

Article

Broadband Mobile Applications' Adoption by SMEs in Taiwan—A Multi-Perspective Study of Determinants

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Abstract: The purpose of this study is to explore what determinants affect small and medium enterprises regarding the adoption of broadband mobile applications. Today, broadband mobile applications are changing the business landscape rapidly, which presents a vital issue for enterprises to understand and tackle. Both qualitative and quantitative methods were applied in this study in order to analyze the issues enterprises may face with broadband mobile applications. Qualitatively, a preliminary study was conducted based on a review of literature to explore the factors that impact small and medium enterprises. Quantitatively, Structural Equation Modeling and AMOS were deployed to further examine the potential factors. As broadband mobile applications are mostly installed in the personal mobile device and operated by individuals, this study integrated the perspective of internal users along with the Technology-Organization-Environment framework to develop an ITOE research model to provide a more comprehensive view on the determinants and factors. The practicality and feasibility of the ITOE research model were then verified by the study results through the fifteen determinants identified. Based on the findings, implications and future research directions are proposed.



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Keywords: broadband mobile application; SME; determinants of adoption; TOE; internal users' perspective

1. Introduction

During the COVID-19 pandemic, many small and medium-sized enterprises (SMEs) suffered declines in business. Mobile applications and services still drive the growth of the world economy. In 2021, the economic value added by mobile applications and services reached 5% of GDP globally [1]. According to the GSMA (Groupe Speciale Mobile Association), by 2025, the figure will reach nearly 5 trillion US dollars. Broadband mobile applications will continue to improve productivity and efficiency in all economic sectors, especially in the service and manufacturing industries. As a result, enterprises are facing austere challenges caused by new types of clients and new patterns of management [2], people working from home by using various telecommuting tools in the time of the coronavirus outbreak, and merchants, more frequently, communicating with customers by using mobile tools during the transaction process. Conversely, the features of broadband mobile technology such as connectivity, agility, interactivity, and being 'always-on' can deliver various advantages to business. Namely, mobile technologies can be used for increasing business operational efficiency, and to improve responsiveness and competitiveness [3].

Widely deployed broadband mobile networks to date enjoy a favorable environment for leading into a new era of mobile applications. The rapidly developing broadband mobile technology with more powerful features not only facilitates various types of innovative applications such as telecommuting, digital marketing, cloud computing services, internet of things (IoT), smart home and smart city, augmented reality (AR), and artificial

intelligence (AI) manufacturing, but also accelerates the innovation of business models and change the appearance of industries [4]. SMEs play an important role in economic growth and job creation [5,6], and faced severe business difficulties during the pandemic [7]. The use of innovative ICT and mobile applications is more vital for SMEs, however, few studies have focused on the adoption of broadband mobile applications to expedite the growth and evolution of SMEs. Yet broadband mobile applications will probably be the key to driving the digitalization of enterprises. Hence, the main purpose of this study is to explore the determinants of SMEs' adoption of broadband mobile applications. We hope that the results of this research may be of great help in strengthening the competitiveness and digital transformation of SMEs.

Most of the broadband mobile applications must be installed in and operated by personal mobile devices, and the intention of internal users must be accounted for. Thus, this study applied the Technology-Organization-Environment (TOE) framework along with the internal users' point of view and proposed an ITOE research model in an attempt to obtain a broader perspective. Qualitative interviews were conducted in the first phase to collect data from 12 SMEs in different industries and in different adoption stages. Subsequently, a questionnaire-based survey was conducted to verify the findings and results from the qualitative interviews and research models.

This study was conducted in Taiwan where SMEs account for 98.9% of firms and over 80% of employment [8]. Both percentages are similar to those of other Asia-Pacific countries. The domestic 4G broadband mobile network penetration rate exceeds 94.5% [9], which ranks third amongst the main Asia-Pacific countries. 5G networks have been deployed since 2020, while the penetration rate as well as the implementation and usage by SMEs are still in the initial stages. The results of this study may provide constructive references to SMEs in other Asia-Pacific countries similarly situated.

This paper is structured as follows: A literature review of the related issues is presented in the second section. The methods and process of analysis, as well as the results, are described in section three. In the fourth section, there is a discussion based on the findings. The conclusion is in the final section and contains the implications, limitations, and proposed future study directions. The research methods and process are shown below in Figure 1.

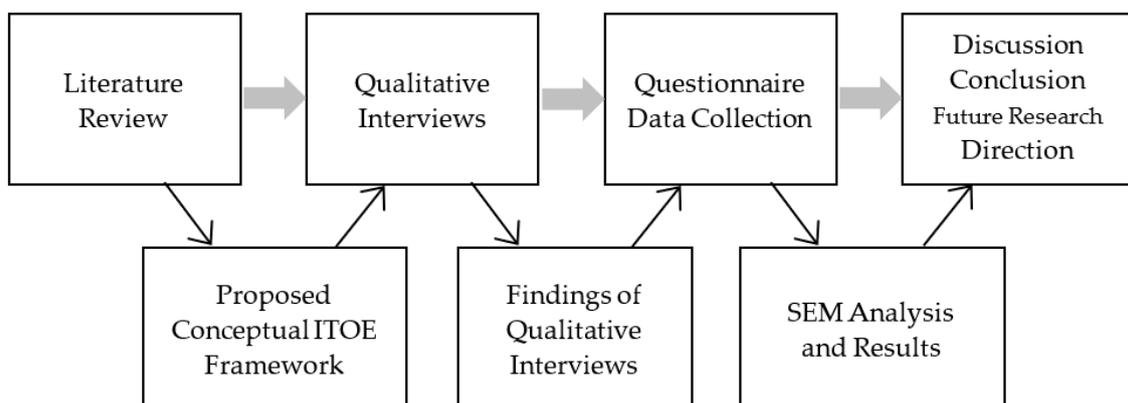


Figure 1. Research methods and process.

2. Literature Review

2.1. Broadband Mobile Applications

Since the inception of the “IMT advanced” guideline released by the International Telecommunication Union (ITU), the fourth generation of the mobile communication technology (4G) network, the most popular mobile broadband network today, has replaced the 3G network and has gradually been widely deployed around the world. The 4G network coverage has increased to 84% globally by the end of 2020. The mobile broadband technology specified by the guideline is that the data transmission rate reaches 100 Mbps peak speed in the high-speed mobility state and 1 Gbps in the low-speed mobility state [10].

Furthermore, fifth generation mobile networks (5G) with faster data transmission speeds were launched in early 2019. Although the penetration rate is not increasing rapidly, the total sales of 5G-capable mobile phones have exceeded 50% and surpassed 4G smartphones sales for the first time in January 2022 [11]. With advanced data transmission technology, broadband networking technology significantly stimulates and drives the innovation development of mobile applications. In comparison to 4G, 5G networks provide more flexible and scalable capabilities through three important technical features, namely, enhanced mobile broadband (eMBB), ultra-reliable and low latency communications (URLLC), and massive machine type communications (mMTC), to connect everyone and everything for higher value creation [12].

IHS Markit's research revealed that, by 2035, the potential economic value of all products and services across multiple industries enabled by 5G worldwide will be as high as \$13.1 trillion [13]. Buellingen and Woerter analyzed from a value chain perspective and found that mobile applications play critical roles in mobile commerce, such as by improving customer satisfaction by providing better services and richer content [14]. Furthermore, there are five types of enterprise mobile applications identified, which are M-Broadcast, M-Information, M-Transaction, M-Operation, and M-Collaboration [15]. Today, through mobile applications and smart technologies, enterprises can more easily collect and use customer data to analyze customer preferences and provide timely, customized marketing services and products [16].

In reference to the aforementioned literature and perspectives, this study suggests that through a broadband mobile network, mobile applications create customer value both directly and indirectly on the mobile device and software which communicates with the stakeholders. Companies benefit by developing their own mobile applications and services, or by using mobile applications or services developed by third parties to upgrade their existing and potential customer values. Additionally, broadband mobile applications possess the diversified features of innovative information communication technologies that have been widely discussed in prior research of various topics, such as information systems, e-commerce, social network services, cloud computing, mobile payments, and business intelligence. These prior studies have empirically found influential determinants in SMEs' adoption of innovative technologies and establish an infrastructure that contributes to the other impactful determinants explored in this study.

2.2. Theoretical Background

The TOE framework has been applied and verified to be practical in the research of various innovative technologies' adoption [17,18]. Numerous literatures use the TOE framework in targeting SMEs (e.g., business intelligence adoption [4]; social media adoption [7,19]; cloud computing [20–22]; e-commerce [23,24]; and cloud-based ERP [25]). This shows that the TOE framework has considerable effectiveness. Yet, Budiono et al. suggested that for the study of SMEs' adoption of emerging technologies, both the organizational and individual perspectives should be taken into account [26]. Rosli et al. also claimed that it is important to evaluate an individual's acceptance of information technology because the organization operation depends on human use [27]. Broadband mobile applications are mostly installed on personal mobile devices and operated by internal users; in order to obtain more comprehensive views and to enhance interpretation, this study proposes an integral ITOE model which applies the TOE framework and takes the internal users' perspectives into consideration in grouping the possible determinants into technological, organizational, environmental, and internal users' contexts.

2.2.1. Technological Context

Considering the technological context means to analyze innovative technology adoption from a technological perspective. This is not only related to the newly adopted technology but also to the enterprise's current system, and their internal and external operations [24,28]. Stjepić et al. proved that compatibility, comparative advantage, and

complexity are significant determinants [4], results which are in line with the results found by Thong in the study of small enterprises adopting enterprise information systems [29]. Maroufkhani et al., in the study of SMEs' adoption of big data analytics, found that observability, aside from compatibility and relative advantage, has significant effects [30]. Zhu et al. also suggested that innovative technology integration depends on the compatibility with the information systems already possessed by an enterprise and the ability to communicate with their business partners [31]. Maduku then proved that complexity has a negative impact on the implementation of mobile marketing applications in SMEs [32]. Furthermore, Alshamaila et al. indicated that in the technological context, the trialability significantly affects SMEs' adoption of cloud computing [22]. Given the findings in this section, the above five factors were included in the consideration of technological context.

2.2.2. Organizational Context

Considering the organizational context means to analyze the internal reasons that affect a company's adaption and implementation of innovative technology. This may be related to a company's product and services, organizational structure, management, and human resources [28]. Several prior studies on enterprises' adoption of emerging technologies identified that the top management or CEO level is a significant determinant of the successful implementation of new technology (e.g., [23,24,26,29,33,34]). Stjepić et al. also found that the support of the management level in the organization is a significant influencing determinant for the adoption of Business Intelligence [4]. Furthermore, Thong found that employees' technological knowledge influences information system adoption in small-sized enterprises [29]. Additionally, the absorbability was found to be a significant determinant of innovation and technology adoption, which is measured by the availability of human and knowledge capital, as well as a company's innovation capabilities [35]. Based on the above literature, this study incorporated the three determinants in the consideration of organizational context.

2.2.3. Environmental Context

Considering the environmental context means to analyze the external reasons that influence decisions regarding the adoption of innovative technology. The research of Lorente-Martínez et al. showed that end users' attitudes have a significant impact on the use of customer-facing inStore technology by retail SMEs [36]. Similarly, Au and Kauffman, in their study of mobile payments, revealed that the stakeholders in emerging financial technologies include services consumers, providers, and governmental regulators [37]. Dahnil et al. reported that SMEs must not hesitate to embrace new technological innovations if competitors are already leading the way in implementation [38]. Mahakittikun et al. indicated that increasing competitive pressure will make retail and service firms more willing to implement mobile payment systems [39]. Chatterjee et al. found that, removed from competitive advantage, partner support is a significant determinant of AI adoption because it benefits the knowledge development and accumulation of employees [40]. Government support was also found to be an important determinant that affects SMEs' adoption of e-commerce [17,24] and sustainability-led practices [34]. In summary, the above highlighted determinants were incorporated into our examination of environmental context.

2.2.4. Internal Users' Context

Regarding the Internal Users' Context, this study initially adopted two constructs, namely performance expectancy and effort expectancy from the Unified Theory of Acceptance and Use of Technology (UTAUT). This is appropriate for measuring an individual's intention and behavior in adopting information technology [41,42]. The performance expectancy is defined as "the degree to which an individual believes that using the system will help him or her to improve on job performance". The effort expectancy is defined as "the degree of ease associated with the use of the system" [41].

3. Methodology and Data

3.1. Qualitative Interview

In the first phase of this study, a qualitative study was developed through conducting semi-structured interviews that aimed to explore and understand the critical determinants, as well as actual attitudes and ideas, of SMEs adopting broadband mobile applications. Alshamaila et al. suggested that a qualitative study is appropriate for the exploration and analysis of these underlying factors. It provides a certain degree of flexibility by using the interview as a data-collection method; thus, it is appropriate in the exploration of the empirical impact of SMEs' adoption in cloud computing. The study also mentioned the benefit of semi-structured interviews to explore the various influential determinants of innovative information communication technology adoption [22]. Moreover, Myers and Newman pointed out that the semi-structured interview is the most popular method in qualitative research [43], while Eze et al. reported that semi-structured interviews allow the researcher to have the space to fully grasp the rich opinions of the interviewees [44].

3.1.1. Sampling Process

Twelve SMEs have been selected as sample companies, which belong to different industries in order to obtain more diverse information [24]. With reference to Scupola [24], the interviewed SMEs were required to meet the following criteria:

- a. Legal enterprises in the country and meeting the definition of SMEs standards (the paid-in capital is less than about USD\$35,000, or the number of regular employees is less than 200 people).
- b. In order to ensure the consistency of environmental conditions (e.g., local policy, mobile communication network facilities, and support from system service providers), the selected enterprises should be located in or around a major metropolitan area.
- c. At least three years of internet connection within the company, to ensure that the company possesses the basic capabilities and knowledge of fixed network and information applications.

In addition, according to the suggestions of Alshamaila et al., four categories of SMEs were included in the samples [22].

- a. Provider: Companies which develop and provide broadband mobile applications as a business.
- b. Adopter: Companies which have adopted broadband mobile applications already.
- c. Initiator: Companies which are beginning to understand and look for related information about broadband mobile applications or are willing to adopt and pay for a broadband mobile application in the next 2 years.
- d. No Intention: Companies which are completely unwilling to use broadband mobile applications.

Apart from the status quo of their company, the respondents in the provider group were asked about their experiences in providing broadband mobile applications in both successful and unsuccessful cases. As Zhu et al. indicates, if the company plans to adopt e-business within two years, it may be considered an initiator [45].

The National Association of Small and Medium Enterprises assisted in selecting the company interviewees. All research objectives and the criteria of respondent selection were disclosed in advance. Respondents were required to be in the management level, be suitably familiar with the enterprise, and have adequate experience in using computers and smartphones. However, because of the internal users' context in the research model, it was not expected that we would interview the top level of the company management, in order to avoid the error occurring between research results and the staff's actual perceptions. In the process of making contact, after the researcher's instructions and communication, all selected SMEs agreed to be interviewed and sent a qualified person to participate. The Table A1 in appendix A provides a summary of the SMEs interviewed; all participants and company names are redacted for the purposes of the study.

3.1.2. Data Collection Process

Before the interview, the interviewer collected the background information of all the selected SMEs. This information included the company's establishment date, main industry sector, business type, capital, business products or services, the branch stores or offices, etc. Most of the information was obtained from the company's website or government agencies' databases. All the collected information was brought by interviewers to the interview site and confirmed by the interviewees. Before the formal interview, the researchers prepared the questions derived from previous literature cited in this study. A pre-interview on three SMEs was conducted and generates successful results.

The formal interview phase was conducted in a face-to-face manner. The interviews took place in the meeting room of respondents' companies or in any easy-access location for the respondents. The duration of the interview was approximately an hour. Half of the interviews lasted approximately 1.5 h. There was a total of 12 interviews for 12 business respondents.

The interview was divided into two parts. In the first part, each company's basic information was verified with respondent, and the missing information in the pre-collected part was collected. This information included the number of employees and business branches. The second part was based on a pre-prepared questions list. The questions list collects important information from the respondents, regarding possible determinants in technology, organization, environment, and internal users' contact. The information indicated whether there were either accelerators or obstacles in adopting broadband mobile applications within the enterprise.

The interview was live-recorded and notes were made by two researchers during the interview. The manuscripts were compared and sent to be confirmed by the respondents within 24 h after the conclusion of the interview. In the process of data collecting and analysis after the interview, as Scupola [24] pointed out, a determinant is considered important if the respondent considers the determinant has an impact on the adoption and implementation of the technology.

3.2. Results of Qualitative Interviews

Following the interviews, the important findings are described below, as based on the four facets of the ITOE model.

3.2.1. Technological Context

The technological context includes the reasons behind the adoption of innovative technology from a technological application perspective, which includes the compatibility of a company's internal and external operations and the characteristics of the innovation technology [28].

- **Relative Advantage:** Most of the respondents reported that the reasons for the adoption of broadband mobile applications are: an increase of efficiency (P1-3, A1-2, I1-3), better management (P1-3, A2-3, I-2), reducing errors (P1-3, A2-3, I1-3), cost reduction (P1-3, A2, I2), instant communication with customers or suppliers (P1-3, A2-3, I1-2), quicker responses to customers' needs (P2-3, A1-3, I1-2), and developing new customers (A1-2, I1), etc. Respondent A2 stated that the usage of broadband mobile applications, such as mobile payments, is already a trend. Most customers will soon use a smartphone to pay a bill, so the broadband mobile applications must be deployed within the company and by the branch stores early in order to meet the needs of customers. However, there were also respondents who claimed that their current business does not require broadband mobile applications (N1-3).
- **Compatibility:** Three respondents in the provider group stated that compatibility was not a problem in past cases; however, their clients had concerns. Respondent A1 reported that the company's social media website is perfectly integrated with broadband mobile applications. Respondent I1 is concerned that the newly adopted broadband mobile application is not connected with the pre-installed reservation

system, so the updated information must rely on internal staff for corrections, and this may cause errors or problems due to delays.

- **Complexity:** Most respondents in the adopter and initiator group believed that broadband mobile applications run effectively on mobile phones, there are few operations difficulties and problems, and the problems were not issues before adoption. Only one respondent, N2, indicated that there are many older age clerks employed in their franchises. It could be too complicated for them to manage information through smartphones, not only because it may cause a high rate of input error, but also because it may provoke backlash.
- **Trialability/Observability:** The companies P1 and P3 provided free basic versions of broadband mobile applications for customers. They only pay if advanced functions are required. Three respondents of the provider group expressed that most of their clients studied the broadband mobile applications in advance. Respondents A2 and I3 reported the product was initially deployed within a particular business unit of their company for a trial. Subsequently, it was slowly implemented in other business units. This not only allowed some employees to understand the practicality through actual usage, but also allowed others to have the opportunity to observe following a time buffer (A2). Respondent I1 said that company's owner had heard of and seen a competitor's broadband mobile application through a long-time client and the company's owner decided to adopt such an application after a period observation so as to acquire an understanding from the competitor's experience.

3.2.2. Organizational Context

The organizational context includes the internal factors that may influence a company's intention to adopt innovative technologies [28].

- **Top Management Support:** Respondents P1 and P3 indicated that a large part of the past successful cases should be attributed to the decision by a company's top-level management. As for those cases without management's or owners' participation, a supervisor was responsible for the decision, and the supervisor often needed to later consult the upper management or owner to modify the decision, or the transaction failed because of a budget issue. Some respondents reported that many employees within their enterprise were not accustomed to the operating modes of the adopted broadband mobile applications, such as video conferencing. As a result, leadership must display full determination to all colleagues in the process of comprehensive implementation (A1-2).
- **Employees' Knowledge:** Respondent P1 pointed out that if the employees of clients' companies have only little knowledge and awareness, it is critical to aid them in fully understanding the importance of broadband mobile applications. Many respondents said that staff levels within information departments are inadequate. Companies are willing to increase their employment and focus on the application and implementation of innovative information technology. However, it is hard to find suitable talent, especially information professionals; SMEs' pay and future vision are difficult to compare with the large electronics companies (A2-3, I1-2, N1-2).
- **Absorptive Capability:** Some of the respondents stated that they are worried about whether there is sufficient additional time and capacity for colleagues to learn and familiarize themselves with the new adopted broadband mobile applications when capacity is already maximized due to existing workloads and responsibilities. (A2, I1). Respondent I2 said that, although leadership had communicated with each department's head before the adoption and was expected to strengthen the provision of education and training if there were problems during the adoption process, the follow-up results are yet to be observed. Respondent N2 stated that, considering work-time and location, it is difficult to ask all the branches and franchisees to send staff to participate in education and training courses together.

3.2.3. Environmental Context

The environmental context includes the external factors that may affect a company's decision on the adoption of innovative technology [28].

- **Competitive Pressure:** Some respondents (A3, I1) in the adopter and initiator group have quite positive expectations of their future competitiveness because their competitors have yet to begin using broadband mobile applications. Some other respondents claimed that they have already felt pressure (A2) or received customers' responses (N1) because their competitors had already adopted the broadband mobile applications. N2 said they always attached great importance to other competitors on the market. Many of their competitors have already adopted a variety of broadband mobile applications. Nevertheless, the customer response is unfavorable, so there is no intention from N2's company to adopt broadband mobile applications for the time being.
- **Business Partner:** All respondents indicated that they have not received strong requests by suppliers or customers. Several respondents expressed great concern about the users' response to the broadband mobile applications if those users are customers or suppliers (A1-3, I1-2). I1 said that attracting younger customers is the most important reason that sparks interest in adopting broadband mobile applications within their company.
- **External Support:** Respondents P2 and P3 stand in the service provider's point of view. They reported that SMEs often consider the good solution provider as an important determinant for adoption. Goods providers can offer adequate services, shorten the implementation time, and prepare well for staff education and training. Most importantly, when an unexpected incident occurs, there must be sufficient support and manpower to promptly resolve it. Losses of SME, caused by abnormal situations, must be avoided. Respondent N2 expressed that good suppliers and support systems are expensive relative to their company's scale and simply difficult to afford. Respondent A1 said that the company's 24 h service cannot be disrupted, so the company attaches great importance to the quality of service providers and would rather pay a higher price to find a better service provider.
- **Government's Support:** Respondents in the provider group believed that the role of the government is very crucial. Respondent P2 suggested that the government's promotions of both the construction of infrastructure, as well as the popularization of broadband mobile signal reception, are needed. Respondents P1 and A2 reported that it may be of more direct help for SMEs if the government has a subsidy policy, and the two companies themselves have already benefited from such a policy. Respondents I2 and I3 claimed that for the popularization of an innovative technology, such as broadband mobile applications, the government should entrust more professionals to educate SMEs employees.

3.2.4. Internal Users' Context

The internal users' context includes the reasons behind the adoption of innovative technology from an individual application perspective, which includes the employees' capability and attitude.

- **Performance Expectancy:** Most of the respondents said they felt the convenience of broadband mobile applications for personal use. They also use broadband mobile applications on private mobile devices for business or to communicate with their company colleagues, customers, or suppliers. More than half of respondents believed that broadband mobile applications could improve the efficiency and convenience of their work (P1-3, A2-3, I1-2, N2) and enhance customer satisfaction (P1-3, A1-3, I1). Some respondents also said they will recommend the use of broadband mobile applications to colleagues, superiors, or management (A1-2, P1-3, I2-3).
- **Effort Expectancy:** Respondents P1 and P3 reported that most of their clients' staff already have a considerable understanding of the adopted programs before their deployment. Therefore, it would not require much effort in implementation. Respon-

dents A2 and I1 stated that the purpose of using broadband mobile applications is to simplify some operating processes. Employees did not feel any pressure before adoption, and some colleagues even thought that the new technology would reduce the pressures of time and mistakes. Respondent N2 reported that colleagues are very busy in their daily work, and do not think that broadband mobile applications will bring convenience but that they could generate extra loadings and interference.

3.2.5. Additional Findings

Through the qualitative interviews, this study found some noteworthy issues. The first issue is user habit. As a provider, respondents P1, P2, and P3 reported that most of the broadband mobile applications must be operated and connected to information through personal mobile devices. One of the most pervasive challenges is to alter the habits of the users in the client's company. Respondent P2 said even if the client company's staff had learned the benefits of broadband mobile applications and showed a very positive attitude, once they knew that some of their personal habits had to be changed, they began to hesitate immediately. User habits could be considered a kind of compatibility; however, most of the above situation is based on private usage on the personal mobile devices rather than compatibility issues with the company's internal systems or operating processes. As respondent A2 said, some staff of the branch stores are not accustomed to the broadband mobile application adopted by company. They still used their own personal communication tools, and this is the main problem in the full adoption and implementation of the new application.

Another issue that has been mentioned is data security. In addition to the preservation and confidentiality of information, many interviewed SMEs (A1-3, I1-3) do not want any other company (including service providers) to be able to access or use their data. Some respondents worried that important information could be leaked by the internal users' personal mobile devices. However, those who had this concern also said that after the instructions by the service provider, the current data transmission and storage options were found to be acceptable for the company. Even so, for business clients with concerns about data security, some respondents' companies have also provided other alternative solutions, such as communicating via email or fax. (A3, I1, I3)

The results of qualitative interviews are summarized in Table 1.

Table 1. Summary of qualitative interviews' findings.

Factors	Support	Degree of Support	Evidence in SMEs
Relative Advantage	Supported	High	P1-3, A1-3, I1-3, N2-3
Compatibility	Supported	Middle	P1-3, A1, I1
Complexity	Not supported	Low	N2
Trialability	Supported	High	P1-3, A2, I2-3,
Observability	Supported	High	P1-3, A2, I1-3, N3
Top Management Support	Supported	High	P1, P3, A1-2, I2, N1-3
Employees' Knowledge	Supported	High	P1, A2-3, I1-2, N1-2
Absorptive Capability	Supported	Middle	I1-2, N2-3
Competitive Pressure	Supported	Middle	A2-3, I1, I3, N1
Business Partner	Supported	High	P1-3, A1-3, I1-2
External Support	Supported	High	P1-3, A1-2, I2-3, N2
Government's Support	Supported	High	P1-3, A2, I2-3
Performance Expectancy	Supported	High	P1-3, A1-3, I1-3, N1
Effort Expectancy	Supported	High	P1-3, A2, I1, N1-3
User Habit	Supported	High	P1-3, A1-2, I1-2, N1
Data Security	Supported	High	P3, A1-3, I1-3, N2

3.3. Research Design—ITOE Model and Hypotheses

As previous section stated, this study proposes an integral ITOE research model. Further, Venkatesh et al. examined the literature of intention models and indicated that individual behavioral intention will significantly influence the actual use-behavior of infor-

mation technology [41]. Vasiljeva et al. suggested that internal users' positive or negative attitudes may strongly affect ICT acceptance decisions in enterprises [46]. Lichtenthaler also argued that employees' attitudes are critical for an organization attempting to adopt emerging technologies [47]. Consequently, based on the results of the first phase, and in reference to the TOE framework and UTAUT by Venkatesh et al., this study developed the following hypotheses, listed in Table 2. It empirically tested the findings by Structural Equation Modeling (SEM). The research model is illustrated in Figure 2.

Table 2. Research hypotheses.

Context	Hypotheses
Internal users	The performance expectancy (H1a)/effort expectancy (H1b)/user habit (H1c) have a significant impact on the intention of internal users to adopt broadband mobile applications
Technology	The relative advantage (H2a)/compatibility (H2b)/trialability (H2c)/observability (H2d) have a significant impact on the SMEs' adoption of broadband mobile applications.
Organization	The data security (H3a)/top management support (H3b)/employees' knowledge (H3c)/absorptive capability (H3d) have a significant impact on the SMEs' adoption of broadband mobile applications.
Environment	The competitive pressure (H4a)/business partner (H4b)/external support (H4c)/government's support (H4d) have a significant impact on the SMEs' adoption of broadband mobile applications.
Behavioral Intention	The intention of internal users (H5) have a significant impact on the SMEs' adoption of broadband mobile applications.

3.4. Analysis Method—Questionnaire

The pre-questionnaires were distributed to 35 executives (Senior Level: 14, Medium Level: 19, and others: 2) selected from the project database of the SMEs Agency. Each item was measured by using the five-point Likert scale. A total number of 34 valid pre-questionnaires were retrieved. The test results of reliability and validity reached a good level. In the formal stage, the selection of SMEs' respondents abided by the principle of a random sample selected from the databases of SMEs promotion organizations, such as the National Association of Small and Medium Enterprises, Corporate Synergy Development Center, and Taipei Computer Association. The participants had at least 6 months' experience in the company and an entry-to mid-level position. A total of 364 questionnaires were distributed in both hard copy and email. Subsequently, 260 valid questionnaires were retrieved, which showed a valid response rate of 71.43% and reached the acceptable level [48]. To better understand the composition of questionnaire participants and associated responses, the information is divided by industry, into services and non-services, and by age of company into various clusters. The statistical data of questionnaire distribution and return are shown in Table A3 in Appendix A, and the sample descriptive statistics are shown in Table A4 in Appendix A.

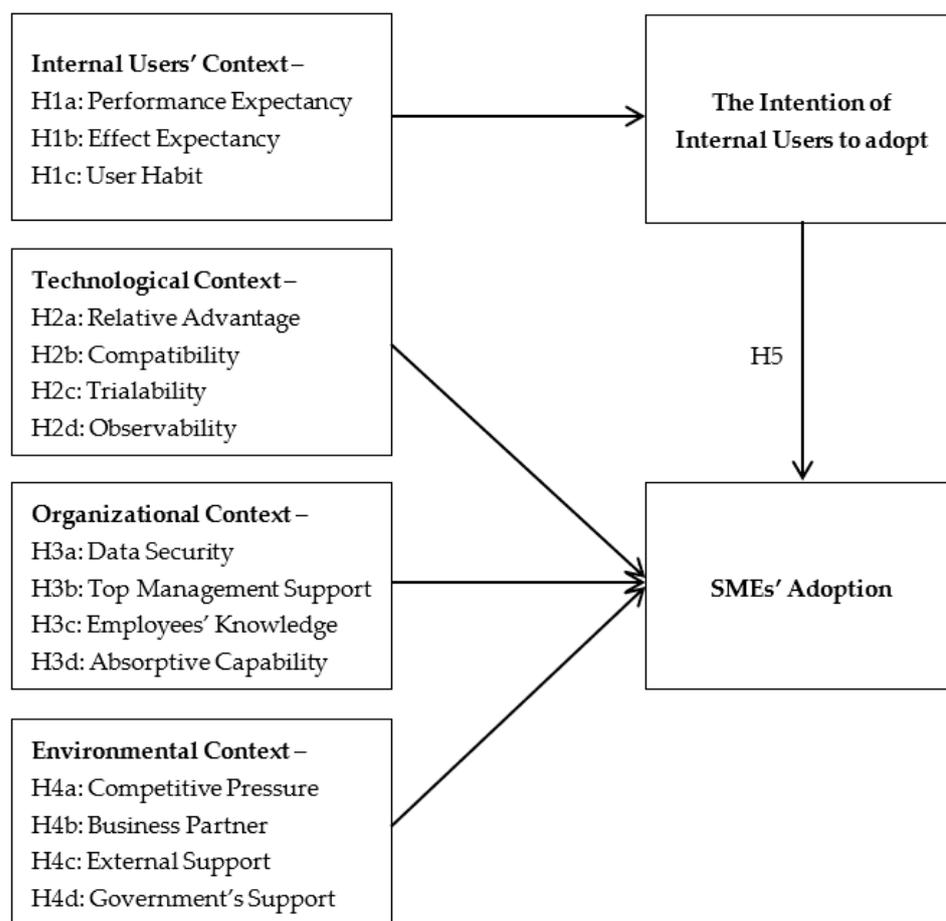


Figure 2. Research model.

4. Results

4.1. The Analysis of Measurement Model

In this study, structural equations modeling (SEM) and AMOS 24 statistical software were used as the analysis tools. SEM is known as covariance structural analysis which integrates two types of statistic patterns: factor analysis and path analysis. It is mainly used for the purposes of verifying the causal relationship between variables, and to check the interrelated dependencies of two or more variables [49]. In addition, using AMOS software to adapt an SEM approach is very appropriate, as it is specifically designed to help test hypotheses about relationships between variables. Using AMOS can also help researchers identify the fitness of a hypothetical model, the relationship between variables and how significant they are [50]. Based on above, this study applied SEM and AMOS to analyze the relationship between the constructs, to examine the fitness of the model, and to test the hypotheses. With reference to Jöreskog and Sorbom [49], and Hair et al. [51], two phases of analyses were applied. Firstly, the Cronbach's α of each context, listed respectively in order of presentation, were evaluated to be 0.919, 0.882, 0.941, and 0.846 which all reached the good reliability level. The confirmatory factor analysis (CFA) was applied to test the discriminant validity and convergent validity, as well as to verify the goodness of fit of the structural model. In this case, the factors loading of one question appeared to offend the estimate (i.e., PE3 did not reach 0.5), it was then excluded and removed from follow-up analysis. Furthermore, the test results of this study showed that both composite reliability and the average variance extracted (AVE) reached the standard (CR value > 0.6, AVE > 0.5) for an appropriate model, as suggested by Bagozzi and Yi [52], and Fornell and Larcker [53]. Thus, the results indicated that the measurement model is beyond the acceptable level. The test results are illustrated in Tables 3 and 4.

Table 3. Measurement of potential variables of loadings, CR value and AVE.

Variables	Question Item *	Loading	Factor Loading	CR Value	AVE
Relative Advantage	RA1	0.839	0.739	0.874	0.698
	RA2	0.868			
	RA3	0.797			
Compatibility	CA1	0.853	0.857	0.868	0.687
	CA2	0.852			
	CA3	0.780			
Triability	TR1	0.776	0.831	0.823	0.607
	TR2	0.768			
	TR3	0.794			
Observability	OB1	0.809	0.837	0.833	0.714
	OB2	0.880			
	OB3	0.805			
Data Security	DS1	0.808	0.707	0.749	0.502
	DS2	0.718			
	DS3	0.582			
Top Management Support	TM1	0.721	0.813	0.775	0.534
	TM2	0.761			
	TM3	0.710			
Employees' Knowledge	EK1	0.638	0.775	0.771	0.531
	EK2	0.824			
	EK3	0.713			
Absorptive Capability	AC1	0.709	0.814	0.768	0.524
	AC2	0.736			
	AC3	0.727			
Competitive Pressure	CP1	0.841	0.928	0.845	0.644
	CP2	0.780			
	CP3	0.786			
Business Partner	BP1	0.747	0.893	0.814	0.594
	BP2	0.812			
	BP3	0.752			
External Support	ES1	0.847	0.936	0.871	0.692
	ES2	0.834			
	ES3	0.814			
Government Support	GS1	0.867	0.944	0.870	0.693
	GS2	0.911			
	GS3	0.706			
Performance Expectancy	PE1	0.791	0.840	0.701	0.541
	PE2	0.676			
	PE3	0.414			
Effort Expectancy	EE1	0.712	0.708	0.761	0.515
	EE2	0.753			
	EE3	0.687			
User Habit	UH1	0.740	0.723	0.780	0.543
	UH2	0.803			
	UH3	0.660			
Internal Users' Intention	EI1	0.679	0.199	0.778	0.540
	EI2	0.726			
	EI3	0.794			

* The list of question item description is in Appendix A, Table A5.

Table 4. Discriminant validity test.

	T1	T2	T3	T4	O1	O2	O3	O4	E1	E2	E3	E4	I1	I2	I3	U1
T1 ¹	0.835															
T2 ²	0.571 **	0.829														
T3 ³	0.546 **	0.602 **	0.779													
T4 ⁴	0.506 **	0.621 **	0.598 **	0.845												
O1 ⁵	0.295 **	0.422 **	0.405 **	0.432 **	0.709											
O2 ⁶	0.308 **	0.323 **	0.422 **	0.392 **	0.467 **	0.731										
O3 ⁷	0.294 **	0.391 **	0.370 **	0.410 **	0.488 **	0.558 **	0.729									
O4 ⁸	0.294 **	0.408 **	0.374 **	0.472 **	0.473 **	0.560 **	0.530 **	0.724								
E1 ⁹	0.316 **	0.433 **	0.418 **	0.453 **	0.470 **	0.461 **	0.481 **	0.491 **	0.803							
E2 ¹⁰	0.317 **	0.396 **	0.422 **	0.527 **	0.493 **	0.490 **	0.404 **	0.483 **	0.708 **	0.771						
E3 ¹¹	0.341 **	0.415 **	0.449 **	0.436 **	0.501 **	0.492 **	0.454 **	0.520 **	0.724 **	0.703 **	0.832					
E4 ¹²	0.367 **	0.454 **	0.457 **	0.471 **	0.467 **	0.471 **	0.445 **	0.477 **	0.746 **	0.689 **	0.781 **	0.833				
I1 ¹³	0.343 **	0.369 **	0.324 **	0.417 **	0.303 **	0.310 **	0.275 **	0.288 **	0.334 **	0.379 **	0.426 **	0.403 **	0.736			
I2 ¹⁴	0.323 **	0.303 **	0.300 **	0.321 **	0.312 **	0.253 **	0.173 **	0.173 **	0.243 **	0.313 **	0.284 **	0.266 **	0.404 **	0.718		
I3 ¹⁵	0.223 **	0.258 **	0.269 **	0.269 **	0.275 **	0.212 **	0.207 **	0.150 *	0.188 **	0.306 **	0.257 **	0.208 **	0.519 **	0.629 **	0.737	
U1 ¹⁶	0.371 **	0.505 **	0.430 **	0.497 **	0.436 **	0.392 **	0.393 **	0.412 **	0.518 **	0.497 **	0.515 **	0.544 **	0.552 **	0.479 **	0.491 **	0.735

** At the significance level of 0.01, (2-tailed), the correlation was significant. * At the significant level of 0.05, (2-tailed), the correlation was significant. ¹ Relative Advantage ² Compatibility ³ Trialability ⁴ Observability ⁵ Data Security ⁶ Top Management Support ⁷ Employees' Knowledge ⁸ Absorptive Capability ⁹ Competitive Pressure ¹⁰ Business Partner ¹¹ External Support ¹² Government Support ¹³ Performance Expectancy ¹⁴ Effort Expectancy ¹⁵ User Habit ¹⁶ Internal Users' Intention.

4.2. The Analysis of the Structural Model

In the goodness of fit test, the χ^2/df ratio in this study is 1.274, which entered into the range of the parsimonious fit value (<3) proposed by Hair et al. [50]; the GFI is 0.826, which also reached the acceptable level (>0.8) proposed by Browne and Cudeck [54]. The AGFI is 0.807 and the NFI is 0.831; both achieved the acceptable level (>0.8) proposed by Hadjistavropoulos et al. [55]. The CFI is 0.958 and the TLI is 0.955 which both reached the good level (>0.9) suggested by Bentler and Bonett [56]. Furthermore, the RMR is 0.042, which meets the suggestion (<0.08) of Hu and Bentler [57]. The RMSEA is 0.033, which also meets the suggestion (<0.08) of Hu and Bentler [57]. The overall results indicated that goodness-of-fit of the structural model is within the favorable range. The results of the model fit test are shown in Table 5.

Table 5. Overall fits of research model.

Indicator of Goodness-of-Fit	Standard Value	Test Result	Level
χ^2 /d.f.	<3 [50]	1.274	good
GFI	>0.8 [54]	0.826	acceptable
AGFI	>0.8 [55]	0.807	acceptable
NFI	>0.8 [55]	0.831	acceptable
CFI	>0.9 [56]	0.958	good
RMR	<0.08 [49]	0.042	good
RMSEA	<0.08 [57]	0.033	good
TLI (NNFI)	>0.9 [56]	0.955	good

The path analysis results of the structural model showed that all causal relationships have reached a significant level. The values of coefficient are shown in Figure 3. Moreover, all hypotheses have been supported by the analysis results of the structural model. A total of 15 determinants reached the significant level. The results are shown in Table 6.

Table 6. Results of regression weights.

Factors		Context	Estimate	S.E.	C.R.	P
Performance						
Ex-pectancy	←	Internal Users	1.551	0.291	5.331	***
Effort Ex-pectancy	←	Internal Users	0.995	0.151	6.604	***
User Habit	←	Internal Users	1.040	0.158	6.563	***
Relative Advantage	←	Technology	1.093	0.125	8.744	***
Compatibility	←	Technology	1.654	0.211	7.841	***
Trialability	←	Technology	1.450	0.187	7.770	***
Observability	←	Technology	1.551	0.204	7.590	***
Data Security	←	Organization	1.217	0.165	7.368	***
Top Management Support	←	Organization	1.508	0.226	6.681	***
Employees' Knowledge	←	Organization	1.368	0.193	7.079	***
Absorptive Capability	←	Organization	1.515	0.233	6.492	***
Competitive Pressure	←	Environment	2.522	0.387	6.516	***
Business Partner	←	Environment	1.979	0.272	7.269	***
External Support	←	Environment	2.603	0.381	6.828	***
Government Support	←	Environment	2.828	0.423	6.680	***
Internal Users	←	Internal Users' Intention	2.284	0.564	4.049	***

*** Significant at $p < 0.001$.

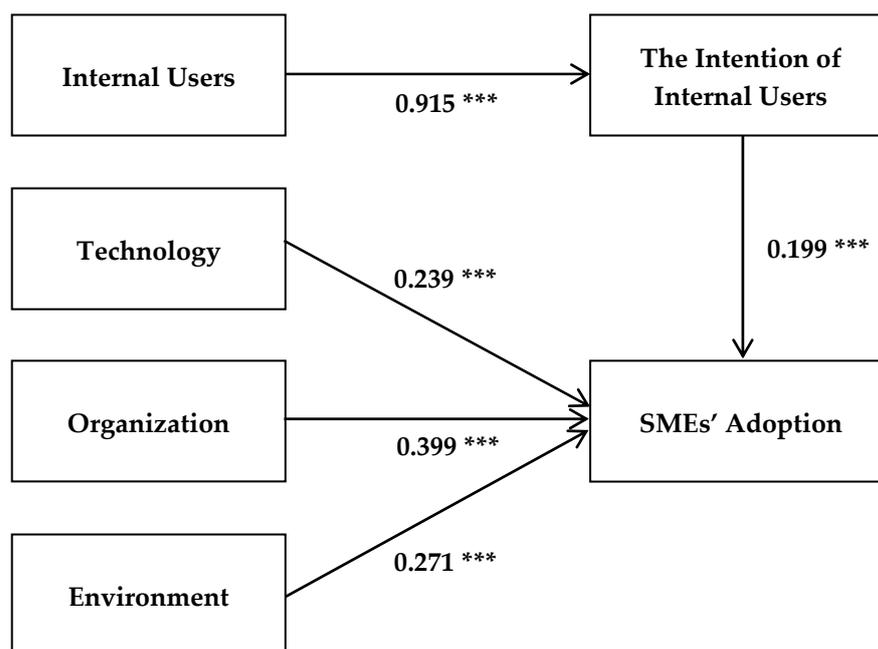


Figure 3. Results of structural modeling analysis. Path coefficients and p -values, the significance is indicated by stars (***) p -value < 0.001).

5. Discussion

In the internal users' context, performance expectancy (H1a) and effort expectancy (H1b) both showed a significant result, which is in line with the result in the study of mobile payment acceptance [58]. The user habit (H1c) also showed a significant result, as Limayem et al. identified that user habits are relevant to the information system's continuance usage [59]. The continuance signified a form of post-adoption. Furthermore, it is referred to as routinization, which is often considered the end-stage of implementation [60]. Additionally, the significant result of internal users' context can be deemed as that while mobile device usage is gradually becoming mature, the adoption of mobile technology is no longer the responsibility of the information sector in the company. Since adoption depends more on the participation of all employees, all sectors within the enterprise are indispensable parts of the adoption of mobile technology. As a consequence, the internal users' context is becoming an integral part of the adoption of future innovative mobile technology applications.

The four determinants in the technological context revealed significant results. These are consistent with the results of the qualitative interviews in the previous chapter. They also in line with the results in the research of SMEs' adoption of enterprise systems [18], and cloud computing [22]. Much prior research indicated that relative advantages (H2a) are deemed to be a vital value generated by innovative technology [4,22,30,38], so it is not surprising that it reached the significant level. Compatibility (H2b) showed a significant result, but only reached a middle degree of support in the prior qualitative study. This could be caused by the uncertainty revealed in the study by Au and Kauffman, which indicated that uncertainty about future standards compatibility may lead enterprises to hesitate to adopt an emerging technology [37]. Apart from this, Oliveira et al. found that compatibility has significant impact on the adoption of cloud computing in the services sector [61]. However, the opposite is true in the manufacturing sector. This is yet to be verified by follow-up research. Considering the trialability (H2c) and observability (H2d), both factors showed a high degree of support in the qualitative study. It might be as Ramdani and Kawalek revealed, that it is usually seen as a high-risk consideration and may lead to serious consequences when SMEs intend to adopt an innovative information technology [18]. The trial usage of the product and the visibility of the counterparts' usage are considered critical. The significant results from the four technological determinants show that cutting-edge

information technology and transparency between mobile applications, their users, and the SMEs are central to a successful adoption of broadband mobile applications by SMEs.

In terms of organizational context, this study has found that top management support (H3b), employees' knowledge (H3c), and absorptive capability (H3d) have significant influences on SMEs' adoption of broadband applications. As in the study of SMEs' e-commerce adoption, Scupola found that high level management began to take employees' suggestions as a vital reference [24]. Both factors are considered important. This study suggests that the operations and developments of broadband mobile applications are more reliant on internal users and personal devices than ever. Issues such as human resources, the employees' ability and suggestions, and the absorptive capability within the company are all becoming important considerations for top-level management. Furthermore, data security (H3a) has been identified as a determinant from the qualitative interview. Afterwards, this was validated by the empirical analysis, which is in accordance with the result of the studies of cloud computing services' adoption [19,62]. Likewise, security and privacy are also important issues for clients of mobile payment services [37]. On the other hand, Kang et al. claimed that, in addition to the benefits, emerging technologies may raise social concerns such as data privacy [3], and this increases pressure on SMEs. Skafi et al. argued that security is a matter of trust. Trust is important when enterprises decide to adopt internet-based technologies [19]. The results from the organizational determinants demonstrate that broadband mobile applications should consider data security, ease of use, and the communication from leadership as important development factors for adoption by the SMEs.

Regarding the environmental context, this study affirmed that competitive pressure (H4a), business partner (H4b), external support (H4c), and government's support (H4d) are significant determinants. Similarly, Ghobakhloo et al. pointed out that external pressure could be caused by government, customers, suppliers, and counterparts [23]. Randolph et al. argued that IT technology in "coopetition" can not only facilitate knowledge communication in business relationships, but also help firms to develop "coopetition" strategies and relationships [63]. Furthermore, there is much research that states that there are limitations for SMEs, such as resources, capital, technology, and attracting skilled employees (i.e., [6,64,65]), which is the so-called "Liability of Smallness" [66]. Chatterjee et al. also proved that external support can help employees acquire the necessary knowledge for the effective use of new technology [40]. Thus, as the respondents expressed in the qualitative interview, external support is regarded as an indispensable determinant in the adoption of innovative information technologies.

The impact of the government's support on an SME's adoption of broadband mobile application is robust; it is significant in both phases of this study. Such results are broadly in line with many studies on the adoption of emerging technologies by SMEs. Lutfi et al. [67] indicated that the government's relevant regulatory and financial incentives help SMEs' decision-making to adopt IT innovations and play a key role, especially in encouraging enterprises that may possess insufficient resources. In this regard, the government should try to strengthen the awareness of the advantages of broadband mobile application for SMEs and to promulgate relevant incentive policies or release subsidies to support SMEs in the adoption of broadband mobile applications, thereby enhancing their competitiveness. From an environmental standpoint, in order for SMEs to consider adopting mobile applications, support is needed from all facets of the business, including potentially partnering with other businesses and governments.

6. Conclusions, Limitations, and Future Research Directions

The analysis results show that the causal relationships between the proposed facets of ITOE framework are tenable and consistent with expectations. Fifteen determinants were identified from a pilot qualitative study and were further validated by the empirical analysis. This study verified that the internal users' intentions will certainly affect the SME's adoption of broadband mobile applications; this is also in line with our hypothesis.

These findings provide several valuable insights for both SMEs and broadband mobile applications providers.

For the SMEs, this study suggests that the characteristics of broadband mobile technology are largely boosting the innovation of mobile applications; this can bring considerable benefits and advantages for business. It is important to ensure the compatibility between the new applications and the inner process and systems of an enterprise before the adoption. The adoption preference of business partners and clients should be taken into account. The possibility of a long-term partnership with external IT supporting resources should not be ignored. Apart from the above, issues of human resources are absolutely crucial to consider. Commitment and resources devoted from high-level management, the enhancement of employees' knowledge, and favorable processes of continuous learning and knowledge sharing will be the cornerstones of successful adoption. Most importantly, the enterprises must fully communicate with internal users to be willing to join the process together and instill the habit of using the new applications with personal mobile devices. The SMEs should consider and prioritize the determinants from the results of this study while determining broadband mobile applications are crucial to the growth of the business.

For application providers, apart from the functions and effectiveness, a thorough data security and privacy protection strategy of products and services must be developed. Providing a trial version or a free trial period would be very helpful in attracting clients and customers to try the application. Furthermore, it is indispensable to provide sufficient after-sales services and timely support to win SME clients. These determinants from the results of the study should fairly improve the SMEs' approach to the adoption of broadband mobile applications, spurring growth for both providers and SMEs.

For the theoretical implication, this study makes contributions to the research of the innovative mobile technologies and applications adoption by SMEs. Internal users' context was added to the TOE framework and then to an ITOE model that has been proposed in this study. The study also incorporates employees' personal considerations and provides a comprehensive view and extensive insights. Feasibility is confirmed by the results of this study. It is expected to serve as a practical reference for future studies. Overall, both SMEs and broadband mobile application developers should consider the results of the significant determinants, demonstrated to be important factors that could improve the adoption process.

In terms of limitations and future research directions, although the results of this study are expected to be constructive for SMEs of both domestic and foreign countries under similar conditions, there may still be issues in individual industries and countries. This study has strived to obtain an in-depth understanding by qualitative interviews and a comprehensive sample collection process. Considering that the respondents of SMEs may not have sufficient expertise for the use of specific broadband mobile technology and its applications, complicated broadband mobile applications are indeed a real challenge for SMEs; however, this study is focused only on the conventional usage of broadband mobile applications. Future research could further explore the adoption of broadband mobile applications in specific settings. Finally, in the research field of mobile applications, it could be instructive if the external users' point of view were to be discussed in future studies.

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Appendix A

Table A1. Interviewed company description.

	Type of Business	Age/ Year	Number of Employees	Adoption Stage	Interviewee's Position
P1	E-Commerce	9	26	Provider	Division Director
P2	Logistic	2	25	Provider	Assistant Manager
P3	Internet Communication	1	70	Provider	Marketing Manager
A1	Social Media	11	100	Adopter	Deputy Unit Manager
A2	Retail	17	14	Adopter	Product Manager
A3	Car Rental	9	120	Adopter	Manager of Customer Service
I1	Travel	6	34	Initiator	Marketing Director
I2	Furniture Manufacturing	16	200	Initiator	Manager of Distributor Department
I3	Electronic Component Manufacturing	36	90	Initiator	Major Account Sales Director
N1	Publishing	12	16	No Intention	Editing Director
N2	Catering	12	80	No Intention	Marketing Manager
N3	Beauty	21	8	No Intention	Accounting Manager

Table A2. Findings Factor definition and reference.

Context	Factors	Definition	References
Internal Users	Performance Expectancy	The degree to which an individual believes that using the system will help individuals to improve on-job performance [41].	[41]
	Effort Expectancy	The degree of ease associated with the use of the system [41].	[41]
	User Habit	The extent to which people tend to perform behaviors automatically because of learning [59].	[59]
Technology	Relative Advantage	An innovation is perceived as being better than the idea it supersedes [60].	[60,68]
	Compatibility	An innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters [60].	[60,69]
	Trialability	The innovation can be used on a trial basis [32].	[32,60]
	Observability	The results of an innovation are visible to others [60].	[30,60]
Organization	Data Security	Data and privacy protection [70].	[70]
	Top Management Support	The strategy, decision, and actions from top management to ensure commitment of resources and successful adoption [19].	[19,68,69]
	Employees' Knowledge	Knowledge of innovative technology possessed by employees [29].	[29,68]
	Absorptive Capability	The ability to apply available knowledge and innovation which is connected to the stage of pre-adoption and adoption [71].	[71]
Environment	Competitive Pressure	Competition pressure from companies in the same industry [22].	[22,68]
	Business Partner	Pressure exerted by customers and suppliers [23].	[23]
	External Support	The main source of external IS expertise [23].	[23,69]
	Government Support	Government policy, government measures or incentives [38].	[38]

Table A3. Questionnaire distribution and returns.

	Distributed	Return	Invalid	Valid	Valid Percentage
Via Email	138	104	11	93	67.39%
Hard Copy	226	182	15	167	73.89%
Total	364	286	26	260	71.43%

Table A4. Sample characteristics.

	Subject	Valid Samples	Percentage %	Cumulative Percentage %
Number of Employees	Under 4	36	13.85	13.85
	5~19	90	34.62	48.47
	20~49	75	28.85	77.32
	50~99	34	13.07	90.39
	100~200	25	9.61	100
Industry Type	Services	179	68.85	68.85
	Non-Service	81	31.15	100
Company Age	Under 1 year	15	5.77	5.77
	1~3 years	42	16.15	21.92
	4~7 years	72	27.70	49.62
	8~10 years	56	21.54	71.16
	11~13 years	34	13.07	84.23
	Over 13 years	41	15.77	100
Position Level	Normal-Level	135	51.92	51.92
	Mid-level	121	46.54	98.46
	others	4	1.54	100

Table A5. Variables and questionnaire.

Variables	Item Code	Items
Relative Advantage	RA1	The use of broadband mobile application can bring more business opportunities for the company.
	RA2	The use of broadband mobile application can help companies reduce costs.
	RA3	The use of broadband mobile application can improve or enhance customer service.
Compatibility	CA1	CP1: In line with the company's current operating practices and processes.
	CA2	CP2: In line with the company's existing information system architecture.
	CA3	CP3: In line with the company's existing regulations and policies.
Trialability	TR1	The company will use broadband mobile applications if there are subsidies.
	TR2	The company will use broadband mobile applications if there are special offers.
	TR3	The company is willing to use broadband mobile applications for some time to see how effective they are.
Observability	OB1	Has seen other companies that have adopted good broadband mobile applications.
	OB2	Has seen the effectiveness of other companies using broadband mobile applications.
	OB3	The company is not sure that using broadband mobile applications will result in the expected return on performance.
Data Security	DS1	The company takes data security very seriously.
	DS2	Customers or suppliers take data security very seriously.
	DS3	The company has strict regulations for employees to access the company's system and data online
Top Management Support	TM1	Senior executives are willing to provide funding and human resources to adopt broadband mobile applications.
	TM2	Senior executives understand the benefits of using broadband mobile applications to the company.
	TM3	Senior executives encourage employees to use broadband mobile applications at work.
Employees' Knowledge	EK1	Employees have enough knowledge of broadband mobile applications.
	EK2	Employees have the ability to use innovative technology.
	EK3	Most of the staff can skillfully use a computer.
Absorptive Capability	AC1	The company is well-aware of the most advanced broadband mobile applications.
	AC2	The company for the adoption of broadband mobile applications will have a clear division of responsibilities.
	AC3	Company personnel are able to adopt broadband mobile applications.

Table A5. Cont.

Variables	Item Code	Items
Competitive Pressure	CP1	The competition between the companies is very intense in the industry.
	CP2	The company's customers can easily switch to other companies to obtain similar products or services.
	CP3	The customer may switch to a competitor's service or product if a company chooses not to adopt broadband mobile applications.
Business Partner	BP1	The company's major suppliers suggested that we adopt broadband mobile applications.
	BP2	The company's main partner suggested that we adopt broadband mobile applications.
	BP3	The company's main customers suggested that we adopt broadband mobile applications.
External Support	ES1	There are companies that actively promote broadband mobile applications to the company.
	ES2	There are companies that can provide enough technical support for broadband mobile applications.
	ES3	There are companies that can provide enough training support for broadband mobile applications to the company.
Government Support	GS1	The government has actively promoted the development of broadband mobile applications.
	GS2	The government has actively advocated the acquisition of relevant knowledge of broadband mobile applications.
	GS3	The government has provided incentives or subsidies to support the company's adoption of broadband mobile applications.
Performance Expectancy	PE1	The use of broadband mobile applications allows me to improve work efficiency.
	PE2	The use of broadband mobile applications can improve the convenience of my work.
	PE3	The use of broadband mobile applications can increase my chances of getting a raise.
Effort Expectancy	EE1	I can clearly understand how to operate broadband mobile applications.
	EE2	I can easily start using broadband mobile applications.
	EE3	It is not difficult for me to learn to use broadband mobile applications.
User Habit	UH1	For business, I would like to stop using my current, private mobile application and use the company's.
	UH2	For business, our customers would like to stop using the current, private mobile applications and use our company's.
	UH3	For business, our business partners would like to stop using the current, private mobile application and use our company's.
Internal Users' Intention	EI1	I hope that the company can adopt a broadband mobile application.
	EI2	Some of the colleagues hope that the company can adopt a broadband mobile application.
	EI3	Most of the colleagues hope that the company can adopt a broadband mobile application.

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