewed the methodology that used SEM as a base framework for analyzing panel survey data. There are two methods that have been discovered in this study which are LGCM and several approaches in the PLS-SEM. The trend of publications related to the panel survey data is increasing over the year. The findings show that the application of LGCM is preferable compared to the PLS-SEM in analyzing the panel survey data. We can see the pattern in the bibliometric analysis where the findings are dominated by the LGCM. This is because the ability and flexibility of LGCM in handling panel survey data are better than the PLS-SEM. Among the ability of LGCM, it can describe the developmental trajectory of a single person and capture individual variations over time. In other words, this method can assess the changes in intra-individual (within the individual) as well as inter-individual (between individuals) variation. LGCM can also identify the important predictor variables that contribute to the individual's growth change over time. [77] described the several advantages of LGCM which permits the investigation of inter-individual differences in change over time and allows the researcher to investigate the antecedents and consequences of change. LGCM also provides group-level statistics such as mean growth rate and mean intercept, can test hypotheses about specific trajectories, and allows the incorporation of both time-varying and time-invariant covariates. This could be the main reason why LGCM is preferable compared to the PLS-SEM, even though it has several limitations. According to [22], the existing approaches of PLS-SEM in panel survey data still have limitations. The approaches also show a lack of flexibility in analyzing the panel survey data in one structural model. Thus, this study employed content analysis to identify the existing approaches of PLS-SEM in analyzing panel survey data and its limitations.

The findings show that there are five existing approaches of PLS-SEM that have been used in analyzing panel survey data. Among the existing approaches of PLS-SEM, the Evaluation approach is the most flexible approach in analyzing panel survey data. Thus, this study discussed this approach more than the other four approaches. This approach consists of three stages in analyzing the panel survey data. The analysis measured the direct effect and the special effect which is the carry-over-effect. Carry-over-effects are effects from one construct at one point in time to the same construct at a subsequent point in time [78]. In stage one, the direct effect and carry-over-effect are assessed by estimating the single PLS model separately across the time. With this, the separate direct effect between the endogenous and exogenous predictors across time can be assessed. Hence, one structural model to access the whole changes (trajectories) and the factors that influence those changes simultaneously cannot be established. In the second stage, the multi-group analysis is employed to assess the strength of direct effects and the carry-over-effects over time. This strength is measured by the changes in the size of the path coefficient and bias-corrected confidence interval. The limitation at this stage is that the factors that influence those changes in the carry-over-effect simultaneously in one structure modal cannot be measured. In the last stage, paired t-test is employed to assess the mean difference between the constructs. The limitation in this stage is that only the mean difference for two points at a time for each construct can be assessed. In addition, the paired t-test requires a few assumptions and the most concern for the researcher is the distributional assumption. Hence, all these stages in the Model 5 approach do not have one structural model to represent the whole changes in the repeated measure. In addition, current approaches cannot capture the individual trajectory, mean of the trajectory of the sample or entire group, the evaluation of individual differences in trajectories, and assess the potential incorporation of predictors of individual differences in trajectories. Consequently, with all these limitations, PLS-SEM is less frequently used for analyzing panel survey data.

6. Conclusions

In conclusion, this study explored the distributions and trends of publications related to the panel survey data. This study also explored the trends of publications according to the Latent Growth Curve Model (LGGM) and PLS-SEM in analyzing the panel survey data. The records were retrieved from the bibliographic databases of Scopus and Web of Science Core Collection (WoSCC). The trends of publications related to the panel survey data showed an increasing trend. However, in the context of the statistical method, the LGCM is preferable compared to the PLS-SEM in analyzing the panel survey data, even though the LGCM has several limitations as highlighted in previous studies. This is because the PLS-SEM shows a lack of capability in handling panel survey data, even though it has five different approaches in analyzing them. The most flexible approach of the PLS-SEM in handling panel survey data is model 5 since it can measure the direct effect, carry-over effect, and the changes of path coefficients over time. However, based on the review, this approach still has some space for improvement. This method cannot capture an individual trajectory, the mean of the trajectory of the sample or entire group, the evaluation of individual differences in trajectories, and assess the potential incorporation of predictors of individual differences in trajectories. Besides, these current approaches are not as flexible as LGCM since it has the ability to use variables simultaneously as independent and dependent in the same model. Therefore, this systematic review could help researchers choose a more suitable method to analyze panel survey data.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. List of Evaluated Articles in Content Analysis.

No	Authors	Title	Year	Journal	DOI
1	Limayem M., Cheung C.M.K.	Understanding information systems continuance: The case of Internet-based learning technologies	2008	Information and Management	10.1016/j.im.2008.02.005
2	Baer J.S., Sampson P.D., Barr H.M., Connor P.D., Streissguth A.P.	A 21-year longitudinal analysis of the effects of prenatal alcohol exposure on young adult drinking	2003	Archives of General Psychiatry	10.1001/archpsyc.60.4.377
3	Bontis N., Booker L.D., Serenko A.	The mediating effect of organizational reputation on customer loyalty and service recommendation in the banking industry	2007	Management Decision	10.1108/00251740710828681
4	Islam A.K.M.N.	Investigating e-learning system usage outcomes in the university context	2013	Computers and Education	10.1016/j.compedu.2013.07.037
5	Barnes S.J., Mattsson J., Sørensen F.	Remembered experiences and revisit intentions: A longitudinal study of safari park visitors	2016	Tourism Management	10.1016/j.tourman.2016.06.014
6	Nelson B., Martin R.P., Hodge S., Havill V., Kamphaus R.	Modeling the prediction of elementary school adjustment from preschool temperament	1999	Personality and Individual Differences	10.1016/S0191-8869(98)00174-3
7	Hannula-Sormunen M.M., Lehtinen E., Räsänen P.	Preschool Children's Spontaneous Focusing on Numerosity, Subitizing, and Counting Skills as Predictors of Their Mathematical Performance Seven Years Later at School	2015	Mathematical Thinking and Learning	10.1080/10986065.2015.1016814
8	Bronstein P., Ginsburg G.S., Herrera I.S.	Parental predictors of motivational orientation in early adolescence: A longitudinal study	2005	Journal of Youth and Adolescence	10.1007/s10964-005-8946-0
9	Sosik J.J., Potosky D., Jung D.I.	Adaptive self-regulation: Meeting others' expectations of leadership and performance	2002	Journal of Social Psychology	10.1080/00224540209603896
10	Chen C.-P., Lai H.-M., Ho C.-Y.	Why do teachers continue to use teaching blogs? the roles of perceived voluntariness and habit	2015	Computers and Education	10.1016/j.compedu.2014.11.017
11	Benitez J., Chen Y., Teo T.S.H., Ajamieh A.	Evolution of the impact of e-business technology on operational competence and firm profitability: A panel data investigation	2018	Information and Management	10.1016/j.im.2017.08.002
12	Gupta V.K., Huang R., Niranjana S.	A longitudinal examination of the relationship between Team Leadership and Performance	2010	Journal of Leadership and Organizational Studies	10.1177/1548051809359184

Table A1. Cont.

No	Authors	Title	Year	Journal	DOI
13	Palos-Sanchez P., Saura J.R., Martin-Velicia F.	A study of the effects of programmatic advertising on users' concerns about privacy overtime	2019	Journal of Business Research	10.1016/j.jbusres.2018.10.059
14	Gegenfurtner A.	Dimensions of Motivation to Transfer: A Longitudinal Analysis of Their Influence on Retention, Transfer, and Attitude Change	2013	Vocations and Learning	10.1007/s12186-012-9084-y
15	Wei Y., Zhu X., Li Y., Yao T., Tao Y.	Influential factors of national and regional CO2 emission in China based on combined model of DPSIR and PLS-SEM	2019	Journal of Cleaner Production	10.1016/j.jclepro.2018.11.155
16	Palos-Sanchez, P; Saura, JR; Martin-Velicia, F	A study of the effects of programmatic advertising on users' concerns about privacy overtime	2019	Journal Of Business Research	10.1016/j.jbusres.2018.10.059
17	Roemer E.	A tutorial on the use of PLS path modeling in longitudinal studies	2016	Industrial Management and Data Systems	10.1108/IMDS-07-2015-0317
18	Saeed K.A., Abdinnour S., Lengnick-Hall M.L., Lengnick-Hall C.A.	Examining the Impact of Pre-Implementation Expectations on Post-Implementation Use of Enterprise Systems: A Longitudinal Study	2010	Decision Sciences	10.1111/j.1540-5915.2010.00285.x
19	Roxas B.	Effects of entrepreneurial intentions: A longitudinal study of selected South-east Asian business students	2014	Journal of Education and Work	10.1080/13639080.2012.760191
20	Jung D.I., Sosik J.J.	Effects of group characteristics on work group performance: A longitudinal investigation	1999	Group Dynamics	10.1037/1089-2699.3.4.279
21	Courty A., Godart N., Lalanne C., Berthoz S.	Alexithymia, a compounding factor for eating and social avoidance symptoms in anorexia nervosa	2015	Comprehensive Psychiatry	10.1016/j.comppsy.2014.09.011
22	Marjoribanks K.	Family background, social and academic capital, and adolescents' aspirations: A mediational analysis	1997	Social Psychology of Education	10.1023/A:1009602307141
23	Piyathasanan B., Mathies C., Patterson P.G., de Ruyter K. Gray D.M.,	Continued value creation in crowdsourcing from creative process engagement	2018	Journal of Services Marketing	10.1108/JSM-02-2017-0044
24	D'Alessandro S., Johnson L.W., Carter L.	Inertia in services causes and consequences for switching	2017	Journal of Services Marketing	10.1108/JSM-12-2014-0408
25	Pai H.-C.	An integrated model for the effects of self-reflection and clinical experiential learning on clinical nursing performance in nursing students: A longitudinal study	2016	Nurse Education Today	10.1016/j.nedt.2016.07.011
26	Prati G., Albanesi C., Pietrantoni L.	The Reciprocal Relationship between Sense of Community and Social Well-Being: A Cross-Lagged Panel Analysis	2016	Social Indicators Research	10.1007/s11205-015-1012-8

Table A1. Cont.

No	Authors	Title	Year	Journal	DOI
27	Roemer E., Henseler J.	The dynamics of electric vehicle acceptance in corporate fleets: Evidence from Germany	2022	Technology in Society	10.1016/j.techsoc.2022.101938
28	Chaparro-Peláez J., Pereira-Rama A., Pascual-Miguel F.J.	Inter-organizational information systems adoption for service innovation in building sector	2014	Journal of Business Research	10.1016/j.jbusres.2013.11.026
29	Lauro N.C., Grassia M.G., Cataldo R.	Model-Based Composite Indicators: New Developments in Partial Least Squares-Path Modeling for the Building of Different Types of Composite Indicators	2018	Social Indicators Research	10.1007/s11205-016-1516-x
30	Zhu X., Wei Y., Lai Y., Li Y., Zhong S., Dai C.	Empirical analysis of the driving factors of China's 'Land finance' mechanism using soft budget constraint theory and the PLS-SEM model	2019	Sustainability (Switzerland)	10.3390/su11030742
31	Lee W.-K.	An elaboration likelihood model-based longitudinal analysis of attitude change during the process of IT acceptance via an education program	2012	Behaviour and Information Technology	10.1080/0144929X.2010.547219
32	Hallencreutz J., Parmler J.	Important drivers for customer satisfaction—from a product focus to image and service quality	2021	Total Quality Management and Business Excellence	10.1080/14783363.2019.1594756
33	Guo Z., Tan F.B., Turner T., Xu H.	Group norms, media preferences, and group meeting success: A longitudinal study	2010	Computers in Human Behavior	10.1016/j.chb.2010.01.001
34	Robina-Ramírez R., Medina Merodio J.A., McCallum S.	What role do emotions play in transforming students' environmental behavior at school?	2020	Journal of Cleaner Production	10.1016/j.jclepro.2020.120638

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Article

Differentiation Strategy and Export Performance in Emerging Countries: Mediating Effects of Positional Advantage among Mozambican Firms

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Abstract: Small and medium-sized enterprises (SMEs) play an important role in economic and development growth, particularly in developing countries. Their success depends on the expansion of their markets across borders, based on the strategies adopted, in which differentiation strategies and positional advantages play an important role. As an emerging country, Mozambican SMEs face a lack of resources and business environmental challenges in deploying their unique advantages when competing abroad. As such, the objective of this paper is to study the impact of differentiation strategies on the export performance of Mozambican SMEs, and the mediating effect of positional advantage on the relationship between the differentiation strategy and export performance of SMEs. To achieve this objective, an empirical study was conducted, based on a sample of 250 Mozambican firms, to test a theoretical model that applied Structural Equation Modeling using the Partial Least Squares (PLS-SEM) algorithm, based on SmartPLS software version 3.3.6 (SmartPLS GmbH, Oststeinbek, Germany). The results show that differentiation strategies positively impact the export performance of SMEs and that positional advantage mildly mediates the relationship between the differentiation strategy and export performance. This suggests that Mozambican SMEs may not be properly taking advantage of the positional advantage of the differentiation strategies, as the added value generated by the positional advantage is relatively modest. As such, Mozambican SMEs still need to support their positional advantages to overcome fierce international competition. This study contributes to the knowledge about the consequences of adopting differentiation strategies and positional advantages on the export performance of SMEs, particularly in the context of emerging countries.

Keywords: competitive strategy; differentiation strategy; positional advantage; export performance; international marketing; international marketing strategies; Mozambique; emerging countries

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1. Introduction

In an increasingly globalized environment, exportation plays a vital role in the strategies embraced by Small and Medium-sized Enterprises (SMEs) (Golovko and Valentini 2011). The decision to export is a simple form of internationalization that fits into international marketing strategies, widely adopted by SMEs (Morgan et al. 2012). However, several barriers discourage SMEs from entering or expanding their export activities in international markets, especially when firms are located in emerging markets (Safari and Saleh 2020). In order to achieve competitiveness in international contexts, SMEs need to develop, on one hand, specific and unique assets that arise from distinctive resources and capabilities (a strategy rooted in a resource-based paradigm, which views firms as

unique and heterogeneous collections of tangible and intangible resources) (Barney 1991); on the other hand, with those resources, firms must manage to craft competitive strategies that enable them to cope with competitive markets, taking advantage of profits and a sustainable market strategy, in order to increase their export performance (Aulakh et al. 2000; Martin et al. 2017; Morgan et al. 2004; Porter 1985; Zehir et al. 2015).

In competitive markets, positional advantage reflects the firm's positioning in providing competitive products and services vis-à-vis its competitors (Porter 1985). However, the firm's positional advantage is the result of the implementation of competitive strategic plans that have an impact on export performance. Moreover, competitive strategies impact export performance through the firm's positional advantage (Keskin et al. 2021; Lado et al. 2004; Martin et al. 2017; Morgan et al. 2004).

The literature suggests that export performance is strongly related to firms' strategic competitive or positional market choices (Morgan et al. 2004). Moreover, it is the firm and industry characteristics, and the firm's adopted strategies that help explain the firm's export performance in emerging markets, i.e., competitive strategies positively affect the firms' export performance (Aulakh et al. 2000; Lado et al. 2004).

Although there are several studies in the literature that investigate the relationship between the differentiation strategy and export performance (Aulakh et al. 2000; Crespo et al. 2020; Furrer et al. 2008; Morgan et al. 2004), this study is original; it highlights, on one hand, the effect of differentiation strategies on the export performance of SMEs and, on the other hand, determines the role of the mediating effect of positional advantage on this relationship (differentiation strategy–export performance) in the context of emerging countries, more particularly in Mozambique.

Although the study of competitive strategies is not new (Crespo et al. 2020; Furrer et al. 2008; Morgan et al. 2004), its application in emerging countries, where SMEs have few resources and the competitive context is very peculiar, is little studied (Aulakh et al. 2000). For example, although the SMEs located in the sub-Saharan region, particularly in Mozambique, contribute to the increase in employment and Gross Domestic Product (GDP), they are affected by several obstacles; these include as poor financing, low technological intensity, the low qualification of human resources, resources, regulatory barriers, the tax burden, the high cost of procedures, and poor market access. These obstacles weaken these companies in building up their competitiveness and their performance indicators, exposing them to weaknesses in highly competitive markets. Moreover, a weak adoption of competitive strategies to increase their performance is noted (Ministério da Indústria e Comércio 2016; Safari and Saleh 2020).

Taking into account the characteristics of Mozambique, an emerging country with SMEs looking to expand their markets abroad, but suffering from a lack of resources and contextual obstacles, this paper aims to study how differentiation strategies support the export performance of Mozambican SMEs using the resource-based view (RBV) of the firm as a core basis.

The following differentiation strategies are going to be used in this paper as they are very important to Mozambican SMEs: (a) can hardly take full advantage of economies of scale (Borch et al. 1999); and (b) can tailor their products and services to provide unique offerings and take full advantage of their positional advantages in international markets (Zehir et al. 2015). As such, differentiation strategies that rest on valuable unique resources are not easily imitated by their competitors (Banker et al. 2014). Furthermore, Mozambican SMEs are encouraged to use their potential to promote export activities (Kaufmann 2020), and efforts to improve their Export Performance (EP) have thus become prominent in the area of export-related research (Safari and Saleh 2020). We also argue that differentiation strategies provide important competitive advantages to internationalizing SMEs (Knight et al. 2020), and that positional advantages directly affect export venture performance; this is because the relative superiority of a venture's value offering determines the buying behavior of the target customers and the outcomes of this behavior for the firm in its foreign market (Morgan et al. 2004). In this sense, this paper focuses on analyzing the

following in a particular case of an emerging market in Mozambique: (a) the importance of differentiation strategies on export performance; (b) the importance of positional advantage on export performance; and (c) how the positional advantage mediates the relationship between competitive differentiation strategies and the export performance of SMEs.

In theoretical terms, this study contributes to the development of International Marketing theory, with emphasis on the importance of positional advantage in exporting SMEs in emerging countries. In practical terms, this study reinforces the urgency in the adoption of competitive strategies by SMEs as a way to survive in increasingly competitive markets.

After this introduction, this paper begins by presenting the theoretical development, based on the existing literature, and develops the research hypotheses. Second, the research methodology is identified, specifying the variables measured and the procedures adopted in data collection. The third section discusses the results, as well as their implications. Finally, the last section contains the conclusions, limitations, and future research.

2. Theory and Hypotheses Development

Competitive strategies play a vital role in competing successfully in the market, as they enable firms to search for a beneficial competitive position, and ensure profit and business sustainability in a particular industry (Porter 1985). A firm's ability to make rapid and adequate progress is based on a competitive strategy that underpins the firm's strategic moves in achieving superior competitiveness and export performance (Furrer et al. 2008).

The RBV is one of the theoretical foundations of strategic management as it is widely used in the strategic management literature (Barney 1991; Brouthers and Xu 2002; Yeniaras et al. 2017). According to Barney (1991), resources are a set of assets and capabilities controlled by firms that enable them to implement unique strategies. Based on the RBV, companies' resources and capabilities are the sources of sustained competitive advantage (Barney 1991); they enable firms to combine unique resources and capabilities to tailor their products and services to the needs of the customers in order to anticipate contextual changes and to achieve superior performance (Brouthers et al. 2015). The RBV is of added value to this paper as it characterizes a company as a collection of resources and capabilities that enable firms to generate firm-specific differentiation strategies that are hard to imitate. Moreover, those unique resources and capabilities support firms when deploying their unique positional advantages, giving them an edge over competitors, and thus supporting competitive advantages and firm and export performance (Yeniaras et al. 2017).

Companies located in developing countries are faced simultaneously with two challenges: on one hand, to overcome the obstacles they encounter in placing their products and services in the domestic market and, on the other hand, even more challenging, to export these products and services to foreign markets (Aulakh et al. 2000). Therefore, the adoption of competitive strategies allows firms operating in emerging contexts to position and increase their export performance. The literature refers to three generic strategies (Porter 1985): (a) cost leadership; (b) product and service differentiation; and (c) focus strategy. Each of them involves a fundamentally different path that converges on the chosen competitive advantage (Porter 1985).

Cost leadership and differentiation strategies seek competitive advantage across a broad range of industry segments, while focus strategies aim for cost advantage (cost focus) or differentiation (differentiation focus) in a narrow segment. In the particular case of the differentiation strategy, companies seek to be unique in their industry in some dimensions that are widely valued by the market, i.e., they select one or more attributes considered important in their core business and position themselves to meet those market needs. The logic of the differentiation strategy requires firms to select attributes that are different and unique from their rival's characteristics (Porter 1985).

Export performance is a multifaceted concept and uses multiple indicators for its measurement (Chen et al. 2016; Ribau et al. 2017; Sousa 2004). There has been a growing interest in export performance measurement scales, among which it is possible to highlight the inclusion of objective and subjective indicators, and the distinction between economic

and strategic indicators. Table 1 presents the distinction between objective and subjective indicators. Objective indicators concern financial ratios and economic and non-economic measures of export markets. Subjective indicators encompass management decisions and export expansion strategies, such as market indicators, competitiveness and technology intensity, performance objectives, and subjective generic measures (Ribau et al. 2017). In this context, the approach of Zou and Stan (1998) is notable for its use of objective indicators, such as financial ratios, and subjective indicators, such as technological intensity and performance objectives that include export and consumer performance. Although Aulakh et al. (2000) do not distinguish indicators into objective and subjective, they consider sales growth, market share, competitive position, and profit as metrics of export performance.

Table 1. Export Performance Measures.

Objective Measures	Subjective Measures
Financial ratios (e.g., profits, return on investment, and cash flow).	Management decision and export expansion strategy: marketing indicator (market trend), competitiveness indicator (price) and technology intensity (level of innovation and technological investment).
Economic measures (e.g., sales, profits, market share, export intensity, export sales growth).	Performance goals (export performance). Customer satisfaction performance (perceived performance) determinants of trust and value in the international market context.
Non-economic export market measures (e.g., no. of export countries, export percentage per country), export growth for each market and each product (e.g., export weight projection).	Subjective generic measures (e.g., export success, achievement of export goals, and achievement of export performance indicator and skill).

Source: Ribau et al. (2017).

Aulakh et al. (2000) examine how firms' export strategies (differentiation, cost leadership, marketing standardization, and export diversification) in emerging economies affect their export performance; this is measured using a four-item scale, assessing the overall role of exports in firms' sales growth, market shares and competitive positions, and the profitability of export sales. The results suggest that the cost leadership strategy has a positive effect on export performance in developed country markets and the differentiation strategy is positively related to export performance in developing country markets.

Zou and Stan (1998) analyze the determinants of export performance and conclude that export performance measures are grouped into seven categories, representing financial, non-financial, and composite scales. The 'sales' category includes measures of the absolute volume of export sales or export intensity. The 'profit' category consists of absolute measures of the overall export profitability and relative measures, such as export profit divided by total profit or domestic market profit. While performance measures in the 'sales' and 'profit' categories are static, the 'growth' measures refer to changes in export sales or profits over a period of time. In comparison to financial measures, which are more objective, non-financial measures of export performance are more subjective. The 'success' category comprises measures that include a manager's belief that exporting contributes to a firm's profit and overall reputation; 'Satisfaction' refers to a manager's overall satisfaction with the firm's export performance; and 'goal achievement' refers to a manager's assessment of performance against set goals. Finally, 'composite scales' refer to measures based on the overall scores of several performance measures. This study concludes that export sales, profit, and composite scales are the most frequently used measures when aiming to measure export performance.

Sousa (2004) analyzes the metrics used in export performance. He concludes that, although the number of different measures used in export performance is large, only a few are used frequently, such as export intensity (export to total sales ratio), export sales growth, export profit, export market share, satisfaction with overall export performance,

and perceived export success. The indicators of export performance were classified into objective and subjective measures. Indicators that are mainly based on absolute values, such as export intensity, export sales volume, and export market share, among others, are referred to as objective measures. On the other hand, indicators that measure perceptual performance or attitude, such as perceived export success and satisfaction with export sales, are considered subjective performance measures.

According to Verreyne and Meyer (2011), the differentiation strategy is often associated with a high level of performance in SMEs and/or new ventures. On the other hand, innovative differentiation is significantly associated with performance, especially for firms operating in dynamic environments. Marketing differentiation has a positive relationship with performance in the case of firms operating in low-dynamic environments; this means that, for firms operating in less dynamic environments, there is only an indirect relationship between innovative differentiation and performance, which is mediated by marketing differentiation. In parallel, and although the effect of organic structures on innovative differentiation is significant in both low- and high-dynamic environments, it is only in dynamic environments that younger firms have a significant advantage in innovative differentiation.

For Aulakh et al. (2000), the differentiation strategy has strong effects on export performance in emerging country markets. Furthermore, a differentiation strategy is more effective for firms embedded in emerging economies within a group of countries that are at similar stages of economic development.

Felzensztein and Gimmon (2014) analyze how firms operating in international food markets can improve their competitiveness and long-term profit under financial pressure. Although the results show that managers prefer to adopt a cost reduction competitive strategy rather than a differentiation strategy, the authors recommend adopting a differentiation strategy with special attention to emerging environmental attributes.

Crespo et al. (2020) analyze the impact of differentiation and cost-based leadership strategies on internationalization performance, considering the contingency perspective (i.e., the duration and preparation for the internationalization of new ventures in Portugal). The results indicate that the differentiation strategy has a positive impact on the international performance of these firms. When examining the impact of firms' cost-based leadership and differentiation strategies in Thailand, Mongkol (2021) concludes that the two strategies combined produce a superior positive impact on firm performance.

The relationship between competitive strategies and export performance is well supported in the literature. Differentiation strategies have a positive impact on the export performance of firms that place their products or services in foreign markets (e.g., Aulakh et al. 2000; Crespo et al. 2020; Keskin et al. 2021; Lado et al. 2004; Mongkol 2021; Morgan et al. 2004); therefore, we present the following research hypothesis:

Hypothesis 1. *Differentiation strategies have a direct positive effect on SMEs' export performance.*

Competitive advantage refers to the firm's positional superiority in the market segment in which it operates. This superiority is based on delivering superior customer value and/or achieving lower costs compared to competitors (Hooley and Greenley 2005). For Martin et al. (2017), a firm's positional advantage is the result of the effort of competitive strategies based on product or service differentiation and cost leadership. According to Porter (1985), the cost of achieving a positional advantage can be affected by the competitive intensity of the context where the firm is located. On the other hand, in Cavusgil and Zou's (1994) approach, the positional advantage of an exporting firm is related to the positions of its rivals and is directly and negatively impacted by the competitive intensity of the environment in which it operates.

By decomposing competitive advantage into cost-based leadership, differentiation strategies and positional advantage, Martin et al. (2017) argue that firms should focus on building marketing competencies that match the adopted cost-based leadership, their differ-

entiation strategy, or their positional advantage, rather than focusing solely on marketing competencies. These firms need positional advantages to improve their export performance, which they only achieve by combining marketing competencies with a competitive strategy to generate a positional advantage.

Morgan et al. (2004) argue that the performance of exporting firms is strongly related to their positional advantage in the market. Positional advantage, in turn, is directly related to the availability of resources and core competencies, and to cost-based leadership and differentiation strategic choices. Differentiation strategies are very important for SMEs as they can rarely take full advantage of economies of scale (Borch et al. 1999). Moreover, differentiation strategies are normally based on the positional strategies of products and services, in order to provide unique offers and to serve the market more properly (Zehir et al. 2015). It is the availability of resources that supports SMEs in their deployment of unique positional advantages, based on differentiation strategies, as SMEs are normally technology and capital-constrained (Ju et al. 2017). As such, positional advantages are important for SMEs so that they avoid being dependent on low-cost strategies that limit their profit margins (Ju et al. 2017). Differentiation strategies support companies to invest in deploying unique positional advantages that support product and service customization, and that are not easily imitated by their competitors (Banker et al. 2014). Moreover, these positional advantages rest on valuable resources that lead to long-term competitive advantages and an enhanced performance (Banker et al. 2014).

Based on firms' competitive advantages, Martin et al. (2017) examine the interaction between firms' marketing competencies, cost-based leadership and differentiation strategies, positional advantage, ambidextrous innovation, and export risk performance. One of the results their study found suggests that positional advantage mediates the relationship between the differentiation strategy and export performance. Keskin et al. (2021) suggest that cost-based leadership and differentiation strategies can achieve higher export performance in foreign markets through competitive advantage. Export intensity and the level of internationalization increases as a result of positional advantages, supported by differentiation-based strategies (Lado et al. 2004). Based on the unique positional advantages that are needed to deploy differentiation strategies, it is expected that the direct relationship between the differentiation strategy and export performance could be complemented by the positional advantages SMEs have (Aguinis et al. 2017). Therefore, we consider the following research hypotheses in this study:

Hypothesis 2. *Differentiation strategy has a positive impact on the positional advantage of SMEs.*

Hypothesis 3. *Positional advantage has a positive impact on the export performance of SMEs.*

Hypothesis 4. *Positional advantage positively mediates the relationship between the differentiation strategy and the SMEs' export performance.*

Conceptual Model

The proposed conceptual model is presented in Figure 1. This model suggests that the differentiation strategy has a direct positive relationship with the export performance of SMEs. Furthermore, the positional advantage mediates the relationship between differentiation competitive strategies and export performance, which means that consolidating the positional advantage of exporting firms enables them to increase their export performance.

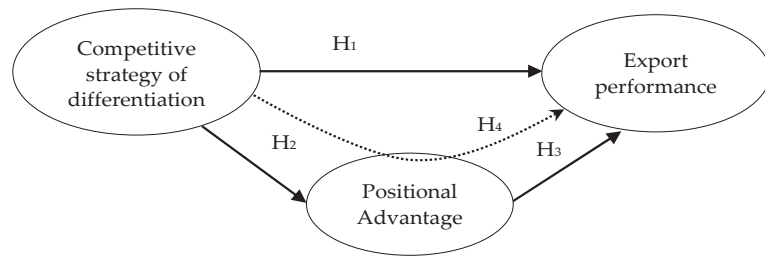


Figure 1. Conceptual model.

3. Methodology

3.1. Questionnaire and Scales

The dimensions of the three constructs were adapted from previously tested scales. The differentiation strategy was measured with a first-order reflective scale adapted from Aulakh et al. (2000) and Morgan et al. (2004). Export performance was also a first-order reflective construct adapted from Jantunen et al. (2005), Kuivalainen et al. (2007), Aulakh et al. (2000), and Zou and Stan (1998). Finally, the positional advantage was adapted from Morgan et al. (2004) and also used a first-order reflective.

Data were collected using a questionnaire consisting of scales adapted and validated in previous research, as presented in Tables 2–4. A seven-point Likert-type scale was used, where the anchors were 1 and 7, where 1 = Strongly disagree and 7 = Strongly agree.

Table 2. Scale items and loadings of export performance.

Variables/Items	Loading
(EP1) Exporting has contributed to the sales growth of our firm	0.891
(EP2) Exporting has improved our firm's market share	0.849
(EP3) Our export activity has made our firm more competitive	-
(EP4) Exporting has contributed to our profitability	0.863
(EP5) Exporting has contributed to entering us into new markets	0.876
(EP6) Exporting has contributed to improving our international image	0.918
(EP7) Exporting has contributed to improving the development of our know-how	0.838

Source: Own elaboration, adapted from Jantunen et al. (2005); Kuivalainen et al. (2007); Aulakh et al. (2000); Zou and Stan (1998).

Table 3. Scale items and loadings of the differentiation strategy.

Variables/Items	Loading
Marketing differentiation	
(MD1) Improving/maintaining advertising and promotion	0.825
(MD2) Building brand identification in the export venture market	0.773
(MD3) Adopting new/innovative marketing techniques and methods	0.866
Product/Service differentiation	
(SD1) Maintaining higher quality standards for our products	-
(SD2) Maintaining unique image for our products	0.848
(SD3) Differentiating products and services from competitors	0.842
(SD4) Achieving/maintaining quick product delivery	0.753
(SD5) Achieving/maintaining prompt response to customer orders	-
(SD6) Offering extensive customer service	0.859

Source: Own elaboration, adapted from Morgan et al. (2004), and Aulakh et al. (2000).

The questionnaire was submitted to a pre-test, carried out with a convenience sample of eight individuals (three university professors and five managers), in order to verify the organization and formatting of the questionnaire, the correct wording, how the respondents would understand the questions, and the necessary response time, in addition to eliminating possible errors and typos. As a result of the pre-test, changes were made in terminology

to facilitate the respondents' understanding. The number of items per variable was reduced to a minimum to keep the questionnaire at an adequate size. The final version of the online questionnaire was made available to companies through Google Drive LimeSurvey for five months (September 2019 to February 2020). The questionnaire was prepared in two languages, English and Portuguese. To complete the questionnaire, respondents were also approached by telephone and in person, but all responses were submitted online.

Table 4. Scale items and loadings for positional advantage.

Variables/Items	Loading
Product	
APRD1: Product quality	0.715
APRD2: Packaging	0.812
APRD3: Design and style	-
Service	
ASERV1: Product accessibility	-
ASERV2: Technical support and after-sales service	0.756
ASERV3: Delivery speed and reliability	-
ASERV4: Product line breadth	0.869

Source: Own elaboration, adapted from Morgan et al. (2004).

3.2. Sampling and Data Collection

The online survey was the approach used to collect data from exporting SMEs in Mozambique. The study sample consisted of 400 exporting SMEs, drawn from the database of the Agency for Investment and Export Promotion (APIEX) of Mozambique. We obtained 305 completed questionnaires, from which we excluded 55 questionnaires with incomplete answers. The total number of completed questionnaires was 250 SMEs. The sample consisted of the agro-industry sector, with 48 firms representing 19.2%, the wood processing sector, with 89 firms representing 35.6%, fishery product sector, with 67 firms representing 26.8%, and the agricultural product sector, with 46 firms representing 18.4%. In terms of the number of employees, there were 168 firms (67.2%) with 5–49 employees, and 82 firms (32.8%) with 50–100 employees. Finally, the owners of 163 enterprises (65.2%), the executives of 79 enterprises (31.6%), and the others of 8 enterprises (3.2%) were respondents to the questionnaire.

3.3. Common Method Bias

Common method bias (CMB) is recognized to be a validity-threatening problem that can jeopardize the study's results. The main sources of CMB result from the following (Podsakoff et al. 2003): (a) the same respondent at a single point rate for both the independent and dependent variables; and (b) the characteristics of the measurement items. To mitigate CMB problems, the respondents were assured of anonymity, i.e., the answers provided would only be used for research/investigation purposes and that personal information, regarding the company or the respondent, was not asked (Podsakoff et al. 2003; Tourangeau et al. 2000). Moreover, as referred to above, the measurement items were pilot tested with academicians for clarity to reduce their characteristic effects (Podsakoff et al. 2003). Then, even after implementing these preventative procedures to mitigate CMB, Harman's (1967) single-factor analysis was used to assess the potential of CMB after data collection: it was possible to conclude that the single factor of the data that emerged explained less than 50% of the variance, suggesting that CMB was not an issue.

3.4. Data Analysis

The statistical analysis of the data obtained was conducted through the partial least squares method of structural equation modeling (PLS-SEM), using the SmartPLS 3.0 software; this is because PLS-SEM is considered a robust data analysis tool when the sample size is relatively small, which is the case, although the sample exceeds the minimum

size of 200 responses (Hair et al. 2016). On the other hand, PLS-SEM is the most robust methodology to use because it is robust when working with non-normal data and when the theoretical framework is at an early stage of development, which involves testing and validating an exploratory model (Henseler and Chin 2010). Moreover, despite the differences between covariance-based structural equation modeling (CB-SEM) and PLS-SME (Dash and Paul 2021), as this research sought to explore the concepts and relationships between them in emerging countries, in which the context may play an important role, PLS-SEM was chosen. Furthermore, although both methods are similar, PLS-SEM seems to present higher item loadings, better construct reliabilities and a higher validity than CB-SEM (Dash and Paul 2021).

Data were analyzed to test the psychometric properties of the scales used, namely the reliability, validity, and uni-dimensionality of the constructs, using specific statistical tests (Hair et al. 2019). The internal consistency was examined using Cronbach's alpha coefficients.

The model was tested by assessing the reliability, convergent validity, and discriminant validity of the items and constructs. As PLS-SEM employs bootstrapping to test the significance of relationships, it works well when dealing with non-normal variables, which is usually the case when multiplying two normally distributed variables (Bollen and Stine 2014; Efron 1988). PLS performs well in mediation analysis (Hair et al. 2016). Moreover, most of the proposed solutions to implement mediation analysis are fulfilled (Aguinis et al. 2017).

The coefficient of determination (R^2) of the endogenous variables was used to explain the percentage of the variability of the dependent variable, explained by the independent variable(s). R^2 is a good indicator of how well observed outcomes are replicated by the model (Hair et al. 2010). The effect size (f^2), which assesses how exogenous constructs help explain an endogenous construct in terms of R^2 , was used to explain the relative importance of the differentiation strategy and positional advantage. Finally, the standardized root mean squared residual (SRMR) was used to test the model fit (Cho et al. 2022).

4. Results and Discussion

Tables 2–4 present the loadings of the items obtained through bootstrapping with 5000 replications. Items EP3, SD1, SD5, APRD3, ASERV1 and ASERV3 were removed because they presented factor loadings below the minimum threshold value required. All other items presented loadings equal to or higher than the minimum recommended threshold of 0.7 (Götz et al. 2010).

Before analyzing the hypotheses presented in Figure 1, the industrial sector, firm size (number of employees) and firm age were tested as control variables. The results are shown in Table 5. As such, it is possible to conclude that there are no statistically significant differences for the variables analyzed. Therefore, the resources of larger firms are not very different from the resources of smaller firms, older firms do not possess better resources or capabilities than smaller firms, and the different sectors do not perform differently.

Table 5. Analysis of control variables.

Paths	Regression Coefficients (β)	<i>p</i> -Values
Sales Volume → Export Performance	−0.140	0.132
Age → Export Performance	0.016	0.801
Number of employees → Export Performance	−0.002	0.980

Table 6 presents the analysis of the internal consistency and reliability of the scales of the three constructs used, based on Cronbach's alpha, Rho-A, and the composite reliability (CR). Cronbach's alpha coefficients were 0.924 for the differentiation strategy, 0.938 for the export performance, and 0.830 for the positional advantage, all above the recommended value of 0.70 (Hair et al. 2016). The Rho-A coefficients were 0.925 for the differentiation strategy, 0.947 for the export performance, and 0.880 for the positional advantage, all above

the recommended value of 0.70 (Dijkstra and Henseler 2015). The CR indicators ranged from 0.880 and 0.938, and are above the recommended value of 0.7 (Hair et al. 2016). Finally, the convergent validity is assured, as the values of AVE are larger than the recommended value of 0.5 (Fornell and Larcker 1981; Götz et al. 2010); this means that all items converge when measuring the underlying constructs under assessment.

Table 6. Internal consistency, reliability and convergent validity.

Constructs	Average Variance Extracted (AVE)	Composite Reliability (CR)	Cronbach's Alpha	rho_A
Differentiation strategy	0.656	0.938	0.924	0.925
Export performance	0.762	0.950	0.938	0.947
Positional advantage	0.596	0.880	0.830	0.880

Source: Own elaboration.

Discriminant validity seeks to demonstrate that a certain construct explains the variance of its own indicators better than the variance of other latent constructs (Henseler et al. 2015). Therefore, the discriminant validity was assessed using two perspectives: the Fornell–Larcker and the heterotrait–monotrait (HTMT) criteria. The results are presented in Table 7. While the Fornell–Larcker method compares the square root of the AVE with the correlation of all latent constructs (Hair et al. 2019), the HTMT criterion indicates the need to compare a predefined threshold that ranges from 0.85 (Kline 2011) to 0.9 (Gold et al. 2001) to the actual result for each construct. When using the HTMT criteria, if the result is lower than this threshold—0.85 (Kline 2011) or 0.9 (Gold et al. 2001)—it is possible to claim that there is discriminant validity among the constructs (Henseler et al. 2015). Table 7 shows that the Fornell–Larcker and the HTMT criteria show discriminant validity.

Table 7. Discriminant Validity.

Variables	Correlations		
	1.	2.	3.
1. Differentiation Strategy	0.810	<i>0.635</i>	<i>0.693</i>
2. Export performance	0.600	0.873	<i>0.556</i>
3. Positional advantage	0.622	0.509	0.772

Note: diagonal elements (in **bold**) are the square root of AVE; the correlations between the variables are presented below the diagonal. They are used to assess the Fornell–Larcker criterium; HTMT scores are presented above the diagonal in *italics*.

4.1. Hypothesis Testing

The model shown in Figure 1 was tested based on the sign, magnitude, and statistical significance of the parameters of the relationships tested, as supported by Götz et al. (2010). The coefficient of determination (R^2) of the endogenous variables was also analyzed.

Linear regression coefficients were used to test hypothesis H_1 , H_2 and H_3 . A hierarchical regression analysis (Aguinis and Gottfredson 2010; Arnold 1982; Sharma et al. 1981) was used to test H_4 . The variable ‘differentiation strategy’ was used as the independent variable. Finally, the effect of the variable ‘positional advantage’ was analyzed with the inclusion of the two relationships to be tested: differentiation strategy x positional advantage.

When testing for the mediation effects (Hair et al. 2016), firstly, the significant direct effect between the independent and dependent variable should be established when the mediating variable is excluded. Secondly, the indirect effect of the mediating variable should be significant when the mediating variable is included in the model. Finally, the relationship between the independent and dependent variables should be significantly reduced when the mediator is added. These three steps were carried out in this study using PLS-SEM.

Table 8 and Figure 2 present the results of the effects of the variables and the confirmation of the hypotheses. It is possible to conclude that all the structural relationships tested

have positive signs and parameters, which is in accordance with the assumptions made. According to the results, the differentiation strategy has a positive effect on export performance, i.e., the results obtained support and validate hypothesis H1 ($\beta = 0.462$; $p < 0.001$); therefore, the differentiation strategy positively affects the export performance. The model tested the relationship between the differentiation strategy and the positional advantage, indicating that the differentiation strategy has a positive effect on the positional advantage, validating hypothesis H2 ($\beta = 0.622$; $p < 0.001$). The results confirm H3 ($\beta = 0.221$; $p < 0.001$), since the positional advantage has a positive impact on the export performance. Finally, the data confirm and validate hypothesis H4, whereby the positional advantage has a positive mediating effect on the relationship between the differentiation strategy and the export performance ($\beta = 0.138$; $p < 0.001$).

Table 8. Estimated direct, indirect, and total effects.

Path	Direct Estimates	CILL (0.025)	CIUL (0.975)	T Values	p-Values	f ²	Hypotheses	
							References	Validated
Direct effects								
DiffStr → ExpPer	0.462	0.351	0.580	7.908	0.000	0.215	H1	✓
DiffStr → PosAvd	0.622	0.513	0.711	12.322	0.000	0.631	H2	✓
PosAvd → ExpPer	0.221	0.089	0.340	3.386	0.001	0.049	H3	✓
Specific indirect effects								
DiffStr → PosAvd → ExpPer	0.138	0.061	0.214	3.509	0.000		H ₄	✓
Total effects								
	0.600	0.494	0.686	12.355	0.000			

Note: DiffStr: differentiation strategy; ExpPer: export performance; PosAvd: positional advantage; CILL: confidence interval lower limit with corrected bias; CIUL: confidence interval upper limit with corrected bias. Source: Own elaboration.

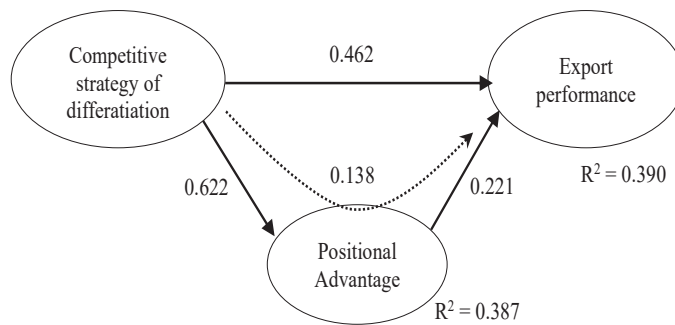


Figure 2. Moderating effect of positional advantage.

Figure 2 shows that the determination coefficient (R^2) of the export performance is 0.390, i.e., both the differentiation strategy and the positional advantage explain 39% of the variance in the export performance. Moreover, the differentiation strategy alone explains 38.7% of the variability in the positional advantage of exporting Mozambican firms, giving a clear importance to the differentiation strategies the Mozambican firms manage to deploy.

When assessing the effect size, as shown in Table 8, it is possible to claim that, based on Cohen (1988), the differentiation strategy has a medium effect ($f^2 = 0.215$) on the export performance, the positional advantage has a weak effect ($f^2 = 0.049$) on the expert performance, and the differentiation strategy has a strong effect ($f^2 = 0.631$) on the positional advantage. These results corroborate the explanatory power of the differentiation strategy when explaining the R^2 obtained for the positional advantage and export performance.

Table 8 shows that the direct effect of differentiation strategy on export performance ($\beta = 0.462$) is larger than the indirect effect ($\beta = 0.138$). To complement this analysis, and to

assess the strength of the mediation effect, Zhao et al.'s (2010) three-factor approach was used, in which it is possible to assess how the indirect effect absorbs the direct effect.

Given the values presented in Table 8 and Figure 2, the proportion of the indirect effect versus the total effect is $0.23 - (0.138)/(0.138 + 0.462) = 0.23 -$, which indicates that the positional advantage partially mediates the relationship between the differentiation strategy and the export performance. These results also corroborate the results obtained when assessing R^2 and f^2 : competitive strategy plays a more important role in explaining the export performance than the positional advantage does.

The results for the sample of 250 firms show that the cut-off value for the standardized root mean squared residual (SRMR) is 0.044, which is lower than the threshold value of the SRMR = 0.06 for samples with $N > 500$, and lower than the recommended value of the SRMR = 0.091 for samples with 200 respondents (Cho et al. 2022). As such, the model fit is assured.

4.2. Discussion and Implications

The conceptual model proposed in this paper integrates the differentiation strategy, positional advantage, and export performance. The results confirm that the differentiation strategy has a positive effect on the export performance of Mozambican SMEs, corroborating with the literature on this matter (Aulakh et al. 2000; Crespo et al. 2020; Morgan et al. 2004; Keskin et al. 2021). The following can be argued: first, that the differentiation strategy, related to the use of unique attributes vis-à-vis competitors (Porter 1985), is successfully used by Mozambican SMEs to increase their export performance; second, the role of economic blocs in emerging economies have allowed firms to have privileges in exporting their products to developed markets (Aulakh et al. 2000; Ministério da Indústria e Comércio 2016); and, third, the adoption of differentiation strategies is an important option for entrepreneurial firms and SMEs when competing in international markets (Knight and Cavusgil 2004; Martin et al. 2017). This confirms previous studies, as Mozambican SMEs show that the unique resources they possess are important to tailoring their products and services; this means that they are not easily imitated by their domestic competitors, and so that they take full advantage of their resources in international markets (Banker et al. 2014; Knight et al. 2020; Zehir et al. 2015).

The results also suggest that the positional advantage mediates the relationship between the differentiation strategy and the export performance of Mozambican SMEs, because as firms gain positional advantage as a result of competitive differentiation strategies, their export performance increases. This confirms the results presented by Martin et al. (2017). This result can be substantiated by the fact that firms' differentiation strategies are effective in achieving a differentiation-based competitive advantage, supporting firms' export performance (Keskin et al. 2021). Firms achieve a higher export performance through the sustainability of positional advantages as a result of the efficient and effective execution of the differentiation strategic advantage (Morgan et al. 2004; Porter 1985). Despite providing important drivers of competitive advantage and directly affecting the export performance of Mozambican SMEs, positional advantages mildly moderate the direct effect of the differentiation strategy; this may indicate that Mozambican SMEs are not properly taking advantage of their positional advantage, i.e., the added value generated by the positional advantage is still relatively low, perhaps as a result of the low differentiation that Mozambican SMEs still experience in international markets. As such, if differentiation strategies help Mozambican SMEs to make products and provide services that are different to their competitors and that are supported in their competitive advantages, they still have to invest in their positional advantages in international markets to overcome fierce international competitors.

This research presents implications at the level of the literature focusing on the development of theory in international marketing and internationalization; it also adds to the body of empirical studies that prove that, in the context of SMEs in emerging economies, differentiation strategies play an important role in supporting the internationalization path

(Aulakh et al. 2000). In parallel, the positional advantage plays an important mediating role in the relationship between the differentiation strategy and the export performance, indicating that the positional advantages may further sustain competitive strategies and improve firm performance (Martin et al. 2017).

Regarding management implications, the study concludes that SME managers should, on one hand, value competitive differentiation strategies and, on the other hand, make SMEs assume positional advantages in their sectors of activity, in order to increase their export performance in international markets. If the RBV of the firm supports companies to achieve their competitive advantage, Mozambican SMEs would need to invest more resources to develop their product and the positional advantages of their services, in order to gain international credibility and to support their differentiation strategies. As resources can rarely be easily purchased or transferred, if Mozambican SMEs are to develop their competences and resources over time, public policies are needed to support the development of internal competitive advantages and to develop a proper organizational climate; this is so that Mozambican SMEs can manage difficult-to-imitate products and services and develop proper international appealing positional advantages.

5. Conclusions, Limitations, and Future Perspective

This article aims to measure the impact of differentiation strategies on the performance of exporting firms and to determine the mediating effect of the positional advantage in this relationship. The results show that the differentiation strategies have a direct positive effect on export performance, which leads us to conclude that Mozambican SMEs, by adopting a product and service-based differentiation strategy, can increase their competitiveness and ability to access international markets, as well as increase their export performance. The results also indicate that positional advantage has a positive mediating effect upon competitive strategies and export performance; therefore, SMEs that have solidified their positional advantage, as a result of differentiation strategies, increase their export performance. This result is very important for an emerging economy, as it is possible to conclude that small ventures and SMEs from emerging countries can benefit from differentiation strategies and positional advantages in their international path. However, Mozambican SMEs, as well as most SMEs in emerging markets, still have to invest in unique resources and capabilities if they want to achieve different, unique competitive advantages and develop a strong international positional advantage.

This research presents limitations. The first limitation is the fact that it is a cross-sectional study. Future research should aim to generate longitudinal data to obtain the dynamic influences. Second, although the use of single respondents is not advisable, despite all the efforts to mitigate CMB, circumventing single response bias was impossible to achieve in the Mozambican context. In this case, future research should increase the number of respondents from each company. For future research, we also integrated the mediating effect of the international experience of SMEs in this conceptual model, since it would be important to know the role of the international experience in the relationship between differentiation strategies and the export performance of these firms, particularly in the context of developing countries. Future studies, method wise, could test similar models in emerging contexts using consistent PLS-SEM or CB-SEM.

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Article

Student Experience, Satisfaction and Commitment in Blended Learning: A Structural Equation Modelling Approach

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Abstract: The COVID-19 pandemic led to higher education institutions adopting alternative teaching models to continue their work while complying with health measures. Specifically, in Spain, once the lockdown period was over, universities adopted the blended learning (BL) model, which allowed for a partial return to the classroom. The BL model meant a completely new approach for students that impacted their learning experience. Using structural equation modelling (SEM), this paper explores in-depth students' experience with BL—social-behavioural, cognitive-affective, sensory and formative—and tests the impact of BL on students' satisfaction and their commitment to learning. Data were collected from a sample of 467 undergraduate students at Complutense University of Madrid (Spain) who filled out a self-administered questionnaire. The model proposed shows fit indices above the recommended thresholds, indicating an adequate model fit. Results suggest a positive influence of the different dimensions of BL experience on satisfaction. In addition, satisfaction with BL had a positive impact on students' affective commitment. Going by these results, the students' experience with BL has been positive, increasing their willingness to study. Finally, the implications of these results for higher educational institutions are discussed and future research lines suggested.

Keywords: higher education; student experience; blended learning; satisfaction; commitment

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1. Introduction

In the spring of 2020, schools and higher education institutions (HEIs) were closed in 185 countries, affecting 1,542,412,000 students, which is 89.4% of the total number of students enrolled in the world [1]. It was an unprecedented situation that, in record time, forced educational institutions and their actors to transform the work ecosystem in order to continue with the activities. The technical infrastructure of universities, pedagogical skills for distance learning and the specific requirements of some disciplines have been the main challenges recognised by HEIs [2]. At the same time, the forced move to distance teaching offered important opportunities to adopt more flexible forms of teaching, such as synchronous and asynchronous or hybrid teaching, better known as blended learning (BL).

In particular, these forms of teaching were applied in higher education, which is less dependent on the presence of the teacher for the learning process of students, thus making the latter less vulnerable to changes in the teaching model.

Consequently, although students in Spanish universities could return to the centres after the lockdown, the need to maintain social distancing norms led them to opt for the BL model, which flexibly combined face-to-face classes and activities with those taught online. This resulted in a new, and therefore little explored, educational context for students.

There has been a considerable amount of research into BL and its impact on student learning, including concepts such as satisfaction, commitment or experience, from a pedagogy point of view. However, no studies have been found that analyse BL using an experientially oriented approach (focusing on the student as a customer) and, even more

importantly, that analyse the relationships that the concepts of experience, satisfaction and commitment have with each other. It is known, in particular, that BL can improve student performance [3] or be satisfactory [4]. Nevertheless, the impact of BL on student commitment through satisfaction, which is considered an intermediate outcome of the student experience and leads to student commitment, has not been studied, least of all during a pandemic period. In fact, several studies have looked at the effect of commitment on satisfaction with BL but not at how satisfaction fosters greater student commitment [5,6].

The literature on BL presents diverse methodological approaches (see Appendix A, Table A1). The main method adopted is based on descriptive analyses, such as frequencies or comparison of means [7–9]. Other studies employ qualitative tools, such as focus groups or personal interviews [10–12]. However, few studies deepen in BL using a structural equation approach [5,13,14].

This research aims to explore in-depth students' lived experiences during the implementation of the BL model during the COVID-19 period and to investigate its impact on student satisfaction and commitment. In particular, the study approaches the experience not from a pedagogical point of view (as to higher or lower performance) but from a more experientially oriented approach and focused on the affective, behavioural, sensory or social situations students have lived through. In addition, the work attempts to answer the following research questions:

1. What aspects of the experience most influence student satisfaction with BL?
2. How does student experience influence satisfaction with BL and commitment to learning?

The paper is organised into four sections. To begin with, it focuses on the existing literature on BL and the development of the hypotheses. Then, the methodology used is explained, and the results are presented. Finally, the results obtained are discussed, and conclusions are drawn.

2. Literature Review

2.1. Blended Learning

BL was first implemented at Stanford University in the 1960s and 1970s, with the onset of the usage of videos, allowing students to learn outside the classroom. Over time, specific learning systems continued to be developed, which, with the great technological advances since the 2000s, have given rise to today's BL [15].

BL is defined as "the thoughtful integration of face-to-face classroom learning experiences with online learning experiences" [16] (page 96). This definition has evolved to a learning environment that allows the incorporation and combination of face-to-face, computer-based, distance and mobile learning both inside and outside the classroom [17,18]. The different combinations that can be developed generate a wide variety of BL models to suit the needs of the student, the teacher and the subject matter [18]. In each model, the weight of the teacher's presence and the student's self-learning through technological resources varies, which highlights the principal characteristics of BL such as presence, self-learning, distance and ubiquity [7].

BL thus encourages students to be more autonomous, allowing them to practice self-organisation and follow the pace of learning that best suits them [19]. In addition, not having to go to the classroom every day saves time, which students perceive as more study time, leading to better academic performance [20]. The use of technology improves students' digital skills, besides increasing their participation in the classroom [21].

From a social point of view, BL allows interactions between students to take place not only in the classroom but also through virtual environments. This benefits the integration of students, forming communities that reduce students' sense of loneliness [22]. In addition, the fact that students with disabilities do not have to travel to the university to receive classes favours this collective, given that many facilities are not prepared for them, affecting their learning [19].

In short, BL is learner-centred learning with a focus on the learner's ability to acquire and process knowledge and solve problems [21].

Despite this, BL is associated with problems of accessibility and equality. The need for computers or other devices that enable online activities to be monitored is a problem for students with limited resources. This engenders differences between students, creating an entry barrier that universities and public institutions must detect and try to resolve [23].

To illustrate and clarify how BL differs from face-to-face and fully online learning models, Figure 1 shows the characteristics of learning models.

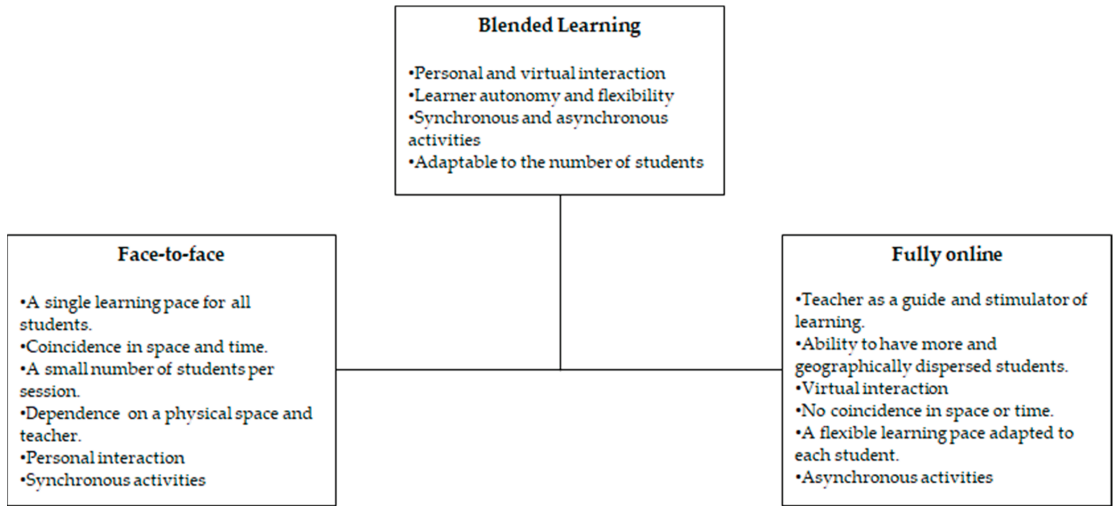


Figure 1. Characteristics of learning modalities.

As can be seen in Figure 1, the face-to-face and fully online models present totally opposite and different characteristics. BL, on the other hand, is not a disruptive model with respect to either the fully online or the face-to-face models but rather integrates the benefits of both models to form a new model that enhances student learning.

2.2. Educational Experience

In business, the consumer experience encompasses the sensations, feelings, cognitions and behavioural responses of a consumer when coming into contact with the brand, which, in turn, has repercussions on the consumer’s satisfaction and commitment to the brand [24]. When applied to education, this would be the sensations, feelings, cognitions and behavioural responses that students experience with the educational services, systems and products of their institution [25]. Of the dimensions of experience mentioned by Brakus et al. [24], one based on the environment in which the BL model takes place (classroom, technical infrastructure, teaching methodology) should be added, given that this is a key element in the educational environment and one of the main touchpoints of the student with the institution.

Social-behavioural experience is based on the behaviours and relationships established with peers or the staff of the institution. In this regard, previous studies show that in BL, there is greater socialisation among students and between students and the teacher [21,26], as well as greater participative behaviour of the students in the activities carried out [27]. These behaviours have been shown to be positively related to satisfaction in BL [28]. Based on the previous results, the following hypothesis is proposed:

H1. *Social-behavioural experience of students positively influences satisfaction with BL.*

Affective-cognitive experience reflects how learning in BL has made the student feel, both emotionally and intellectually. Gazica et al. [29] demonstrated that BL did not generate

greater motivation in students in comparison to the face-to-face modality. However, it does provide the student with a greater capacity for reasoning and understanding the subject matter [30]. This experience has been found to be a predictor of satisfaction with BL [6], which is why the following hypothesis is proposed:

H2. *Affective–cognitive experience of students positively influences satisfaction with BL.*

Sensory experience in education involves students' perceptions through the senses, with a particular focus on sight and hearing. Unfortunately, no previous literature could be located that studies the sensory experience of the student in BL environments or its relationship with student satisfaction in this modality. Even so, if we understand that for the correct functioning of BL, it is necessary for the student to be able to hear and see the teacher and the class materials either in the classroom or online, it seems logical to pose the following hypothesis:

H3. *Sensory experience of students positively influences satisfaction with BL.*

Formative experience depends on the infrastructures available, the methodology used and the organisation of the BL model. In this regard, there are studies that report problems in the organisation of online and face-to-face activities, leading to an overlap between them [31], or student difficulties with the introduction of new methodologies [32]. This gives rise to the following hypothesis:

H4. *Formative experience of students positively influences satisfaction with the BL model.*

Satisfaction is understood as the degree to which students enjoy their studies [33] and is a predictor of their commitment to learning [34]. Previous literature has shown that there is a positive relationship between student satisfaction and commitment to learning [6,35], particularly as to normative and affective commitment [36]. This takes place when students see the objectives of the course reflected in the activities carried out and the involvement of the teacher, which predisposes them to take a greater interest in their studies [6]. Therefore, the following hypotheses are proposed:

H5. *Student satisfaction positively influences affective commitment.*

H6. *Student satisfaction positively influences normative commitment.*

Based on the above, the conceptual model shown in Figure 2 depicts the proposed model and the hypotheses put forward. The model shows the social-behavioural, affective–cognitive, sensory and formative experience dimensions, as well as the resultant satisfaction and, in turn, normative and affective commitment.

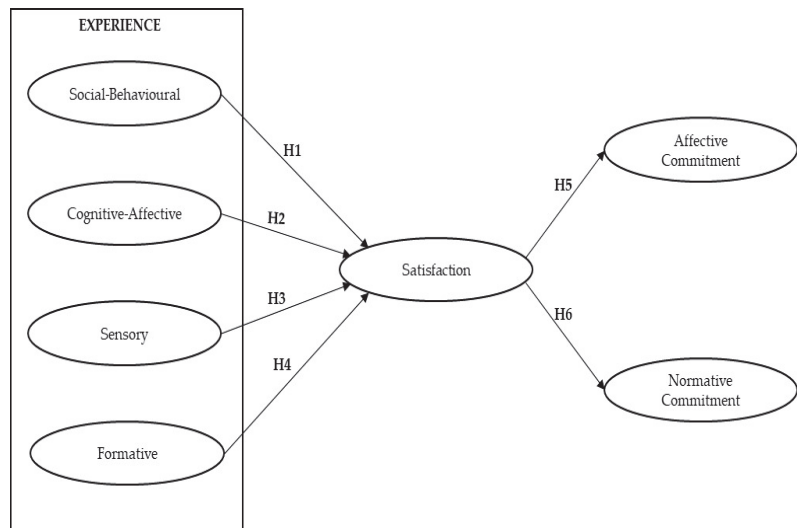


Figure 2. Conceptual model and hypotheses.

3. Methodology

3.1. Survey

A self-administered questionnaire was sent to undergraduate students of the following disciplines: social and legal sciences, arts and humanities, health sciences, sciences, engineering (see Appendix A, Table A2). The fieldwork was carried out in April and May 2022; prior to the questionnaires, participants provided informed consent, and the data obtained were treated with the utmost confidentiality and following all ethical protocols.

The questionnaire was designed to measure the four dimensions of experience (social-behavioural, cognitive-affective, sensory and formative), satisfaction and commitment to learning in a BL environment. To measure social-behavioural, cognitive-affective and sensory experience dimensions, the items proposed by Brakus et al. [24] were adapted, while for the formative experience, items from Mbwesa [37] and Parasuraman et al. [38] were adapted. Satisfaction was measured using the items developed by Chen and Chau [7], and normative and affective commitment by adapting items from Meyer, Allen and Smith [39] and Fernandez-Lores et al. [40], respectively. All items were measured on a Likert-5 scale, with 1 representing strongly disagree and 5 strongly agree. Table 1 lists the items used to measure each variable.

Table 1. Variables and items used in survey.

Variable	Item	Description	Adapted from
Social-Behavioural	SOB1	Strengthened my relationship with peers	[24]
	SOB2	Facilitated my relationship with peers	
	SOB3	Broadened my circle of friends	
Cognitive-Affective	COA1	Encouraged me to study collaboratively with peers	[24]
	COA2	Encouraged me to help my peers	
	COA3	Encouraged me to work as a team	
Sensory	SEN1	I heard the teacher well	[24]
	SEN2	I heard my peers well	
	SEN3	I saw the teacher well	

Table 1. Cont.

Variable	Item	Description	Adapted from
Formative	FOR1	The university had up-to-date equipment	[38]
	FOR2	The virtual environments used were adequate	[37]
	FOR3	My faculty organised the BL courses appropriately	[37]
Satisfaction	SAT1	If I have the opportunity to do another course in BL, I would gladly do so	[7]
	SAT2	I would recommend it to other students	
Affective Commitment	AC1	Because it felt good	[40]
	AC2	Because I was having fun	
	AC3	Because I enjoyed it	
Normative Commitment	NC1	Because it was a must for me	[39]
	NC2	Because I felt it was my obligation	
	NC3	Because it was wrong to stop doing it	

The questionnaire was reviewed by a panel of experts to assess the content validity and to ensure the accuracy of the translations of the texts. In order to check the clarity of the questions and elicit information on adequacy in terms of completion time, a pretest was carried out on a group of 23 students. Some items were eliminated and reworded for simplification and comprehension. In addition, an ethics committee gave a positive assessment of the proposed items and the procedure for obtaining them. The analysis of the data obtained was carried out with SPSS Statistics 25.

3.2. Sample

Of 501 survey responses obtained between April and May 2022 from undergraduate students at the Complutense University of Madrid (Spain), 467 were found valid. The sample had a cross-sectional character and was obtained only from the Complutense University of Madrid because it adopted a basic BL model in which students had one week of face-to-face classes and another week of online classes. This meant that within the particularities that each case might have, there was a common pattern in all of them, homogenising the experience in this learning modality, giving rise to variability in the sample but not in the object of study. The characteristics of the sample are shown in Table 2.

Table 2. Characteristics of the sample.

Characteristic	%
Gender	
Male	67.7
Female	25.9
I would rather not say	6.4
Field of knowledge	
Social and legal sciences	38.1
Arts and humanities	29.1
Health sciences	18.4
Sciences	10.1
Engineering	4.3
Classes attended	
0%	9.4
25%	3.6
50%	7.1
75%	29.3
100%	50.5

4. Results

Structural equation modelling (SEM) was carried out using the maximum likelihood estimation method to corroborate the hypotheses, using SPSS AMOS 28.0. First, the measurement model was estimated to assess factor structure, reliability, convergent validity and discriminant validity. Subsequently, the parameters of the structural model were estimated, and the hypothesised relationships were tested.

4.1. Measurement Model

The criteria for validity and reliability are used to check the fit of the measures. Reliability represents the ability of a measuring instrument (items) to consistently deliver the same result. Validity represents the degree to which a measuring instrument (items) accurately measures a concept [41].

The reliability of the subscales of the model was adequate, with alpha coefficients above 0.7 [42].

The factor loadings, composite reliability and mean variance extracted were assessed for convergent validity, as suggested by Hair et al. [42]. The loadings of all items exceeded the recommended value of 0.6, and the composite reliability and the average variance extracted in all cases exceeded the recommended values of 0.7 and 0.5, respectively, as shown in Table 3.

Table 3. Reliability and validity of measures.

Item	Mean	SD	Loading	α	CR	AVE
SOB1	1.97	1.241	0.838	0.919	0.949	0.883
SOB2	1.88	1.142	0.85			
SOB3	1.82	1.124	0.858			
COA1	2.17	1.255	0.789	0.913	0.945	0.88
COA2	2.46	1.311	0.854			
COA3	2.33	1.311	0.845			
SEN1	3.04	1.206	0.877	0.884	0.993	0.843
SEN2	2.82	1.278	0.832			
SEN3	3.02	1.282	0.842			
FOR1	3.64	1.415	0.782	0.855	0.919	0.837
FOR2	3.42	1.414	0.798			
FOR3	3.34	1.495	0.774			
SAT1	2.2	1.427	0.857	0.936	0.842	0.74
SAT2	2.19	1.36	0.81			
AC1	2.87	1.391	0.766	0.916	0.883	0.743
AC2	2.32	1.268	0.828			
AC3	2.41	1.317	0.815			
NC1	3.8	1.24	0.911	0.895	0.915	0.787
NC2	3.68	1.293	0.886			
NC3	3.49	1.354	0.828			

Table 4 demonstrates the discriminant validity between the constructs, as the mean variance estimates extracted, which exceeded 0.5, were higher than all the phi-squared correlations between the constructs [43].

Table 4. Discriminant validity.

	SOB	COA	SEN	FOR	SAT	AC	NC	AVE
SOB	1							0.883
COA	0.272	1						0.88
SEN	0.241	0.259	1					0.843
FOR	0.177	0.190	0.168	1				0.837
SAT	0.325	0.349	0.309	0.228	1			0.74
AC	0.249	0.267	0.237	0.174	0.731	1		0.743
NC	0.030	0.032	0.029	0.021	0.093	0.071	1	0.787

4.2. Structural Model

The structural model was estimated (see Figure 3). The recommended fit indices in assessing model adequacy [44,45] were above the recommended range [46,47], indicating a respectable fit: $\chi^2 = 392.822$; $df = 163$; ($p < 0.01$); comparative fit index (CFI) = 0.968; Tucker–Lewis index (TLI) = 0.963 and root mean error of approximation (RMSEA) = 0.054 with a 90% confidence interval of 0.048 and 0.061. Table 5 shows the standardized path coefficients of the relationships of dimensions.

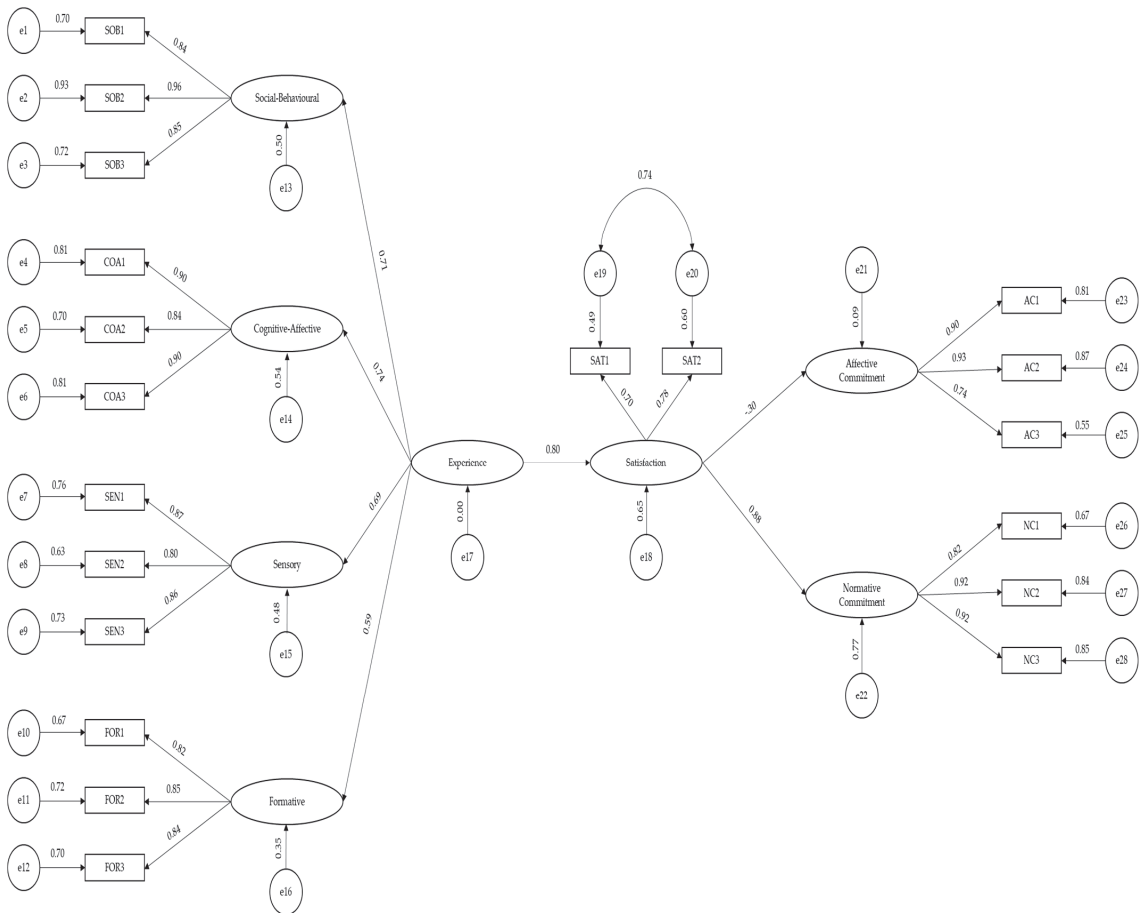


Figure 3. Estimation of model.

Table 5. Structural model results.

Effect	Path	SE	<i>p</i>	H
SOE → EXP	0.709	0	<0.001	Supported
COA → EXP	0.736	0.095	<0.001	Supported
SEN → EXP	0.692	0.105	<0.001	Supported
FOR → EXP	0.593	0.107	<0.001	Supported
EXP → SAT	0.804	0.105	<0.001	Supported
SAT → NC	−0.305	0.057	<0.001	Not supported
SAT → AC	0.875	0	<0.001	Supported

All standardised path coefficients were positive and significant at 99% confidence, except for the relationship between satisfaction and normative commitment (standardised path coefficient = -0.305 ; $p < 0.01$). These results support the hypotheses stated, except for H6 ('Student satisfaction positively influences normative commitment'), in which, despite being significant, the opposite effect is observed, with a negative relationship between satisfaction and normative commitment, consequently rejecting H6.

Among the different dimensions of experience, the hypotheses (H1, H2, H3, H4) are corroborated, with cognitive–affective experience having the greatest weight (standardised path coefficient = 0.736 ; $p < 0.01$) and formative experience being the one that, surprisingly, contributes the least (standardised path coefficient = 0.59 ; $p < 0.01$). Experience has a strong influence on student satisfaction with the BL model (standardised path coefficient = 0.804 ; $p < 0.01$), such that as experience increases, so too does satisfaction. Finally, increasing satisfaction has greatly increased affective commitment (standardised path coefficient = 0.875 ; $p < 0.01$), supporting H5.

5. Conclusions

The aim of the study was to explore the students' experience of the BL model and its impact on their satisfaction and commitment to learning during COVID-19. This experiment was carried out in a university with students from several fields of knowledge, highlighting the impact of the student experience on their satisfaction and commitment to their learning using BL during COVID-19.

The results demonstrate that a positive experience with BL contributes positively to student satisfaction and affective commitment. These results are broadly in line with what has been suggested by the previous literature. Specifically, the different dimensions of experience influence satisfaction, with cognitive–affective and social–behavioural experiences having the greatest effect. The latter is of particular interest, given that Gao et al. [13] established that there was no relationship between the social–behavioural experience and satisfaction. However, this may be explained by the fact that the BL model encourages students to socialise [21,26], mainly through online communication, such as class forums and the use of social networks, which during the pandemic, when social interactions were reduced, became more important [22]. The effect of the cognitive–affective experience is underpinned by the fact that interaction and collaboration with other students encourage discussion and critical thinking, which translates into increased learning and satisfaction [9]. The positive influence of the formative and sensory experience is justified by the fact that the perception of an efficient and suitable study environment promotes satisfaction [5]. Another noteworthy result is the negative and significant effect that satisfaction has on normative commitment. This contradicts the previous literature but may be justified by the existing health situation, which may have conditioned and influenced this relationship. Affective commitment, on the other hand, has a positive relationship with satisfaction. This is explained by the fact that students in this learning model feel more comfortable and enjoy studying, which makes them more involved in learning as a matter of enjoyment [11,19,20].

These results deepen the study of the experience in the BL model, showing that it can be very satisfactory and can strengthen the affective bond of the student with the study

and their academic training. This work takes the study of the BL experience to its ultimate consequence, student commitment, filling a gap unexplored to date.

Furthermore, it also has implications for the university by demonstrating the importance of managing the student experience for greater success in the implementation of BL. It stresses that universities are not external to the existing relationships in the markets and should consider their students as customers and act accordingly.

In concrete terms, the results encourage educational institutions to boost their investment in infrastructure and teacher training. Since, as demonstrated, the sensory and formative experiences positively influence student satisfaction, so improving aspects linked to these experiences would contribute to greater satisfaction. This study also highlights the importance of a clear and concrete institutional strategy in the implementation of BL, which reduces variability in the student experience. Finally, as shown above and revealed by earlier studies, BL as an environment is conducive to the socialisation of students through online and offline communications. In this regard, the realisation of activities inside and outside the classroom that involve students and lead to the development of personal relationships would be advisable for an improvement in the social-behavioural experience.

This work is not without limitations. Firstly, the data collected were self-reported by the students, so in order to fully understand the experience, additional information was necessary, for which in-depth interviews were conducted. In addition, self-reported data has the inherent limitation that it only considers the subjects' vision, so the results should be cross-referenced with academic results. This was not feasible in our study because, during the pandemic, the change in the educational model also involved a change in the evaluation system. Finally, the study has the limitations of transversal studies, such as data being obtained at a single point in time. However, since the objective of this study was to analyse the student's experience in BL during COVID-19, this type of study seems appropriate.

With regard to future lines of research, the replication of this study outside contexts of health crises or similar situations, which could condition the experience in these teaching models, can be considered. Furthermore, contrasting the students' experience with their academic performance could contribute to a greater understanding of students' experiences in this educational context.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by Ethics Committee of Complutense University of Madrid (protocol code CE_20220317-09_SOC and date of approval: 4 April 2022).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Not applicable.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. A sample of approaches from previous studies.

Author	Approach	Methodology	Relationship
[8]	Pedagogy	Descriptive	Academic experience → Dropout
[9]	Pedagogy	Descriptive	BL → Satisfaction
[10]	Pedagogy	Descriptive and in-depth interviews	Preference between face-to-face and BL
[11]	Pedagogy	Case studies	BL → Commitment
[14]	Technological	Partial least squares	Commitment → Continuance intention
[5]	Pedagogy	Partial least squares	BL → Commitment → Satisfaction
[19]	Pedagogy	Descriptive and in-depth interviews	BL → Performance
[21]	Pedagogy	Descriptive	BL → Skills acquisition
[28]	Pedagogy/Technological	Descriptive	BL → Interaction and satisfaction
[6]	Pedagogy	Descriptive and in-depth interviews	Commitment → Satisfaction
[32]	Pedagogy	Descriptive and in-depth interviews	BL → Satisfaction
[34]	Pedagogy	Descriptive	BL → Benefit perceptions

Table A2. Survey. (This survey has been translated from its original version used with the participants).

Your Experience in Blended Learning					
<p>The following questionnaire aims to study the UCM student’s experience with blended learning in the academic year 2020/2021. In this academic year, COVID-19 forced UCM to adopt blended learning, combining online and face-to-face learning. The following questions refer to this learning model during this period.</p> <p>Please rate each item according to how accurately it describes your experience, using the following scale: 1 = strongly disagree to 5 = strongly agree</p>					
The following statement best describes my academic experience during blended learning:					
	1	2	3	4	5
Teachers dedicated time to attend to the students					
Teachers provided personalised attention to students					
The university had up-to-date equipment					
The virtual environments used were adequate					
My faculty organised the BL courses appropriately					
Teachers did an adequate assessment of the subject					
Teachers used an appropriate teaching methodology					
The content of the courses was adapted to blended learning					

Table A2. Cont.

Your Experience in Blended Learning					
The following statement best describes my blended learning classes:					
	1	2	3	4	5
I heard the teacher well					
I heard my peers well					
I saw the teacher well					
I could see the audio-visual material well					
Strengthened my relationship with peers					
Facilitated my relationship with peers					
Broadened my circle of friends					
Encouraged me to study collaboratively with peers					
Encouraged me to help my peers					
Encouraged me to work as a team					
Were stimulating					
Encouraged me to be more active in class.					
I would have continued studying in blended learning because:					
NOTE: We know that in the last academic year, blended learning was compulsory, so the following questions are aimed at assessing the main reasons that led you to continue studying in this learning model instead of dropping your degree or dropping subjects.					
	1	2	3	4	5
I felt good					
I was having fun					
I enjoyed it					
I was highly motivated					
It was a must for me					
I felt it was my obligation					
It was wrong to stop doing it					
I would have felt guilty if I didn't do it					
With regard to blended learning:					
	1	2	3	4	5
If I had the opportunity to do another course in BL, I would gladly do so					
I would recommend it to other students					
I was satisfied					
Served my needs well					
In which year of your course were you enrolled during the last academic year (tick the option where you had the highest number of subjects enrolled):					
First					
Second					
Third					
Fourth					
Fifth					
Not at university					

Table A2. Cont.

Your Experience in Blended Learning	
What percentage of the total number of classes did you attend in the last academic year?	
0%	
25%	
50%	
75%	
100%	
Field of knowledge	
Social and legal sciences	
Arts and humanities	
Health sciences	
Sciences	
Engineering	
Gender	
Male	
Female	
I would rather not say	

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Article

Strategic Entrepreneurship and the Performance of Women-Owned Fish Processing Units in Cibinong District, Bogor Regency

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Abstract: Strategic entrepreneurship refers to the ability of an MSME to investigate potential entrepreneurial ventures while exploiting its current competitive advantages. Academics and practitioners have offered models to deconstruct strategic entrepreneurship; however, there are few distinctive strategic entrepreneurship models appropriate for certain business circumstances. Culinary businesses in Cibinong District, Bogor Regency face several challenges, including low-quality human resources, inadequate capital and technology, and poor entrepreneurial spirit. This study aims to learn how the performance of women-owned fish processing MSMEs under COVID-19 conditions connects to several strategic entrepreneurship components, such as environmental factors, individual resources, resource orchestration, and competitive advantage. Research data taken from 30 women-owned fish processing businesses were processed using SMART-PLS 3.0, followed by a quantitative descriptive method analysis. The outcome was that the components of the environment, specific resources, and orchestration of those resources could generate performance and value for the customer, leading to competitive advantages. This research provides a current understanding of attitudes to businesswomen's activities throughout the pandemic period, particularly in relation to entrepreneurship chances and MSME performance. Strategic entrepreneurship is necessary to improve performance in dynamic environments.

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Keywords: businesswomen; environmental factors; individual resources; organizational resources; resource orchestration; creating performance; entrepreneurship

1. Introduction

The adoption of financial and nonfinancial initiatives within businesswomen's organizations has a number of benefits for businesses. Financial indicators are typically used to assess a company's efficiency; on the other hand, some nonfinancial measurements, such as customer loyalty and employee happiness, need to be considered and cannot be disregarded (Visedsun and Terdpaopong 2021). It is important to take into account how the organizational climate, including leadership, culture, and organizational structure, might impact an organization's success (Odongo et al. 2019).

One of the dynamic environmental factors that micro, small, and medium enterprises (MSMEs) must address in 2020 is the COVID-19 outbreak. Regrettably, social distance restrictions have decreased the number of customers, especially in the food and culinary industries. Many firms can prosper in a changing environment by seeking new business opportunities, such as incorporating activity on websites, applications, social media, e-commerce, and the exploitation of other resources. Despite the COVID-19 outbreak having an influence on the MSME food or culinary processing business, it is still rated as a high performer and a possible winner (Dcode Economic and Financial Consulting 2020). Entrepreneurs need to be more creative, aggressive, and competitive to survive and perform well in a dynamic economy. Strategic entrepreneurship is the term for this style of conduct (Ireland et al. 2003).

The concept of strategic entrepreneurship helps businesses, despite size and age, produce superior performance and preserve profits through opportunity- and advantage-seeking activities to reach prosperity in a dynamic and globalizing environment (Tülüce and Yurtkur 2015; Zucchella and Magnani 2016). Strategic entrepreneurship may increase the variety of goods on the market, create new market niches, and stimulate novel forms of competition (Kantur 2016). To increase profitability and market share, businesses of all sizes should integrate strategic entrepreneurship into their operations (Dogan 2015). MSMEs may be capable of continuing to achieve their primary goal of promoting economic growth, value creation, competitiveness, and employment (Awang et al. 2015).

A strategic entrepreneurial approach is appropriate for small and large organizations (Papulova and Papulova 2015). Entrepreneurship can influence national economic growth, including in Indonesia. Indonesia must quicken and elevate the caliber of its economic growth as a growing country. To create competitive entrepreneurial circumstances, it is essential to construct an entrepreneurial ecosystem (Iqbal et al. 2021). According to the Ministry of Cooperatives and MSMEs of Indonesia, MSMEs accounted for 97% of employment in 2021; moreover, they made up 61.97% of the country's GDP (Mariana 2022). MSMEs in the marine and fishery sectors have great potential for Indonesian business development. There are 60,855 small, medium, and large fish processing facilities in Indonesia (Directorate General of Competitiveness of Marine and Fishery Product Development of Marine dan Fishery Ministry of Indonesia 2019). Some of these are in Bogor Regency.

Bogor Regency is a second-level administrative region of West Java Province, Indonesia, and is very important as one of the buffer zones for the capital city. According to the Statistical Agency of West Java Province, 6,088,233 people lived in Bogor Regency in 2020, representing 12.19% of the entire population of West Java Province (Statistics of West Java Province 2021). Undoubtedly, there are significant opportunities and challenges for the economic growth of this population. One of the Bogor Regency's economic drivers is the expansion of micro, small, and medium-sized enterprises (Dewi 2020). Micro, small, and medium-sized businesses are essential for boosting the economy and creating jobs in many developing countries (Iqbal et al. 2021). Thus, the development of MSMEs in Bogor Regency could create job opportunities and enhance its economic growth.

The growth of micro, small, and medium-sized businesses, particularly seafood processing, is one of the factors driving the Bogor Regency economy (Dewi 2020). Micro and small firms in Bogor Regency face several challenges to their development, including low-quality human resources, inadequate capital and technology, and poor entrepreneurial spirit. Due to a number of factors, MSMEs typically have low levels of competitiveness, which can lead to business failure (Rainanto 2019). Fortunately, the existence of these businesses could be supported by enough resources. Bogor Regency produced over 115 thousand tons of 10 different varieties of consumable fish in 2020 (Statistics of Bogor Regency 2021). These fish have great potential to be turned into competitive, high-quality fishery products. According to the requirements of the Minister of Maritime Affairs and Fisheries Regulation Number 59 of 2021 concerning "The Increasing the Added Value of Fishery Products", the increase in added value is obtained by processing fresh fish into processed fishery products.

In contrast to other sub-districts, Cibinong District serves as the administrative hub of the Bogor Regency Government and is distinguished by the absence of a village government system throughout its whole administrative region. Cibinong District can be referred to as Cibinong City or can be considered an urban region. The majority of the people in this district have access to higher-quality infrastructure facilities, infrastructure of acceptable quality, and a strong network of banking literacy (Utami 2014). Business actors exist and grow in Cibinong District because of these benefits, particularly in the processing of fishery products. Of the 135 value-added fishery business players in the Bogor Regency, 30 were in Cibinong District. Additionally, it is interesting to note that all of them are run by women.

In addition to the benefits listed above, Cibinong District has excellent potential as a market for culinary goods made from processed fish, given its position as the administrative hub of Bogor Regency. Among the 39 districts in Bogor Regency, Cibinong District has the most commercial and service facility establishments (Machmud et al. 2021). Cibinong District also has the highest scalogram in the Bogor Regency's score for economic growth facilities, and is the hub of the economic boom in Bogor Regency. Cibinong District's labor structure has evolved, shifting from a predominance in the agricultural sector to the manufacturing and service industries (Utami 2014).

In a press release in 2021, the Ministry of Women's Empowerment and Child Protection of Indonesia mandated a message for women. They stated that in the COVID-19 pandemic era, the role of women in the family was directed to further increase their active participation in various development activities (Legal Bureau of the Ministry of Women's Empowerment and Child Protection of Indonesia 2021). This demonstrates that women can actively participate in socioeconomic activities, while at the same time playing a role as housewives or teachers to instill values in their children. One measure for empowering and improving the community's economy following the COVID-19 pandemic is to increase the role of women-owned fish processing MSMEs in Bogor Regency by utilizing various local potentials, referring to targets of the Sustainable Development Goals (SDGs) agenda, number five (Gender Equality) and number eight (Decent Work and Economic Growth).

Hence, despite encountering a variety of obstacles, MSMEs may continue to fulfill their primary responsibility of fostering economic growth, value creation, competitiveness, and employment. According to the definition above, a strategic plan needs to be developed for the sustainability of women-owned fish processing MSMEs. Strategic entrepreneurship is a planning and forecasting technique used to take full advantage of possibilities when competing and outperforming rivals.

Strategic entrepreneurship is one way to gain competitive advantage supported by creativity and innovation (Ireland et al. 2003). The ability of business actors to manage their resources with the help of leadership, culture, and an entrepreneurial attitude is an example of this type of innovation. These three things are the core of entrepreneurship. Strategic entrepreneurship research is still conceptual and not based on empirical findings (Ireland et al. 2003).

Based on this, researchers have the chance to conduct empirical research by identifying the traits of women who process fishery products, and by examining the relationships between variables in the strategic entrepreneurship model that are related to the success of MSME women who process fishery products in Bogor Regency. Women who process fishery products will be identified based on their age, level of education, business ownership status, business history, time of business establishment, sources of business capital, total assets, total turnover, and number of employees.

It is obvious that strategic planning must be devised to secure the long-term viability of MSMEs. An approach to making the most of the prospects in Cibinong District, in terms of addressing retail rivalry and boosting the sector's competitiveness, is through strategic entrepreneurship. This study investigates the characteristics of women-owned fish processing units in Bogor Regency, strategic entrepreneurial considerations, and the influence of input-process-output segmentation to maximize opportunities by fostering competition in MSME business processes.

The subject of this study is fish processing MSMEs in Cibinong District owned by women. The purpose of this study is to comprehend the relationship between the performance of women-owned fish processing MSMEs under the conditions of COVID-19 and the components of strategic entrepreneurship. The findings of this study will be useful for the development of governmental intervention strategies that suit the needs of businesswomen involved in the processing of fish. This study also applies structural equation modeling using partial least squares (PLS-SEM) to a new field.

2. Materials and Methods

This study used a survey method using a questionnaire, with women-owned fish processing units serving as the direct respondents, to provide a thorough account of the circumstances surrounding a case. Data collection, surveys, and the direct distribution of questionnaires to respondents were all part of the search methodology, which focused on women-owned fish processing facilities in Cibinong District, Bogor Regency.

According to the Statistics of West Java Province in 2020, the population of Bogor Regency was 6,088,233, or 12.19% of the total population of the province (Statistics of West Java Province 2021). Bogor Regency consists of 40 districts (Saraswati 2014), and is the most populated resident regency in Indonesia (Directorate General of Population Affairs and Civil Registration of the Ministry of Home Affairs of Indonesia 2021; Kusnandar 2021). Cibinong District is one of the most densely populated districts in Bogor Regency.

In contrast to other sub-districts, Cibinong District, which serves as the administrative hub of the Bogor Regency Government, is distinctive in that the entirety of its administrative region lacks a village government structure. The bulk of the population in this district benefits from better access to education, high-quality infrastructure, and a strong network of banking literacy (Aprilia et al. 2021; Utami 2014). Figure 1 provides a map of the area studied in Cibinong District, Bogor Regency.



Figure 1. Cibinong District Map of Bogor Regency.

2.1. Census Data Collection Method

For this analysis, we combined primary and secondary data. Primary data were collected directly via a questionnaire to determine how effectively management understood strategic entrepreneurship. This study was carried out between August 2022 and October 2022 in Cibinong District, Bogor Regency with a census of 30 respondents of commercial businesswomen fish processing units. Secondary data on strategic entrepreneurship were gathered from a variety of relevant literary works, including journals, books, earlier study findings, and statistical data reports (Hair et al. 2017).

The goal of the questionnaire was to assess the six aspects of strategic entrepreneurship (environmental factors, organizational resources, individual resources, resource orchestration, creating value and advantage, and creating performance). The environmental factors were measured using items developed by Revilla et al. (2011) and Tang (2008), while the organizational resource items proposed by Hitt et al. (2011) were used. Resource orchestration was measured by adapting items from Carnes et al. (2017), creating value and advantage by adapting items from Porter (2007), and creating performance by adapting the items from Shepherd and Wiklund (2009). All items were evaluated using a Likert scale of one to five, with five expressing strong agreement. The Likert scale is used to convey how strongly respondents agree or disagree with specific statements about actions, things,

people, or events. The suggested scale typically consists of five points. A Likert scale was chosen with five class scores as the measurement. There are a total of five groups, made up of the average value of each informant. The following formula can be utilized to determine class intervals:

$$SR = (a - b)/c$$

Explanation:k

SR = Range.

a = Maximum scores.

b = Minimum scores.

c = Number of class intervals.

$$\begin{aligned} SR &= (5 - 1)/5 \\ &= 0.8 \end{aligned}$$

These calculations enable us to establish that the calculated scale range is 0.8. According to the statement on the research questionnaire, the average range of 1.00–1.80 falls into the Poor category, >1.80–2.60 falls into the Fair category, >2.60–3.40 falls into the Good category, >3.40–4.20 falls into the Very Good category, and >4.20–5.00 falls into the Excellent category. The items used to measure each variable are listed in Table A1 in Appendix A.

The selection of micro and small-scale criteria refers to article 35 of Government Regulation number 7 of 2021 (Government of Indonesia 2021). This law states that micro standards have an annual revenue of fewer than 2 billion rupiahs and business capital of no more than 1 billion rupiahs, excluding land and structures. In addition, small-scale businesses are considered to be businesses that do not include land and buildings, with yearly sales of between 2 billion and 15 billion rupiahs and business capital of between 1 billion and 5 billion rupiahs.

2.2. Data Analysis

The data processing and analysis for this study employed partial least square structural equation modeling, validity testing, reliability tests, descriptive analyses, and Simulation of Partial Least Square Structural Equitation (PLS-SEM). In this study, Smart PLS 3.0 was used. Descriptive analysis was performed to obtain a wide description of the characteristics of respondents, including gender, age, education, and MSME profile, as well as to describe strategic entrepreneurship implementation using the mean. For the measurement, a 5-point Likert scale was used to determine the scale range. A Likert scale is used to assess responders' attitudes, views, and perceptions of social issues (Sugiyono 2017).

The measurement model (outer model) and the structural model (inner model) are the two sub-models that make up PLS-SEM analysis (Hair et al. 2014). The constructs' convergent validity, discriminant validity, and reliability are assessed using the outer model (Hair et al. 2017). In addition, the inner model is used to assess the relevance of the path coefficients and the R-square value. Two categories of variable are used in PLS-SEM. The first is an observed variable, sometimes known as a manifest variable because it can be seen immediately. The second category is unobserved variables, sometimes known as latent variables since they cannot be observed directly (Hair et al. 2014). Together with the seven latent variables, there are 36 manifest variables (environmental influences, organizational resources, individual resources, resource orchestration, competitive advantage and value creation, and performance creation).

This research mainly employed the strategic entrepreneurship model based on Hitt et al. (2011) combined with Kiyabo and Isaga (2019) model. This study adopted Hitt et al. (2011) input-process-output model, extending the understanding of the strategic entrepreneurship construct. This used environmental factors, organizational resources, and individual resources as inputs, along with resource orchestration as the process, and creating value for customer advantages as the outputs. Another output was added: SME performance, from Kiyabo and Isaga (2019) model. Hence, from these models, this study generates the

input, process, and output of the strategic entrepreneurship model with inputs such as environmental factors (X1), organizational resources (X2), and personal resources (X3). The process segment has a variable latent resource orchestration (X4). Thus, the output section contains two variables: producing value and competitive advantage (X5), and creating performance (Y). Figure 2 displays the research model.

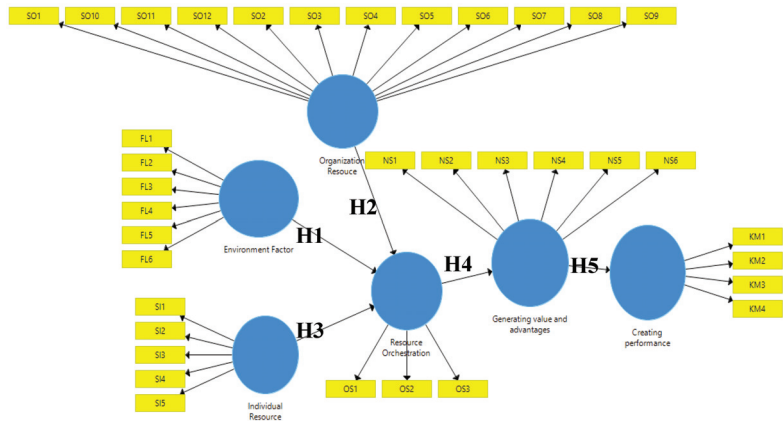


Figure 2. The Research Model.

The research hypotheses, as shown by the research model in Figure 2, are as follows:

H1: Environmental factors (FL) have a positive effect on resource orchestration (OS).

H2: Organizational resources (SOs) have a positive effect on resource orchestration (OS).

H3: Individual resources (SI) have a positive effect on resource orchestration (OS).

H4: Resource orchestration (OS) has a positive effect on creating value and competitive advantage (NS).

H5: Creating value and competitive advantage (NS) has a positive effect on performance creation (KM).

The outer model evaluation and the inner model evaluation are the two evaluation models utilized in PLS-SEM data analysis (Cheung 2013). Outer models are used to examine the effects of latent variable indicators. Multicollinearity was employed in this work to clarify the data without any discernible bias prior to analysis. The absence of a multicollinearity issue is a prerequisite for properly examining the outer model. A situation with substantial correlation or connectedness between indicators is called multicollinearity. A variance inflating factor (VIF) value of more than five indicates a multicollinearity correlation value, which is defined by a correlation value of more than nine. Multicollinearity is present if the latent variable VIF value is more than five. The actions that can be taken include lowering or eliminating indications with a high degree of association (Hair et al. 2017).

The evaluation of the outer model consists of three tests. A convergent validity test can be used to assess how well manifest variables can explain hidden variables by looking at loading factors above 0.50. When the average variance extracted (AVE) result is more than 0.50, the discriminant validity test is used to assess how many latent variables and manifest variables differ from one another. A previous study explained the connection between Cronbach's alpha above 0.60 and composite reliability used to test composite reliability (Hair et al. 2017). The inner model is utilized to determine the effect of the independent variable on the dependent variable by comparing the coefficient of determination (R square) and the path coefficient (Ghozali 2015).

3. Results and Discussion

3.1. Common Method Bias

A problem known as common method bias (CMB) occurs when the measuring technique utilized in an SEM study causes issues, rather than the network of causes and effects among latent variables in the model under investigation (Kock 2015). In this study, Smart PLS was used to identify CMB threats. The test signified that the VIF elements were lower than the 3.3 threshold. This indicates that the model is free from CMB (Hair et al. 2017; Kock 2015).

3.2. Model Measurement

The fit of the measurements was examined using validity and reliability standards. The ability of a measuring device (or objects) to consistently produce the same result is known as reliability. Validity is a measure of how accurately a notion is measured by a measuring tool (items). Since there are multicollinearity conditions, the actions that can be taken include lowering or eliminating indications with a high degree of association. The outcomes of VIF measurements at the manifest variable level for all latent variables in Table 1 are listed below, while a summary of the model’s measurements after the multicollinearity test is shown in Table 2.

Table 1. Variable Manifest (VM) VIF Measurement Results.

Items	KM	NS	FL	SI	SO	OS
KM						
NS	1.000					
FL						1.857
SI						3.092
SO						3.225
OS		1.000				

Source: Compiled by the author.

Table 2. Summary of model measurements after multicollinearity test.

Item	Indicator	Measurement Result				Supported		
Outer Loading	>0.7	FL2	0.977	SI3	0.940	KM2	0.831	Yes
		FL6	0.967	OS1	0.900	KM3	0.871	
		SO4	0.747	OS2	0.819	KM4	0.816	
		SO5	0.829	OS3	0.872			
		SO9	0.754	NS2	0.829			
		SO10	0.890	NS4	0.904			
		SO12	0.869	NS6	0.834			
		SI2	0.806	KM1	0.745			
Average Variance Extracted (AVE)	>0.5	FL		0.944	OS	0.747	Yes	
		SO		0.672	NS	0.734		
		SI		0.767	KM	0.668		
Composite Reliability	>0.6	FL		0.971	OS	0.899	Yes	
		SO		0.911	NS	0.892		
		SI		0.867	KM	0.889		
Cronbach Alpha	>0.6	FL		0.941	OS	0.830	Yes	
		SO		0.877	NS	0.823		
		SI		0.714	KM	0.841		

Source: Compiled by the author.

The statements in the questionnaire were valid at a significance level of 5%, where r counts surpassed r tables based on the validity and reliability results of the 30 samples (0.361). In this study, each variable’s Cronbach’s alpha value was greater than 0.06, which indicates the dependability of the variables.

The Fornell–Larcker criterion, a gauge of the anticipated degree of “difference” between items for various factors, was used to test discriminant validity. The correlation square was compared to the AVE of each factor to assess the discriminant validity of the model. The other numbers are the correlation coefficients between the factors, which are thought to have excellent discriminant validity when the AVE is greater than the correlation coefficient between the factor and the other factors. The value on the diagonal represents the square root of the AVE (Hair et al. 2017). Values off the diagonal are correlations, whereas values (on the diagonal) represent the square root of the AVE. The discriminant validity results are shown in Table 3.

Table 3. Discriminant validity matrix.

Items	KM	NS	FL	SI	SO	OS
KM	0.817					
NS	0.651	0.857				
FL	0.372	0.809	0.972			
SI	0.583	0.773	0.636	0.876		
SO	0.491	0.752	0.655	0.811	0.820	
OS	0.512	0.813	0.680	0.820	0.724	0.864

Source: Compiled by the author.

3.3. Respondent Characteristics

One of the respondents in this study was the owner of a fish processing company; thus, the sample consisted of one small business and 29 microbusinesses. Both characteristics are mentioned in Table 2. In addition, 50% of respondents in small businesses were between the ages of 41 and 50. This age group was regarded as still being capable and ready for the workplace. Most of them possessed either a bachelor’s degree (37%) or senior high school degree (37%) as their last degree. Moreover, 87% of business units have been in operation for five to ten years. The respondent who owned the small business was 61 years old and had completed senior high school. In addition, the business had been in operation for more than 20 years. The respondent characteristics are shown in Table 4.

Table 4. Respondent Characteristics.

Category	Subcategory	Unit	%
Age (years old)	21–30	4	13%
	31–40	5	17%
	41–50	15	50%
	>51	6	20%
Last Education	High School/Equal	11	37%
	Diploma	8	27%
	Bachelor	11	37%
Ownership status	Own	30	100%
Business Establishment Background	Own initiative	29	97%
	Match to educational background	1	3%
Age of organization (years)	<1		0%
	>1–5	3	10%
	>5–10	26	87%
	>10–20	1	3%
Working capital	Own capital	30	100%
Amount of Assets (Million Rupiahs)	>50–500	27	90%
	>500	2	6.67%
	>1000	1	3.33%
Revenue (Million Rupiah/month)	25–75	29	97%
	75–100		0%
	>100	1	3%
Amount of manpower (person)	>3–10	29	97%
	>10	1	3%

Source: Compiled by the author.

3.4. Descriptive Analysis of Strategic Entrepreneurship

Descriptive analysis was used to examine how entrepreneurs regarded the implementation of strategic entrepreneurship management in Bogor Regency's women-owned fish processing unit MSMEs based on three input variables: environmental factors, organizational resources, and personal resources. The process variables, namely resource orchestration and output variables, were composed of competitive advantage, value creation, performance generation, and benefits.

Three criteria—dynamics, munificence, and complexity—were used to assess environmental elements as external determinants. A good grade of 4.467 was used to estimate the variable's average value. This outcome demonstrated the superior environmental support provided by the MSME Business System for fish processing units in Bogor Regency. The least favorable average, which was nonetheless seen favorably, indicated capital support from banks and investors. Several business owners chose to borrow money privately instead of applying for bank loans because banks require guarantees, or have challenging application processes and onerous rules. Table 5 displays the descriptive analysis findings.

Table 5. Descriptive Analysis of Strategic Entrepreneurship.

Latent Variable	Manifest Variable	Code	Mean Value	Category
Environment Factor	Consumer demand	FL1	4.633	Excellent
	Business environment	FL2	4.467	Excellent
	Capital access	FL3	4.233	Excellent
	Fulfillment resource	FL4	4.567	Excellent
	Production complexity	FL5	4.467	Excellent
	Marketing complexity	FL6	4.433	Excellent
Organizational resource	New ideas and creativity	SO1	4.233	Excellent
	Risk taking	SO2	4.267	Excellent
	Failure is tolerated	SO3	4.400	Excellent
	Learning is promoted	SO4	4.433	Excellent
	Supporting innovation	SO5	4.300	Excellent
	Continuous change	SO6	4.600	Excellent
	Commitment to improvement	SO7	4.633	Excellent
	Protect innovation threatening	SO8	4.367	Excellent
	Delivering opportunities	SO9	4.200	Very Good
	Reasonable entrepreneurship	SO10	4.333	Excellent
	Revisit entrepreneurship principle	SO11	4.467	Excellent
	Link strategic management and entrepreneurship	SO12	4.533	Excellent
Individual Resource	Introducing opportunity	SI1	4.533	Excellent
	Entrepreneurial agility	SI2	4.333	Excellent
	Real logical thinking	SI3	4.600	Excellent
	Framework of entrepreneurship	SI4	4.467	Excellent
	Opportunity collection	SI5	4.500	Excellent
Resource Orchestration	Structuring resource portfolio	OS1	4.567	Excellent
	Bundling resource	OS2	4.433	Excellent
	Leverage capability	OS3	4.467	Excellent
Creating value and competitive advantage	Customer relationship	NS1	4.567	Excellent
	Different in service	NS2	4.467	Excellent
	Business cost	NS3	4.500	Excellent
	Differentiation	NS4	4.567	Excellent
	Focus	NS5	4.700	Excellent
Creating performance	Able to tax payment	KM1	4.367	Excellent
	Improvement in asset	KM2	4.633	Excellent
	Creating new jobs	KM3	4.533	Excellent
	Improvement in selling	KM4	4.767	Excellent

Source: Compiled by the author.

A mean value of 4.397 for the organizational resource variable suggests that entrepreneurial leadership and entrepreneurial culture fall into the excellent category. Entrepreneurial leadership is the capacity to persuade others to pursue their objectives, search for possibilities, manage resources strategically, and foster an entrepreneurial environment that will help them stay competitive (Fontana and Musa 2017). Entrepreneurial culture is the term used to describe a company’s culture that values not only seeking opportunities but also making money (Utoyo et al. 2020). On the other hand, the indicator of business owners providing opportunities had the lowest average value, indicating that MSMEs were still unable to adequately inform their employees.

The individual resource variable, which had an average of 4.487 responses, can demonstrate an entrepreneur’s entrepreneurial attitude toward the opportunities directed to business development with the commitment, decisions, and actions to pursue the opportunities in dynamic environmental conditions (Gillin et al. 2019). This result gave the rating ‘excellent’. On the other hand, the average for the entrepreneurial agility score was the lowest. It might be said that Cibinong District’s fishery product processors continually adjust to market conditions in an effort to maintain the continuity of their businesses.

The capability to manage resources (structure), resources that turn into capabilities (bundling), and capabilities to provide value for customers were all included in the resource orchestration variable, which similarly had a mean value of 4.489 (leveraging). This placed it in the excellent category. Strategic entrepreneurship management demonstrated a great ability to give MSMEs a competitive edge, create value, and deliver performance and benefits for businesses, people, and society.

3.5. Analysis Results

With a loading factor value of 0.50 and no multicollinearity issues, 17 of the 36 indicators under examination pass the convergent validity test, according to the assessment outer model (Table 1). The study model was cleared of the indicators FL1, FL3, FL4, FL5, SO1, SO2, SO3, SO6, SO7, SO8, SO11, SO12, SI1, SI4, NS1, NS3, and NS5. In the discriminant validity test, every latent variable had an AVE value greater than 0.50. Figure 3 depicts the final model.

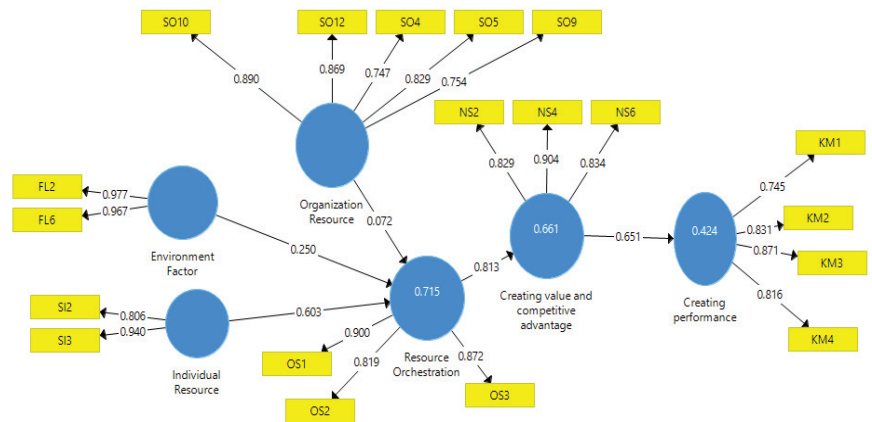


Figure 3. Final Model.

All the latent variables in the composite reliability test were known to have alpha Cronbach values of 0.60, and those variables matched the requirements for the composite reliability test. This follows the concept that the study model can be accepted as valid and credible by eliminating the eleven variables. The inner model was assessed by analyzing the R-square and path coefficient values. In addition, this model used the R-square value to determine how much an exogenous variable would influence an endogenous variable.

The test results showed that 71.5% of the variability in resource orchestration can be accounted for by the input segment's R-square value, including the variables for environmental conditions, organizational resources, and individual resources (Table 6). Sixty-six percent of the elements influencing value and competitive advantage in the process segment can be attributed to the resource orchestration variable. In the output sector, 42.4% of the creating performance variable may be attributed to both competitive advantage and creating value.

Table 6. Result of R-Square.

Variable	R-Square
Resource orchestration	0.715
Creating value and competitive advantage	0.661
Creating performance	0.424

Source: Compiled by the author.

The original sample value, p value, and t-statistic values were generated by the significance test of the route coefficient using the bootstrapping technique to examine the research model and research hypothesis. The initial sample values made it clear how the variables related to others. When the variable had a positive influence, it went from being negative to positive, and vice versa. The t-statistic value could be used to calculate the significance of a hypothesis test. The hypothesis was supported because the p value was less than 0.05. The route coefficient value, which shows the relationship between all variables, is shown in Table 7.

Table 7. Path Coefficients.

Path	Original Sample	T-Statistic	p -Value	Hypotheses
FL → OS	0.250	1.889	0.030	H1 Accepted
SO → OS	0.072	0.376	0.354	H2 Not Accepted
SI → OS	0.603	3.411	0.000	H3 Accepted
OS → NS	0.813	10.586	0.000	H4 Accepted
NS → KM	0.651	7.610	0.000	H5 Accepted

Source: Compiled by the author.

According to the test results, environmental factors have a considerable impact on orchestration resources since the p value is lower than 0.005, which is 0.030; therefore, hypothesis 1 is accepted. Organizational resources have no discernible impact on orchestration resources because the p value of 0.354, which is higher than 0.005, indicates that H2 cannot be accepted. Hence, individual resources have a favorable and considerable impact on orchestration resources. Moreover, the p value of H3 being lower than 0.005, which is 0.000, indicates that H3 is accepted.

Thus, it can be concluded that resource orchestration significantly affects value creation and competitive advantage. The p value of H4 is also less than 0.005, proving that H4 is accepted. The p value of H5 being substantially lower than 0.005 shows that H5 is accepted. Thus, providing value and gaining a competitive edge have a favorable impact on production performance.

The test results of this research are similar to those of previous empirical studies, and show that environmental conditions significantly affect resource orchestration in the input segment. The entrepreneur's local, physical, psychological, and social environments make up their environment (Grundstén 2004). Environmental circumstances might affect an entrepreneur's ability to compete and build company procedures in one of two ways: either as strength or weakness. It is necessary for entrepreneurs in the fish processing business sector to make efforts to recognize changes in the business environment if they are to maximize their ability to turn environmental influences into strengths.

Additionally, it is vital to comprehend the degree of complexity of marketing, service, and operational processes as well as the resources available to satisfy the needs of resources utilized

in fish processing business processes (Revilla et al. 2011). Based on the findings of the descriptive study, it is still difficult for women-owned fish processing firms in Cibinong District, Bogor Regency to discover specific information about how to obtain finance from banks or investors.

There are two key components in organizational resources: entrepreneurial attitude, and entrepreneurial culture (Ireland et al. 2003). The business owner or leader plays a particularly substantial part in preparing management and staff to implement a culture that fosters the growth of both employees' abilities and the application of ideas and innovations in retail (Utoyo et al. 2020). On the other hand, an entrepreneur can develop fresh resources that produce wealth, or endow existing resources to do so.

Employees will be motivated to adopt an entrepreneurial mindset, which is essential to the success of the company, not simply as a result of an entrepreneurial environment's ability to inspire innovation (Cho and Lee 2018). This will have an impact on how effectively and efficiently the fish processing unit's resources are managed. The results of the descriptive study, however, indicate that women-owned fish processing businesses in Cibinong District, Bogor Regency are still not doing the best job of giving their employees the opportunity to take chances with their responsibilities and authority at work.

The impact of the individual resource variable on resource orchestration was shown to be both favorable and significant. This demonstrates that women-owned fish processing businesses in Cibinong District, Bogor Regency, tend to be less than ideal at managing information about market development to find new opportunities and less than ideal at evaluating the benefits and drawbacks of proposed product innovations. According to the researchers, this is due to management being dominated by people between the ages of 41 and 50 who are high school graduates and whose experience and skills are insufficient, particularly in retail management connected to decision-making and strategic management.

According to the findings of the descriptive study, the women's business processing unit in Cibinong District, Bogor Regency, is still not doing the best job of managing information opportunities in the region's fish processing industry. Women-run fish processing businesses must focus on the cooperative operation of organizational and personal factors and the combination of individual and organizational elements.

Value creation and competitive advantage are significantly impacted by the resource orchestration variable. To determine the strategy used in the application of producing value and competitive advantage in retail, it is crucial to identify, create portfolios, group, improve, and enhance the competence of resources owned by retailers. Additionally, a combination of input groups will offer shops various tactics they can use. Based on the findings of the descriptive analysis, it can be concluded that the women-owned fish processing businesses in Bogor Regency have not given their resources the necessary attention. Therefore, it is essential to provide programs that assist staff in developing their knowledge and skills.

Performance creation is positively impacted by the variables providing value and competitive advantage. This demonstrates how efforts to improve product competitiveness and consumer value have a significant impact on performance creation. This is in line with the strategic entrepreneurship paradigm (Hitt et al. 2011). Effective strategic entrepreneurship would aid businesses in gaining an edge over rivals and adapting to environmental changes, which would benefit businesspeople, organizations, and societies overall, and have a considerable positive impact on economic performance (Awang et al. 2015).

3.6. Managerial Implications

The managerial ramifications of this study were used to enhance the strategic entrepreneurship management effectiveness of female MSMEs in fish processing units in Bogor Regency. Based on the lowest average descriptive analysis result, an analysis of the impact of strategic entrepreneurship implementation in input segments could be developed.

The most substantial impact on resource orchestration came from individual resources. For MSMEs, problems in the dynamic environment include fiercer and more widespread competition as well as client demands for the quality of various services and goods. There-

fore, entrepreneurs must develop a vision toward positive transformation and innovation. Thus, they must enhance their organizational capabilities if they want to survive and expand their business.

They should increase their organization's capacity for accepting, authorizing, and embracing constructive change. Therefore, it is important to modify how those involved in the transformation process perceive one another. Organizational reform is necessary for the benefit of both the organization and its personnel (worthiness).

Briefing and sharing sessions with stakeholders and staff could be used to implement this kind of change. By creating a good work environment that can foster employees' creativity and independence in submitting innovative ideas, they could establish an innovative culture to produce innovations in new goods and processes.

Entrepreneurs must enhance organizational capacities so that organizations may better utilize their assets, personnel, and operational procedures. To explore the competencies required and the resources that should be gathered or maintained, they must have a systematic framework. Human resources (HR) are crucial to the success of managing strategic entrepreneurship by enhancing organizational capabilities. To encourage business actors to be more competitive, they must upgrade their skills, particularly in HR management, by integrating HR into training programs, exhibition events, entrepreneurship seminars, and technical guidance (Dewi 2020).

4. Discussion

H2 was taken into consideration, and it was found that the $p > 0.05$ did not reach the level of significance. This finding led to the rejection of the premise that organizational resources significantly affect resource orchestration for women-owned fish processing businesses in Cibinong District, Bogor Regency. This suggests that strategic entrepreneurship management significantly affects MSMEs' capacity for innovation.

The research verified a significant relationship between resource orchestration, value creation, and competitive advantage for MSME performance. According to the research, businesses would have a better chance of enhancing the quality of their products if resource orchestration management effectively positioned its resource portfolio, improved human resources, and integrated the use of opportunity- and advantage-seeking behavior. This result is consistent with Porter Diamond's national advantage argument. The findings are in line with the theory advanced by Hitt et al. (2001), Hughes et al. (2021), Okoi et al. (2022) and Utoyo et al. (2020) that organizational performance has an impact on both direct and indirect resource management.

The total cost of investing in human capital is greater than the value of the results generated, or the cost of investing in human capital is greater than the results produced. The resource-based perspective also assumes that when MSME resources are objectively maximized, shareholder value will also be maximized. The findings support Okoi et al.'s (2022) claim that by nurturing a certain culture, knowledge, and abilities within an MSME, human capital management strategies inside the organization will play a crucial role in the maintenance of competitive advantage over competitors.

Additionally, the Porter Diamond Model of National Advantage is connected to the result. This result disproves the notion that innovative entrepreneurship has no measurable effect on MSME performance. This implies that entrepreneurship innovation has a major impact on the performance of MSMEs. The study provided evidence that there is a significant connection between entrepreneurial value and competitive advantage and MSME performance (Latianingsih et al. 2022; Okoi et al. 2022).

According to the findings, if new ideas are fostered and a paradigm shift is noticed, the organization's sales volume and profits will experience a boost, elevating the performance of the MSME. The results are consistent with the theory that entrepreneurial innovation is the readiness to encourage imagination and experimentation within the firm, as well as the utilization of technological leadership and R&D. Customers become aware of the worth of the goods or services given because of the innovation (Lumpkin and Dess 2001).

The performance of Cibinong's women-owned fish processing MSMEs during the pandemic period and the entrepreneurial component of strategic entrepreneurship are positively associated. During such periods, entrepreneurs face considerable risks that affect their financial situation and, ultimately, their capacity to survive (Kunc and Bandahari 2011; Pal et al. 2014). However, significant economic shocks can encourage the adoption of new business models and technologies (Brodherson et al. 2017) and present new opportunities (Beliaeva et al. 2020; Hausman and Johnston 2014; Pearce and Michael 2006). Therefore, new products, services, and business models are tested by women owners of fish processing MSMEs in Cibinong, which tend to be less affected by economic downturns.

According to studies using data from developed and emerging economies, rising economic pressure frequently encourages businesses to adopt innovative choices that have a favorable impact on their financial performance (Beliaeva et al. 2020; Hausman and Johnston 2014). Innovative companies also improve their market share and dominance (Pearce and Michael 2006; Guellec and Wunsch-Vincent 2009). Therefore, business decisions are crucial in times of crisis and become important success elements for MSMEs (Sahut and Peris-Ortiz 2014). In contrast, neither the performance of businesses nor the strategic element of SE, nor the industry-specific actions taken by Cibinong's MSME businesswomen during the COVID-19 epidemic, were found to be statistically associated.

The proposed strategic concept of entrepreneurship within the context of strategic management theory, with a focus on individual strategic entrepreneurship components (environmental factors, individual resources, resource orchestration, and competitive advantage) as well as the analysis of small and medium enterprises' activities in the context of economic crises, constitutes the study's theoretical originality. This study specifically sought to show that there is a noticeable difference in the link between strategic entrepreneurship and MSME performance during tumultuous times and stable economic conditions. By examining MSME strategic behavior in a sustainable context, for instance, it is possible to draw the conclusion that business owners should combine a number of different strategic stances to obtain the best results (Atuahene-Gima and Ko 2001; Bayiley and Behaylu 2022; Deutscher et al. 2016; Ho et al. 2016).

Given the period of time it was conducted and the characteristics of the sample, this study also presents a distinctive contribution regarding MSMEs in Cibinong District, Bogor Regency during the COVID-19 pandemic of 2019–2021. Due to management's cognitive biases in their view of companies' historical conduct, research on post-crisis business strategies runs the risk of being prejudiced and unreliable (Bao et al. 2011). The results are also applicable to all businesses that fit the selection criteria because the sample of domestic companies was representative.

The identified methods of managing MSMEs that ensure a firm performs at its best during the COVID-19 pandemic are of practical value to top managers, MSME decision-makers, and those in charge of creating and implementing strategies. It is crucial for MSME managers to understand that combining SE components—which improves performance in stable circumstances—can have detrimental effects during economic crises. In the latter scenario, they should concentrate on encouraging entrepreneurial behavior, which typically entails creativity, a readiness to take calculated risks when creating new goods and services, and the proactive pursuit of and use of new business prospects (Cho and Lee 2018; Soininen et al. 2012).

5. Conclusions and Implications

5.1. Conclusions

In this study, the performance of MSMEs in Cibinong District, Bogor Regency, was compared to the impact of strategic entrepreneurship strategies. Environmental factors, individual resources, resource orchestration, and competitive advantage were the four strategic entrepreneurship practices that could enhance the performance of small and medium-sized enterprises selected for study.

The results from the analyses showed that the input characteristics of environmental variables, organizational resources, and personal resources are in the ‘excellent’ category. This demonstrates that the implementation of strategic entrepreneurship in women-owned fish processing MSMEs in Bogor Regency has been proceeding well. The orchestration resource displayed an average ranking in the excellent category in the process dimension. In terms of output, the competitive edge, value creation, performance creation, and other benefits all had averages that fell into the excellent category. As a result, strategic entrepreneurship management in food-related MSMEs in Bogor Regency was already performing quite well.

The interaction of the strategic entrepreneurship variables demonstrated that the environment and individual resources had a favorable and significant impact on resource orchestration. Resource management had an impact on the development of competitive advantage. The production of performance and benefits for people, organizations, and society were also impacted by competitive advantage.

Based on the study’s findings, it is determined that MSME management should strategically structure its resource portfolio, invest in human capital, and integrate by projecting both opportunity- and advantage-seeking behaviors to update its quality goods. Managers of MSMEs should be aware that entrepreneurial innovation and strategic resource management play a significant role in determining MSME performance since they foster creativity, introduce cutting-edge technology, and promote R&D activities that increase an organization’s profitability.

5.2. Limitations and Future Research

Certain limitations should be considered when evaluating these findings. The first point is that the cross-sectional data used reflect recent business performance. The long-term effect of strategic entrepreneurship on the fish processing performance of women-owned MSMEs may be a topic for future studies. Second, the primary dependent variable in the study was managers’ individual perceptions of the activities of the organizations, which was a subjective indication of such activities. Despite the approach’s dependability, more research is needed to clarify the outcomes.

Third, we solely considered the direct impacts of strategic entrepreneurship components or their mixtures. The authors of future studies could decide to concentrate on other factors that moderate the relationship between strategic entrepreneurship and corporate performance. It may also be necessary to conduct replication studies employing a variety of samples, such as those made up of huge businesses and state-owned corporations.

5.3. Policy Implications

Fish processing in Bogor Regency is one of the most important contributors to the region’s economic growth; thus, it is necessary for the government to maintain and generate the development of this business. Since environmental factors, individual resources, resource orchestration, and creating value and competitive advantages are essential factors in increasing the performance of micro, small, and medium fish processing enterprises in the Bogor Regency, the government should consider several policy recommendations related to these factors.

The first policy recommendation is to provide training for businesswomen to enhance product quality and produce differentiated products, including branding and packaging. The second policy is to promote the entrepreneurial mindset of businesswomen by providing capacity building and training. The third policy is to improve market access for their processed fish products by promoting these products at exhibitions and on government websites or social media. The last policy is to provide easy access to credit for businesswomen by providing credit terms and publishing credit recommendations. In addition, the local government should collaborate with banks, especially local banks, to provide low-interest credit.

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Appendix A

Table A1. Survey (The original survey used with the participants was translated into this version).

Latent Variable	Manifest Variable	Code	Value				
			1	2	3	4	5
Environmental Factors	Consumer demand continues to increase	FL1					
	Can adapt to business environment	FL2					
	Can get capital access	FL3					
	Can fulfill resource	FL4					
	Production complexity	FL5					
	Marketing complexity	FL6					
Organizational Resources	Having new ideas and creativity with employees	SO1					
	Give employees a chance to take risks	SO2					
	Employee failure is tolerated	SO3					
	Having programs for employees to learn	SO4					
	Supporting innovation	SO5					
	Continuous change	SO6					
	Commitment to improvement	SO7					
	Protect innovation threats	SO8					
	Delivering opportunities	SO9					
	Reasonable entrepreneurship	SO10					
	Revisit entrepreneurship principles	SO11					
	Link strategic management and entrepreneurship	SO12					
Individual Resources	Introducing opportunity	SI1					
	Entrepreneurial agility	SI2					
	Real logical thinking	SI3					
	Framework of entrepreneurship	SI4					
	Opportunity collection	SI5					
Resource Orchestration	Structuring resource portfolio	OS1					
	Bundling resource	OS2					
	Leverage capability	OS3					
Creating value and competitive advantage	Customer relationship	NS1					
	Different in service	NS2					
	Business cost	NS3					
	Differentiation	NS4					
	Focus	NS5					
Creating performance	Able to tax payment	KM1					
	Improvement in assets	KM2					
	Creating new jobs	KM3					
	Improvement in selling	KM4					

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Article

Structural Equation Model (SEM) of Social Capital with Landowner Intention

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Abstract: The continuous loss of farmland in Indonesia is a major problem in the food production industry. The Gempol-Pandaan road, which is a section of the Trans Java toll road and connects the major cities of Surabaya and Malang, gives the Pandaan District of Indonesia its strategic location. Sustainable Food Agriculture Land (SFAL) in the Pandaan District is one strategy for expanding wetland farming. Therefore, this research aims to analyze the connection between social capital and landowners’ intention to alter SFAL in Pandaan District, Pasuruan Regency, hoping to resolve existing land-use conflicts. The purpose of this study was to use partial least square structural equation modeling (PLS-SEM) to the question of how landowners’ social capital is related to their intention to change land use. The PLS-SEM analysis shows that there are less opportunities for SFAL landowners to shift land use when social capital is high. Conversely, greater intentions among SFAL landowners to convert agricultural land to nonagricultural uses are associated with weaker or lower relationships among social capital characteristics.

Keywords: social capital; SEM analysis; SFAL; intention; land-use change

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1. Introduction

Rice is the main staple food for half of the world’s population, especially for people in Asia. It is cultivated in 113 countries, with China and India leading in the production of half of the world’s rice supply, followed by Indonesia, Bangladesh, Vietnam, Thailand, and Myanmar (FAO 2017). Approximately 80% of rice production involves small-scale farmers, making its social economic discourse very contentious. According to OECD/FAO (2018), Indonesia’s annual rice consumption per capita in 2017 reached 135 kg, higher than that of the Philippines (115 kg), Thailand (99 kg), and Malaysia (81 kg). Therefore, rice has always been among the top priorities for Indonesian government policies, especially those on trade and agriculture. The agricultural sector has presented a significant impact on the overall development of Indonesia in terms of increasing people’s income, foreign exchange earnings, and controlling inflation. Indonesia is the biggest agricultural country, and biodiversity land in Indonesia is the second largest after Brazil. The agricultural sector is important because most of the poor live in rural areas, with the main income coming from the agricultural sector (Boni 2022). The agricultural sector’s GDP has followed an upward trend from 2015 to 2019. Agriculture accounts for 13.5% of the country’s GDP. GDP growth is predicted to remain strong in the agricultural sector, even compared with other sectors whose numbers have been substantially reduced. The annual GDP growth rate of the agricultural sector is 1.75 percent (Central Bureau of Statistics 2020). Meanwhile, according

to The Central Statistics Agency (BPS), Indonesia's agricultural land has decreased by 0.019% from the total area of the previous year, so that agricultural land in Indonesia in 2022 was 10.41 million hectares. This is due to population growth, migration, suburban urbanization, and fluctuating land requirements (Surya et al. 2020). As a result, the demand for conversion of agricultural land to other uses will continue to rise, resulting in changes in land use (Prayitno et al. 2020), particularly the conversion of agricultural land to built-up land in Pandaan District (Prayitno et al. 2019b). Land conversion is defined as the conversion of agricultural land to nonagricultural land (Prayitno et al. 2018). The conversion of agricultural land functions can occur due to several factors, such as social, economic, and policy factors (Prayitno et al. 2021a).

Land is important in various sectors; the demand for land will rise, resulting in land conversion (Rondhi et al. 2018). This land-use change occurs for certain reasons, namely the need for development to meet the increasing needs of the population, simultaneously followed by the demands of societal needs, which continue to rise with the passage of time (Prayitno et al. 2021a, 2021b; Wang et al. 2018). If not addressed immediately, the uncontrolled conversion of agricultural land can cause serious problems (Rosyidie 2013) (Hidayat et al. 2021). In addition, the conversion of agricultural land towards economic growth, which is quite intensive, can also cause a decrease in environmental quality. Land-use change raises various economic, social, and environmental problems. Uncontrolled land conversion causes problems such as environmental degradation, traffic congestion, poverty, crime, and other social conflicts (Surya et al. 2020). To address this problem, policies that regulate land conversion are being implemented in response to the problem of converting agricultural land to other uses. One of them is the government regulation (PP) No. 1 of 2011 on the Determination and Transfer of Functions of Sustainable Food Agricultural Land (Lahan Pertanian Pangan Berkelanjutan/LP2B/SFAL), which states that SFAL is protected and cannot be converted. SFAL is irrigated land devoted to rice production that is determined to be protected and developed consistently in order to produce staple food for self-reliance, security, and national food sovereignty. There is also Law No. 41 of 2009 concerning the protection of SFAL, which mandates the government and local governments to carry out control through the provision of incentives, disincentives, mechanisms licensing, protection, and counseling. The protection SFAL is carried out by giving sanctions to perpetrators of violations of Section 44 of Law No. 41 of 2009, which prohibits the conversion of land designated as SFAL.

Regulations must protect food agricultural land to ensure SFAL availability and improve farmer welfare. These regulations thus control the conversion of agricultural land functions, ensuring national food self-sufficiency, resilience, and sovereignty. Controlling SFAL can be accomplished through the use of incentives and disincentives. Incentives are rewards for farmers who maintain and do not convert SFAL, according to the government regulation No. 12 of 2012. Meanwhile, disincentives such as revocation of incentives are imposed on farmers who have received incentives but fail to fulfill their obligations. They are carried out when farmers who have received incentives fail to fulfill their obligations by failing to protect their SFAL by violating norms, standards, procedures, and criteria, or if the land has been converted.

Landowners' intentions to change land use are influenced by social, economic, and land regulations factors (Ilham et al. 2005). In terms of social factors can be seen from psychological attitudes, which are divided into three dimensions (cognitive, affective, and behavioral) (Lenzi et al. 2012). The psychological dimension of affective attitude can be distinguished based on place attachment (Prayitno et al. 2019a), and social factors, namely the sense of community, which is related to social capital.

According to (Putnam 1993b), social capital enables the formulation of new strategies in development. Social capital is generally explained as the characteristics of networks, norms, and beliefs in social relations that facilitate the cooperation and coordination of people to achieve desired and mutually beneficial goals. According to several studies, social capital plays a role in a farmer's decision-making process. However, there is no

clear conception of how the components of social capital interact to determine behavior. Understanding community interaction through social capital can explain the factors of social capital that can drive the decision-making process toward certain behaviors. Research (Hunecke et al. 2017) explains the importance of social capital in farmers' decision processes regarding technology adoption. Likewise, Sobels et al. (2001) argued about the role of social capital in trust, norms, reciprocal expectations, and linkages. In that study, social capital is related to factors that contribute to the network of Landcare groups in rural Australia. Prayitno et al. (2022a) also explains that social capital consists of networks, norms, and trust, and that social capital emphasizes social networks bound by feelings of mutual understanding, cooperation, trust, and shared values that can encourage sustainable agriculture. In addition, according to research conducted by (Castillo et al. 2021), social capital is important in understanding farmer behavior toward pressurized irrigation technology. In this study, social capital and its interactions influenced farmers toward the transition from traditional irrigation to pressure irrigation. Based on several studies, the existence of social capital is able to influence the decisions or desires of farmers for the agricultural land they own. Social capital influences decision-making or collective action in a community. Social capital is a network based on trust, reciprocity, and mutual support with shared access and use of resources. Social capital can increase self-awareness and motivate people to act and sympathize with others (Prayitno et al. 2022a; Auer et al. 2020; Auliah et al. 2022; Hwang and Stewart 2017). Therefore, the relationship between social capital and the intention to change land needs to be identified. The components of social capital, which are trust, norms, and networks (derived from community ties), are examples of social capital that improve society's efficiency by facilitating coordination and cooperation for mutual benefit (Putnam 2001).

Trust is defined as one of the components forming social capital. Trust is a hope that grows in society and is born from an honest nature, regular behavior, and cooperation based on shared norms (Fukuyama 1995). Norms are defined as values, expectations, understandings, and goals that are believed to be carried out jointly by the community (Field 2003), and social networks are collaborative networks between communities that facilitate communication and interaction that enable the growth of trust and strengthen cooperation in society (Putnam 1993b). Social capital will build trusting relationships among people, which can influence positive outcomes (Cheevapattananuwong et al. 2020; Nugraha et al. 2021). When the social capital of a community is high, the relationship between the community and its supporting environment will be tighter and support the protection of land use. This is because farmers or landowners are the key decision makers in choosing land use (Rajpar et al. 2019), so community social capital can affect changes in agricultural land (Kizos et al. 2018; Deng et al. 2020). High social capital is required for the development of a society capable of defending and protecting its interests, particularly in land protection (Nugraha et al. 2021).

Pasuruan Regency is one of the East Java regencies undergoing land-use development, supported by its strategic location, adequate road infrastructure, and its role as the main route for East Java's economic center. Additionally, the Gempol–Pandaan toll road connects two major cities, Surabaya and Malang, and will eventually become part of the Trans Java toll road. This has resulted in the conversion of agricultural land, with 213.69 Ha being converted in Pandaan District, which is 4.9% of total land use (Prayitno et al. 2020). This change will also impact landowners' intention to change land functions. Pandaan District is one of the districts in Pasuruan Regency. According to the RTRW of Pasuruan Regency for the 2009–2019 period, one of the cultivation area development strategies is to develop agricultural areas through the determination of Sustainable Food Agriculture Land (Bappeda Kabupaten Pasuruan 2010). Agricultural land designated SFAL must be protected and not converted into urban or rural areas. Furthermore, a policy of controlling space use in incentives and disincentives for SFAL makes it challenging to change land functions. This contradicts the fact that many agricultural lands have been converted into toll roads, which causes a dilemma for landowners to maintain land or convert their agricultural

land. Therefore, this study aims to determine the relationship between social capital and landowners' intention to change the SFAL in Pandaan District, Pasuruan Regency.

2. Materials and Methods

2.1. Data Collection

This study gathers data through questionnaires and interviews with relevant parties. The population of food agricultural landowners in Pandaan District is 5951 farmers. The sample used for the questionnaire is 400 respondents, who are SFAL owners, based on a sample calculation with the Isaac Michael approach with an error rate of 5%. Social capital has 3 variables: "trust", which is measured by 8 indicators; "norms", which is measured by 4 indicators; and "network", which is measured by 11 indicators. Each indicator (mentioned below) is filled with a score from 1 to 5 (Likert scale from Strongly Disagree to Strongly Agree) by the respondents, and the results are calculated using index analysis (Table 1).

Table 1. The indicators of social capital.

Variable	Indicators	Symbol	Source
Trust (X1)	Over the past 5 years, the level of trust in the village has been getting better	X1.1	(Farisa et al. 2019; Irawati et al. 2021; Nugraha et al. 2022; Prayitno et al. 2022b)
	Many people in my village help each other	X1.2	
	If a community project is not profitable for me but has benefits for many other people in the village, I will donate time or money to the project	X1.3	
	Trust in local community leaders	X1.4	
	Trust in local religious leaders	X1.5	
	Trust in the village apparatus or government	X1.6	
	Trust in fellow villagers	X1.7	
	Trust in the community in lending and borrowing goods (Ex. agricultural equipment)	X1.8	
Social Network (X2)	I like to work individually with fellow villagers	X2.1	(Prayitno et al. 2022b)
	I enjoy working in groups with the village community	X2.2	
	I have many close friends who are comfortable, can talk about personal matters, and ask for help in this village	X2.3	
	If I suddenly had to be out of town for a day or two, I would rely on the neighbors to look after what I had. (Example: house, land, children, etc.)	X2.4	
	If I need some money for capital and farming costs, many people in the village (especially in the farmer group) are willing to help finance me	X2.5	
	If I suddenly face a long-term emergency such as crop failure, many villagers (especially people in farmer groups) are willing to help me	X2.6	
	I am very active in participating in farmer groups	X2.7	
	People in farmer groups help each other in marketing agricultural products	X2.8	
	People in farmer groups help each other in farming tools and agricultural infrastructure	X2.9	
	People in farmer groups help each other in terms of agricultural needs (fertilizers, pesticides, etc.)	X2.10	
	The people in the farmer group and I have a good relationship	X2.11	
Norms (X3)	I obey the written rules in the community	X3.1	(Farisa et al. 2019; Irawati et al. 2021; Nugraha et al. 2022; Prayitno et al. 2022b)
	I get a written sanction if I violate written rules in the community	X3.2	
	I obey the unwritten rules in the community	X3.3	
	I get unwritten sanctions if I violate written rules in the community	X3.4	

A score of 1 is given if the respondent feels they strongly disagree with the statement in the questionnaire. A score of 2 is given if the respondent does not agree with the statement in the questionnaire. A score of 3 is given if the respondent feels they quite agree with the statement in the questionnaire. A score of 4 is given if the respondent agrees with the statement in the questionnaire. A score of 5 is given if the respondent feels they strongly agree with the statement in the questionnaire. Statements for scores 1–5 are contained in each question in the questionnaire. Examples of these statements are mentioned in (Table 2).

Table 2. Example of the statement variable trust in each score in the questionnaire.

Variable	Indicator	(Score) Statement
Trust	Trust in local religious leaders	(1) Strongly disagree, I feel that religious leaders are not nurturing and inconsistent in holding the values of truth and justice and do not have deeper knowledge and experience in religious science
		(2) Disagree, I feel that religious leaders are less nurturing and less consistent in holding the values of truth and justice
		(3) I quite agree, I feel that religious leaders are quite nurturing and quite consistent in holding the values of truth and justice
		(4) Agree, I feel that religious leaders are nurturing and consistent in holding the values of truth and justice
		(5) Strongly agree, I feel that religious leaders are nurturing and consistent in holding the values of truth and justice and have deeper knowledge and experience in religious science

2.2. Structural Equation Modeling Analysis

This study uses structural equation modeling (SEM) analysis to determine the relationship between variables. In this study, the SEM model was applied using the SEM-PLS (Partial Least Square) software to assess the relationship between social capital and the intention to change land use for SFAL landowners. SEM analysis is a multivariate analysis that makes it possible to comprehensively test the relationship between complex research variables in the entire model. The advantage of using SEM analysis over other analyses is that SEM analysis can be used to determine whether a research model is valid or whether the research model is suitable or not. SEM can produce a research model that involves a number of latent variables, the indicators in it, and the relationship between the two (Haryono 2014). However, the weakness in the SEM analysis itself is that the causality relationship in the variables is not determined by the SEM but is built by the theories that support it. Therefore, SEM is used in this study because it can bring up a statistical model for predicting the calculation of the relationship between direct and indirect variables in the theoretical model (Ghozali 2008), namely in the theoretical model of social capital variables (beliefs, norms, and social networks), as well as variable land-use change intentions for SFAL landowners. The theoretical model of social capital in SEM analysis describes trust as being very important for developing relationships, social networks, and norms (Prayitno et al. 2018; Fukuyama 2001). In terms of norms, there are several actions that are acceptable and unacceptable to build trust when socializing in society. The existence of norms cannot be separated from the formation of social networks, because social norms are built with the formation of social networks. Each social capital variable is measured using 23 indicators. Then, based on the relationship between the social capital variables, changes in the land use of SFAL landowners will be affected. The relationship between social capital and changes in land use is quantified in two parts, depending on the response of the landowner to the question of whether they intend to change or sell the land or not.

2.3. Pandaan District Overview

Pandaan District is one of the subdistricts of Pasuruan Regency and is located astronomically at 112°30′–113°30′ east longitude and 7°30′–8°30′ south latitude. Pandaan District

has a total area of 4327 Ha and is divided into 17 villages, which are further divided into 86 hamlets, 151 community units (rukun warga/RW), and 530 neighborhood units (rukun tetangga/RT) (Figure 1). Rice fields are the most common land use in Pandaan District, accounting for 2847 Ha or 65.70 percent of the total land-use area (BPS Pasuruan 2020). The average productivity of rice fields in Pandaan District is 6.3 tons/ha/year and the average price of grain is IDR 4400/kg. This demonstrates that farming is the primary source of income for the Pandaan District community. In 2018, a toll road connecting Malang to Surabaya City was built, located in the middle of Pandaan District and the eastern part of the direction of the national road connecting Malang and Surabaya City. The construction of the toll road will also influence the development of the surrounding land use.

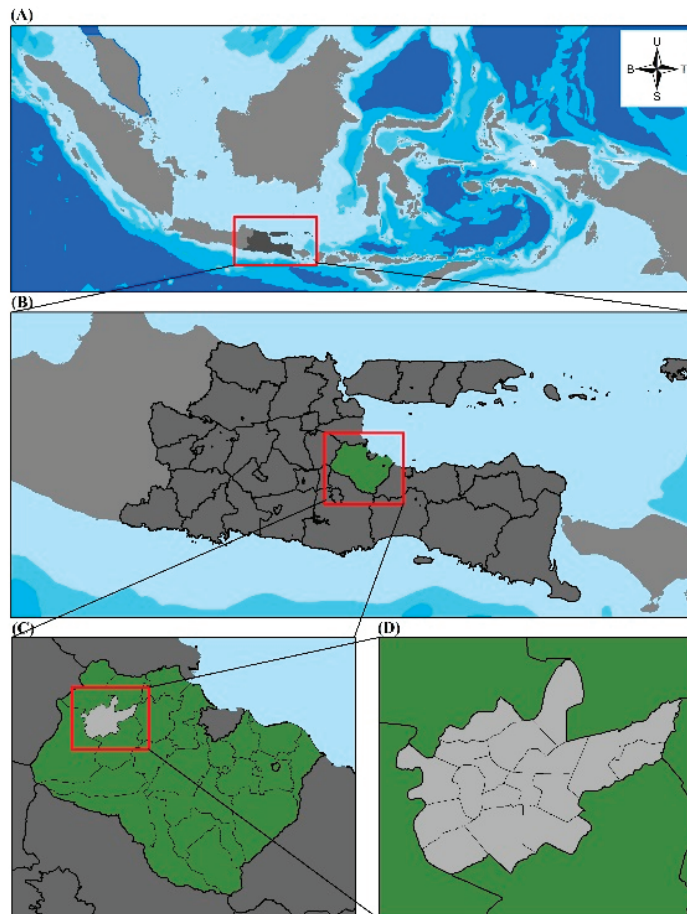


Figure 1. Map of study area: (A) East Java in Indonesia. (B) Pasuruan Regency to East Java. (C) Map of Pasuruan Regency; the highlighted area shows Pandaan District. (D) Pandaan District.

The development of uncontrolled land use can lead to converting agricultural land to nonagriculture. In general, the conversion of agricultural land in Indonesia is caused by internal and external factors. Internal factors are caused by poverty, and external factors are caused by land taxation (PBB) or land growth due to economic development and population growth. The conversion of agricultural land in Pandaan District is an issue due to the construction of toll roads, which affects land-use development. This loss of productive land will disrupt food production's sustainability if it is not controlled. In

addition, this agricultural land also has the function of providing and opening employment, environmental functions, and functions of water catchment areas. So, if there is a change in the function of agricultural land, it will cause the loss of these other functions. SFAL is a system and process of planning, determining, developing, utilizing, fostering, controlling, and supervising agricultural food land and its area in a sustainable manner (UU Number 41 of 2009). The designation of SFAL land is carried out as a policy effort to control the rate of conversion of agricultural land so that other functions, such as ecological functions, can be maintained. Pandaan District has 1108.96 Ha of Sustainable Food Agricultural Land (SFAL). Table 3 mentions the area of SFAL in each village in Pandaan District (Table 3).

Table 3. The area of SFAL in each villages.

No	Villages	SFAL Area (Ha)
1	Jogosari	19.95
2	Kutorejo	31.63
3	Petungasri	16.73
4	Banjarkejen	82.45
5	Banjarsari	76.24
6	Durensewu	49.17
7	Karangjati	25.57
8	Kebonwaris	84.39
9	Kemirisewu	117.89
10	Nogosari	37.48
11	Plintahan	59.09
12	Sebani	115.08
13	Sumberejo	88.54
14	Sumbergedang	84.08
15	Tawangrejo	31.14
16	Tunggulwulung	101.96
17	Wedoro	87.57
Total Area		1108.96

Kemirisewu Village has the largest SFAL in Pandaan District, with 117.89 Ha, or 10.63 percent of the total area. Additionally, Sebani Village has a large Sustainable Food Agricultural Land area of 115.08 Ha or 10.38 percent (BPS Pasuruan 2020). Meanwhile, Pandaan Village is the only subdistrict that does not have land designated as SFAL. This is due to its strategic location, as it is traversed by the national road connecting Malang to Surabaya City and has developed quite quickly. Agricultural land designated as SFAL must still be protected and may not be converted (Al Azizi et al. 2022). This also influences the desire of landowners to change their land. In addition, the intention of landowners to change land use is also influenced by social factors, such as social capital (Ilham et al. 2005). So, in this study, we examine the social capital of SFAL landowners and landowners' intentions to change SFAL in Pandaan District.

3. Results and Discussion

3.1. Respondent Characteristics

This study uses respondents who are owners of agricultural land in Pandaan District and still maintain their land. Respondents in this study joined farmer groups in each village in Pandaan District. This study involved 500 respondents with different characteristics. Concerning age, most people are of productive age; there were 81 respondents (16.2%) aged 25–40 years, 126 respondents (25.2%) aged 41–45 years, and 117 respondents (48.6%) aged 46–50 years. Furthermore, concerning the livelihoods of the respondents, 341 respondents (68.2%) indicated their main livelihood as food agriculture land farmers. Another 159 respondents (31.8%) were food agricultural landowners with side jobs such as village officials, factory employees, private employees, civil servants, entrepreneurs, laborers, traders, breeders, and Linmas. As for the landowner respondents, most of them had an

area of 0.5 ha of agricultural land, specifically 182 respondents (36.4%). Next, based on the income of the respondents in this study, most of them had a relatively high income according to the Pasuruan Regency Minimum Wage (UMK) in 2020 of IDR 4,190,133, because, apart from getting a basic salary, the respondents also had additional wages from side jobs. Then, based on education, it can be seen that 289 respondents had their most recent education in high school.

3.2. Intention to Change SFAL Based on Social Capital

The intention to change land is a variable that aims to find out how the landowner wants to maintain or change their land. SFAL land change decisions in Pandaan District will be linked to social capital. The results of the intention to change SFAL of the landowners in Pandaan District can be seen in Figure 2.

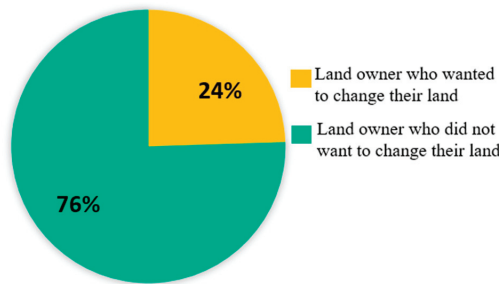


Figure 2. SFAL owners’ decisions in Pandaan District to change their land.

Figure 2 illustrates that from the total number of SFAL landowners in Pandaan District, 76% answered that they did not intend to change the land, while 24% said they intended to change the land (Figure 2). These results are linked to social capital in Pandaan District. The distribution of the percentage of respondents in land change decisions in each village in Pandaan District is shown in Figure 3.



Figure 3. SFAL owners’ intention in each village in Pandaan District to change their land.

Figure 3 illustrates that 100% of landowners in Wedoro Village, Sebani Village, Karangjati Village, and Durensewu Village have no intention to change their land, while in Banjarkejen Village, Kutorejo Village, Plintahan Village, Sumbergedang Village, Tawangrejo Village, and Pertungasri Village, more than 50% of respondents answered that they wanted to change their land (Figure 3). After knowing the land change decisions in Pandaan District, the next step was to find their relationship to social capital using structural equation modeling (SEM) analysis applied in PLS-SEM software.

3.3. Social Capital of SFAL Landowners' Intentions

SEM analysis requires several assumptions to be met, including sample size, normality, outliers, and multicollinearity. According to the assessment of the normality output table, most univariate and multivariate normality tests usually are distributed because they fall within the 2.58 range. With the condition that p is less than 0.05, the evaluation of outliers also meets the requirements. Furthermore, the determinant value of the covariance matrix is 0.000 for the value of multicollinearity.

The assumptions of SEM analysis for this study were met based on some of the explanations. Furthermore, the model test and structural model measurements were performed. The measurement of the model test with the resulting model has not yet met the good fit criteria, so changes must be made so that the model produces good fit results (Table 2). The model of SFAL owners who want to change land is presented in Figure 4. There are some indicators that do not meet the requirements or are invalid, so these indicators were discarded. The discarded indicators on the trust variable include K2. Meanwhile, on the social network variable, the discarded indicators include J1, J8, J9, J10, and J11. The discarded indicators for social norms are N3 and N4.

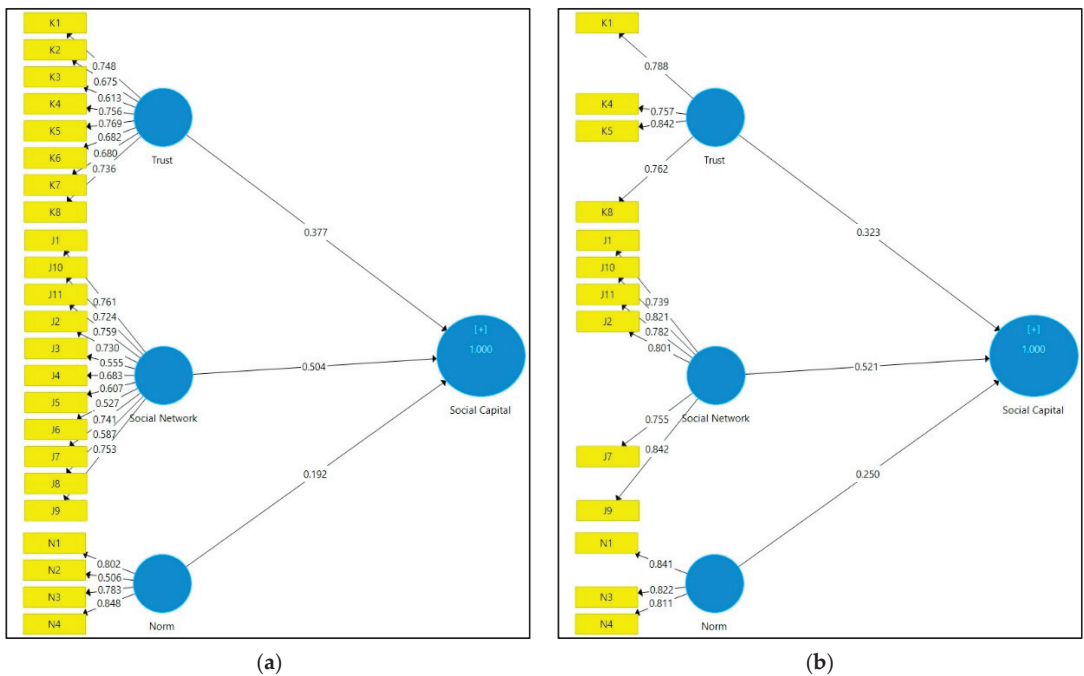


Figure 4. The first model of CFA (a) and the second-phase CFA model (b) of SFAL landowners intentions.

We made modifications in Figure 4, showing that the modification results bring the model to a good fit. Then, regression weights results must be analyzed to examine the influence relationship between variables. Testing the relationship between latent variables is based on the critical ratio (CR) value and the significance probability value. The critical ratio (CR) criteria are 1.96 and a p -value of 0.05. The regression weights produced the following results (Table 4):

- The influence of norms on trust: Testing of the norm variable's relationships to trust showed a critical ratio (CR) of 1.210 (≥ 1.96), with an estimate value of 0.135 and a probability value of 0.222 ($p < 0.05$). This proves that there is an insignificant positive relationship between norms and trust. Trust is the basis for creating social relationships

and networks. In a society that has a high level of trust, there tends to be positive social rules and interpersonal relationships that support cooperation.

- The influence of norms on the network: The norm variable's relationship with networks showed a critical ratio (CR) value of -0.363 (≥ 1.96), with an estimate value of -0.25 and a probability value of 0.717 ($p < 0.05$). This proves that there is a negative relationship and an insignificant influence between norms and networks, evidenced by negative values in the critical ratio and probability values that are above the standard criteria.
- The influence of trust on networks: The influence of trust variables on networks was shown to have a CR value of 3.361 with a p -value of 0.000 (very small and below 0.05). This proves that there is a significant positive relationship between trust and networks. With strong community trust, there is the strongest network of SFAL owners in Pandaan Subdistrict.

Table 4. Comparison of cut-off values between first and second CFA model.

The Goodness of Fit Index	Cut-Off Value	First-Stage CFA		Second-Stage CFA	
		Result	Information	Result	Information
SRMR	>0.10	0.135	Good Fit	0.12	Good Fit
d_ULS	>0.05	6.37	Good Fit	1.96	Good Fit
d_G	-	3.17	Good Fit	1.19	Good Fit
Chi-Square	>0.05	5.29	Good Fit	2.11	Good Fit
NFI	<0.9	0.45	Good Fit	0.58	Good Fit

The relationships between latent variables of social capital in the forms of trust, network, and norms have positive and negative effects on each other, and all are not significantly related to each other. From the relationships of the three variables, the significant effect is only between the trust variable and networks. It is therefore interpreted that the trust of SFAL owners who wish to change their land has a strong influence on forming a network, while the prevailing norms have a negative and insignificant influence on the network. So, it is obvious that the relationship between the three social capital variables is not strong, which makes it easy for residents who own SFAL to want to change their land. For this reason, it can be concluded that the weaker/lower the relationship between variables forming social capital, the higher the intention of SFAL landowners to make land-use changes. The standardized regression weights value can see the value of the influence of the relationship between trust and networks of 0.484 , while the value of the influence of norms on trust is 0.146 .

Social Capital of SFAL Owners Who Are Not Willing to Sell Their Land

As mentioned, according to the assessment of the normality output table, most univariate and multivariate normality tests usually are distributed because they fall within the 2.58 range. With the condition that p is less than 0.05 , the evaluation of outliers also meets the requirements. Furthermore, the determinant value of the covariance matrix is 0.000 for the value of multicollinearity. Based on what was explained, the assumptions of the SEM analysis for this study were met (Figure 5).

Furthermore, the model test and structural model measurements were performed. However, the measurement of the model test with the resulting model has not yet met the good fit criteria, so changes must be made so that the model produces good fit results. For example, the population model of SFAL owners who want to change their land is presented in Figure 3. Based on the results of SEM, the discarded indicators on the trust variable include K4, K5, and K8. Meanwhile, the discarded indicators on the social network variable include J1, J4, J6, J7, J8, and J9. The discarded indicators for social norms are N3 and N4. It can be said that five indicators in the "trust" and "social network" variables and two indicators in the "norm" variable are indicators that can measure the social capital variables of SFAL owners who are not willing to sell their land.

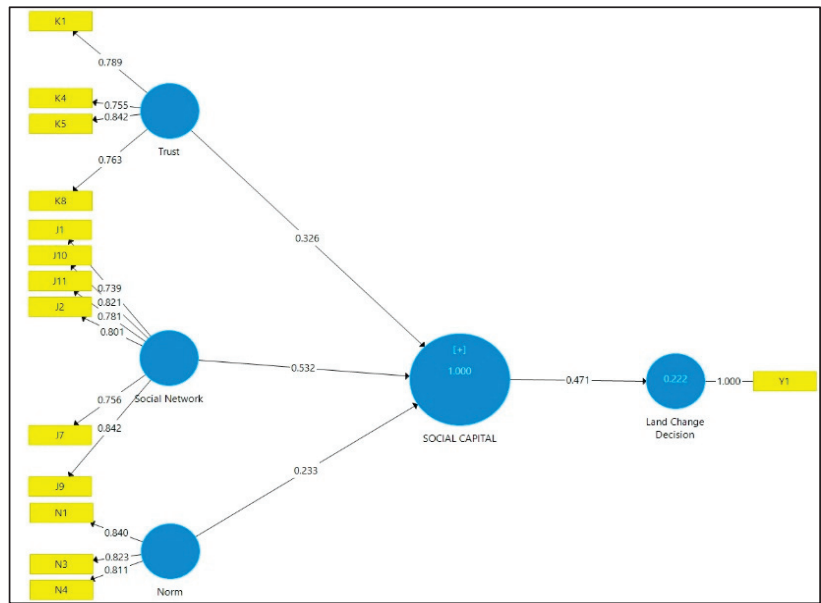


Figure 5. SEM result for social capital of SFAL owners who do not want to change their land use.

The regression weights results must be examined to examine the influence of the relationships between variables. Then, the critical ratio (CR) and significance probability values test the relationship between latent variables (Table 5). Following the modifications in Table 6, it is obvious that the modification results bring the model to a good fit.

Table 5. Value of R square Model.

Variable	R Square	Strength
Social network	0.510	Good Enough
Social capital	0.006	Low
SAFL landowners’ intentions	1.000	Very Good

Table 6. Value of Path Coefficients on Relationship Latent Variables.

Variable	Original Sample	Standard Error	T-Statistic	Information
Social Network -> Social Capital	0.442	0.009	48,079	Significant
Trust -> Social Capital	0.432	0.011	38,011	Significant
Social Capital -> SFAL Landowners’ Intentions	-0.078	0.047	1649	Significant
Norm -> Social Network	0.714	0.028	25,433	Significant
Norm -> Social Capital	0.236	0.008	29,958	Significant

- The influence of norms on trust: Testing the relationship between norm variables and trust showed a critical ratio (CR) value of 3.625 (≥ 1.96), with an estimated value of 0.249 and a probability value of 0.000 (very small and below 0.05). This proves that there is a significant positive relationship between norms and trust. This way, the stronger the community norms, the stronger the trust of the community who owns SFAL in Pandaan District will be.
- The influence of norms on the network: The correlation between norms and networks can be seen with a CR value of 2.156 and a *p*-value of 0.000 (very small and below 0.05). This shows that there is a significant positive relationship between norms and networks.

- The influence of trust on networks: The influence of the trust variable on networks can be seen with a CR value of 6.654 with a p -value of 0.000 (very small and below 0.05). This proves that there is a significant positive relationship between trust and networks. This way, the stronger the trust, the stronger the community network of SFAL owners in Pandaan District will be.

The relationships between latent social capital variables in the form of trust, network, and norms significantly influence each other. The norm and network variables significantly affect the trust variable (Figure 6) (Table 6).

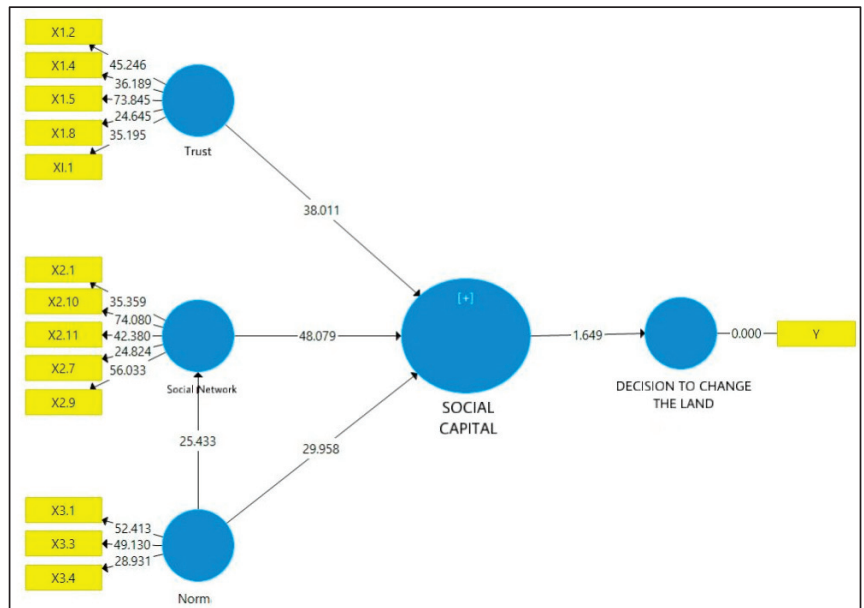


Figure 6. Result of Bootstrapping Social capital of SFAL owners.

3.4. Research Implication

In developing countries such as Indonesia, land conversion, in the sense of changes in land use, is basically unavoidable in the implementation of development. The rapid growth of the population, which is not followed by the demands of the community's need for land, has led to conflicts of interest over land use and discrepancies between land use and its allotment plan. Even though the land itself is limited and cannot be added (Eko and Rahayu 2012), in many cases, land conversion occurs from agricultural to nonagricultural land.

Regarding land-use conversion, suburban areas are areas that have experienced a lot of land conversion from agriculture to non-agriculture. Many of these land functions are caused by the influence of the development of the surrounding cities (Rahayu 2009). It is the same only in Pandaan District, Pasuruan Regency; this region has its main source of income in the agricultural sector. However, in 2018, the construction of a toll road connecting Malang and Surabaya City led to land-use development in Pandaan District.

Changes in land use have resulted in a slew of complex issues involving spatial, economic, social, and environmental dimensions. Changes in land use are marked by the allocation of space for the development of trade and services, large-scale settlements, recreational facilities, shopping centers, educational facilities, and other urban activities (Surya et al. 2020). Changes in land use are a consequence of the need for land and the demands of increasing population growth (Prayitno et al. 2018). Changes that occur from agricultural to nonagricultural land are influenced by various social, economic, and government policies that make development rules (Prayitno et al. 2021a). Social capital is one of the social factors

that influences the intention of SFAL landowners in Pandaan District to transfer land. Social capital is a form of support when obstacles occur. Social capital is able to support the sustainability of community agriculture in the midst of land conversion. Through social capital, landowners can survive with a high sense of trust, strong network ties, and norms that are still well-maintained (Setiawan et al. 2020).

Social capital in this study is divided into three dimensions namely trust, norms, and social networks (Putnam 1993a). Trust is the basis of a relationship; trust is defined as a person's belief in others, demonstrated by taking risks and hoping that other people will act mutually supportively and not harm them. A high level of trust in someone will strengthen cooperation between communities (Putnam 1993c). Based on the results of the analysis, this study showed a significant positive relationship between the norms and beliefs of the community owners of SFAL land in Pandaan District. High trust in society will tend to be followed by positive social norms (Cox 1995). Norms themselves are also interpreted as certain rules that must be followed by society, including religion, moral guidelines, and codes of ethics (Field 2003). Thus, the stronger the community norms, the stronger the trust of the community owners of SFAL in Pandaan District.

Furthermore, through the social network dimension, the research results show a significant positive relationship between norms and social networks, as well as a significant positive relationship between trust and social networks. Social networks are defined as community involvement that causes better relations and creates a sense of togetherness to achieve the desired goals (Sawatsky 2008). The social network is one of the elements of social capital, and it refers to reciprocity and trust (Fathy 2019). Thus, the social network of community owners of SFAL land in Pandaan District is related to norms and beliefs; that is, the stronger the norms and beliefs, the wider the social network of SFAL owners in Pandaan District. The social capital of SFAL owners in Pandaan District is marked by the existing condition of farmers who are willing to lend each other equipment and other agricultural needs, such as fertilizers, pesticides, etc. Community owners of SFAL land in Pandaan District will help each other even when experiencing emergencies such as crop failure. Other communities are willing to help (especially people in farmer groups) with capital, farming costs, and marketing agricultural products.

The conversion of agricultural land in rural areas has a huge impact on the community, especially on farmers as landowners, because agricultural land, apart from being a source of income, also has a social role for the community. Rural communities that have strong social capital tend to choose to maintain their agricultural land (Prayitno et al. 2021a). This is in line with research findings, according to which the community owning SFAL land in Pandaan District chose to retain its agricultural land because it was based on community social capital. The people who own the SFAL in Pandaan Subdistrict say they do not want to change their land: with an average response of 74%, the community wants to keep the SFAL land as a source of income. Thus, the SFAL landowner community's social capital in Pandaan District significantly affects the SFAL landowners' decision to make land changes. Higher or stronger social capital relations will influence SFAL landowners' intention to change their land to make it less expensive. Several actions that the government can take based on the findings of this study include:

- Implement policy changes and innovations to encourage SFAL owners to defend their property. Increase trust and community networks in communities with low social capital, provide a variety of information related to cooperation among community members, exchange information in land management, assist each other in the implementation of plant maintenance, and assist in the provision of seed water, among other on-farm activities.
- Governments could give detailed and realistic directions about the boundaries of SFAL land changes to landowners who have a proclivity to make SFAL land-use changes, as well as contribute to the community's social capital.
- Implement policy changes and innovations to encourage SFAL owners to keep their land property. Increase trust and community networks in communities with low social

capital, provide a variety of information related to cooperation among community members, and exchange information on land.

4. Conclusions

Social capital elements include trust, norms, and networks. The social capital index of Pandaan District is in the moderate category, with the highest index being trust at 73.58. The higher/stronger the social capital relationship, the less SFAL owners will want to change land functions. On the other hand, the weaker/lower the relationship between social capital variables, the greater the intentions of SFAL landowners to make land-use changes.

The relationships between latent variables of social capital in the form of trust, network, and norms have a significant positive influence on each other. The norm and network variables have a significant effect on the trust variable. This means that in Pandaan Sub-district, the prevailing norms and trust can increase networks among residents and SFAL owners who are not willing to sell their land, even though the selling price is high. The value of greatest influence is the relationship between trust and networks, with a value of standardized regression weights of 0.583, while the lowest value is the relationship between norms and networks, with a standardized regression weights value of 0.145. Indications of the relationship between social capital variables that influence each other illustrate the strength of social capital in Pandaan District, which makes SFAL owners reluctant to change and/or sell their land. For this reason, it can be concluded that the higher/stronger the social capital relationship, the more reluctant SFAL owners are to make land transformations or land-use changes.

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Article

The Critical Factors Affecting the Implementation of Corporate Governance in Indonesia: A Structural Equation Modeling Analysis

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Abstract: The concept of corporate governance has become a topic of global discussion since The New York Stock Exchange crashed on 19 October 1987, when many multinational companies listed on the New York Stock Exchange experienced large financial losses. CG was a preventive measure and increased investor confidence in the company. CG implementation is influenced by isomorphisms, such as organizational structure and the external environment in the form of regulation, competition, and culture. In Indonesia, the quality of CG implementation still contributes to the country's economic growth. Weak CG implementation is due to the adoption of the western system immediately. It arises due to a high ownership structure, government intervention, underdeveloped capital markets, and weak law enforcement. This study aims to examine and analyze more deeply about factors that cause CG not to be inadequate to develop properly in Indonesia. Private and state-owned companies in the East Kalimantan Industrial Estate are the research samples for the SOR modelling exploration method. The SOR (stimulus-organism-response) model is a novelty in identifying CG implementation. Identification of the model to obtain a structural model is carried out by using PLS-SEM (partial least square structural equation modelling) through an institutional approach. The results found that the organizational structure and national cultural environment strongly influence CG implementation through the mediation of organizational structure. The contribution to understanding the national cultural environment in CG implementation efforts will be driven by organizational structure. Comprehensively, this study describes other factors such as organizational culture, environment competition, and the environment mediated by organizational structure. The national cultural environment mediated by organizational culture did not significantly affect CG.

Keywords: CG implementation; SOR model; organizational structure

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1. Introduction

Corporate governance has become a topic of global discussion since The New York Stock Exchange Crash on 19 October 1987, when many multinational companies listed on the New York Stock Exchange experienced huge financial losses. Implementing Corporate Governance (CG) is considered an anticipation for company executives to hide losses with financial engineering aimed at revamping performance and financial reports (Pramono 2011). One of these preventive measures is contained in the CG guidelines, which require an independent commissioner to form an audit committee tasked with overseeing financial management and observing the reporting process to encourage reliable financial reports so that it can increase investor trust.

CG issues in the first generation were dominated by conflicts of interest between principals and agents because of the separation between ownership and control of a modern company. Conflicts of interest between principals and agents arise when a company grows larger so that the company's management that was originally held by the owner (owner-manager) must be handed over to professionals. In this case, the issue that is considered dominant is the need for a mechanism to ensure that the management (agent), who is

a worker in a company that owns capital (principal), will manage the company in the interests of the owner (Berle and Means 1932).

In the second generation, CG issues lead to conflicts of interest between strong majority and weak minority shareholders (La Porta et al. 1998). According to La Porta et al. (1998), the application of CG in a country is influenced by the condition of legal instruments in protecting the interests of various parties related to the company, especially minority owners. A legal system that is not conducive and is not yet in favor of the public interest can result in a strong conflict between strong majority shareholders and weak minority shareholders, so it has the potential to damage the country's economic system as a whole.

In Indonesia, CG has begun to be widely applied to companies since the 1997 monetary crisis. The application of CG has become a vital need for state-owned companies (BUMN) and private companies (individuals) as a fundamental value for increasing the welfare and sustainability of companies (Dwiridotjahjono 2009). However, CG principles still needed to be fully implemented during the early 21st decade, and CG has yet to show significant progress in Indonesia. It is illustrated by the annual Credit Lyonnais Securities Asia (CLSA) (2018) survey regarding the evaluation of CG implementation in Asia Pacific countries. Indonesia still ranks 12th, which only fulfils 34% of the 100 assessment indicators. Fundamental problems causing hampered implementation of CG include, among others (Pramono 2011), the practice of companies financed by banks belonging to business groups, as well as short-term loans from abroad, shareholder domination, the ineffective performance of regulators and financial institutions, and weak protection of creditors and investors.

One of the efforts to improve CG implementation in Indonesia is appreciating BUMN and BUMS companies. Nevertheless, these efforts still have not increased the professionalism of the company. Winner companies are still involved in disciplinary cases, such as PT PLN (BUMN) in the Riau-1 PLTU bribery case and PT Garuda Indonesia in the aircraft procurement bribery case. It has become a concern of researchers to identify why the implementation of CG in Indonesia has not been successful even though the regulations, instruments, and tools are good. Indreswari (2006) and Allen and Gale (2000) stated that the low performance and efficiency of BUMN occurred due to the monopoly of certain sectors, which encouraged abuse of authority. Morgan (2006) mentioned that competition could replace external CG management to improve the company's quality so that the organization will be closely related to the environment. As a stimulus factor, the environment has elements that will affect the organization (Lubis and Huseini 1987).

Isukul and Chizea (2015), in research conducted in Nigeria, South Africa, and Egypt, stated that a good and conducive environment would support the development of CG in each country, and regulations have a major impact on CG (La Porta et al. 1998). Stimulus in regulation will demand compliance, while stimulus in competition focuses on increasing organizational value on marketability and improving the quality of human resources (Udayasankar et al. 2008). CG implementation as a response is expected to increase the professionalism of managers. Sharma and Joseph (2003) explained that the implementation of CG will only be successful with the support of professionalism from parties related to the company. The value of professionalism has several attributes, namely self-confidence, service, confidentiality, competence, contract, community, caring, and commitment (Spitzsch and Hansen 2010). Hall (1968) found that professionalism was not correlated with authority and the existence of regulations and procedural specifications. However, professionalism is positively correlated with a division of labor, impersonality, and compensation. Dawuda (2010) also explains that CG can be used as an antidote to corruption and a proven control in several countries to ensure good governance is running. Dawuda's research found that CG can form competent and professional personnel if the governance structure has been properly implemented and implemented.

Furthermore, Wahyudin and Solikhah (2017) found that understanding the importance of good corporate governance (GCG) has already grown in Indonesian businesses. The listed businesses that took part in CGPI Awards from 2008 to 2012 always see an

improvement in both number and quality. Accounting-based financial performance, such as return on assets, return on equity, and earnings per share, are impacted by the CG rating of Indonesian go-public businesses. The Indonesian stock market does not immediately respond to CG implementation rating, so it has yet to be able to accelerate the company's growth soon. In this study, to find out how the environment in the form of regulation, competition, and societal culture influences organizations in implementing CG, the stimulus-organism-response (SOR) model is used Mehrabian and Russell (1974). The SOR paradigm is applied to three levels of interrelated variables. This model implies that human behavior can be better understood as an interactive process in which environmental events (stimuli) are perceived and processed cognitively by individuals in organizations that lead to a type of behavior (response). D. J. Campbell (1985) confirms that the SOR model can be used to explain individual behavior towards their work in organizations. Figure 1 gives a framework chart for using the SOR model (Mehrabian and Russell 1974) in this research.

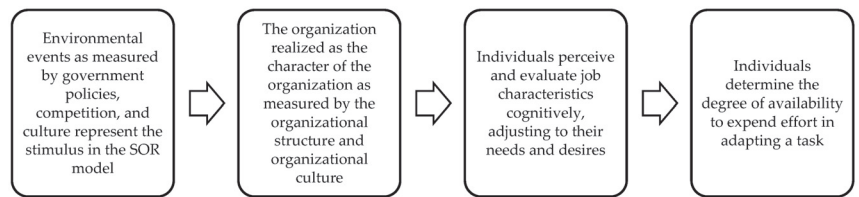


Figure 1. SOR Model Thinking Framework in Research.

The SOR model framework is a novelty in this study. The environment is a variable that influences the organization in realizing good CG implementation. Environmental influence analysis uses appropriate institutional theory in explaining, understanding, and measuring organizational behavior. DiMaggio and Powell (1983) argued that organizations will operate in similar environments and adopt the same structure and culture. In previous research, Udayasankar et al. (2008), Su (2006), and Gallego-Alvarez and Pucheta-Martinez (2019). The institutional theory used to analyze environmental and organizational influences is not applied to the SOR model framework, which is considered to be used to measure behavior in this study as the perception of managers in implementing CG. Udayasankar et al. (2008) measured regulatory environment variables and competition in the organization. Su (2006) measured culture, and Gallego-Alvarez and Pucheta-Martinez (2019) measured regulatory (coercive), competitive (mimetic), and cultural (normative) environments based on institutional theory to measure their effect on firms in disseminating information.

The implementation of CG in Indonesia has yet to increase the professionalism of managers, even though there are sufficient institutional regulatory instruments from the government. Using the theory of individual behavior, the various problems of abuse, and problems that exist, it can be shown that the perception of CG has not been able to form an attitude that builds professional behavior. The SOR behavior change model and institutional theory are expected to explain the influence of regulation, competition, and culture on organizational culture and structure, which will affect the implementation of CG. This combination of different models and theories will capture the interactive influence of the regulatory environment, competition, and culture on organizational culture and structure so that CG implementation can shape manager professionalism.

This research was conducted in the Kaltim Industrial Estate (KIE) area considering the material's mastery level and the relatively controlled environment. The KIE area also has companies whose shareholders are controlled by the government (BUMN) and the private sector, both individuals and foreign investment (PMA), so this research can examine more deeply about the research subject. The motivation to conduct this research is to answer why CG has not developed properly in Indonesia (ACGA 2014; Indreswari 2006). This study

compares the influence of employees' perceptions of state-owned and private companies on implementing CG quantitatively using an institutional isomorphism approach. The research conducted expected to provide an empirical contribution to the application of the stimulus-organism-response model in obtaining a solution to the problem of why the application of CG in companies still cannot increase professionalism; provide an empirical contribution in testing that CG will develop and be closely related to the environment in which the company is located; provide an empirical contribution in testing that government with its regulations, industry with competition, and culture with corporate ethics and norms are three environmental dimensions that greatly influence the implementation of CG; and provide an empirical contribution to the implementation of CG principles as a measurement indicator of CG implementation. This research also provides empirical contributions in the application of institutional theory models because institutional theory can be considered capable of explaining, understanding, and measuring organizational behavior, and contributing empirically to testing the theory used to explain the process of adaptation in institutional practice within organizations called an isomorphism. This research enhances the SOR model framework as a novelty and implements it on companies whose shareholders are controlled by the government.

The research consists of introduction of the research, theoretical concepts, research hypothesis, the methodology used for this research, the measurement of variables and the results of the research, the discussion of the results, and concludes by providing research limitations, managerial implications, and discussion material for further research.

2. Theoretical Concepts and Hypothesis Development

Since it became a global discussion in 1987, corporate governance has been used to anticipate company executives so as not to hide the company's losses. The Asian crisis is suspected because of weak CG implementation (Johnson et al. 2000). Research organized by ADB (2000) stated that the weakness of CG in Asia arose due to a high level of ownership structure, government intervention, underdeveloped capital markets, and weak law enforcement. Furthermore, research on CG has been carried out by Paniagua et al. (2021), who examines how CG and ownership structures relate to the financial performance of firms. Several factors, including organizational culture, organizational structure, regulatory environment, competitive environment, and national cultural environment, influence the implementation of CG in a company.

Organizational culture is defined as organizational practices that express the values of that organization. Deal and Kennedy (1982) and Peters and Waterman (1982) are some of the works that popularized organizational culture. The popularity of the organizational culture literature during the 1980s appears to have responded to the decline in corporate performance in the United States vis-a-vis firms in Japan. Academics seek to explain this decline by relying on culture as the main factor. In another study (Hofstede 2001), the focus on culture shifts to the power one has over CG where culture becomes a strong explanatory variable.

Contrary to previous arguments regarding a direct relationship between organizational culture and performance, this study's conceptual framework hypothesizes that organizational culture is not directly related to performance. However, the relationship occurs through internal CG. Semenov (2000) argues that "... simple models linking culture to performance no longer match the knowledge that academics have developed regarding culture's role in organizational analysis. There is a need for a better understanding of the relationship between culture and impact on organizations".

Hypothesis 1 (H1). *Organizational culture will have a significant effect on CG implementation.*

Semenov (2000) compared the CG systems of industrialized western countries and argued that cultural scores explained differences in CG in 17 Western countries better than any other economic variable listed in the literature. Lin (1976) supports this argument and

demonstrates an intercultural theory of CG systems based on the dimensions of cultural values that link shareholder structure and self-dealing arrangements, insider trading, and disclosure. Since organizational culture studies, internal CG are rare, this study seeks to fill a gap in the literature. This argument is similar to Schwartz and Davis (1981), who stated that ‘company culture has a major impact on a company’s ability to realize goals and plans . . .’.

Organizational structure describes how work is divided, grouped, and formally coordinated. In the context of CG, Blau and Schoenherr (1971) defines CG in its broadest sense as “the totality of the legal, cultural, and institutional arrangements that determine what public companies can do, who controls, how those controls are implemented, and how the risks and rewards of activities are allocated. In contrast, Shleifer and Vishny (1997) give a narrow definition of CG, who state that CG deals with ‘how financial suppliers guarantee themselves a return on their investment’’. Similarly, the Cadbury Committee of Financial Aspects of Corporate Governance defines CG as ‘the system that directs and controls companies’ (Cadbury 1992). Nguyen (2022) found the fact that, in corporate governance at banks, there is a difference between bank stability and the effectiveness of audit committees that depend heavily on the soundness of each bank and the institutional quality of each country. On the other hand, Dang and Nguyen (2021) found that internal corporate governance is significantly related to future stock risk. These different definitions reflect CG’s perspectives and areas that must be addressed. This broad definition captures not only the function of a corporate governance structure or organ, but also its external environment, which consists of social influences, government regulations that regulate companies, and labor and capital markets.

Hypothesis 2 (H2). *The organizational structure will affect the implementation of CG as a control mechanism.*

Meanwhile, the narrow definition only places CG as a company’s business affairs, including the company’s internal structure and management processes. The organization as a structure will greatly influence how CG is implemented. According to Walsh et al. (2011), organizational structure will influence internal and external mechanisms and governance to ensure that CG will be implemented.

Hypothesis 3a (H3a). *The regulatory environment is expected to significantly affect the implementation of CG by mediating organizational culture.*

Regulation is the management of decisions that are made very complex following a set of rules made by the government and were in force at that time. To their needs, regulations are made according to the context. The regulatory environment requires the compliance of the various parties involved to behave by the established rules of the game so that organizational goals can be achieved effectively. In terms of CG in Indonesia, the government stipulates regulations that must be complied with by companies in Indonesia (Morgan 2006). Gallego-Alvarez and Pucheta-Martinez (2019) states that the regulatory environment will face formal and coercive pressures to comply with social standards within organizations. This coercive power is closely related to regulatory agencies that have the power to sanction companies (e.g., legal mechanisms). For J. L. Campbell (2006), Coercive pressure is closely related to the main regulatory instruments that can sanction companies, such as legal and enforcement mechanisms. Larrinaga (2007) views this type of coercive isomorphism as involving regulations that encourage the disclosure of ecological information, guarantee mandatory compliance, or threaten future regulation. Coercive pressure is usually associated with governments and regulatory agencies. This pressure is closely related to the main regulatory instruments that can sanction companies, such as legal and enforcement mechanisms. J. L. Campbell (2006) supports that companies will behave more responsibly by conducting their activities in an institutional environment with greater coercive pressure and where the legal system is oriented towards protecting stakeholder interests.

Hypothesis 3b (H3b). *The regulatory environment is suspected to influence the implementation of CG by mediating the organizational structure.*

The institutional theoretical notion is that the institutional environment can greatly influence the development of formal and informal structures in an organization, often greater than market forces and pressures (Lounsbury 2005). The institutional theory addresses elements of social structure in a deeper and more resilient way: there is a need to consider the processes by which structures, including norms, rules, routines, and schemes, become institutionalized as authoritative parameters or guides for social behavior (Scott 2004). Following the philosophy and logic of this theory, it can be argued that one of the main influences responsible for effective CG compliance within a country is the existence of institutions that can compel organizations to adopt and implement transparent and fair CG practices (Judge et al. 2008). Greenwood et al. (2008) argues that coercive isomorphism occurs because organizations tend to be motivated to avoid sanctions. In research, La Porta et al. (2002) found that best practices in CG can only thrive in the presence of a good legal and regulatory framework. For a CG framework to be effective, legal entities and regulators must be sound so that investors can rely on them when they enter into contractual agreements.

Intense product market competition forces management to improve financial performance and make the best decisions for the future since failure to do so is likely to result in bankruptcy and job loss. Well-managed companies will take over the market from poorly managed companies. The competition will help bring out the best performance from the management team and discipline management. In Allen and Gale's (2000) model, competition is a substitute for external CG mechanisms, particularly the market for firm control.

Hypothesis 4a (H4a). *The competitive environment will affect the implementation of CG by mediating organizational culture.*

The competitive environment is considered to influence the discipline of organizations by eliminating inefficient organizations (Udayasankar et al. 2008). Holmstrom (1982) considers that the competitive environment makes monitoring more efficient on the culture of corruption by managers. Udayasankar et al. (2008) and Gallego-Alvarez and Pucheta-Martinez (2019) classify the competitive environment as an isomorphism through a mimetic process. Scott (2001) identifies from mimetic processes due to cognitive institutional influences. He argues that the mimetic institutional perspective through resource dependence as one of the reasons that can explain the effect of competition must be mediated by a productive and useful organizational culture to be able to make CG implementation effective.

Hypothesis 4b (H4b). *The competitive environment will influence the implementation of CG by mediating the organizational structure.*

Udayasankar et al. (2008) explained that the competitive environment has a negative effect on CG if the organization has a complex structure. This argument is based on the competitive advantage that arises from CG, which acts as a driving force for organizations to improve CG implementation. However, Udayasankar et al. (2008) demonstrated that, as perceptions of the competitive environment increase with high organizational structure complexity, it weakens CG rather than enhances it. Hatch and Cunliffe (2013) emphasizes that the type of structure is the most important thing in the organization. This opinion is based on the organizational structure that will encourage or restrain an innovation from being implemented. The organizational structure is a boundary that opens up various possibilities. These constraints create the possibility of choice and action. Without any restrictions, possible action will not exist (D. J. Campbell 1985).

Hypothesis 5a (H5a). *The national cultural environment will influence the implementation of CG by mediating organizational culture.*

Wibowo (2008) emphasizes that organizational culture is a resource that produces competitive cultural advantage. A company that ultimately allows companies to achieve better results. Hitt et al. (2001) conducted studies that study the relationship between organizational culture and CG, which illustrates that the explanatory power of organizational culture becomes very important when the national cultural environment also supports organizational culture as an invisible resource in generating competitive advantage. The Indonesian context is no exception because organizational culture is a long-lasting resource and provides better company performance. It is because the cultural environment will shape organizational culture, which is valuable, rare, inimitable, and irreplaceable. The unique nature of the cultural environment that shapes organizational culture will differ greatly from country to country (Barney 1986). Related to the importance of organizational culture to CG, culture needs to be studied thoroughly to reveal its role in CG (Schein 1992). From a theoretical point of view, CG is thought to help prevent scandals, fraud, and other potential problems that can damage a company. A company with a good CG image will enhance the company's reputation. Semenov (2000) states that organizational culture significantly impacts a company's ability to realize goals and plans.

Hypothesis 5b (H5b). *The national cultural environment will influence the implementation of CG by mediating the organizational structure.*

Khan and Law (2018) states that the cultural environment is composed of values and beliefs and is the programming of the collective mind. The cultural environment system is a set of values, attitudes, and ways structurally and historically developed and shared. The cultural environment will directly or indirectly affect the organization in terms of organizational design, work design, and organizational rewards. In terms of how good CG implementation emphasizes the existence of structural variables where the cultural environment mechanism is translated into a structure within the organization. Feng (2017) states that the complexity, formalization, and centralization of decisions will greatly affect the implementation of CG in a company. According to him, studying the organizational structure is a way to focus on maximizing CG contribution. Gallego-Alvarez and Pucheta-Martinez (2019) state that the cultural environment that influences the organization is the basis of normative isomorphism, where the organizational structure will adapt to the norms, values, and orders that distinguish one society from others throughout the world. Thus, the cultural environment guides the organization in shaping its structure.

3. Methodology

This research was conducted with a quantitative approach using a questionnaire or survey method, which consists of an explanatory survey with a correlational design and a descriptive survey. The research population is state-owned and private companies in the Bontang Industrial Estate (KIE) Kaltim Industrial Area in Lok Tuan, North Bontang. The BUMN cluster has a population of 289, while the private cluster has a population of 189, bringing the total population in this study to 407 people. A sample survey was conducted from a population of 407 people to test the instruments to be used. Facts were found in the field that line 3 managers have very low awareness. They do not even know about CG, which is the subject of research. With these considerations in mind, line 3 managers who are operators and technical employees were removed from the list of populations to be targeted.

The target population in this study was 199 respondents, with a total of 144 SOE respondents and a total of 55 private respondents. The sampling technique in this research used purposive sampling by considering the size and representativeness of the population.

The sample limit measurement used the Slovin formula (Bordens and Abbott 2011), as in Equation (1).

$$n = \frac{N}{1 + Ne^2} \quad (1)$$

where n is the sample size, N is the population size, and e is the error rate.

The proportion of the BUMN sample is 72.3% of the total minimum sample using the Slovin formula, while private companies are 29.3%. Thus, the minimum sample of BUMN is 95 respondents and the private sector is 39 respondents. Sources of research data come from primary data and secondary data. Primary data were obtained by: (1) a questionnaire survey; (2) an interview survey; and (3) non-reactive methods and available statistical data. Collecting primary data using an instrument in the form of a questionnaire consisting of closed questions using intervals and open questions is used to obtain a more comprehensive picture. Open questions use a ratio scale to be coded and analyzed using statistical tools. In contrast, secondary data were obtained by policy documents, statistical documents, or monographs and reporting documents issued by state-owned and private companies. The policy documents used in this study are (1) Law Number 40 of 2007 concerning Limited Liability Companies; (2) BUMN Law Number 19 of 2003; (3) Regulation of the Financial Services Authority Number 21/POJK.04/2015 concerning the Implementation of Public Company Governance Guidelines; and (4) SOE Minister Regulation Number Per 01/MBU/2011 concerning the Implementation of Good Corporate Governance (GCG).

In this research, there are three variable concepts, including the Regulatory Environment, the impact on professionalism will be used the stimulus-organism-response (SOR) model of Mehrabian and Russell (1974). Regulatory Environment (X1), Competition Environment (X2), Cultural Environment (X3), Organizational Culture (M1), Organizational Structure (M2), and Implementation of Corporate Governance (Y1). Scaling indicators—variable response indicators using interval scales with scores 1–7, which means that the value one will be worse and the value seven will be better for assessing the variables' attributes (Nachmias and Nachmias 1987). Data will be said as good and quality if using quality measurement instruments. A quality instrument is an instrument that has a reliability of a measure and validity or validity of a measure. The variable reliability test method used the Pearson Product Moment Correlation Reliability method and Cronbach's Alpha. Pearson Product Moment Correlation, to measure the strength of the relationship between variable X and variable Y, and be used to determine the validity of an instrument for several interval data. Validity test of the measure to find out how well the indicators represent the variables following the operational definition of the variable: the better the suitability, and the higher the validity of the measurement (Newman et al. 2013). Validity test of the criteria level carried out in research by testing and calculating the Pearson Correlation coefficient between each indicator with a total score of all indicators.

The research data analysis method using descriptive data analysis and partial least squares analysis (PLS-SEM) makes it possible to simultaneously test the relationship between multiple exogenous and endogenous variables to explore and predict the relationship between latent variables because the theory is undeveloped or weak. Partial Least Square (PLS) is a multivariate statistical analysis that can estimate/test the research model simultaneously both the relationship between variables or between variables and their measurement items with the aim of predictive studies Hair et al. (2006).

Structural analysis in PLS-SEM in this study can be explained in Figure 2. Latent variables are represented in a circle, while the latent variable forming indicators are represented with long ovals. Arrows represent the relationship between latent variables and latent variables with indicators. In PLS-SEM, the relationship is always shown as a one-way arrow. The stages of analysis in PLS-SEM are explained by Sudarmanto (2005). In summary, the PLS-SEM evaluation of the reflective latent variable measurement model and the structural equation model can be seen in Table 1.

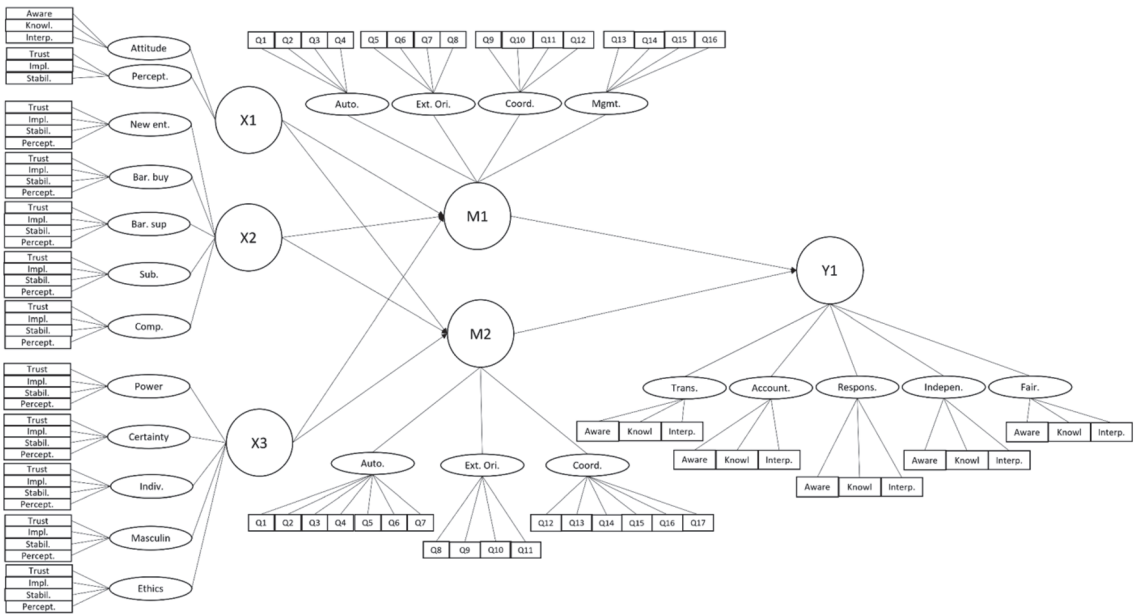


Figure 2. Research Structure Equation Model.

Table 1. Evaluation of the results of the PLS-SEM model.

Evaluation	Indicators	Appropriateness
Outer Model	<ol style="list-style-type: none"> Indicator reliability Discriminant validity Internal consistency Convergent validity 	<ol style="list-style-type: none"> Outer loading must be ≥ 0.7 for the theory test and 0.5–0.7 for exploratory research Cross-loading the indicator variable to the latent variable must be greater in value than the other latent variables. Fornell-Larcker, each latent variable must be greater than the correlation between latent variables. Composite reliability ≥ 0.7 for the theory test and ≥ 0.6 for exploratory research. Cronbach’s alpha ≥ 0.7 for the theory test and ≥ 0.6 for exploratory research Average Variance Extraction (AVE) must be greater than 0.5
Inner Model	<ol style="list-style-type: none"> The coefficient of determination (R^2) The significance and magnitude of the structural model coefficients 	<ol style="list-style-type: none"> In general R^2 value ≥ 0.75 is good Significant

4. Results

Analysis of the influence between variables was carried out by analytical methods PLS-SEM (partial least square structural equation modelling) with the aim of predictive or exploratory studies through the development of structural models (Hair et al. 2006). The PLS model consists of measurement and structural models. The measurement model uses second-order factors with variables hierarchically measured by dimensions, and several measurement items further measure these dimensions. The estimation of second-order factors is then carried out using the repeated indicator approach (first-order factor stage), followed by the two-stage approach for evaluating the causality between variables and dimensions (second-order stage) after obtaining a valid and reliable model (Hair et al. 2006). This research focuses more on second-order analysis.

4.1. The Measurement Model at the Variable Level Evaluation

The measurement model was evaluated at the second-order factor level, which measures the quality of the measurement model of the relationship between the variables and their dimensions. The results of the measurement model at the variable level are presented in Table 2. The quality of the measurement model is seen from the Loading Factor (LF) ≥ 0.70 , Composite Reliability (CR) ≥ 0.70 , and Average Variance Extracted (AVE) ≥ 0.50 , as well as an evaluation of discriminant validity, which is the Fornell-Lacker Criterion, which is the AVE root above the correlation between variables.

Table 2. Validity and Reliability of Research Variable Dimensions.

Variable	Dimension	Loading Factor	Composite Reliability	Average Variance Extracted
Regulation (X1)	Attitude	0.952	0.951	0.906
	Perception	0.952		
Competition (X2)	New arrival	0.741	0.894	0.630
	Bargaining buyer	0.849		
	Bargaining supplier	0.707		
	Substitution	0.774		
	Competitor	0.884		
National Culture (X3)	Equality	0.560	0.861	0.558
	Certainty	0.838		
	Individualism	0.744		
	Masculinity	0.772		
	Ethics	0.791		
Organizational Culture (M1)	Autonomy	0.574	0.892	0.679
	External Orientation	0.892		
	Coordination	0.901		
	Human Resources	0.883		
Organizational Structure (M2)	Complexity	0.803	0.877	0.704
	Formalization	0.873		
	Decentralized/Centralized	0.841		
Corporate Governance (Y1)	Transparency	0.729	0.912	0.675
	Accountability	0.883		
	Responsibility	0.808		
	Independency	0.796		
	Fairness	0.883		
	Effectiveness	0.968		
	Efficiency	0.971		
Responsibility	0.966			

The results show that the regulatory environment variable is measured by two dimensions, namely attitudes and perceptions where there is a very strong relationship between the two dimensions with an LF of 0.952 each. It can be caused by employees/managers having good attitudes and perceptions regarding PJOK, regulations, and laws. LF value greater than 0.7 indicates that the variable indicator has a high level of validity. The variable indicator must be eliminated or removed from the model if the value is smaller. The level of strength or truth is still weak (Ardiansah 2017). The competitive environment variable is measured by five accurate dimensions, where the most dominant dimensions reflecting the competitive environment were competitors (LF = 0.884) and bargaining power of buyers (LF = 0.849).

In contrast, bargaining power of supplier has LF = 0.707, which is good but still needs improvement. The national cultural environment is measured by five valid dimensions with LF, where the most dominant dimensions are certainty with LF = 0.838 and ethics with LF = 0.791. On the other hand, the equality dimension has the lowest LF (0.560), indicating that equality in a national culture still needs improvement.

Organizational culture variables are measured by four valid dimensions, where the very dominant dimensions are coordination (LF = 0.901) and external orientation dimensions (LF = 0.892). In contrast, the autonomy dimension still needs improvement with the lowest loading factor (LF = 0.574). Organizational structure dimensions are measured by three valid dimensions where, overall, there is a strong relationship between the dimensions of complexity, formalization, and decentralization/centralization in measuring organizational structure variables. However, the formalization dimension has the highest LF (0.873), indicating that the organizational structure's most important dimension is formalization. The CG variable has five valid dimensions, and the most important/dominant dimensions are accountability and fairness, with each LF value of 0.883. CG looks stronger in the dimensions of accountability and fairness.

This measurement model has CR values above 0.70 and AVE above 0.50 for each variable. It shows that the dimensions that measure the variables are reliable/reliable or consistent in measuring each variable (Mulyana et al. 2017). The content of dimensional variations in the research variables is more than 50%, indicating that the variables have good convergent validity. These results also indicate that structural testing of the influence between variables can be carried out with the support of a good measurement model.

Discriminant validity was carried out in the PLS analysis of this study to ensure that each dimension/item of focus measurement measures the variables it measures that are related or unrelated (Farrell and Rudd 2009). The method used in evaluating discriminant validity is the Fornell-Lacker criterion, namely, the root of the AVE variable is greater than the correlation between variables. The results of discriminant validity measurements are presented in Table 3. Based on the processing, it can be seen that all the roots of the AVE variable are higher than the correlation with other variables, which indicates that the evaluation of discriminant validity is fulfilled.

Table 3. Discriminant validity.

Variable	National Culture	Organizational Culture	Corporate Governance	Competition	Regulation	Organizational Structure
National Culture	0.747					
Organizational Culture	0.621	0.824				
Corporate Governance	0.151	0.212	0.822			
Competition	0.421	0.360	0.214	0.794		
Regulation	0.061	0.043	0.266	0.097	0.952	
Organizational Structure	0.536	0.539	0.325	0.338	0.124	0.839

Based on the stages of the model testing process, the VIF value of each variable being tested needs to be calculated to avoid multicollinearity, so that the estimated parameter values and standard errors are not biased. From the data processing presented in Table 4, the variables of regulation, competition, and national culture in influencing organizational culture and organizational structure show a VIF value of <5 or less than the tolerance limit, according to Hair et al. (2006). It can be concluded that there is no high multicollinearity among the variables of regulation, competition, and culture. Likewise, for organizational culture and organizational structure in influencing corporate governance, VIF value < 5.

Table 4. Multicollinearity testing.

Variable	Organizational Culture	Organizational Structure	Corporate Governance
Regulation	1.010	1.010	
Competition	1.223	1.223	
National Culture	1.216	1.216	
Organizational Culture			1.410
Organizational Structure			1.410

4.2. Structural Model Evaluation

The results of testing the model hypothesis as a whole based on each hypothesis statement are presented in Table 5. Hypothesis analysis used the parameter path coefficient value from -1 to 1 . The hypothesis is accepted if the T-statistic is less than the p -value and the p -value < 0.05 .

Table 5. Results of testing the structural model hypothesis.

Hypothesis	Hypothesis Statement	Standard Path Coefficient	T-Statistic	p Value	Result
H1	Organizational culture \rightarrow Corporate Governance	0.052	0.542	0.588	Hypothesis Rejected
H2	Organizational structure \rightarrow Corporate Governance	0.296	3,419	0.001	Hypothesis Accepted
H3a	Regulatory environment \rightarrow CG Implementation; Organizational Culture Mediation	0	0.02	0.984	Hypothesis Rejected
H3b	Regulatory environment \rightarrow CG Implementation; Organizational Structure Mediation	0.025	1.076	0.283	Hypothesis Rejected
H4a	Competition Environment \rightarrow CG Implementation; Organizational Culture Mediation	0.006	0.407	0.684	Hypothesis Rejected
H4b	Competition Environment \rightarrow CG Implementation; Organizational Structure Mediation	0.038	1.397	0.163	Hypothesis Rejected
H5a	Cultural Environment \rightarrow CG Implementation; Organizational Culture Mediation	0.03	0.534	0.594	Hypothesis Rejected
H5b	Cultural Environment \rightarrow CG Implementation; Organizational Structure Mediation	0.141	3.087	0.002	Hypothesis Accepted

The analysis results generally show that all hypotheses have a positive path coefficient direction with different significance for each variable. The hypothesis is not accepted, meaning that the relationship between variables is not significant, which indicates that, every time one variable changes, it does not significantly increase changes in other variables, namely organizational culture and CG implementation; regulatory environment and CG implementation through the mediation of organizational culture and organizational structure; environment competition and CG implementation through the mediation of organizational culture and organizational structure; as well as the cultural environment and CG implementation through the mediation of organizational culture. Conversely, there is a significant influence on the organizational structure variable on CG and the organizational environment and CG implementation mediated by organizational structure.

5. Discussion

The use of the term corporate governance (CG) has increased when factors involve sustainable investor confidence, shareholder activity, increased social responsibility, and sustainable organizational development. CG is a system of arrangements that directs and controls the company to increase value for all relevant stakeholders (Blau and Schoenher 1971). CG development is an indicator that cannot be separated from the level of investor trust. The increased intention on the influence factor of CG quality becomes important in economic development. In this study, the factors that have a significant or positive influence on the implementation of CG, namely the organizational structure and the national cultural

environment through the mediation of the organizational structure, while other variables do not have a significant effect even though they have a positive direction or in the other word, it has a very weak effect on the implementation of CG.

Organizational structure has a significant effect on CG implementation because each structure will direct the behavior of managers in implementing CG in their daily work. Cosset et al. (2016) mentioned that companies with good CG on average have better labor productivity and cost efficiency, and can make acquisitions that can increase company value, meaning that the organizational structure is good. According to Monks and Minnow (2004), CG is a structural mechanism intended to guarantee checks and balances that reflect the long-term sustainability of an organization. In addition, a significant influence on the implementation of CG was also identified in the national cultural and environmental factors through the mediation of the organizational structure, which is like the results of the study DiMaggio and Powell (1983), Scott (2001), and Hofstede (1991). In these studies, it can be interpreted that there is ruler control and scientific selection in the formation of the organizational structure in CG implementation. The dominant political power, or what Hofstede calls the elite (Hofstede 1991), is to apply the norms and standards of the national culture as a model of organizational structure and policies, which then apply years later without being questioned or forming a culture (Bebchuk and Roe 1999).

The success of national cultural variables in influencing CG implementation by mediating organizational structure provides strong support for the argument that isomorphism embedded in national culture will influence CG implementation strategies by establishing a strong organizational structure that aligns with company goals. Contribution to the understanding of the national cultural environment will be driven by the organizational structure, which is considered a residue of cultural norms in that country. This finding provides a theoretical implication that, in an institutional approach, companies try to seek legitimacy in society by conforming to societal norms and culture. Consistent with DiMaggio and Powell (1983), who state that organizational structural conformity is driven by institutional strength that is not related to efficiency in implementing it.

Furthermore, some factors have a weak influence on CG implementation, namely organizational culture, regulatory environment, regulatory environment mediated by organizational culture and organizational structure, competitive environment mediated by organizational culture and organizational structure, and national cultural environment mediated by organizational culture. The CG system initiating from the west will deal with organizational culture, a company resource that has formed the order and is a competitive advantage for companies, making CG a foreign system tasked with controlling and directing management (Hitt et al. 2001). In line with the findings above, Semenov (2000) compared the CG system in western countries, and it turns out that knowledge of these countries is still low. Insufficient knowledge of CG significantly impacts a company's ability to realize CG implementation (Schwartz and Davis 1981). With a lack of knowledge and understanding of CG in the work environment, the work culture in the company where the research is conducted separates the work culture that has been formed from the CG culture.

According to Tabalujan (2002), the regulatory environment in Indonesia requires a fundamental change to the legal culture so that people can become more law-abiding and principle-abiding. Such conditions are needed so that legal instruments and supporting institutions can function optimally following appointed objectives based on the legal culture and culture of the Indonesian people. Traditional cultural values are more dominant than legal-formal institutionalized legal rules (Lukviarman 2004). Johnson et al. (2000) state that the loss and non-functioning of organizational culture does not give life to the existing legal/regulatory system because culture refers to the attitudes, values, and opinions held by members of the organization regarding its implementation. The non-existence of an unsupportive organizational culture in companies makes CG implementation even more complicated. He believes that organizational culture is not a significant determinant of CG implementation in the companies studied. These results are inconsistent with the findings of previous studies such as Wilderom and Van den Berg (2005). However, a weak

relationship with the determination of organizational culture was recorded in research by Wibowo (2008). Arogyaswamy (1987) claims that organizational culture in a regulatory environment is not always crucial in determining CG implementation. The mediation of organizational structure in this variable is due to the regulatory environment in its legal products by Bebchuk and Roe (1999), considered to have the dominant power to regulate the structure of the company. This legal force is not always made by officials who side with the public and are not influenced by important groups, but it also has implications for other possible perspectives with the position of the two poles of the shareholding and stakeholder perspectives.

Economic changes influence the competitive environment in the context of company competitiveness, which is expected to lead to the implementation of CG with a management control system. However, Wibowo (2008) indicates that organizational culture is not a determinant of the significance of the company's internal CG. Specifically, Arogyaswamy (1987) claims that culture and competitive environment are not always crucial in determining the success of CG implementation in a company. The application of organizational structure mediation on competitive environment variables also does not significantly affect the implementation of CG. This result is contrary to previous studies such as Pfeffer and Leblebici (1973), Nickell (1996), and Porter (2008). However, the weak influence of the competitive environment on CG mediated by organizational structure was noted in the study by DiMaggio and Powell (1983). The emphasis is on research by Polder et al. (2009) regarding the importance of implementing the best CG in every company in a globally competitive environment as protection against potential risk threats. However, the behavior of CG implementation cannot be predicted even though a company restructuring has been carried out as a limitation in carrying out management. Meanwhile, implementing CG practices is still just to check the compliance box. DiMaggio and Powell (1983) stated that self-awareness and self-interest are very important in improving the development of organizational structures.

The national cultural environment and organizational culture do not strongly influence each other in implementing CG because they explicitly comply with Semenov's (2000) argument that national culture limits variance in organizational culture. However, Hatch also stated that culture also relies on differences besides relying on similarities. It means that not all values are accepted collectively but can be rejected collectively (Hatch and Cunliffe 2013). Specifically, Gerhard (2008) argues that organizational culture does not have to determine national culture in designing and executing management strategies and practices so that national culture acts as a strong boundary. The decision to be unique, as long as the risks and challenges are properly understood and considered, can often offer potential competitive advantages. Therefore, it should not reduce the space for freedom and differentiation. It is appropriate that Hatch and Cunliffe (2013) states that national culture may not be able to answer the challenges faced at any moment. It is the basis for identifying when national culture limits organizational culture and when it is possible to use it.

Different contexts in the form of the legal and regulatory environment, cultural environment, and business patterns (competition) that are predominantly adhered to in a country are the main factors that deserve consideration in identifying CG implementation systems and models. Thus, the effectiveness of governance tools does not depend on the number of existing regulations but depends heavily on the regulatory environment in the form of instruments and law enforcement in a country. It is what Tabalujan (2002) claimed allegedly caused the failure of CG implementation in companies that foreign technical assistance funds mostly assisted. In his research, it was explained that one of the reasons for the non-functioning of law in developing countries, especially in Indonesia, is due to the neglect of the cultural factors of the Indonesian people. The implication is that regulatory issues are not the only dominant factor influencing CG implementation. Other factors interact in Indonesia that influence CG implementation, such as environmental factors on the effectiveness of implementation and its supporting institutions (Lukviarman 2004).

From a formal legal standpoint, Tabalujan (2002) believes that Indonesia already has a fairly complete set of laws. What is needed is a fundamental change to the legal culture so that people can become more law-abiding and principle-abiding. Conditions like this are needed so that legal instruments and supporting institutions can function optimally so that they are following the stated goals. Thus, it can be said that traditional cultural values play a more dominant role than formally institutionalized regulations.

6. Conclusions

This research serves as a basis for identifying factors influencing this research. This research can summarize the modelling of CG implementation in Indonesia based on an institutional approach to three types of isomorphism, which emphasizes the institutionalization of CG implementation. This study confirms the cultural environment as a normative isomorphism from three perspectives of isomorphism in the institutional approach that influences CG implementation. The influencing normative isomorphism is based on national culture mediated by organizational structure. Ruler control and scientific selection occur in the formation of the organizational structure in the implementation of CG. The success of national cultural variables in influencing CG implementation by mediating organizational structure provides strong support for the argument that isomorphism embedded in national culture will influence CG implementation strategies by establishing a strong organizational structure that aligns with company goals. Contribution to understanding the national cultural environment in CG implementation efforts will be driven by the organizational structure, which is considered a residue of cultural norms in that country. The PLS-SEM analysis method with an institutional approach can describe measurement and structural factor models that influence CG on various variables. As a result, this study found that CG practices are strongly influenced by organizational structure and the national cultural environment mediated by organizational structure. In addition, it was also confirmed that sound CG practices that pay attention to the cultural aspects of certain countries would have an optimal impact.

There is no research without limitation. This research used quantitative methods with limited variables. Further research using qualitative methods is needed to deepen the research results regarding the implementation of CG. Future research is expected to be able to carry out limitations or restrictions on focus variables so that research results are sharper and more in-depth about CG in Indonesia, as well as being input into further analysis and application of regulations related to improving the quality of CG in Indonesia. This research can become the foundation for developing a research model with other variables to identify CG implementation.

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Article

The Impact of COVID-19 and Climate Change on Food Security in Pamijahan District, Bogor Regency

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Abstract: Food security is a requirement for meeting household food demands and is expressed in the availability of enough food that is sufficient both in quantity and quality, safe, equitable, and inexpensive. Academics and practitioners have attempted to revise food security models that may depict disaster-prone places, particularly Pamijahan District; however, these varied models each have their setbacks when compared to the world's various global conditions. This study aims to examine how food security is affected by the availability, accessibility, and consumption of food under the influence of climate change and the COVID-19 outbreak in the period 2017–2022. The methods used in this study were mixed-methods (quantitative and qualitative). In this study, participants underwent SMART PLS 3.0 analysis, followed by quantitative analytic techniques. Study results showed that the total food security condition of Cibunian Village in Pamijahan District in the period 2017–2022 can be categorized as vulnerable. Based on the FSVA analysis, it revealed that Cibunian Village was in the category of being vulnerable to food insecurity in general for the 2017–2022 period, while based on the SKPG analysis from the perspective of food access, there has been a 33.3% increase in food insecurity. The COVID-19 outbreak, climate change, and food consumption are the causes, and they all significantly and positively affect food security. This work advances our knowledge of food security in the COVID-19 outbreak age and the issues posed by global climate change. Everywhere, even in disaster-prone areas, complete food security should be attained.

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Keywords: climate change; COVID-19; food security; food availability; food accessibility; food utilization

1. Introduction

Food is a human right and becomes a government obligation to fulfill (Dohlman et al. 2019). Currently, the world is facing climate change due to global warming. Climate change has increased the frequency of hydrometeorological disasters (Azizah et al. 2022). Since the last decade, climate change has become a major threat to food security.

Indonesia is located on the equator and is influenced by various weather and climate extremes. Variations in weather and climate affect forecasts of planting and harvesting seasons, seed supply distribution systems, and crop yields, causing potential problems in the food security system (Sakya and Mahardh 2010).

The Corona Virus Disease (COVID)-19 outbreak at the end of 2019 exacerbated the challenges of achieving food security. The COVID-19 outbreak created a multidimensional crisis in the health, economic, social, and political sectors, with further implications for food security (Rahmah et al. 2020). The impacts of climate change and the COVID-19 outbreak require further analysis to achieve sustainable food security (Rasul 2021). Achieving sustainable food security to end hunger refers to the SDGs (Sustainable Development Goals) program's 2nd (zero hunger) and 13th (climate action) goals.

Food security is closely related to food availability and food access (Mun'im 2021). Two global crises, the COVID-19 outbreak and climate change, demand appropriate action

from the government so that food security can be realized (Molden et al. 2020). On the other hand, hydrometeorological situations and the COVID-19 outbreak are creating instability in food security.

Food security is mandatory around the world, including in Indonesia. The Economist Group (2022) reported that Indonesia's Food Security Index was ranked 63rd out of 113 countries in 2022. According to the report, the sustainability and adaptation pillars have the lowest indicator performance in the index. They show that productive research related to the development of food security that is adaptive to climate change risks is still seriously needed in Indonesia, including in Bogor Regency.

Alinovi et al. (2010) state that resilience is influenced by stability, social safety nets, access to public services, assets, income, access to food, and adaptive capacity. Alam et al. (2016) stated that the food security model consists of food availability, food accessibility, food utilization, and food security.

Bogor Regency is a second-level administrative region of West Java Province, Indonesia, and is very important as one of the buffer zones for the capital city of Jakarta. According to the Statistical Agency of West Java Province, 6,088,233 people lived in Bogor Regency in 2020, representing 12.19% of the entire population of West Java Province (Yudhanto et al. 2023).

Bogor Regency's Food Security Index is ranked 317 out of 417 districts in Indonesia. Bogor Regency is included in a disaster-prone area. In 2021, the Bogor Regency Regional Disaster Management Agency reported that the frequency of disasters in Bogor Regency from 2017–2020 had continued to increase.

The Food Security Vulnerability Atlas (FSVA) is a thematic map that visualizes the geographical conditions of food insecurity (Food Security Agency 2022). In 2021, the FSVA of Bogor Regency, Pamijahan District, categorized food security, and especially food availability, as vulnerable in terms of access and utilization of food.

The uniqueness of Pamijahan District, surrounded by the Salak Mountain area, is that it has high potential for food resources and also high disaster vulnerability (Regional Disaster Management Agency 2022). This area is located in a dangerous zone. In the period 2020–2022, La Nina winds will come to this area and threaten potential disasters such as floods and landslides. It was recorded that on 22 June and 23 June 2022, flash floods and landslides occurred in Pamijahan District, Bogor Regency, which resulted in 194 heads of families being affected in Cibunian Village and Purwabakti Village (Regional Disaster Management Agency 2022).

Pamijahan District is located at coordinates $106^{\circ}38'00''$ to $106^{\circ}42'00''$ East longitude and $6^{\circ}38'00''$ to $6^{\circ}44'00''$ South latitude. The slope of the surrounding area ranges from 8% to 40%, and the height of the land in Pamijahan District is in the range of 1000–2000 m (Ulfah Rahayu et al. 2019).

The average temperature in Pamijahan District in the period 1991–2002 was 25.60°C , with an increase in temperature from 1991–2022 of 0.60°C and the highest rainfall reaching more than 500 mm per month. It can be categorized as an area with an extreme climate (BPS 2021).

From 1991 until 2022, there were 46 hydrometeorological disasters, which were dominated by floods, landslides, and strong winds. The high incidence in a region will be affected by climate change, increasing the potential for food insecurity in that area. The locations for collecting data for this study were Cibunian Village and Purwabakti Village in Pamijahan District because they are categorized as very disaster-prone villages with high rainfall and steep slopes (Ulfah Rahayu et al. 2019).

Facing various existing obstacles, residents of Pamijahan District must have the ability to maintain their food security for survival in the future. Based on this experience, a model of food security in disaster-prone areas, especially those affected by climate change and those that have also experienced non-natural disasters such as COVID-19, is an interesting thing to develop for the sustainability of the area. This food security model is a planning

and prediction technique that has the advantage of dealing with opportunities for similar events in the future.

Food security as a way to deal with hunger is strongly supported by food availability, food access, and food utilization. The support of these three sub-systems must be strong so that they can face various interventions from outside and within the system. Several previous studies have not formulated a model of food security that has been analyzed statistically; instead, they are still conceptual in nature, not referring to empirical studies.

Through this phenomenon, researchers have an interest in conducting empirical studies by identifying the unique characteristics of residents who live in disaster-prone areas and measuring the relationship between model variables of food security that are related to climate change disasters and the COVID-19 outbreak.

Good food security planning can secure the continuity of food availability, access to food, and utilization of food for residents of Pamijahan District. One of the approaches used to deal with external interventions is to develop a model. This research investigates the characteristics of the residents of Pamijahan District and the food security model that was formed to maximize the potential for food availability, food access, and food utilization in the face of climate change and outbreaks of non-natural disasters.

The results of this study will be useful for developing strategies for the government to always maintain suitable food security in disaster-prone areas. In this study, structural equity modeling through partial least squares (PLS-SEM) is also used in the new field of food security.

The appropriate statistical technique for predicting food security management planning in disaster-prone areas is partial least squares structural equation modeling (PLS-SEM). This technique is used because it prioritizes predictive results without requiring normal distribution assumptions, and this technique is very good to use when the sample size is small (Joseph F. Hair et al. 2019).

The PLS-SEM analysis tool is Smart PLS. The use of Smart PLS is highly recommended when you have a limited number of respondents and the model being built is complex. In this study, Smart PLS Series 3.0 is used because this research is predictive and explains latent variables rather than testing a theory with a small number of samples (J. H. Hair et al. 2017).

2. Materials and Methods

A questionnaire with a sampling method was used to determine the condition of residents in Pamijahan District. Data collection, surveys, direct distribution of questionnaires to respondents, and in-depth interviews with an expert are all parts of the research method.

The research location is Pamijahan District, which supplies food in Bogor Regency (Indonesian Ministry of Agriculture's Food Security Agency 2021). The uniqueness of this district is its susceptibility to food security due to flash floods and landslides in June 2022. Figure 1 provides a map of the area studied in Pamijahan District, Bogor Regency.

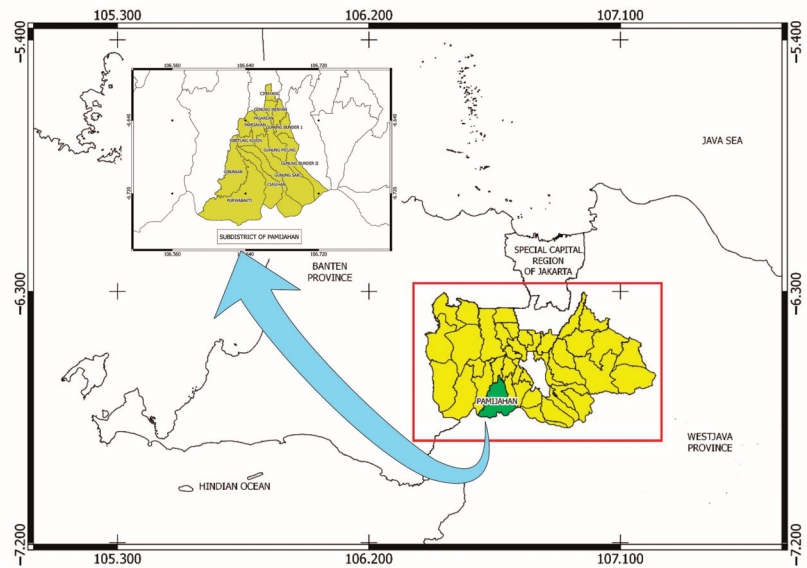


Figure 1. Pamijahan District map of Bogor Regency.

2.1. Data Collection Method

In analyzing food security above, researchers combined primary and secondary data. Primary data was collected through surveys using questionnaires and in-depth interviews to determine residents' understanding of the effects of climate change and the COVID-19 outbreak on food security. This study was carried out in Pamijahan District, Bogor Regency, with respondents who were community members who were very affected by the climate change disaster and the COVID-19 outbreak. Secondary data was obtained from the various relevant literature, journals, books, and government statistical data.

The purpose of collecting data through a questionnaire is to access the sub-system of food security (food availability, food access, and food utilization) regarding the presence of climate change and non-natural disasters (COVID-19). The variable measurement of food availability was developed by 2021, while food access was introduced by Béné et al. (2021). Food utilization is measured using the approach from (Baliwati 2019), the climate change variable is measured based on the explanation from (Rasul 2021), and the COVID-19 outbreak is measured using variables from (Hendriks et al. 2022).

The process of collecting information for this study was carried out by interviewing relevant stakeholders. As for the observation process, the authors carried it out directly with respondents. Detailed research stages can be seen in Figure 2.

In Figure 2, this study begins with observing the food security system, which consists of food availability, access, and utilization (Alam et al. 2016). The second step is to determine the food security model with the variables of climate change and the COVID-19 outbreak so that a design model for food security can be produced in disaster-prone locations. The third stage is interviews with respondents and in-depth interviews with key persons using questionnaire media (this research questionnaire can be seen in Appendix A), as well as an interview guide, so that a reflection of the condition of food security is produced, which is affected by climate change and the COVID-19 outbreak. The results of the path analysis using SEM-PLS and the derived food security situation from the results of the FSVA and SKPG analyses, compiled with the results of in-depth interviews with key persons, formulated managerial implications for achieving food security in disaster-prone areas.

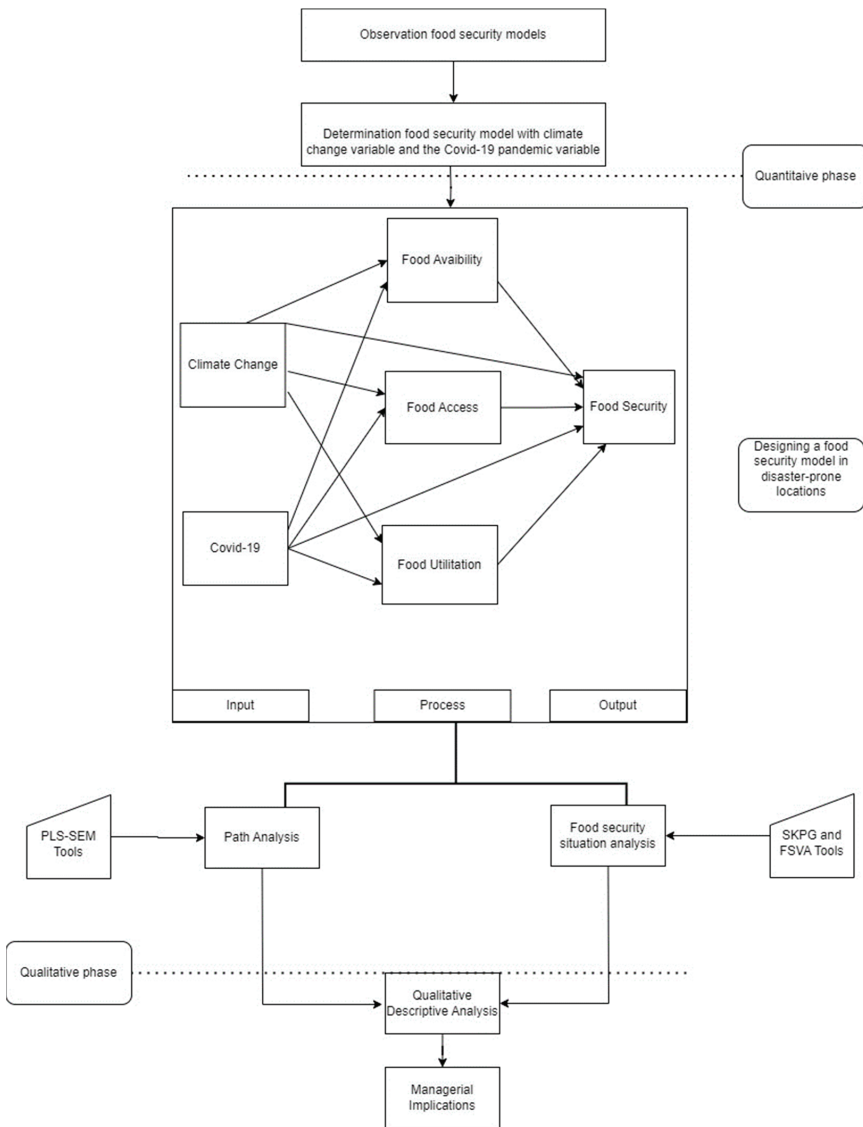


Figure 2. Research method.

All items were evaluated using a Likert scale of one to five, with five expressing strong agreement. The Likert scale is used to convey how strongly respondents agree or disagree with specific statements about actions, things, people, or events. The suggested scale typically consists of five points. A Likert scale was chosen with five class scores as the measurement. There are a total of five groups, made up of the average value of each informant. The following formula can be utilized to determine class intervals:

Explanation:
 $SR = \text{Range} (0.8)$

$$SR = \frac{(a - b)}{c}$$

$b = \text{Minimum scores (1)}$

a = Maximum scores (5)

c = Number of class intervals (5)

These calculations enable us to establish that the calculated scale range is 0.8. According to the statement on the research questionnaire, the average range of 1.00–1.80 can be categorized into the Poor category; >0.80–2.60 can be categorized into the Fair category; >2.60–3.40 can be categorized into the Good category; >3.40–4.20 can be categorized into the Very Good category; and >4.20–5.00 can be categorized into the Excellent category. The items used to measure each variable are listed in Table A1 in Appendix A.

2.2. Data Analysis

The data processing and analysis for this study employed partial least squares structural equation modeling, validity testing, reliability tests, descriptive analyses, and simulation of partial least squares structural equilibrium (PLS-SEM). In this study, Smart PLS 3.0 was used. Descriptive analysis was performed to obtain a wide description of the characteristics of respondents, including gender, age, education, and respondent profile, as well as to describe food security implementation using the mean. For the measurement, a 5-point Likert scale was used to determine the scale range. A Likert scale is used to assess respondents' attitudes, views, and perceptions of social issues.

Secondary data in the form of FSVA maps and SKPG maps of Pamijahan District from the Bogor District Government were analyzed in relation to the food security situation in the Bogor District. Primary data for quantitative analysis was collected using a survey method with questionnaire aids, as well as the results of in-depth interviews with key persons in Pamijahan District who understand the characteristics and local ecological knowledge that can maintain food security in the area, as well as residents and housewives who have babies or toddlers who are affected by floods and the COVID-19 outbreak. The population of this study was composed of 194 families affected by natural disasters in Pamijahan District, Bogor Regency. The locations affected by the disaster in Pamijahan District are Cibunian Village and Purwabakti Village. The determination of examples for research respondents is based on the formula from Frank Lynch as follows (Iskandar 2018):

$$n = \frac{NZ^2 \cdot p(1-p)}{ND^2 + Z^2 \cdot p(1-p)}$$

where:

n = Sample size (64)

N = Total population (194)

Z = Value in the area under the normal distribution curve (1.96)

P = Largest possible proportion (0.50)

D = Degree of deviation (10%)

By using a population-sample table based on the formula from Frank Lynch, for a total population (N) of 194 at a 95% confidence level and a degree of deviation (D) of 10%, the sample size (n) in this study amounted to 64.

2.3. Model Analysis

The study began with an analysis of the food security situation in Pamijahan District, Bogor Regency, using secondary data from the results of the FSVA analysis and SKPG analysis from the Bogor Regency Food Security Service (Rimadianti et al. 2016). Termination of the indicators that most influence the status of food security after the disaster due to climate change and COVID-19 in Pamijahan District, Bogor Regency, uses path analysis with Smart PLS 3.0 software (Yudhanto et al. 2023). Then the results of the analysis above are compiled with the results of in-depth interviews to formulate managerial implications for maintaining food security in disaster-prone areas. This research uses a validity test, a reliability test, descriptive analysis, and partial least squares structural equation simulation (PLS-SEM).

In FSVA analysis, there was a change in the assessment indicators, which were originally nine indicators in 2017, to six indicators in 2019. The nine FSVA indicators in 2017 include the ratio of stalls to households, the ratio of shops to households, the ratio of people with the lowest welfare status, the ratio of households without access to electricity, the number of villages without adequate connecting access, the ratio of children not attending school, the ratio of households without access to clean water, the ratio of health workers to residents, and the ratio of households without residential facilities. Then the FSVA analysis was refined into six indicators covering the ratio of agricultural land area, the ratio of food supply infrastructure, the ratio of people with the lowest level of welfare, the number of villages with inadequate connecting access, the ratio of households without access to clean water, and the ratio of the number of villagers per health worker. The six indicators are weighted according to their level of importance, then a composite score is calculated and grouped according to the cut-off for each category.

The measurement model (outer model) and the structural model (inner model) are the two sub-models that make up the PLS-SEM analysis (Joe F. Hair et al. 2014). Construct convergent validity, discriminant validity, and reliability were assessed using the outer model (J. H. Hair et al. 2017). In addition, the inner model is used to assess the relevance of the path coefficient and R-square value. Two categories of variables are used in PLS-SEM. The first is the observed variable, sometimes known as the manifest variable because it can be viewed immediately. The second category is unobserved variables, sometimes known as latent variables because they cannot be observed directly (Joe F. Hair et al. 2014). Together with the six latent variables, there are 112 manifest variables. The model of this study can be seen in Figure 3. Previously, a content validation test was carried out on the research questionnaire to obtain validity (Ayu Dessy Sugiharni 2018), conducted by two experts, including academics and practitioners in the field of food security. The value of the content validity ratio (CVR) from the results of the questionnaire content validation test in this study was 0.89, so the questionnaire can be said to be valid.

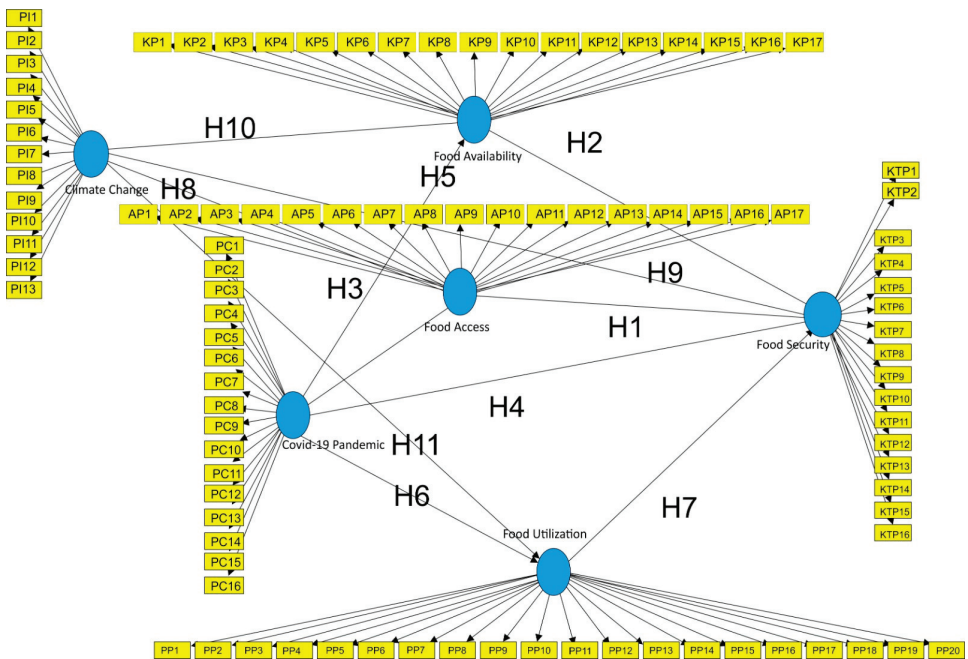


Figure 3. Research models.

The hypotheses in this study can be described as follows:

- H1.** *Access to food has a positive and significant effect on food security in Pamijahan District.*
- H2.** *Food availability has a positive and significant effect on food security in Pamijahan District.*
- H3.** *The COVID-19 outbreak has had a positive and significant effect on access to food in Pamijahan District.*
- H4.** *The COVID-19 outbreak has had a positive and significant effect on food security in Pamijahan District.*
- H5.** *The COVID-19 outbreak has had a positive and significant effect on food availability in Pamijahan District.*
- H6.** *The COVID-19 outbreak has had a positive and significant effect on food utilization in Pamijahan District.*
- H7.** *Food utilization has a positive and significant effect on food security in Pamijahan District.*
- H8.** *Climate change has a positive and significant effect on access to food in Pamijahan District.*
- H9.** *Climate change has a positive and significant effect on food security in Pamijahan District.*
- H10.** *Climate change has a positive and significant effect on food availability in Pamijahan District.*
- H11.** *Climate change has a positive and significant effect on food utilization in Pamijahan District.*

Outer model evaluation and inner model evaluation are two evaluation models used in PLS-SEM data analysis (Cheung 2013). The external model is used to test the effect of latent variable indicators. Multicollinearity was used in this work to clarify the data without any visible bias before analysis. The absence of multicollinearity problems is a prerequisite for properly checking the outer model. Situations with substantial correlations or connectedness between indicators are called multicollinearity. A variance inflating factor (VIF) value of more than five indicates a multicollinearity correlation value, which is defined as a correlation value of more than nine. Multicollinearity occurs if the VIF value of the latent variable is greater than five. Actions that can be taken include reducing or eliminating indications with a high degree of association (J. H. Hair et al. 2017).

The evaluation of the outer model consists of three tests. The convergent validity test can be used to assess how well the manifest variable can explain hidden variables by looking at the loading factor above 0.50. When the average variance extract (AVE) results are greater than 0.50, the discriminant validity test is used to assess how much the latent and manifest variables differ from each other. Previous research explained the relationship between Cronbach's alpha above 0.60 and the composite reliability used to test composite reliability (J. H. Hair et al. 2017). The inner model is used to determine the effect of the independent variables on the dependent variable by comparing the coefficient of determination (R square) and the path coefficient (Ghozali and Latan 2015).

3. Results and Discussion

3.1. Food Security Conditions in Pamijahan District

The conceptual framework for regional food security considers food availability, access to food, and utilization of food, which guarantees that all individuals have the right to obtain food according to their needs. The opposite condition of food security is called food and nutrition insecurity.

Information related to food insecurity was analyzed using two analytical tools according to its causes. Based on the causes, food insecurity can be divided into chronic food insecurity and transient food insecurity. Chronic food insecurity was analyzed using the analysis map of Food Security and Vulnerability, or Food Security and Vulnerability Atlas (FSVA), and transient food insecurity using the Food and Nutrition Alertness System/SKPG analysis.

3.1.1. FSVA Analysis

The FSVA analysis for Pamijahan District was carried out in 2017, 2019, 2021, and 2022. Table 1 shows the composite results of the FSVA analysis for 2017, 2019, 2021, and 2022 in the Pamijahan District.

Table 1. FSVA analysis of Cibunian Village and Purwabakti Village.

Village	Year			
	2017	2019	2021	2022
Cibunian	1	4	3	3
Purwabakti	1	3	2	3

Source: Compiled by the author

The results of the FSVA analysis were divided into 2 groups, namely the food-insecure vulnerable group consisting of Priority 1 (very food-insecure), Priority 2 (food-insecure vulnerable), and Priority 3 (somewhat vulnerable to food insecurity). The food-secure group consists of Priority 4 (somewhat food-secure), Priority 5 (food-secure), and Priority 6 (very food-secure).

In 2017, Cibunian Village and Purwabakti Village were in Priority 1, namely in the vulnerable category of food insecurity caused by the low level of welfare of the population, the high number of children who are not in school, and the high number of households that do not have clean water facilities. There are differences in the approach and method of calculating the 2017 FSVA analysis, so it cannot be compared with the following year's FSVA analysis.

3.1.2. SKPG Analysis

SKPG is an early warning system adopted from GIEWS, the Global Information and Early Warning System on Food and Agriculture (Shaw 2007). In the SKPG analysis, three aspects are used: the availability aspect (planting area and puso area), the aspect of food access (food prices), and the aspect of food utilization (nutritional status of toddlers). This study found an increase in food insecurity in terms of food availability and food access. Figure 4 presents the development of the results of the availability aspect analysis in Pamijahan District in the 2017–2022 period.

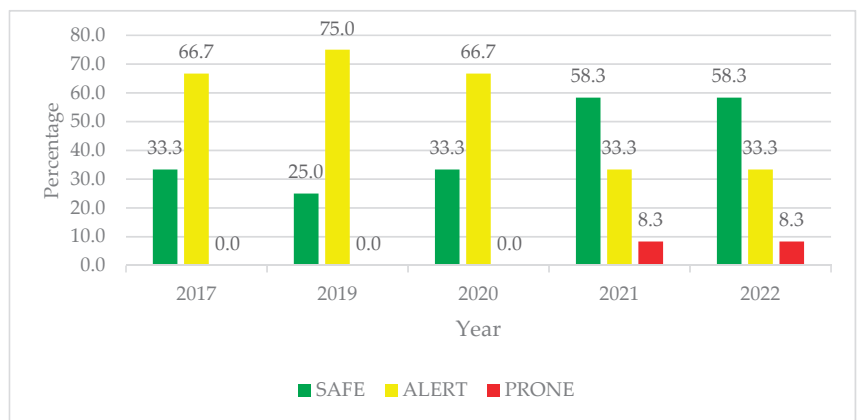


Figure 4. Food availability in 2017–2022.

Based on the SKPG analysis, the food security status is classified into three categories: safe, alert, and food insecure. Food security generally looks stable in terms of availability in 2017, 2019, 2021, and 2022, but there has been an 8.3% increase in food insecurity. This

shows an increase in crop failures caused by natural disasters such as floods, droughts, and plant-destroying organism attacks as a result of climate change (UNFCC 2015). Figure 5 shows the situation of food security in terms of food access.

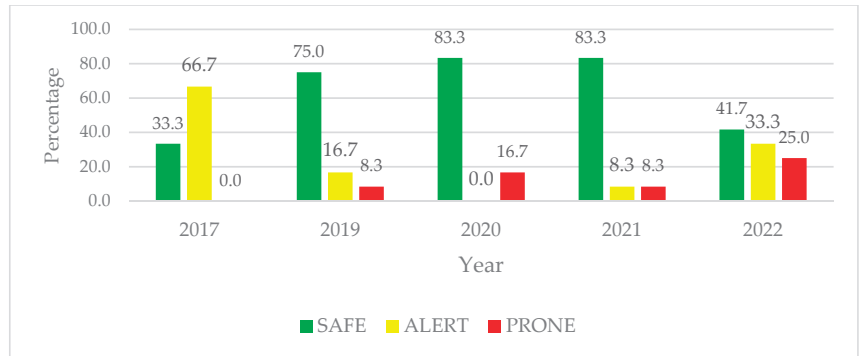


Figure 5. Access to food in 2017–2022.

Changes in rice prices compared to prices in the previous three months are used to assess food access. The vulnerable category increased from 0% to 25% from 2017 to 2022, while food alert conditions increased from 2017 to 33.3% in 2022, indicating an increase in food costs beginning in 2019 owing to the COVID-19 pandemic. The COVID-19 epidemic poses a significant danger to food availability (Rume and Islam 2020). The COVID-19 pandemic has caused a 20% increase in global food prices (Laborde et al. 2020).

3.2. Determination of the Most Influential Indicators on Food Security in Pamijahan District, Bogor Regency

3.2.1. Common Method Bias

A problem known as common method bias (CMB) occurs when the measurement technique used in SEM studies causes problems rather than a network of causes and effects among the latent variables in the model being investigated (Kock 2015). In this study, Smart PLS is used to identify CMB threats. The test indicates that the VIF element is lower than the 3.3 threshold. This shows that the model is free from CMB (J. H. Hair et al. 2017; Kock 2015).

3.2.2. Model Measurement

The suitability of the measurements is checked using validity and reliability standards. The ability of a measuring device (or object) to consistently produce the same result is known as reliability. Validity is a measure of how accurately an understanding is measured by measuring instruments (items). Because there is a multicollinearity condition, actions that can be taken include reducing or eliminating indications with a high degree of association. The VIF/correlation matrix measurement results at the manifest variable level for all latent variables in Table 1 are listed below, while the summary of model measurements after the multicollinearity test is shown in Table 2.

The assumption that must be met when analyzing the outer model is that there are no multicollinearity problems. Multicollinearity is a problem of interconnection or strong correlation between indicators. The multicollinearity correlation value is indicated by a correlation value of more than 9, which is indicated by a variance inflating factor (VIF) value of more than 5.

Table 2. Correlation matrix information.

Items	AP	KTP	KP	PC	PP	PI
AP		2.023				
KTP						
KP		1.096				
PC	1.194	1.510	1.194		1.194	
PP		1.739				
PI	1.194	1.509	1.194		1.194	

Source: Compiled by the author. Remarks: AP: access to food; PC: COVID-19 outbreak; ETC: food security; PP: utilization of food; KP: food availability; PI: climate change.

If there is a latent variable VIF value of more than 5, then there is multicollinearity. The consequent actions that can be taken include dropping or removing indicators that have a strong correlation. Following are the results of VIF measurements at the manifest variable level for all latent variables shown in Table 3.

Table 3. Summary of model measurements after the multicollinearity test.

Item	Indicator	Measurement Result					Supported	
Outer Loading	>0.7	PI4	0.874	KP4	0.821	KP3	0.783	Yes
		PC15	0.816	AP4	0.760	AP1	0.754	
		KP8	0.796	KTP1	0.799	PP5	0.811	
		PP2	0.896	PC13	0.872	PC7	0.833	
		PI5	0.884	KP5	0.796	PP1	0.853	
		PC16	0.810	AP9	0.874	KTP12	0.900	
		KP9	0.816	KTP11	0.886	PC6	0.732	
		PP3	0.829	PC14	0.830	KP6	0.838	
Average Variance Extracted (AVE)	>0.5	PI		0.773		PC	0.667	Yes
		KP		0.649		AP	0.636	
		PP		0.718		KTP	0.734	
Composite Reliability	>0.6	PI		0.872		PC	0.923	Yes
		KP		0.937		AP	0.839	
		PP		0.911		KTP	0.892	
Cronbach Alpha	>0.6	PI		0.901		PC	0.901	Yes
		KP		0.924		AP	0.731	
		PP		0.871		KTP	0.816	

Source: Compiled by the author.

All of the statements in the questionnaire were declared valid at the 5% significance level, where the r count exceeded the r table based on the results of the validity and reliability of 64 samples (0.361). In this study, the value of Cronbach's alpha for each variable was greater than 0.06, which indicates the dependability of the variable.

The Fornell-Larcker criterion, measuring the degree of anticipated "difference" between items for various factors, was used to test for discriminant validity. The square of the correlation was compared with the AVE of each factor to assess the discriminant validity of the model. In the other case, the correlation coefficient between factors is considered to have very good discriminant validity when the AVE is greater than the correlation coefficient between factors and other factors. The values on the diagonal represent the square root of AVE (J. H. Hair et al. 2017), while the values outside the diagonal are correlations. The results of discriminant validity are shown in Table 4.

Table 4. Discriminant validity matrix.

Items	AP	KTP	KP	PC	PP	PI
AP	0.798					
KTP	0.429	0.857				
KP	0.259	0.263	0.805			
PC	0.551	0.317	0.149	0.816		
PP	0.597	0.457	0.254	0.455	0.848	
PI	0.526	0.522	0.104	0.403	0.489	0.879

Source: Compiled by the author.

3.2.3. Result Analysis

With a loading factor value of 0.50 and no multicollinearity problems, 26 of the 112 tested indicators passed the convergent validity test, according to the outer model assessment (Table 1). In the discriminant validity test, each latent variable has an AVE value greater than 0.50. Figure 6 depicts the final model.

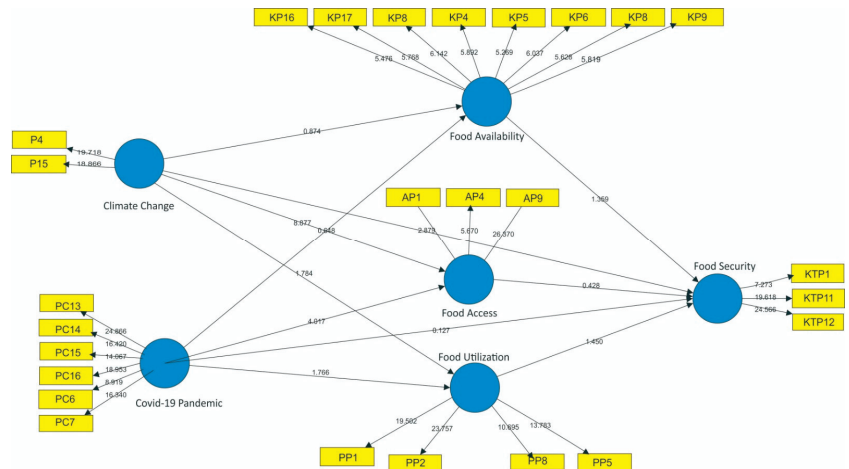


Figure 6. Final research model.

All latent variables in the composite reliability test are known to have a Cronbach’s alpha value of 0.60, and these variables meet the requirements for the composite reliability test. This follows the concept that the research model can be accepted as valid and credible by eliminating eleven variables. The inner model is assessed by analyzing the R-square value and the path coefficient. In addition, this model uses the R-square value to determine how much influence the exogenous variables have on the endogenous variables.

The results of the convergent validity test are determined based on the principle that the measurement of a construct must have a high correlation (Joseph F. Hair et al. 2019). The convergent validity of a construct with a reflective indicator was evaluated by average variance extracted (AVE). The minimum AVE value is equal to or greater than 0.5, while an AVE value of 0.5 or more means that the construct can explain more than 50% of the item variance.

Analysis of *discriminant validity*, which is carried out to ensure that each concept of each latent model is different from other variables, refers to value cross-loading, or the *Fornell-Larcker criterion*, from the manifest variable to its latent variable. *Discriminant validity* aims to test to what extent the latent construct differs from other constructs. A high value indicates that a construct is unique and able to explain the phenomenon being measured. All latent construct values must be greater than the correlation with other constructs so that

the discriminant validity requirements in this model have been fulfilled. The calculation results of the *Fornell-Larcker criterion* for *discriminant validity* are shown in Table 5.

Table 5. Fornell-Larcker criterion for discriminant validity.

Items	AP	KTP	KP	PC	PP	PI
AP	0.798					
KTP	0.429	0.857				
KP	0.259	0.263	0.805			
PC	0.551	0.317	0.149	0.816		
PP	0.597	0.457	0.254	0.455	0.848	
PI	0.526	0.522	0.104	0.403	0.489	0.879

Source: Compiled by the author. Remarks: AP: access to food; PC: COVID-19 outbreak; KTP: food security; PI: climate change; KP: food availability; PP: food utilization.

All latent variable values in the model have findings that are greater than the correlation values of the other latent variable constructs, according to measurements using the Fornell-Larcker criterion, as shown in Table 5. As a result, this model meets the criteria for discriminant validity (J. F. Hair et al. 2019). Furthermore, it may be argued that this model is both usable and legitimate. To test and evaluate the inner model, R-square and path coefficient significance are used. The impact of exogenous variables on endogenous variables is measured using the R-square. Table 6 displays the R-square calculation's outcomes.

Table 6. Results of the R-Square.

Variable	R-Square
Access to Food	0.413
Food security	0.355
Food availability	0.025

Source: Compiled by the author.

According to Table 6, which is in the moderate category, the food access variable can explain the food security variable by 41.3%, and the food utilization variable can explain the food security variable by 31.9%. Food availability and food security have a 2.5% association, which is considered to be low. A 35.5% link exists between food security and the accessibility, utilization, and availability of food. There are additional elements that influence food security in this situation, including the stability of the food system.

The route coefficient significance test, which uses the bootstrap method, produced the original sample values, *p*-values, and *t*-statistic values to assess the research model and research hypotheses. The variables' relationships to one another are made evident by the initial sample values. A variable transforms from a negative to a positive state when it has a positive influence, and vice versa. A hypothesis test's significance can be determined by calculating the *t*-statistic value. The *p*-value is less than 0.05, which indicates that the hypothesis is supported. Table 7 displays the value of the route coefficient, which depicts the link between all variables.

Food security is positively impacted by access to food, with a *p*-value greater than 0.05. This shows that despite a variety of circumstances and conditions that might make it difficult to access food, residents of Cibunian Village and Purwabakti Village, Pamijahan District, will continue to make an effort to meet their food needs, so H1 is not accepted.

With a *p*-value greater than 0.05, food availability has a beneficial but small impact on food security. As a result, H2 is not accepted. This shows that food is still available for the citizens of Cibunian Village and Purwabakti Village in the Pamijahan District, though the quantity and variety have declined at the home level and in food supply facilities.

Table 7. Path coefficients.

Path	Original Sample	T-Statistic	<i>p</i> -Value	Hypotheses
AP → KTP	0.074	0.428	0.334	H1 not accepted
KP → KTP	0.155	1.359	0.087	H2 not accepted
PC → AP	0.404	4.017	0.000	H3 accepted
PC → KTP	0.021	0.127	0.449	H4 not accepted
PC → KP	0.128	0.648	0.259	H5 not accepted
PC → PP	0.308	1.765	0.039	H6 accepted
PP → KTP	0.184	1.450	0.074	H7 not accepted
PI → AP	0.363	3.377	0.000	H8 accepted
PI → KTP	0.368	2.879	0.002	H9 accepted
PI → KP	0.052	0.374	0.354	H10 not accepted
PI → PP	0.365	2.784	0.003	H11 accepted

Source: Compiled by the author.

With a *p*-value less than 0.05, the COVID-19 outbreak has a positive and significant influence on the food access variable, indicating that the COVID-19 outbreak has caused a fall in the income of residents in Cibunian Village and Purwabakti Village. Furthermore, the COVID-19 outbreak has raised food prices, impeded food distribution, and forced the closure of food supply facilities. In the event of a COVID-19 outbreak, there is a policy of restricting community activities that influence the food delivery system, so H3 can be accepted.

With a *p*-value greater than 0.05, the COVID-19 outbreak has a positive but insignificant influence on food security. This demonstrates that, despite the COVID-19 outbreak, Pamijahan residents continue to consume food, but the amount consumed has dropped, particularly consumption of animal food, causing family members, including toddlers, to feel unwell more frequently. As we know, the output of food security is good nutritional and health status, which is shown in the monthly increase in the weight of children under five and the consumption of food by the needs for an ideal healthy life, resulting in H4 being accepted.

The COVID-19 outbreak has a positive but insignificant effect on food availability, with a *p*-value of more than 0.05. This shows that food is still available at the household level and in food supply facilities, but the amount and type have decreased. Apart from that, the COVID-19 outbreak has also caused the reserve fund to buy food to decrease, so H5 was not accepted.

The COVID-19 outbreak had a beneficial and substantial effect on food utilization, with a *p*-value less than 0.05. Because of the COVID-19 outbreak, the variety and amount of food consumed have decreased, while the use of rice fields for food sources has increased, allowing H6 to be accepted.

Food utilization has a positive but insignificant effect on food security, with a *p*-value greater than 0.05. This suggests that residents of Cibunian Village and Purwabakti Village continue to eat every day, but the frequency and kind of food consumed have decreased. Furthermore, the quality of drinking water has deteriorated, causing H7 to be accepted.

Climate change has a favorable and significant impact on food access, with a *p*-value less than 0.05. This demonstrates that floods caused by climate change reduce the amount of money available for food purchases. Flooding also forced food providers to change modes of conveyance due to a lack of road access. Furthermore, during flood conditions, food supply facilities such as booths and shops are closed, so H8 can be accepted.

With a *p*-value less than 0.05, climate change has a positive and substantial effect on food security. The nutritional and health status of a community reflects the region's food security situation. This suggests that floods caused by climate change have made residents of Cibunian Village and Purwabakti Village sicker more frequently; hence, H9 is accepted.

With a *p*-value greater than 0.05, climate change has a positive and substantial effect on food availability. This demonstrates that food is still available during floods caused

by climate change, but the amount and type at the household level, as well as the food provider's advice, are reduced, hence H10 is refused.

3.3. Public Perception of the Effects of Climate Change and the COVID-19 Outbreak on Food Security in Pamijahan District

According to Watts (2009), sustainable development will be successful if all stakeholders, including the community, work together as a single organism. It is critical to understand the perspectives of those who are touched by the events that occur, as well as local knowledge, to reduce existing problems. As a result, this study employs a sequential explanatory mixed-methods design (John W. Creswell 2014), which includes both quantitative and qualitative components. The qualitative technique based on in-depth interviews seeks to ascertain the community's opinion on the impact of climate change and the COVID-19 outbreak on food security and existing local ecological knowledge.

Based on in-depth interviews, flood-affected residents endure fear and trauma. Residents stated that the flood disaster had a greater impact on the economy and family food availability than the COVID-19 outbreak because the flood damaged rice fields and fish ponds, which are also sources of livelihood and food for residents, as well as transportation for food providers. Rising temperatures, erratic weather, and high-intensity rains causing floods and landslides are all symptoms of climate change. During the COVID-19 outbreak, no inhabitants were confirmed positive for COVID-19, although health precautions were put in place to avoid COVID-19 transmission.

Flooding of fish ponds and rice fields caused crop failure among the inhabitants, resulting in a decreased food supply. The water also destroyed food storage facilities (refrigerators, cupboards, and other items), leaving inhabitants without food. The flood devastated the road transportation infrastructure, isolating the town and making it difficult for locals to obtain rice and other basic components. The state of food supplies was likewise unstable for a few months following the disaster. Those who could previously buy 30 kg of rice can now only buy 10 kg of rice, while those who could previously buy 1 kg of eggs can now only buy 2 eggs.

Flood-affected residents saw a greater than 50% loss in income, affecting their capacity to obtain food. Flooding cost 68.8% of respondents their jobs as farm laborers. Furthermore, the flood destroyed highways, resulting in a scarcity of some foodstuffs.

A decreased income forces residents to cut their food budget, reducing the frequency of meals for flood-affected residents, which is not in accordance with a balanced nutritional diet. Aside from that, locals reported that following the floods and the COVID-19 outbreak, residents, particularly toddlers, became more easily ill. This has the potential to generate nutritional and public health issues if not handled properly.

According to in-depth interviews, floods caused by climate change and the COVID-19 outbreak have had an impact on all facets of food security in food-surplus but disaster-prone countries. Farm laborers provide the majority of the livelihoods of those affected by the crisis, according to (The Economist Group 2022), and farmers are the most susceptible group because of climate change and the COVID-19 outbreak. Agriculture is fundamentally reliant on the environment. While agriculture is crucial for producing food and providing nutrients for human health, it can also have an impact on the environment by polluting air and water and generating greenhouse emissions (Gilbert 2012).

Agriculture, food, public health, and climate change are all interconnected in different ways (Lam et al. 2017; Ramachandran et al. 2020). Declining environmental quality can have an impact on public health and raise health care spending, which in turn has an impact on agricultural and food production (Wu et al. 2016). Environmentally friendly agricultural and food systems, on the other hand, can reduce GHG emissions, improve public health, and raise the capacity and output potential of future agricultural systems (Barbier 2020).

For the establishment of an environmentally friendly agricultural and food system, local ecological knowledge and resources must be studied (Lam et al. 2017). Based on

conversations with agricultural extension workers, traditional leaders, and local farmers in Pamijahan District, they continue to adopt sustainable farming practices based on local ecological knowledge. Agricultural activity is not simply a means of meeting human needs but also of drawing closer to the Creator. Before beginning the planting process, Pamijahan local community/farmers hold a scattering meeting attended by the Association of Farmers Groups (Gapoktan), neighborhood associations, village heads, and village elders to determine the planting time and location based on constellations.

Local farmers control pests and diseases by rotating planting kinds, trading seeds among farmers, and using natural pesticides. Local farmers believe that in growing rice, everything in the food chain, including pests and animals, has a role, so they do not use chemicals to manage them. This is consistent with the concepts of sustainable agriculture, which include adaptive agriculture that continues to grow, remains functional, is resistant to stress, becomes productive, uses resources efficiently, and balances sustainability goals at all scales (Mucharam et al. 2022).

Citizens in Pamijahan District have a history of preserving the harvest (rice) in a specific room called “Goah” or Leuit to assure the availability of food stocks. Rice storage in Goah/Leuit is being encouraged anew as the Pamijahan community abandons the habit. Goah/Leuit protects food security, especially in times of calamity or crop failure (Kusdiwanggo 2020).

Respondents in this study were people in Pamijahan District, Bogor Regency, who were devastated by floods and landslides on 22 June 2022. There were 64 households that responded. Respondent factors such as age, occupation, education, and income were examined. Table 8 shows further features of the respondents.

Table 8. Respondent criteria.

Characteristics	Criteria	Percentage (%)
Age (year)	31–40	43.8
	<50	21.9
	21–30	20.3
	41–50	14.1
Job	Agricultural labor	70.2
	Self-employed	10.9
	Farmer	9.4
	Trader	3.1
	Driver	1.6
	Debt collector	1.6
	Motorcycle driver	1.6
	Teacher	1.6
Level of education	Elementary School	76.6
	Junior High School	12.5
	Senior High School	7.8
	Bachelor Degree	3.1
Income per month (IDR)	Rp. 1,000,000–1,500,000	32.8
	Rp. 500,000–1,000,000	20.3
	Rp. 2,000,000–3,000,000	18.8
	Rp. 1,500,000–2,000,000	17.2
	Rp. 0–500,000	9.4
	Rp. >3,000,000	1.6

Source: Compiled by the author.

The characteristics of the respondents in this study were dominated by the age range of 31–40 years, namely 43.8%. This age range covers the productive age, which has the potential to increase resilience to face disaster threats due to climate change and non-natural disaster threats. Farm laborers are the dominant occupation of the respondents in this study, namely 68.8%. Farm laborers are people who receive wages by working in

other people's gardens or fields. The income of 32.8% of the respondents in this study amounted to Rp. 1,000,000–1,500,000 per month, which is still far below the Bogor Regency regional minimum wage of 4,217,206. The educational level of 76.6% of the respondents is elementary school.

3.4. Managerial Implications

The study's managerial implications are being implemented to establish food security in disaster-prone communities in Pamijahan District, Bogor Regency. Based on the findings of the food security situational analysis and qualitative descriptive analysis, the aspects most affected by climate change, specifically floods and the COVID-19 epidemic, are food availability and food access. The pathway analysis results also show that in order to mitigate the impacts of climate change and the COVID-19 epidemic, it is important to improve food availability and access.

To achieve food availability that fulfills the needs of each individual, the people of Pamijahan District may reestablish the tradition of storing rice/food crops in "Goah/Leuit" to guarantee food availability in natural and non-natural disaster situations. Furthermore, the community must re-implement sustainable agriculture by combining local ecological knowledge (being environmentally friendly, not greedy, and using agriculture to get closer to the Creator) with the most current advances in science and technology (using climate and weather information and disaster information in agricultural planning).

Stable food availability can be achieved by bringing food closer to the community, where it is not affected by price changes, food delivery problems caused by disasters, or decreasing incomes. A potential strategy is to use the grounds around the house for food (Boyacı-Gündüz et al. 2021).

Adaptation to disaster mitigation due to climate change is accomplished by the use of an agroforestry pattern in the implementation of sustainable agriculture (Alfatikha et al. 2020). This involves combining agricultural and forestry crops to increase resilience and reduce the danger of landslides, floods, and droughts.

4. Discussion

Climate change through increasing temperatures has an impact on rising sea levels, high rainfall intensity, and drought, which threaten food security and nutrition through interrelated impacts on land for agriculture, the growth of crops, the survival of sources of animal food, and labor productivity in agriculture (Hendriks et al. 2022). The average temperature in Pamijahan District in the period 1991–2022 increased by 0.60 °C. This temperature increase is still within normal limits, referring to the Paris Agreement (UNFCCC 2015), which states that the maximum limit for the global average temperature rise internationally is 1.5 °C. Increasing temperatures cause changes in distribution and rainfall and increase the potential for extreme climates.

At least one extreme climate event occurred between 1991 and 2022. A longer dry season resulted in drought, which was positively related to disaster events in Pamijahan District in particular. Temperature changes also affect seasonal shifts, such as a shorter rainy season with higher rainfall (floods) and a longer dry season. Bogor Regency is included in the most disaster-prone areas in West Java; according to provincial disaster-prone index data for 2011, it ranked fifth overall.

Torrential rains caused severe flooding and landslides in Pamijahan District, Bogor Regency, on 22 June 2022. These events caused three people to die, displaced more than 335 people, and destroyed more than 281 houses, schools, health facilities, and infrastructure (Regional Disaster Management Agency 2022). Floods in Pamijahan District caused disturbances throughout the food system, including damage to food supply infrastructure, namely rice fields, fields, fish ponds, food storage, transportation, and markets. In addition, access to food and clean water is also hampered (Hendriks et al. 2022). Because the majority of the affected residents were agricultural laborers, the floods that damaged rice fields and fish ponds also killed the residents' sources of income and livelihoods.

Floods, landslides, and strong winds are the three main hydrometeorological disasters in Pamijahan District. The probability of food insecurity in an area will increase if disasters occur frequently there (Baliwati 2019). Food insecurity can also be understood as a situation in which access to and consumption of food in a place, community, or household are insufficient to meet everyone's physiological needs for survival and growth. Food insecurity can occur simultaneously with certain events.

Using two analytical approaches, information on food insecurity and its causes is examined. Food insecurity can be classified as chronic or transient, depending on the cause (Sowe et al. 2015). This study investigated transient and chronic food insecurity using an analysis of the Food and Nutrition Awareness System (SKPG) and the Food Security and Vulnerability Map (FSVA).

Based on the findings of the FSVA analysis, the condition of food security in the Cibunian and Purwabakti villages in 2022 will drop to Priority 2 (somewhat vulnerable to food insecurity). From the end of 2019 until the end of 2022, the COVID-19 outbreak occurred, which attacked aspects of food access and significantly decreased the income and welfare of the population, resulting in a decrease in food purchasing power (Béné et al. 2021). The disruption caused by the COVID-19 outbreak has affected the poor and other marginalized groups, especially those with low purchasing power (Roubík et al. 2023).

As a result of crop failure, there is an increase in food insecurity in terms of food availability. Natural disasters that damage agricultural land and intensify the existence of creatures that disturb plants are one of the factors causing these conditions (Nuraisah and Kusumo 2019).

In addition to the unresolved COVID-19 disaster, in 2022 there will be flash floods, which will affect the food supply in Cibunian Village and Purwabakti Village. It was emphasized by (Rasul 2021) that the COVID-19 outbreak has largely had an impact on the components of food access related to decreased purchasing power and food shortages as a result of widespread social restrictions. In addition, in 2022, the villages of Cibunian and Purwabakti will experience flash floods, which will hinder access to logistics and hamper food distribution.

The percentage of under-fives in Pamijahan District is a benchmark for food utilization. Malnutrition in toddlers during the COVID-19 outbreak can be caused by several factors, including a decrease in services due to the restrictions resulting from the outbreak (Yuwansyah et al. 2021). In the 2018–2022 period, the frequency of underweight toddlers increased by 8.3% in Pamijahan District.

Five of the eleven feasible hypotheses were confirmed by this study:

1. The variable food availability has been positively and significantly impacted by the COVID-19 outbreak; this shows that the outbreak has reduced household income in Cibunian Village and Purwabakti Village. The COVID-19 outbreak in Cibunian Villages and Purwabakti Village has also had an impact on rising food prices, difficulties in food delivery, and the closure of food supply facilities (shops/basketball stalls). A policy to impose local operational restrictions also had an impact on the food distribution system during the COVID-19 outbreak situation.
2. Utilization of food has been positively and significantly impacted by the COVID-19 outbreak. This shows that the COVID-19 outbreak has resulted in a decrease in overall food consumption and an increase in the use of carrots as a food source.
3. Access to food is positively and significantly affected by climate change. This shows how catastrophic floods caused by climate change reduce the amount of money available to buy food and change the mode of transportation for those who deliver food since the floods cut off access to roads. Additionally, during flood situations, food supply facilities such as booths and shops are closed.
4. Food security is positively and significantly affected by climate change. The nutritional and health status of a community reflects the level of food security in that location. This shows that flooding due to climate change has made people sick more often in the Cibunian and Purwabakti villages.

5. Food use is positively and significantly affected by climate change. It shows how disasters caused by climate change reduce the quality of food and water.

5. Conclusions and Implications

5.1. Conclusions

The condition of food security in Pamijahan District, especially Cibunian Village and Purwabakti Village, meets the criteria of food insecurity for the period 2017–2022, according to FSVA analysis from the aspects of food availability, access, and utilization. Additionally, according to SKPG analysis, there is an increase in food insecurity of 8.3% for food availability, an increase of 33.3% for food access, and an increase of 8.3% for food utilization.

This study found a positive and substantial relationship between the COVID-19 outbreak variables, food access variables, and food use variables. In addition, there is a positive and robust relationship between climate change variables and food access, food use, and food security.

5.2. Limitations and Future Research

The constraints of this study are those imposed by the author, notably for the responding subjects, who are residents of two villages in Pamijahan District who have been directly affected by natural catastrophes and the COVID-19 outbreak. Second, this study is based on the perceptions of individual respondents who were intimately involved in the natural tragedy and the COVID-19 outbreak when food insecurity occurred concurrently.

Third, this study analyzes the direct influence of the correlation of all dependent variables in the developed food security model. Subsequent research can replicate all of the model variables that have been developed by involving the entire larger area over a longer period of time and by adding the dependent variable of the presence of digitization of food products that is getting closer to producers and consumers by comparing it with different regions within one province.

5.3. Policy Implications

It is critical to incorporate long-term sustainability into short-term policy decisions while developing policies and strategies. However, to ensure that short-term measures create long-term advantages, strategic thinking and a rigorous assessment of long-term policy alternatives and investment plans are required. Policies and plans should be connected with local ecological demands and knowledge, both short- and long-term.

Climate change and the COVID-19 outbreak present numerous challenges to global and regional food security. This study explores local ecological knowledge for establishing food security in disaster zones as well as the impact of climate change and the COVID-19 outbreak on food security. As a result, adaptation to climate change mitigation and the COVID-19 outbreak must be tackled by all stakeholders, especially local organizations or indigenous peoples who combine local ecological knowledge with the most recent scientific and technological breakthroughs.

5.4. Policy Recommendations

Policy recommendations:

1. Improving the process of developing social capital and other resources in order to build a disaster-resilient and food-independent society based on local ecological knowledge combined with scientific findings and cutting-edge technology.
2. Investigating and protecting local ecological knowledge through the use of the law and the establishment of non-commercial cultural places.
3. Improving farmers' access to financial independence by developing an environmentally and health-friendly circular economy.
4. The government should add sustainable living information to formal and non-formal education.

5. The government should invest in agriculture research and innovation that is both sustainable and health-friendly.

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Appendix A

Table A1. Survey (the original survey used with the participants was translated into this version).

Latent Variable	Manifest Variable	Code	Value				
			1	2	3	4	5
Climate Change	The current temperature/environment is hotter than it was 10–20 years ago	PI1					
	The rainy season lasts longer now than 10–20 years ago	PI2					
	The dry season lasts longer than 10–20 years ago	PI3					
	Rainy season patterns are easier to predict today than they were 10–20 years ago	PI4					
	The dry season pattern is easier to predict now than it was 10–20 years ago	PI5					
	Rainfall more often now than 10–20 years ago	PI6					
	There has been a lot of deforestation and land conversion over the past 10–20 years	PI7					
	Landslides are happening more frequently now than 10–20 years ago	PI8					
	Tornado disasters are happening more frequently now than 10–20 years ago	PI9					
	Flood disasters are more common now than 10–20 years ago	PI10					
	Crop failure due to disasters is more common now than 10–20 years ago	PI11					
	Plant pests were more common 10–20 years ago	PI12					
	Droughts are more common today than they were 10–20 years ago	PI13					

Table A1. Cont.

Latent Variable	Manifest Variable	Code	Value				
			1	2	3	4	5
COVID-19	Some villagers who have been confirmed infected by COVID-19	PC1					
	There are restrictions on activities during the COVID-19	PC2					
	There is independent isolation for residents positive for COVID-19	PC3					
	The head of the family often gets sick	PC4					
	Family members often experience pain	PC5					
	There are anticipatory steps to prevent disease	PC6					
	There are efforts by the village government to anticipate the threat of disease outbreaks	PC7					
	There is cooperation in handling sick residents	PC8					
	There is a movement for the consumption of healthy, nutritious, and balanced food	PC9					
	The family always does regular exercise	PC10					
	Online school	PC11					
	There is a health protocol in every social activity in the village	PC12					
	Villagers wear masks when going out	PC13					
	Villagers always wash their hands	PC14					
	Villagers keep their distance	PC15					
	Villagers carry out vaccines	PC16					
Food Availability	Climate Change						
	Climate change causes floods	KP1					
	Food production decreased due to the flood disaster	KP2					
	The amount of food availability in the market is reduced after the flood disaster due to climate change	KP3					
	The type of food availability in the market is reduced after the flood disaster due to climate change	KP4					
	The amount of food availability in households has increased after the floods caused by climate change	KP5					
	The type of household food availability has increased after the flood disaster due to climate change	KP6					
	Household food stores decreased after the flood disaster	KP7					
	There is a reserve fund to buy food after catastrophic floods due to climate change	KP8					
	There is a village food barn after the flood disaster caused by climate change	KP9					
	COVID-19						
	Food production has decreased due to COVID-19	KP10					
The amount of food availability in the market has decreased after the COVID-19	KP11						
The type of food availability in the market has decreased after the COVID-19	KP12						

Table A1. Cont.

Latent Variable	Manifest Variable	Code	Value				
			1	2	3	4	5
	The amount of food availability in households has increased after the COVID-19	KP13					
	The type of household food availability has increased after the COVID-19	KP14					
	Household food stocks are reduced after the COVID-19	KP15					
	There is a reserve fund to buy food after the COVID-19	KP16					
	There is a village food barn after the COVID-19	KP17					
	Climate Change						
	Family income decreased after the flood disaster	AP1					
	Income decreased after the flood disaster	AP2					
	The flood disaster caused food distribution to be hampered	AP3					
	Changes in means of transportation of foodstuffs after the flood disaster	AP4					
	The flood disaster caused a decrease in the cost of storing food	AP5					
	Food prices increased after the floods	AP6					
Food Access	Increased food prices cause food shortages in households	AP7					
	Many roads were damaged by the floods	AP8					
	Stores/stalls providing food are closed due to the flood	AP9					
	COVID-19						
	Family income has decreased after COVID-19	AP10					
	Income reduced after COVID-19	AP11					
	COVID-19 has hampered food distribution	AP12					
	Changes in food transportation equipment after COVID-19	AP13					
	COVID-19 causes a decrease in the cost of storing food	AP14					
	Food prices increased after the COVID-19	AP15					
Food Access	Increased food prices cause food shortages in households	AP16					
	Stores/stalls providing food are closed due to the COVID-19	AP17					
	Climate Change						
	There was a decrease in the quality of food after the flood disaster	PP1					
	Flood disaster causes foodstuffs/food to be cleaner and safer	PP2					
	Flood disaster caused foodstuffs/food to be stored longer	PP3					
	The amount of food eaten became more after the flood disaster	PP4					
	The frequency of eating is more frequent after the flood disaster	PP5					
Food Utilization	Utilization of coral reefs for food crops increased after the flood	PP6					
	Leftover food decreased after the flood disaster	PP7					
	The frequency of cooking decreased after the flood disaster	PP8					
	COVID-19						
	There has been a decline in the quality of drinking water after COVID-19	PP9					
	There has been a decline in food quality after COVID-19	PP10					

Table A1. Cont.

Latent Variable	Manifest Variable	Code	Value				
			1	2	3	4	5
	COVID-19 causes foodstuffs/food to be cleaner and safer	PP11					
	COVID-19 causes foodstuffs/food to be stored longer	PP12					
	The type of food has become more varied COVID-19	PP13					
	The amount of food eaten becomes more	PP14					
	The amount of food consumption is higher after COVID-19	PP15					
	The use of coral reefs for food crops increased after COVID-19	PP16					
	The application of hydroponic cultivation has increased after the outbreak	PP17					
	Food leftovers have decreased after the COVID-19 Outbreak	PP18					
	Cooking frequency decreased after the COVID-19 Outbreak	PP19					
	COVID-19 causes patterns of food consumption	PP20					
	Climate Change						
	Flood disasters cause you to get sick more often	KTP1					
	Flood disasters due to climate change cause your family members to get sick more often	KTP2					
	I feel all of my suits getting bigger after flood disaster	KTP3					
	The weight of your family members decreased after the flood disaster	KTP4					
	Food availability at household decreased after the flood disaster	KTP5					
Food Security	Food consumption increased after the flood disaster	KTP6					
	Consumption of animal and vegetable side dishes increased after the flood	KTP7					
	Vegetable consumption increased after the flood	KTP8					
	Your toddler's body weight went down after the flood	KTP9					
	Your toddler is often sick after the flood	KTP10					
	COVID-19						
	COVID-19 cause you to get sick more often	KTP11					
	COVID-19 cause your family members to get sick more often	KTP12					
	I feel all of my suits getting bigger after COVID-19	KTP13					
	The weight of your family members decreased after the COVID-19	KTP14					
	Food availability at household decreased after COVID-19	KTP15					
Food Security	Food consumption increased after the COVID-19	KTP16					
	Consumption of animal and vegetable side dishes increased after COVID-19	KTP17					
	Vegetable consumption increased after COVID-19	KTP18					
	Your toddler's body weight went down after COVID-19	KTP19					
	Your toddler is often sick after the COVID-19	KTP20					

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