

Article

Bridging Digital Cultural Consumption and Sustainability: How Motivation, Competencies, and Digital Cultural Consumption Shape Environmental Engagement

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Abstract

Digital cultural consumption has become an increasingly important form of cultural participation, yet its implications for sustainability remain insufficiently understood. While previous studies have examined digital culture, digital competencies, and pro-environmental behavior separately, little is known about how these factors jointly contribute to environmental engagement in digital cultural contexts. This study develops and empirically tests an integrated structural model explaining the relationships among functional motivations, digital competencies, digital cultural consumption, and environmental engagement. Environmental engagement was conceptualized as a multidimensional construct encompassing environmental awareness, attitudes, and pro-environmental behavior and was operationalized as a single latent construct due to the substantial empirical overlap observed among these dimensions. The proposed model was tested using structural equation modeling (SEM) based on data collected through a nationwide CAWI survey of 620 digital cultural consumers in Poland. Functional motivations positively influenced digital cultural consumption ($\beta = 0.264, p < 0.001$). Digital competencies exerted a significant positive direct effect on environmental engagement ($\beta = 0.142, p = 0.002$), indicating that individuals with higher digital competencies are more likely to demonstrate stronger environmental engagement in digital cultural contexts. Digital cultural consumption was positively associated with environmental engagement ($\beta = 0.405, p < 0.001$) and partially mediated the relationship between functional motivations and environmental engagement ($\beta = 0.107, p < 0.001$). The study contributes to the literature by integrating research on digital cultural participation and sustainability within a single explanatory framework, highlighting digital cultural consumption as one of the mechanisms linking users' motivations with environmental engagement. The findings suggest that strengthening digital competencies and fostering motivation to participate in digital cultural activities may support more sustainable forms of digital cultural participation.

Keywords: digital culture consumption; sustainability; environmental engagement; digital competencies; pro-environmental behavior; functional motivations; structural equation modeling; digital participation; environmental awareness; mediation analysis



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1. Introduction

Digital technologies have fundamentally reshaped how cultural content is created, distributed, accessed, and consumed. Cultural participation is no longer confined to visiting cultural institutions, attending in-person events, or purchasing physical cultural goods. Increasingly, consumers engage with culture through streaming platforms, social media, mobile applications, digital archives, e-books, podcasts, online events, video platforms, and virtual exhibitions. Digital cultural consumption has therefore become an important dimension of contemporary cultural participation and everyday consumer behavior [1–3].

Digital cultural consumption is more than the online extension of traditional forms of cultural participation. It encompasses a broad range of digitally mediated practices, experiences, choices, and interactions. Users do not simply access cultural content; they search for it, evaluate and compare it, comment on it, recommend and share it, save and personalise it, and integrate it into their everyday social practices and identity work. Digital cultural consumption thus takes place in a hybrid environment in which online and offline activities are increasingly intertwined [1,4]. Beyond reshaping cultural participation, digital cultural consumption has become an increasingly important component of the digital economy and a potential driver of more sustainable consumption. By complementing or partially replacing traditional forms of cultural participation, digital services may reduce the need for travel, printed materials, and other resource-intensive activities. At the same time, they foster new forms of consumer engagement that support broader sustainability goals, making digital cultural consumption an increasingly important area of research at the intersection of the digital economy and sustainable consumption.

The growing importance of digital cultural consumption is closely linked to users' motivations. People engage with digital culture not merely because content is technically available, but because it addresses a range of functional, cognitive, aesthetic, communicative, social, identity-related, and creative needs. Functional motivations are likely to be particularly relevant in this context. Convenience, accessibility, flexibility, time savings, efficiency, and reduced effort may encourage individuals to adopt and sustain practices related to digital cultural consumption [5–7].

However, access to digital culture alone does not guarantee meaningful, informed, or responsible participation. The quality and scope of participation also depend on users' digital competencies, including the ability to search for and assess information, navigate digital platforms, understand recommendation mechanisms, evaluate the credibility of online content, manage digital identity and privacy, and address technical problems. These competencies shape not only how people participate in digital culture, but also their capacity to make more informed decisions about the sustainable use of technology and the environmental implications of digital consumption [8–10].

The environmental dimension of digital cultural consumption is becoming increasingly important. Digital forms of cultural participation are often viewed as more environmentally friendly than traditional alternatives, particularly when they reduce travel, printed materials, or the use of physical media. However, the environmental impact of digital consumption is more complex. Streaming, cloud storage, data transmission, the production of electronic devices, energy consumption, and the short replacement cycles of digital equipment all create environmental pressures. The sustainability potential of digital cultural consumption therefore depends not only on technological infrastructure, but also on users' awareness, attitudes, competencies, and everyday practices [11–13].

Previous research has examined digital culture, digital competencies, e-consumption, and pro-environmental behavior as important, but largely separate, fields of inquiry. Studies of digital cultural participation have primarily focused on patterns of participation, access to digital cultural resources, and users' motivations [3,6]. Research on digital compe-

tencies has concentrated on the knowledge, skills, and attitudes required to operate actively, safely, and critically in digital environments, highlighting their contribution to broader social and sustainable development goals [8,9,14]. In parallel, the sustainable consumption literature has mainly examined environmental awareness, environmental attitudes, and pro-environmental behavior as determinants of sustainable consumer choices [12,15,16]. However, these research streams have largely evolved independently and have rarely been integrated within a single explanatory framework. As a result, limited attention has been paid to the mechanisms through which functional motivations, digital competencies, and digital cultural participation jointly shape environmental engagement. Consequently, the role of digital cultural participation as a potential mechanism linking users' motivations with environmental engagement remains insufficiently understood.

To address this gap, this study develops and empirically tests an integrated structural model linking functional motivations, digital competencies, digital cultural consumption, and environmental engagement. Unlike previous studies, which have predominantly examined these constructs within separate theoretical traditions, the proposed framework explains how motivational and competency-related factors jointly contribute to environmental engagement through digital cultural participation. Environmental engagement was conceptualized as a multidimensional construct encompassing environmental awareness, attitudes, and pro-environmental behavior and was operationalized as a single latent construct due to the substantial empirical overlap observed among these dimensions.

The aim of this article is to develop and empirically test a model explaining the relationships between functional motivations, digital competencies, digital cultural consumption, and consumers' environmental engagement. More specifically, the study examines the direct effects of functional motivations and digital competencies on the focal constructs and assesses the mediating role of digital cultural consumption in shaping environmental engagement. The model was tested using structural equation modeling (SEM) based on data collected through a CAWI survey from a nationwide sample of 620 users of digital cultural content in Poland.

This article makes three main contributions. First, it integrates previously separate streams of research on digital cultural consumption, digital competencies, and sustainable consumption into a single explanatory framework, thereby extending current knowledge on the determinants of environmental engagement in digital environments. Second, it demonstrates that digital cultural consumption constitutes one of the mechanisms through which functional motivations are associated with environmental engagement. Third, the findings provide practical guidance for policymakers, cultural institutions, and organizations promoting sustainable development by highlighting the importance of strengthening digital competencies and encouraging motivation-driven participation in digital cultural activities.

The remainder of the article is structured as follows. Section 2 reviews the literature, develops the conceptual model, and formulates the research hypotheses. Section 3 describes the methodology, research procedure, measurement instrument, and sample characteristics. Section 4 presents the results of the confirmatory factor analysis (CFA) and SEM, including the assessment of the measurement model and hypothesis testing. Section 5 discusses the findings. Section 6 outlines the study's limitations and directions for future research. Section 7 presents the practical implications, while Section 8 summarises the main conclusions.

2. Literature Review

2.1. Digital Cultural Consumption

Digital cultural consumption is one of the key phenomena shaping contemporary transformations in cultural participation. It does not simply involve moving traditional forms of cultural reception online. Rather, it encompasses a wide range of behaviors, experiences, choices, and interactions through which users engage with cultural content via digital technologies. In practice, this includes the use of streaming platforms, social media, mobile applications, digital archives, games, e-books, podcasts, video platforms, and virtual exhibitions [1]. As the authors of the *Kultura 2.0* [2] report argue, digital culture is not merely “internet culture”, but a broader set of phenomena characteristic of the information and network society, in which both emerging and established forms of cultural participation are being transformed.

Digital cultural consumption should also be understood within the broader framework of cultural consumption as a social, economic, and identity-related practice. Krzysztofek [17] argues that, in contemporary society, culture is becoming increasingly intertwined with the economy, while consumption serves as a means of constructing and communicating one’s social position, lifestyle, and membership in particular groups. In digital environments, this process is further intensified. Choosing specific content, platforms, or modes of participation is no longer simply an act of cultural reception; it can also become a form of self-presentation and social relationship building. Consumers’ decisions leave digital traces in the form of ratings, comments, recommendations, shares, or curated playlists, thereby contributing to the wider ecosystem of digital communication.

The literature on new media highlights their widespread accessibility, immediacy, and capacity to operate across multiple parallel communication spaces as defining characteristics [18]. Consequently, digital cultural consumption extends beyond passive content reception and includes active searching, selection, evaluation, recommendation, and co-creation of cultural resources. Dey, Yen, and Samuel [1] define digital consumer culture as a set of behaviors emerging from users’ interactions with digital technologies. Their approach emphasises its relational and dynamic nature, as well as the blurring of boundaries between online and offline activity. Similarly, Theodoridis [4] notes that digital technologies and social media have become tools through which people communicate their cultural choices and seek social validation for their decisions. Contemporary digital cultural consumption therefore involves not only using content, but also constructing experiences, relationships, and identities in digital environments.

A defining feature of contemporary digital cultural consumption is that it increasingly takes place within digital platform environments. These platforms provide not only access to cultural content, but also tools for searching, personalising, organising, and sharing it. As noted in the *E-muzea* [5] project report, digital cultural services involve more than making digitised resources available. They also include functionalities that support the user experience, such as search engines, recommendation systems, tagging, comment functions, and opportunities to create personal content collections. From the consumer perspective, therefore, the object of consumption is not limited to cultural content itself, but also includes the way that content is accessed, organised, and presented.

The development of digital platforms also supports the increasing personalisation of cultural participation. By analysing users’ previous behavior, preferences, and digital activity, platforms can tailor recommended content to individual needs and interests. Personalisation may improve convenience and facilitate access to relevant resources. At the same time, it may narrow the diversity of cultural experiences by steering users towards predictable algorithmic recommendation paths [1,3]. Digital cultural participation should therefore not be equated solely with access to content. User activity increasingly occurs

within the business models of digital platforms, where content, interactions, and user data become part of broader processes of service personalisation and commercialisation [19]. As a result, digital cultural consumption develops within a service-oriented logic in which accessibility, functionality, convenience, and the quality of the user experience become as important as the content itself [5].

The opportunity to participate in digital culture depends not only on technological development and the availability of content, but also on users' individual resources. As highlighted in the *Kultura 2.0* [2] report, digital exclusion is not limited to a lack of access to infrastructure. It also includes financial, cognitive, design-related, content-related, production-related, institutional, and political barriers. Access to the internet alone is therefore not sufficient for active participation in digital culture. Digital competencies also play a crucial role, as they enable individuals to use digital platforms effectively and to navigate environments shaped by algorithms and recommendation systems in an informed manner. Paprzycka [10] argues that analysing digital culture requires moving beyond the traditional distinction between humanistic and technical competencies, because understanding how technologies operate has become a prerequisite for critical participation in digital culture. The level of digital cultural consumption is thus shaped both by the availability of technologies and content and by users' competencies, which allow them to make informed and effective use of these resources.

One of the most important factors influencing digital cultural consumption is users' motivations. According to Uses and Gratifications theory, the use of media and digital technologies is purposeful: users select particular content and platforms in order to satisfy specific needs and obtain expected benefits. Previous research suggests that user motivations are among the main determinants of digital cultural consumption. The use of digital cultural resources is driven not only by their technological availability, but above all by their capacity to address a range of cognitive, aesthetic, communicative, social, identity-related, and creative needs [1,4,5,17]. As noted in the *E-muzea* [5] project report, cultural goods and services primarily fulfil intangible needs, including the need for knowledge, expression, communication, aesthetic experience, and creative activity. In digital environments, this range of needs expands through virtually unrestricted access to content, interaction with other users, and opportunities to actively co-create and share cultural resources.

Among the different categories of motivation, functional motivations are particularly important. They include convenience, ease of access, flexibility, time savings, and the ability to use content regardless of time and place. Digital forms of cultural participation reduce spatial and temporal barriers, improve the accessibility of cultural resources, and allow users to decide independently how, when, and how intensively they engage with cultural content [3,5]. As a result, functional motivations increase the perceived usefulness of digital cultural services and encourage more frequent use of digital forms of participation. It can therefore be expected that individuals driven more strongly by functional motivations will use digital cultural services more frequently than those for whom such motivations are less important. The measurement of functional motivations adopted in this study was based on the scales developed by Janssen et al. [6] and Wolny [7], as these instruments were specifically designed to capture motivations underlying digital cultural participation and the use of digital cultural services. Based on these considerations, the following hypothesis is proposed:

H1. *Functional motivations positively influence digital culture consumption.*

2.2. Digital Competencies of Digital Culture Consumers

Digital competencies are a key component of contemporary human capital and play an important role in both professional and social life. As the digital economy develops and

the concept of Industry 5.0 gains prominence, there is growing demand for individuals who understand digital environments and can use modern technologies effectively in both work and everyday life [20]. In the context of digital cultural consumption, however, digital competencies extend beyond technical proficiency. They also include the ability to use digital resources in an informed, critical, and responsible manner. The literature offers a range of definitions of digital competencies, which differ in scope and in the elements they emphasise [21]. In Poland, a widely used definition adopted by the Ministry of Digital Affairs describes digital competencies as “a combination of knowledge, skills, and attitudes that enable people to live, learn, and work in a digital society, that is, one that uses digital technologies” [22,23]. A similar approach is reflected in the European digital competence frameworks, which emphasise the broad scope of these competencies and their close relationship with social competencies [24]. Gallardo-Echenique et al. [21] note that the diversity of definitions stems partly from different understandings of the terms competence and literacy. They stress that digital competencies should not be reduced to technical skills, but also include awareness, reflection, evaluation, and the responsible use of digital technologies.

Digital competencies can be analysed from both normative and relational perspectives. The normative perspective focuses on identifying the knowledge, skills, and attitudes required to function effectively in digital environments. The relational perspective, in turn, highlights their role in supporting a broad range of individual activities, including the use of digital media, social interaction, and access to information and cultural resources [25]. The relational perspective is especially relevant to digital cultural consumption, as the use of cultural goods and services requires not only the ability to operate technology, but also the ability to search for, select, evaluate, and interpret content, as well as to make informed decisions in digital environments.

The rapid development of digital technologies, accelerated by wider digital transformation and the growing use of artificial intelligence-based tools, has made digital competencies an essential resource for both organisations and consumers [26]. The literature emphasises that digital technologies have been reshaping how people access information, learn, and manage household activities for many years, while also creating new opportunities for participation in social and cultural life [27]. Digital transformation is also associated with growing demand for competencies related to the effective use of digital resources, adaptability, and information analysis [28]. Digital competencies should therefore be understood not as a set of isolated technical skills, but as a condition for informed, responsible, and effective consumer behavior in digital environments.

The ability to measure digital competencies makes it possible not only to assess consumers' readiness to function in digital environments, but also to identify areas requiring further development. As Kaczorowska-Spychalska [29] observes, the growing virtualisation of consumer behavior, attitudes, and decision-making has made digital technologies an integral part of everyday consumer activities. Depending on their level of digital competence, users may engage with digital technologies in more or less informed, critical, and responsible ways. Higher levels of digital competence may support not only more effective use of digital cultural goods and services, but also a better understanding of the consequences of one's actions, including their environmental implications. Digital competencies were measured using the framework proposed by Perifanou and Economides [30], which was selected because it captures a broad range of competencies directly relevant to participation in digital environments, including the effective and responsible use of digital services. It can therefore be expected that consumers with stronger digital competencies will demonstrate higher levels of environmental engagement. Based on these considerations, the following hypothesis is proposed:

H2. *Digital competencies positively influence environmental engagement.*

2.3. *Environmental Engagement*

Consumers' environmental engagement is one of the key conditions for achieving the goals of sustainable development. In this study, it is understood as a multidimensional construct comprising environmental awareness, attitudes towards environmental protection, and pro-environmental behavior. This approach reflects contemporary perspectives on consumer behavior, according to which actual environmental action is shaped not only by ecological knowledge and awareness, but also by personal values and declared attitudes. The importance of these elements is also emphasised in the 2030 Agenda. Sustainable Development Goal 12 calls for sustainable consumption and production patterns by reducing the negative environmental impact of human activity and encouraging more responsible consumer behavior [31]. Achieving these objectives requires not only appropriate institutional and technological solutions, but also greater environmental awareness across society and support for behaviors that promote sustainable consumption. Although environmental awareness, environmental attitudes, and pro-environmental behavior are conceptually distinct dimensions, they are widely recognized in environmental psychology as complementary components of environmental engagement, jointly reflecting individuals' orientation toward environmental responsibility [12,15,16].

Environmental awareness is a fundamental dimension of environmental engagement. It refers to an individual's level of knowledge, values, beliefs, and sensitivity to environmental issues. It includes both an understanding of processes occurring in the natural environment and a willingness to take action in support of environmental protection. The literature suggests that environmental awareness is shaped by knowledge, emotions, and the willingness to undertake actions aimed at maintaining a harmonious relationship between people and the environment [32]. A comprehensive perspective is offered by the concept of the "ecological triad", according to which the assessment of environmental awareness should include systems of values and norms, motivation to participate in activities supporting sustainable development, and consistency between attitudes and behaviors across different areas of individual activity [33]. Environmental awareness is therefore not determined solely by declared views, but also by the extent to which those views correspond to actual behavior. The development of environmental awareness is a gradual process involving greater sensitivity to environmental problems, growing interest in environmental protection, and the progressive internalisation of norms that support pro-environmental behavior [34]. As a result, environmental awareness is now understood both holistically, as a system of values and social beliefs concerning the environment, and practically, as knowledge and ways of understanding the principles of environmental protection and the rational use of natural resources [35].

A high level of environmental awareness does not always lead to concrete environmental action. Research indicates that the relationship between awareness and pro-environmental behavior is complex and shaped by numerous psychological and social factors. Key barriers include feelings of powerlessness, social norms, and growing eco-anxiety, all of which may reduce people's willingness to act despite strong concern for environmental issues [36]. Similar conclusions were reached by Amjad et al. [37], who found that greater environmental awareness can encourage pro-environmental behavior while also increasing susceptibility to eco-anxiety, particularly among younger consumers. Digital technologies and online media are playing an increasingly important role in addressing this gap, as they facilitate access to environmental information and support the exchange of knowledge and experience. Hrei et al. [38] argue that the internet and social media are among the most effective contemporary tools for raising environmental aware-

ness by providing information, initiating discussion, and engaging users in environmental action. Gnanasekaran et al. [11] likewise highlight the importance of motivations and incentives in supporting the development of pro-environmental attitudes and behaviors. Findings reported by Wu and Zhang [13] further suggest that the use of digital media can positively influence pro-environmental behavior by increasing environmental knowledge and strengthening concern for environmental protection. Digital media also enable new forms of civic engagement, as illustrated by Environmental Awareness Activism, in which social media platforms are actively used to raise environmental awareness and promote climate action [39].

Recent empirical evidence further supports the role of digital environments in fostering pro-environmental engagement. For example, exposure to environmental information through social media has been shown to strengthen individuals' intentions to engage in pro-environmental behavior by increasing environmental knowledge and reinforcing pro-environmental social norms [40]. Likewise, participation in online environmental communities encourages environmentally responsible behavior through social learning, peer influence, and knowledge exchange [41]. More broadly, a recent systematic review concluded that digital technologies can facilitate behavioral change toward sustainability by supporting information sharing, community engagement, and environmentally responsible decision-making across diverse digital contexts [42]. These findings provide additional empirical support for the assumption that participation in digital environments—including digital cultural platforms—may contribute to higher levels of environmental engagement. Taken together, these findings suggest that increased exposure to environmental information and sustainability-oriented social interactions constitutes the primary mechanism through which digital cultural consumption may enhance environmental engagement. Greater environmental knowledge and social learning may subsequently encourage more reflective consumption practices and environmentally responsible behaviors.

Environmental awareness is an important, but not the only, determinant of consumers' pro-environmental behavior. Achieving sustainable development goals requires changes on the part of both producers and consumers, and greater environmental awareness can help reduce the negative environmental impact of consumption [43]. Pro-environmental behavior is also an integral element of sustainable consumption, understood as meeting the needs of the present generation without compromising the ability of future generations to meet their own needs [15]. As researchers emphasise, sustainable consumption is closely linked to individual values as well as social and market conditions, including social norms, product availability, and the behavior of other market participants [16]. At the same time, many studies point to a persistent gap between declared attitudes and actual consumer behavior. Despite growing environmental awareness, consumers do not always make choices consistent with the principles of sustainable consumption. Commonly identified barriers include the high prices of environmentally friendly products, their limited availability, greenwashing, doubts about the effectiveness of individual action, inconvenience associated with purchasing or using sustainable alternatives, and insufficient social support for pro-environmental choices [16,44]. In the context of digital cultural consumption, digital environments may help reduce some of these barriers by facilitating access to environmental information, strengthening pro-environmental social norms, and enabling interaction with communities that promote sustainable lifestyles. Digital platforms facilitate access to environmental information, support the exchange of experiences, promote responsible consumption patterns, and enable active participation in sustainability-related initiatives. It can therefore be expected that greater engagement in digital cultural consumption will be associated with higher levels of consumers' environmental engagement. The measurement framework adopted in this study was based on the instrument developed by

Barragán-Sánchez et al. [12], which conceptualizes environmental awareness, attitudes, and pro-environmental behavior as distinct but closely related dimensions of environmental engagement. The rationale for integrating these dimensions into a single latent construct is presented in the Section 3 and further discussed in light of the empirical validation results. Based on these considerations, the following hypothesis is proposed:

H3. *Digital culture consumption positively influences environmental engagement.*

2.4. Model Development

The aim of this study is to examine the mechanisms associated with environmentally oriented engagement in the context of digital culture participation and digital competencies. In particular, the study investigates how functional motivations related to digital culture consumption influence environmental engagement, both directly and indirectly through digital culture consumption behaviors. Additionally, the model examines the role of digital competencies as a factor supporting environmentally engaged participation in digital environments.

The conceptual assumptions of the model are grounded in previous studies emphasizing the importance of motivational, behavioral, and competency-related determinants of participation in digitally mediated cultural and environmental practices. Existing literature suggests that functional motivations may stimulate active engagement with digital culture by increasing the frequency and intensity of participation in online cultural activities. At the same time, digital competencies are often recognized as a prerequisite for meaningful participation in digital environments, facilitating access to information, interaction, and environmentally responsible forms of online engagement.

Environmental engagement is conceptualized in this study as a multidimensional construct encompassing environmental awareness, environmental attitudes, and environmentally responsible behaviors. These dimensions are closely related in the sustainability literature and are frequently treated as complementary manifestations of individuals' environmental orientation. Environmental awareness provides the cognitive foundation for understanding environmental challenges, environmental attitudes reflect evaluative judgments and personal concern regarding environmental issues, whereas environmentally responsible behaviors represent the behavioral expression of these beliefs and values. Together, these dimensions form a broader orientation toward sustainability and environmental responsibility.

Drawing on these theoretical considerations, the proposed model assumes that functional motivations encourage participation in digital culture, which may subsequently foster environmental engagement through increased exposure to information, social interaction, and sustainability-related content. Furthermore, digital competencies are expected to directly support environmental engagement by enabling individuals to effectively access, evaluate, and utilize digital resources related to environmental issues.

The proposed mediating relationship is grounded in the assumption that functional motivations alone are unlikely to translate directly into environmental engagement. Rather, they first encourage individuals to participate more actively in digital cultural activities by increasing the attractiveness, accessibility, and perceived usefulness of digital cultural content [5–7]. Through this increased participation, users are exposed more frequently to sustainability-related information, environmentally oriented social interactions, and responsible consumption practices, all of which have been shown to foster pro-environmental engagement in digital environments [13,38,40,41]. Consequently, digital culture consumption is expected to function as the behavioral pathway through which functional motivations contribute to higher levels of environmental engagement.

The conceptual model proposed in this study is presented in Figure 1.

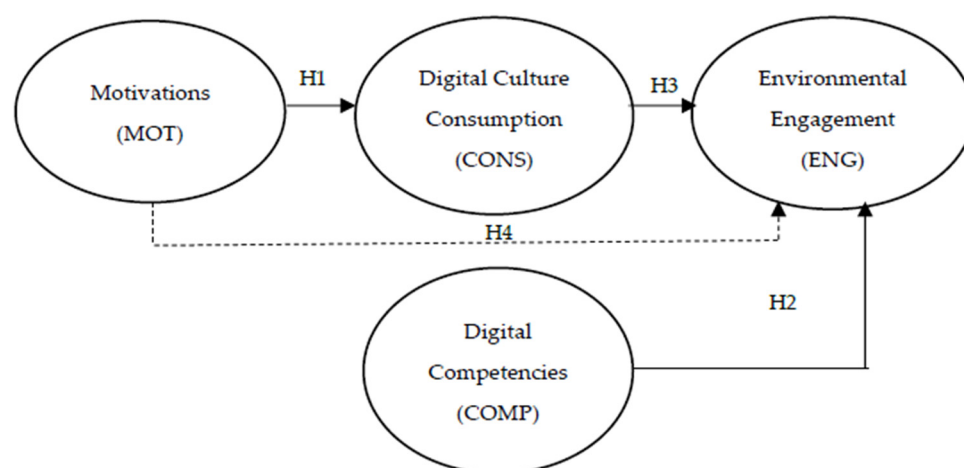


Figure 1. Conceptual framework and hypothesized research model.

The model assumes that functional motivations positively influence digital culture consumption, which in turn contributes to environmental engagement. Furthermore, digital competencies are expected to directly support environmental engagement by facilitating informed and active participation in digital environments. The model also assumes an indirect effect of functional motivations on environmental engagement through digital culture consumption.

Based on the reviewed literature, the conceptual model presented in Figure 1 integrates the direct relationships proposed in the preceding sections. Accordingly, hypotheses H1–H3 were formulated to explain the effects of functional motivations and digital competencies on digital culture consumption and environmental engagement. Furthermore, considering the theoretical relationships between these constructs, digital culture consumption is expected to act as a mediating mechanism through which functional motivations influence environmental engagement. Therefore, the following mediation hypothesis was formulated:

H4. *Digital culture consumption mediates the relationship between functional motivations and environmental engagement.*

3. Materials and Methods

3.1. Questionnaire Development

To empirically validate the proposed research model, a structured questionnaire was developed using previously validated measurement scales adapted to the context of digital culture consumption. The research instrument was designed based on a comprehensive review of the relevant literature and previous studies on user behavior in digital environments, digital competencies, and pro-environmental attitudes.

The operationalization of the variables included four main constructs: motivations for engaging in digital culture (MOT), digital competencies (COMP), digital culture consumption (CONS), and environmental engagement (ENG = AWAR + ATT + BEH). Individual measurement items were adapted from previously published studies. Measures of digital culture consumption and motivations for engaging in digital culture were adapted from the studies by Janssen et al. and Wolny [6,7]. Digital competencies were assessed using the scale developed by Perifanou and Economides [30]. To capture the environmental dimension, the items measuring AWAR, ATT, and BEH were adapted from the validated framework by Barragán-Sánchez et al. [12]. While the original scale treated these dimensions as distinct constructs, our study adopted an integrated solution. Due to the high empirical convergence and strong multi-layered overlap observed during the CFA—particularly between

awareness and behavior—these dimensions were unified into a single, comprehensive first-order construct labeled ENG. This modification was justified both statistically, to address the substantial empirical overlap observed among the three dimensions, and theoretically. Although environmental awareness, attitudes, and behavior are conceptually distinct constructs, environmental engagement is widely conceptualized as a multidimensional phenomenon encompassing cognitive, affective, and behavioral components [12,15,16]. At the same time, the high correlations observed between these dimensions may also reflect the declarative nature of self-reported measures, common method variance, social desirability bias, or partial conceptual overlap among some questionnaire items. These issues are further discussed in the Section 5. All modified measurement items preserved their original core meaning while being tailored to fit the specific digital culture context of the present study. Respondents evaluated each statement using a five-point Likert scale, where 1 indicated strongly disagree and 5 indicated strongly agree. The questionnaire also included questions regarding respondents' demographic characteristics, including gender, age, education, employment status, and place of residence. A detailed operationalization of all constructs is presented in Table 1.

Table 1. Measuring scales' items.

Measuring Scales' Items
Digital Culture Consumption (CONS)
CONS1—Watching movies on streaming platforms
CONS2—Watching TV series on streaming platforms
CONS3—Listening to music
CONS4—Listening to podcasts
CONS5—Using audiobooks
CONS6—Reading e-books
CONS7—Reading digital publications (e.g., PDF documents)
CONS8—Participating in online cultural events (e.g., concerts, theatre performances)
CONS9—Using digital resources provided by libraries, museums, and similar cultural institutions
CONS10—Searching for information about cultural events and cultural content on the Internet
CONS11—Watching recordings of artistic events on video platforms (e.g., theatre performances, operas, exhibitions)
Functional Motivations (MOT)
MOT1—I choose digital culture because of its convenience, requiring minimal effort (e.g., in terms of time, organization, cognitive effort, and physical effort)
MOT2—Digital formats allow me to save time
MOT3—Digital culture gives me access to a wider range of content
MOT4—Online participation offers me greater flexibility in terms of time
MOT5—It is easier for me to integrate digital culture into my daily routine
MOT6—Digital culture is less expensive for me than participating in traditional (non-digital) culture
MOT7—I use digital culture only when I am unable to participate in person
MOT8—I choose digital culture because it is not limited by location (it does not matter where I am when I access digital cultural content)
MOT9—Digital culture enables me to find content of interest more quickly
MOT10—Digital culture fits my lifestyle better than traditional (non-digital) culture
Digital Competencies (COMP)
COMP1—I can use digital platforms with ease
COMP2—I am able to search for valuable cultural content online
COMP3—I understand how recommendation algorithms work
COMP4—I can assess the credibility of online content
COMP5—New cultural applications are easy for me to use
COMP6—I can independently solve minor technical problems related to accessing digital culture
COMP7—I feel confident in the digital environment
COMP8_INV (reverse-coded item)—I need help using new digital platforms
COMP9—My digital skills influence the extent of my participation in culture
COMP10_INV (reverse-coded item)—Lack of digital skills limits participation in online culture

Table 1. *Cont.*

Measuring Scales' Items
Environmental Awareness (AWAR)
AWAR1—I have heard about the environmental impact of using digital culture (e.g., streaming, e-books, music platforms)
AWAR2—I have a clear understanding of the environmental impact of using digital culture
AWAR3—I have participated in courses, training sessions, or awareness initiatives concerning the environmental impact of digital culture
AWAR4—I can clearly identify which forms of participation in digital culture have an environmental impact
AWAR5—I can identify which forms of digital culture consumption generate the highest energy consumption
AWAR6—I know how to take actions to reduce the negative environmental impact of my use of digital culture
Environmental Attitudes (ATT)
ATT1—I believe that participating in digital culture is more environmentally friendly than participating in traditional culture that requires travel
ATT2—I believe that the way people use digital culture can have a real impact on climate change
ATT3—When choosing between an online and an in-person cultural event, I take climate-related considerations into account
Environmental Behaviors (BEH)
BEH1—I make conscious decisions to reduce the environmental impact of my participation in digital culture
BEH2—I use digital culture in a more environmentally responsible way (e.g., by reducing streaming quality or extending the lifespan of my devices)
BEH3—I choose digital culture instead of in-person events because it reduces the need for travel and associated CO ₂ emissions

Source: [6,7,12,30].

3.2. Data Collection

A quantitative research approach was employed using the Computer-Assisted Web Interviewing (CAWI) technique. This method was selected because it enables efficient data collection from large and heterogeneous populations while ensuring the quality and consistency of the obtained responses. Its applicability to studies involving users of digital environments has also been confirmed in previous research [45,46].

Before the survey was launched, the research protocol and questionnaire were reviewed by the Human Research Ethics Committee of the University of Economics in Katowice to ensure compliance with internationally recognized ethical standards. The Committee issued a favorable opinion (Approval No. 2/2025), confirming that the study adequately protected participants' rights and welfare. Data collection was carried out via the SurveyMonkey platform by the Research and Development Center of the University of Economics in Katowice. Throughout the fieldwork, the demographic structure of the sample was monitored to maintain an appropriate distribution of respondents according to gender and age. The study targeted individuals actively participating in digital culture, and data were collected between 3 and 14 March 2026. Participation was entirely voluntary and anonymous. Before completing the questionnaire, respondents were informed about the scientific purpose of the study, provided informed consent, and were advised that they could discontinue participation at any stage without any consequences. All research procedures complied with the requirements of the General Data Protection Regulation (GDPR). The final analytical sample consisted of 620 respondents (N = 620).

3.3. Sample

The study sample comprised 620 respondents and represented a heterogeneous socio-demographic profile (Table 2). Women constituted a slight majority (51.0%), while men accounted for 48.2% of the participants. The age structure was dominated by respondents aged 35–44 years (31.3%), followed by those aged 25–34 years (26.3%), whereas the remaining age groups each represented less than 15% of the sample.

Table 2. Sample characteristics.

Item		In %
Gender	Female	51.0
	Male	48.2
	Other	0.8
Age group	18–24	12.7
	25–34	26.3
	35–44	31.3
	45–54	14.8
	55–64	10.5
	65 and more	4.4
Education level	Primary	3.7
	Basic vocational	15.8
	Secondary	37.9
	Tertiary	42.6
Employment	Yes	80.3
	No	19.7
Place of residence	Rural	25.3
	Towns, up to 50,000 residents	7.7
	Towns, 51,000–100,000 residents	8.4
	Towns, 101,000–500,000 residents	36.6
	Towns over 501,000 residents	21.9

Source: own preparation.

In terms of educational attainment, tertiary education was the most common level (42.6%), followed by secondary education (37.9%). Basic vocational education was reported by 15.8% of respondents, whereas only 3.7% had completed primary education. Most participants were economically active (80.3%). Regarding place of residence, the largest proportion lived in towns with 101,000–500,000 inhabitants (36.6%), followed by rural areas (25.3%) and cities with more than 500,000 inhabitants (21.9%). Detailed sample characteristics are presented in Table 2.

3.4. Methods of Analysis

SEM was employed to validate the measurement structure and evaluate the relationships among the constructs. All questionnaire items were measured using five-point Likert scales ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). Because the observed indicators represented ordinal variables rather than continuous measures, the analyses employed the robust weighted least squares estimator with mean and variance adjustment (WLSMV). This estimator is recommended for ordinal categorical data and non-normally distributed indicators because it provides robust parameter estimates, standard errors, and fit statistics under conditions frequently observed in social science survey research [47–49].

Prior to model estimation, the distributional properties of the observed variables were examined. Multivariate normality was assessed using Mardia’s test, while univariate normality was evaluated using the Anderson–Darling test. The results indicated significant departures from both multivariate and univariate normality, further supporting the use of the WLSMV estimator for the subsequent analyses.

The analytical procedure was conducted in several consecutive stages. First, preliminary psychometric analyses were performed to evaluate the internal consistency and reliability of the measurement scales. Reliability was assessed using Cronbach’s alpha (α), ordinal alpha, McDonald’s omega (ω), and composite reliability (CR). Reliability coefficients above 0.70 were interpreted as satisfactory, following commonly accepted psychometric recommendations [49,50].

Next, CFA was applied to assess the factorial validity of the latent constructs and verify the adequacy of the proposed measurement structure. CFA enabled the evaluation of relationships between observed indicators and their corresponding latent variables, as well as the identification of problematic indicators or structurally overlapping constructs.

Model fit was evaluated using several commonly recommended fit indices, including the Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), robust RMSEA, and Standardized Root Mean Square Residual (SRMR). Following established SEM recommendations, CFI and TLI values above 0.90 were interpreted as indicating acceptable model fit, whereas RMSEA and SRMR values below 0.08 were considered satisfactory [51–53]. In addition to the commonly reported fit indices, the normed chi-square statistic (χ^2/df) was examined as an auxiliary measure of model fit. Values below 5.0 were considered indicative of acceptable fit, whereas values below 3.0 suggested good model fit. The use of the χ^2/df ratio partially addresses the well-known sensitivity of the chi-square statistic to sample size in large-sample SEM applications [52].

Convergent validity was assessed using standardized factor loadings and Average Variance Extracted (AVE). Standardized factor loadings above 0.50 were considered acceptable, although selected indicators with slightly lower loadings were retained when theoretically justified and when their removal did not substantially improve the overall model quality [50]. CR was additionally examined to assess construct consistency. Discriminant validity was evaluated using latent variable correlations, the Fornell–Larcker criterion, and the heterotrait–monotrait ratio (HTMT) [54,55]. Following recent recommendations, bootstrap confidence intervals for HTMT coefficients were additionally estimated using 5000 bootstrap resamples. HTMT values below 0.85 and confidence intervals not exceeding the recommended threshold were interpreted as evidence of satisfactory discriminant validity.

During the CFA stage, additional analyses were conducted to evaluate the empirical distinctiveness of the environmental constructs. Preliminary results indicated substantial overlap among environmental awareness, environmental attitudes, and environmentally responsible behaviors. Consequently, alternative model specifications were examined, including higher-order factor solutions. The final measurement structure was selected on the basis of theoretical interpretability, discriminant validity assessment, model stability, and overall fit indices.

After validation of the measurement model, SEM was applied to test the hypothesized relationships among the latent constructs. SEM was selected because it enables the simultaneous estimation of multiple direct and indirect relationships between latent variables while accounting for measurement error [52]. The final structural model examined the direct effects of functional motivations on digital culture consumption, digital culture consumption on environmental engagement, and digital competencies on environmental engagement.

In addition, mediation analysis was performed within the SEM framework to examine whether digital culture consumption mediates the relationship between functional motivations and environmental engagement. Indirect effects were estimated directly within the structural model using standardized coefficients [56]. The mediation analysis enabled the assessment of both the magnitude and statistical significance of the indirect relationships between the analyzed constructs. Structural relationships were evaluated using standardized path coefficients (β), associated *p*-values, and 95% confidence intervals.

The statistical analyses were conducted in the R statistical environment (version 4.5.2) [57] using several dedicated packages for psychometric and structural equation modeling analyses. CFA and SEM were performed using the lavaan package [58,59], which is widely used for latent variable modeling and covariance structure analysis. Relia-

bility and validity analyses, including CR, AVE, the Fornell–Larcker criterion, and HTMT, were conducted using the *semTools* [60] and *psych* [61] packages. Assessment of univariate and multivariate normality was performed using the *MVN* package [62]. Graphical visualization of the measurement and structural models was prepared using the *semPlot* package [63].

4. Results

4.1. Measurement Model Assessment

The CFA and SEM were preceded by Mardia's multivariate normality test and the Anderson–Darling test for univariate normality. The results indicated significant departures from both multivariate and univariate normality (Mardia skewness = 17,668.792, $p < 0.001$; Mardia kurtosis = 39.706, $p < 0.001$). Furthermore, all observed indicators demonstrated significant deviations from normal distribution in the Anderson–Darling tests ($p < 0.001$). These results additionally justified the application of the WLSMV estimator, which is recommended for ordinal and non-normally distributed data.

To evaluate the psychometric properties of the proposed constructs, CFA was conducted. The initial measurement model included six latent constructs representing digital culture consumption (CONS), functional motivations (MOT), digital competencies (COMP), environmental awareness (AWAR), environmental attitudes (ATT), and environmentally responsible behaviors (BEH).

Preliminary analyses revealed psychometric problems associated with two reverse-coded indicators within the digital competencies construct (COMP8_INV: $\lambda = 0.087$, $p = 0.040$; COMP10_INV: $\lambda = -0.416$, $p < 0.001$). These items demonstrated weak and inconsistent factor loadings, suggesting possible wording-related response effects and potential respondent difficulties in interpreting reverse-coded statements. Consequently, both reverse-coded indicators were removed from subsequent analyses to improve model stability and construct consistency.

The CFA results additionally indicated substantial empirical overlap among environmental awareness, environmental attitudes, and environmentally responsible behaviors. The latent correlations among these constructs were very high (AWAR–ATT: $r = 0.797$; AWAR–BEH: $r = 0.977$; ATT–BEH: $r = 0.867$), suggesting insufficient discriminant validity. In particular, the almost perfect correlation between environmental awareness and environmentally responsible behavior indicates that these dimensions were not empirically distinguishable in the present dataset. This strong association may reflect the close conceptual relationship between the constructs, but it may also have been influenced by the declarative nature of the self-reported measures, common method variance, social desirability bias, or partial conceptual overlap among some questionnaire items.

Consequently, to obtain a parsimonious and statistically stable measurement model, environmental awareness, environmental attitudes, and environmentally responsible behavior were integrated into a single first-order construct labelled Environmental Engagement (ENG). This solution was adopted on both empirical and theoretical grounds, reflecting the close interrelationships among these dimensions while reducing problems associated with discriminant validity in the measurement model.

The final four-factor measurement model demonstrated satisfactory fit to the data. The obtained fit indices met commonly accepted SEM criteria and indicated acceptable model adequacy (Table 3). In particular, the values of CFI (0.931) and TLI (0.927) exceeded the recommended threshold of 0.90, while RMSEA (0.057), robust RMSEA (0.053), and SRMR (0.063) remained below the recommended cutoff value of 0.08. Overall, these results provide support for the factorial validity of the proposed measurement model and justify its use in subsequent structural analyses.

Table 3. Measurement model fit indices.

Fit Index	Value	Recommended Threshold
χ^2/df	3.035	<5.0
CFI	0.931	>0.90
TLI	0.927	>0.90
RMSEA	0.057	<0.08
Robust RMSEA	0.053	<0.08
SRMR	0.063	<0.08

Note: df = degrees of freedom. Source: own preparation.

Standardized factor loadings for the retained indicators were statistically significant ($p < 0.001$) and ranged from 0.385 to 0.685. Most indicators exceeded the recommended threshold of 0.50, indicating satisfactory relationships between the observed variables and their respective latent constructs. Several indicators with slightly lower loadings were retained because of their theoretical relevance and acceptable contribution to construct reliability. Overall, the pattern of factor loadings provided support for the convergent validity of the measurement model.

To further evaluate the quality of the measurement model, construct reliability was assessed using a range of complementary indicators, including Cronbach's alpha, ordinal alpha, McDonald's omega, composite reliability, and AVE (Table 4).

Table 4. Reliability and convergent validity statistics.

Construct	Cronbach's α	Ordinal α	McDonald's ω	Composite Reliability (CR)	AVE
CONS	0.788	0.807	0.808	0.856	0.307
MOT	0.783	0.815	0.796	0.801	0.313
COMP	0.715	0.752	0.731	0.735	0.284
ENG	0.840	0.858	0.842	0.846	0.339

Source: own preparation.

The reliability results indicated satisfactory internal consistency for all retained constructs. Cronbach's alpha, ordinal alpha, McDonald's omega, and composite reliability values generally exceeded the recommended threshold of 0.70, supporting the reliability of the measurement scales.

Although the AVE values for all latent constructs were below the conventional threshold of 0.50 (ranging from 0.284 to 0.339), all constructs demonstrated satisfactory composite reliability (CR = 0.735–0.856). Fornell and Larcker [55] originally proposed that satisfactory composite reliability may partially compensate for lower AVE values when assessing convergent validity. More recent methodological recommendations, however, emphasize that convergent validity should be evaluated using multiple complementary criteria rather than relying on a single indicator alone [64]. Accordingly, the relatively low AVE values observed in the present study should be interpreted with caution and regarded as a limitation of the measurement model. Therefore, the assessment of construct validity was not based solely on AVE but was complemented by additional reliability and discriminant validity measures presented below.

Discriminant validity was evaluated using both the Fornell–Larcker criterion and HTMT, following contemporary recommendations for structural equation modeling. The Fornell–Larcker criterion assesses whether a construct shares more variance with its own indicators than with other constructs, whereas HTMT is considered a more sensitive and reliable approach for detecting potential discriminant validity problems.

As presented in Table 5, the square roots of the AVE values exceeded the corresponding inter-construct correlations for the majority of the latent variable pairs, indicating acceptable

discriminant validity across those dimensions. However, a localized infraction of the traditional Fornell–Larcker criterion was detected between functional motivations (MOT) and digital competencies (COMP), where the latent correlation ($r = 0.725$) exceeded the respective square roots of their AVE values (0.559) and (0.533). This statistical proximity indicates a substantial conceptual and empirical overlap, suggesting that digital consumers who possess higher technological capabilities may perceive greater functional benefits by pragmatic and functional motivations to exploit digital platforms.

Table 5. Fornell–Larcker criterion.

Construct	CONS	MOT	COMP	ENG
CONS	0.554			
MOT	0.274	0.559		
COMP	0.171	0.725	0.533	
ENG	0.433	0.206	0.223	0.583

Note: Diagonal elements (bold) represent the square roots of AVE, whereas off-diagonal elements represent latent variable correlations. Source: own preparation.

Given recent methodological recommendations highlighting the limitations of the Fornell–Larcker criterion, discriminant validity was additionally assessed using the HTMT approach with bootstrap confidence intervals (Table 6).

Table 6. HTMT matrix with 95% bootstrap confidence intervals.

Construct	CONS	MOT	COMP	ENG
CONS	-			
MOT	0.231 (0.217–0.356)	-		
COMP	0.179 (0.176–0.292)	0.722 (0.606–0.802)	-	
ENG	0.443 (0.309–0.535)	0.165 (0.116–0.280)	0.191 (0.125–0.309)	-

Note: Values below the diagonal represent HTMT coefficients. Values in parentheses indicate 95% bootstrap confidence intervals based on 5000 resamples. Source: own preparation.

The HTMT values ranged from 0.165 to 0.722. All coefficients remained below the recommended threshold of 0.85. Furthermore, none of the upper bounds of the bootstrap confidence intervals exceeded the critical value, providing additional evidence of satisfactory discriminant validity among the retained constructs. The highest HTMT value was observed between functional motivations and digital competencies (HTMT = 0.722; 95% CI: 0.606–0.802), indicating substantial but acceptable conceptual relatedness between these constructs. This relationship is theoretically plausible, as individuals with stronger motivations to engage in digital cultural activities are also more likely to possess higher levels of digital competencies, which facilitate access to, navigation within, and active participation in digital environments.

Therefore, despite the partial violation of the Fornell–Larcker criterion, the overall evidence supports satisfactory discriminant validity among the retained constructs. In accordance with contemporary methodological recommendations, discriminant validity was evaluated primarily using the HTMT criterion, which is considered a more sensitive and reliable indicator than the Fornell–Larcker criterion for assessing discriminant validity. Consequently, the retained constructs were considered empirically distinguishable and suitable for subsequent structural analysis.

4.2. Structural Model Results

The hypothesized relationships among functional motivations, digital culture consumption, digital competencies, and environmental engagement were examined using SEM. The final structural model demonstrated satisfactory fit to the data ($\chi^2 = 2321.955$, $df = 765$, $CFI = 0.931$, $TLI = 0.927$, $RMSEA = 0.057$, robust $RMSEA = 0.053$, $SRMR = 0.063$) and explained 7.0% of the variance in digital culture consumption and 20.7% of the variance in environmental engagement. The structural model accounted for 7.0% of the variance in digital culture consumption ($R^2 = 0.070$) and 20.7% of the variance in environmental engagement ($R^2 = 0.207$). Crucially, while the R^2 for CONS is statistically modest, it is methodologically acceptable given that the primary focal construct and target end-variable of this research framework is ENG. Within this conceptual model, CONS is operationalized predominantly as a mediating mechanism rather than a final outcome variable. According to Hair et al. [50], the acceptability of R^2 values depends heavily on the specific research domain; in studies examining consumer behavior and psychological perceptions, R^2 values as low as 0.10 or 0.20 are frequently encountered and considered satisfactory, as human decisions are inherently shaped by a wide array of unobserved external factors. The lower R^2 for CONS implies that digital cultural participation is highly fragmented and predominantly governed by external determinants outside the conceptual scope of this framework, such as subscription pricing or leisure time constraints. Conversely, for the primary target variable (ENG) the model achieves a much more substantial explanatory power, demonstrating that the integrated structural paths of functional motivations, digital competencies, and cultural consumption possess stable and non-trivial predictive validity as conceptualized under the guidelines of Hair et al. [50].

Figure 2 illustrates the final SEM model with standardized path coefficients, whereas Table 7 reports the detailed results of the structural relationships and mediation analysis.

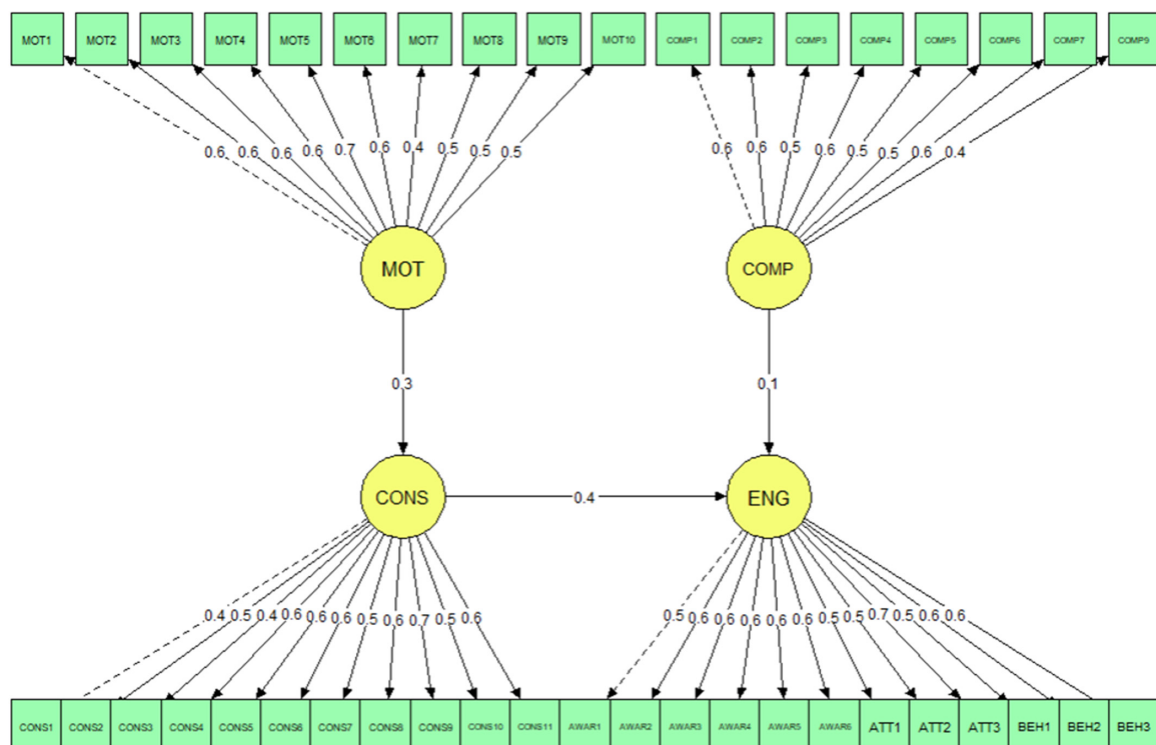


Figure 2. Structural equation model with standardized path coefficients. Note: Values represent standardized path coefficients (β). Values on paths are rounded to one decimal place for clarity; for precise three-digit values, statistical significance, and confidence intervals (see Table 7). Source: own preparation.

Table 7. Structural model results.

Hypothesis	Path	β	95% CI	<i>p</i> -Value	Result
H1	MOT → CONS	0.264	[0.184, 0.344]	<0.001	Supported
H2	COMP → ENG	0.142	[0.051, 0.234]	0.002	Supported
H3	CONS → ENG	0.405	[0.331, 0.480]	<0.001	Supported
H4	MOT → CONS → ENG (indirect)	0.107	[0.067, 0.147]	<0.001	Supported

Note: β = standardized coefficient, SE = standard error. Model estimated with WLSMV. R^2 for CONS = 0.070, R^2 for ENG = 0.207. Source: own preparation.

The SEM analysis indicated that functional motivations significantly predicted digital culture consumption ($\beta = 0.264$, $p < 0.001$), supporting H1. This result suggests that individuals motivated by convenience, accessibility, flexibility, and efficiency are more likely to engage in digital culture consumption activities.

The analysis additionally demonstrated that digital competencies exerted a significant direct effect on environmental engagement ($\beta = 0.142$, $p = 0.002$), supporting H2. This finding indicates that digitally competent individuals may demonstrate greater awareness of the environmental implications of digital technologies and more sustainable forms of participation in digital environments.

Digital culture consumption, in turn, significantly predicted environmental engagement ($\beta = 0.405$, $p < 0.001$), supporting H3. Thus, more intensive participation in digital cultural activities was associated with stronger environmental awareness, more pro-environmental attitudes, and more environmentally responsible behaviors.

Mediation analysis further revealed a statistically significant indirect effect of functional motivations on environmental engagement through digital culture consumption ($\beta = 0.107$, $p < 0.001$), supporting H4. This result indicates that functional motivations indirectly contribute to environmental engagement by stimulating participation in digital culture consumption.

Overall, the findings indicate that environmental engagement is shaped by both behavioral participation in digital cultural activities and users' digital competencies. Among the direct predictors, digital cultural consumption exhibited the strongest effect on environmental engagement ($\beta = 0.405$), whereas digital competencies also contributed significantly, although to a lesser extent ($\beta = 0.142$). Furthermore, digital culture consumption served as a significant mediating mechanism linking functional motivations with environmental engagement, highlighting the importance of active participation in digital cultural environments for fostering environmentally responsible engagement.

5. Discussion

In the face of dynamic technological changes, and particularly the growing role of digital technologies, the issue concerning the relationship between digital cultural consumption and the environmental engagement of its recipients is gaining importance. The considerations undertaken in the article are part of one of the key and most current challenges, namely the so-called twin transition—the simultaneous process of digitalization and the green transformation of the economy. The cultural sector, experiencing digitalization, has ceased to be merely an area serving entertainment and has become a unique space for redefining consumer behavior and disseminating pro-environmental values, which, in a certain way, allows culture to be perceived as the fourth, dynamic pillar of sustainable development [65]. From this perspective, digital cultural consumption should be viewed not only as a contemporary form of cultural participation but also as an integral component of the digital economy. By complementing or partially replacing traditional forms of cultural engagement, digital services have the potential to promote more sustainable consumption patterns through reduced reliance on travel, physical materials, and other

resource-intensive activities, while at the same time broadening access to cultural content. Consequently, understanding the factors that foster environmentally responsible engagement in digital cultural environments is becoming increasingly important for both sustainability research and policies supporting digital transformation.

The literature indicates that the consumption of digital culture is not limited to technical access to specific content, but encompasses a broader system of social practices, communication patterns, interactions, and decisions made within the environment of digital platforms, applications, social media, and online services [1,3,4,8,66]. In this context, it becomes particularly important to question whether and in what way digital cultural practices can support environmental awareness, pro-environmental attitudes, and environmentally responsible behaviors. The significance of this issue is reinforced by research showing that digital media can foster the dissemination of ecological knowledge and strengthen pro-environmental behaviors, although digital consumption itself also generates its own environmental footprint related to infrastructure, data transmission, and device usage [11,13,67].

The empirical study made it possible to integrate previously separate theoretical perspectives concerning digital culture consumption, digital competencies, and pro-environmental engagement, constituting an important contribution to the discussion on the sustainable dimension of the digital transformation of culture. The results of SEM made it possible to positively verify all four research hypotheses, while demonstrating a high degree of model fit to the empirical data.

The verification of hypothesis H1 confirmed that functional motivations positively and significantly affect digital culture consumption ($\beta = 0.264$, $p < 0.001$). This implies that convenience, accessibility, temporal and spatial flexibility, time and cost savings, and ease of use of content may constitute an important mechanism increasing the intensity of participation in digital culture [3]. This result corresponds with the approach proposed by Dey et al. [1], according to which consumer behavior in the digital environment is shaped by interactions with technologies, platforms, applications, and social media. Thus, digital culture consumption develops not only because content is available online, but because the way it is made available responds to the practical needs of contemporary consumers. These results are also consistent with studies on e-consumption [6], emphasizing that digital transformation redefines traditional motives of participation in favor of a service logic oriented toward personalization and the minimization of access barriers.

The key and, at the same time, strongest relationship identified in the structural model proved to be the direct, positive effect of digital culture consumption on environmental engagement ($\beta = 0.405$, $p < 0.001$), which allowed hypothesis H3 to be positively verified. The obtained results indicate that digital participation in culture may be associated with a higher level of environmental awareness, more pro-environmental attitudes, and greater readiness to undertake environmentally responsible behavior.

The present finding is consistent with previous studies demonstrating that digital environments facilitate the dissemination of environmental knowledge and strengthen pro-environmental engagement [13,38,40,41]. Two complementary explanations may account for this relationship. First, digital space, and particularly social media, constitutes an extremely effective ecosystem for the distribution of ecological knowledge, facilitating users' access to information about the climate crisis and stimulating their ecological attitudes and awareness [13,38]. Similar conclusions were also formulated by Wolny et al. [68], indicating that consumer behavior in the digital environment can directly build ecological awareness by facilitating contact with green communities (promoting, among other things, zero-waste principles or the circular economy). In this context, digital culture consumption increases users' contact with diverse content, narratives, discussions, and recommendations, among

which issues related to climate change, consumer responsibility, the reduction in excessive consumption, or the environmental consequences of a particular lifestyle are appearing increasingly often. Digital cultural environments may therefore serve as an intermediary space between cultural content and reflection on environmental responsibility. This does not mean, however, that digital consumption itself is automatically ecological. Although the literature increasingly emphasizes the issue of the hidden carbon footprint of information and communication technologies—pointing to the high energy intensity of data centers, high-resolution streaming, the use of electronic devices and digital infrastructure, and the generation of e-waste [11]—the present study demonstrates that more frequent and more comprehensive participation in digital culture fosters a stronger pro-environmental orientation. Moreover, consumers may consciously choose digital culture (e.g., e-books, podcasts, or virtual events) as a deliberate strategy for reducing negative environmental impact, eliminating emissions associated with physical transport or the material production of goods, which reflects decision-making mechanisms at the intersection of the real and virtual worlds (phygital environment).

Taking the above into account, the positive relationship between digital culture consumption and environmental engagement should be interpreted with caution. Although digital forms of culture may reduce some of the environmental costs associated with traditional consumption, the development of technological infrastructure and its use also have specific environmental consequences. The obtained results therefore indicate the potential of digital culture as an environment for shaping environmental awareness and attitudes, rather than an unequivocally pro-environmental character of all forms of digital consumption. This conclusion is particularly important because it makes it possible to avoid a simplified opposition between digital culture as “green” and traditional culture as “less sustainable.”

The confirmation of hypothesis H2 allows us to state that digital competencies exert a direct, positive effect on users’ environmental engagement ($\beta = 0.142$, $p = 0.002$). This implies that individuals with high digital competencies may be more inclined toward conscious and responsible functioning in the digital environment. Digital competencies encompass not only the technical ability to use specific tools, but also the ability to search for, evaluate, and interpret information and its credibility, to understand the mechanisms of digital services, to protect privacy, to manage data, and to critically evaluate content, identify disinformation and greenwashing, and implement reflective pro-environmental behavior in everyday online practices [8,24]. In the context of the digital consumer, the competencies described in the DigCompConsumers model are also particularly important, including, among others, the evaluation of commercial information, the recognition of advertising messages, the management of digital identity, and the consideration of responsible and sustainable consumption [9]. The obtained results correspond with the findings of studies [63], which define digital competencies and digital citizenship as “smart tools” enabling individuals to transform theoretical ecological knowledge into real, agentic, and confident environmental agency. They are also consistent with more recent studies showing that digital competencies and digital literacy support environmentally responsible technology use and sustainable decision-making in digital environments [69–71]. Moreover, advanced e-skills allow for a better understanding of the ecological consequences of technology itself, promoting sustainable and responsible patterns of using equipment and internet resources [12].

The relatively high association observed between functional motivations and digital competencies is also theoretically justified. Individuals who are more strongly motivated to participate in digital cultural activities are more likely to acquire and develop the competencies necessary to access, navigate, and actively engage with digital environments [69,72]. At

the same time, higher levels of digital competencies may reinforce motivation by reducing technological barriers and increasing the perceived usefulness, convenience, and accessibility of digital cultural resources [70,71]. Therefore, although these constructs are closely related, they represent distinct dimensions of digital engagement: functional motivations reflect the reasons for engaging in digital cultural activities, whereas digital competencies describe the capabilities that enable such participation.

The positive verification of hypothesis H4 made it possible to state that digital culture consumption performs the function of a mediator in the relationship between functional motivations and environmental engagement ($\beta = 0.107, p < 0.001$). This finding is consistent with recent studies indicating that participation in digital environments may translate users' initial motivations into more environmentally responsible behaviors by increasing exposure to sustainability-related information, social interaction, and opportunities for environmentally oriented engagement [40,41]. This relationship reveals a unique, two-stage behavioral mechanism: pragmatic and utilitarian motives of e-consumers (an orientation toward convenience or efficiency) stimulate their entry into the space of digital consumption of cultural goods. In turn, deeper participation in this digital ecosystem, combined with inevitable exposure to social and environmental content and the operation of digital impulses, the so-called digital nudges, leads to the evolution of purely functional behaviors toward higher reflexivity, sensitivity, and pro-environmental responsibility [73]. Digital consumption of cultural services thus becomes a bridge transforming consumer pragmatism into active engagement for sustainable development.

In this context, this mechanism fits into broader considerations concerning sustainable consumption. As Leary et al. [15] indicate, consumer behavior may contribute to market and environmental changes if consumers perceive their actions as meaningful and agentic. In turn, Sheoran and Kumar [16] emphasize that sustainable consumer behavior is shaped by numerous barriers, such as price, availability, convenience, social norms, greenwashing, or a sense of limited influence. The results of the present study suggest that digital culture may be one of the contexts in which some of these barriers are weakened, because the digital environment facilitates access to information, contact with pro-environmental values, and participation in social circuits of meaning.

It is also important that environmental engagement was conceptualized in the study as a construct encompassing environmental awareness, environmental attitudes, and environmentally responsible behavior. Such an approach is consistent with the perspective present in the literature, in which pro-environmental behavior is often analyzed as the result of the interaction of knowledge, attitudes, values, norms, and conditions of action [13,15,16]. Although such integration ensured high model stability, it also reflects a common problem in sustainability research concerning the declarative character of attitudes. This phenomenon, described in the literature as the attitude-behavior gap, indicates that respondents show a strong tendency to standardize their answers under the influence of social desirability bias, as a result of which declared behaviors may be overestimated in relation to actual actions in everyday life [16,74]. The present findings nevertheless suggest that digital culture may constitute a space in which knowledge, attitudes, and behaviors are reinforced through continuous contact with content, social interactions, and examples of pro-environmental practices. At the same time, the exceptionally high empirical overlap observed between environmental awareness and environmentally responsible behavior suggests that these dimensions may not have been fully distinguishable within the present measurement framework. This overlap may reflect not only their close conceptual relationship but also the declarative nature of self-reported measures, common method variance, social desirability bias, and partial overlap between individual questionnaire items.

Taken together, the findings indicate that environmental engagement in digital cultural contexts is shaped by multiple complementary mechanisms. Among the direct predictors, digital cultural consumption emerged as the strongest determinant of environmental engagement, suggesting that active participation in digital cultural environments may play a more important role in fostering environmentally responsible engagement than digital competencies alone. Nevertheless, digital competencies remained a significant predictor, indicating that the ability to effectively access, evaluate, and use digital technologies provides an important foundation for environmentally responsible participation in digital environments. These findings extend previous research by demonstrating that environmental engagement is influenced not only by environmental values and attitudes but also by patterns of digital cultural participation and the competencies that enable such participation.

In conclusion, the obtained results constitute an important step toward the conceptual and empirical linking of the digital transformation of the cultural sector with environmental goals. They demonstrate that digital culture and e-competencies should not be perceived merely as technologically neutral tools of entertainment or work, but as key components of modern social capital stimulating consumers' ecological responsibility. Overall, the findings suggest that digital cultural consumption extends beyond being a technological alternative to traditional forms of cultural participation. Instead, it may represent an important mechanism through which the digital economy supports more sustainable consumer behavior. However, realizing this potential depends on consumers having the digital competencies and functional motivations required to engage with digital services in an informed and responsible manner.

6. Practical Implications

The practical implications of the present study concern three main stakeholder groups: cultural institutions, educational institutions and policymakers, and developers of digital platforms and services.

For cultural institutions, the findings indicate that functional motivations significantly predicted digital cultural consumption (H1). In light of this relationship, cultural institutions should invest in technologies and tools that enable audiences to participate in and consume culture in digital formats. For many organisations, such expenditure may be challenging. Nevertheless, institutions should develop clear budgets and implementation plans for digital improvements and assess the expected return on these investments. Such initiatives may contribute to higher levels of cultural consumption and, potentially, to increased revenues from paid events, while also supporting the cultural development of society. This recommendation is particularly relevant in relation to H3, which confirmed that engagement with digital culture significantly predicted environmental engagement. Given the growing need to strengthen environmental awareness, attitudes, and behaviors in society, enabling digital cultural consumption becomes an even more important task for contemporary cultural institutions. Consumers' functional motivations also had a significant indirect effect on environmental engagement through digital cultural consumption (H4). From a practical perspective, this finding highlights the importance of stimulating consumer motivations through digital communication strategies, including social media marketing and electronic word-of-mouth, in order to encourage greater engagement with digital cultural content.

For educational institutions and policymakers, the direct effect of digital competencies on environmental engagement (H2) provides a rationale for regularly assessing these competencies and implementing initiatives that support their development. In this respect, the development of digital competencies could be integrated into existing educational

programmes in institutions such as schools and higher education institutions. At the policy level, initiatives aimed at strengthening digital competencies and promoting sustainable forms of digital participation may contribute to achieving both digital transformation and sustainability objectives.

For developers of digital platforms, streaming services, and other digital cultural ecosystems, the findings suggest that the design of digital services can support more sustainable consumption by both enhancing accessibility and user experience and encouraging environmentally responsible choices.

7. Limitations and Future Directions for Research

The findings presented in this article make a relevant contribution to the existing literature on digital cultural consumption. At the same time, several limitations of the study should be acknowledged, together with directions for future research. The data analysis identified a number of issues that should be considered in subsequent studies.

The study is based on cross-sectional survey data, which limits the possibility of drawing causal conclusions. Although SEM enables the testing of theoretically grounded directional relationships, the observed associations should be interpreted as structural relationships rather than definitive evidence of causality. Future research could employ longitudinal designs to examine changes in digital culture participation and environmental engagement over time.

All constructs were measured using self-reported questionnaire data. Consequently, the results may be affected by common method variance, social desirability bias, and subjective interpretation of survey items. This limitation is particularly relevant for environmental engagement measures, which may be susceptible to socially desirable responding.

The exceptionally high correlation observed between environmental awareness and pro-environmental behavior ($r = 0.977$) indicates substantial empirical overlap between these dimensions. Although the integrated Environmental Engagement construct demonstrated satisfactory psychometric properties within the structural model, this finding should be interpreted with caution. The observed overlap may reflect the close conceptual relationship between awareness and behavior, but it may also have been influenced by the declarative nature of the self-reported measures, common method variance, social desirability bias, and partial conceptual overlap among some questionnaire items. Consequently, future studies should further examine whether these dimensions can be more clearly distinguished by refining the measurement instrument, separating cognitive and behavioral indicators more explicitly, and complementing self-reported measures with objective or behavioral indicators whenever possible.

Two reverse-worded indicators within the digital competencies scale demonstrated poor psychometric performance and were removed from the final model. This finding may indicate difficulties associated with reverse-coded items in online surveys and suggests the need for further refinement of competency measurement instruments. Measuring digital competencies in future research could engage the competency model that is more developed and statistically verified.

Important psychometric limitations arise from the measurement model's construct validity diagnostics. Specifically, the AVE values across all latent variables fell below the conventional 0.50 threshold, indicating that the constructs explained a relatively limited proportion of the variance in their indicators. Additionally, a localized violation of the Fornell–Larcker criterion was observed due to the high latent correlation between functional motivations (MOT) and digital competencies (COMP). Although other psychometric indicators—including satisfactory composite reliability ($CR > 0.70$) and acceptable HTMT values—supported the overall adequacy of the measurement model, these findings

should not be interpreted as fully compensating for the relatively low AVE values. Consequently, the convergent validity of the measurement model should be interpreted with caution. Future studies should refine the measurement scales by developing more distinct and highly operationalized indicators, thereby improving variance extraction and further strengthening construct validity.

The structural framework left a substantial portion of variance unexplained, particularly regarding digital culture consumption ($R^2 = 0.070$) and, to a lesser degree, environmental engagement ($R^2 = 0.207$). This predictive limitation underscores that the current model omits several crucial confounding and explanatory variables. Factors such as respondents' detailed socioeconomic status, specific political orientations, general environmental values (e.g., biospheric vs. egoistic values), and the quality of regional digital infrastructure could significantly shape both cultural consumption habits and ecological engagement. Future research should expand this theoretical framework by integrating these multi-level structural predictors to drastically enhance the systemic explanatory variance (R^2) of the model.

This study relied on a non-probability sample, which may limit the generalizability of the findings beyond the analyzed population. Future studies could benefit from more diverse and representative samples to verify the robustness of the proposed relationships.

The topic of this study is wide and there are many opportunities for further development. This study should be continued and enriched in future research projects. Improvements made to the questionnaire could justify repeating the study and comparing the results to those presented in this article.

8. Conclusions

The aim of this study was to explain how functional motivations, digital competencies, and digital cultural consumption are related to users' environmental engagement. The proposed model brought together areas that have typically been examined separately in previous research: participation in digital culture, digital competencies, and sustainability-related attitudes and behaviors. This study therefore contributes to the discussion of the dual transition, which links digitalisation with environmental goals and the social dimensions of sustainable development.

The findings confirmed that functional motivations, such as convenience, accessibility, flexibility, and time savings, encourage digital cultural consumption. More frequent engagement in digital cultural practices was, in turn, positively associated with environmental engagement, understood as a broader construct comprising environmental awareness, environmental attitudes, and environmentally responsible behavior. Digital cultural consumption also acted as a mediating mechanism between functional motivations and environmental engagement. This suggests that daily, pragmatic reasons for engaging with digital culture may have consequences that extend beyond access to content and ease of use.

Digital competencies also played an important role by directly supporting environmental engagement. This finding shows that informed participation in digital environments is not limited to technical proficiency. It also involves the ability to search for and evaluate information, understand how platforms and recommendation systems operate, and make more reflective decisions about one's own online practices. Digital competencies may therefore support not only active participation in digital culture, but also more responsible functioning in a digital society.

The findings suggest that digital cultural environments can provide a space in which cultural participation, information exchange, social interaction, and sustainability-related content intersect. Engagement with digital culture may increase users' exposure to environ-

mental knowledge, pro-environmental narratives, and examples of responsible consumption practices. This does not mean, however, that digital cultural consumption is inherently more sustainable than participation in traditional forms of culture. Digital practices may reduce some of the costs associated with travel, printing, and physical cultural media, but they also depend on digital infrastructure, data transmission, electronic devices, and energy use, and they contribute to the generation of electronic waste.

The relationship between digitalisation and sustainable development in the cultural sector should therefore not be analysed solely through the lens of technology. Users' motivations, competencies, and patterns of using digital resources are equally important. Digital cultural consumption may serve as a meaningful mechanism linking consumers' functional motivations with their environmental engagement, but its environmental potential depends on the conditions under which digital services are designed, provided, and used. These findings open up further avenues for research on the role of cultural participation in shaping more informed and responsible patterns of everyday life.

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References

1. Dey, B.L.; Yen, D.; Samuel, L. Digital Consumer Culture and Digital Acculturation. *Int. J. Inf. Manag.* **2020**, *51*, 102057. [\[CrossRef\]](#)
2. Bendyk, E.; Filiciak, M.; Hofmokl, J.; Kulisiewicz, T.; Tarkowski, A. *Kultura 2.0. Wyzwania Cyfrowej Przyszłości*; Polskie Wydawnictwo Audiowizualne: Warszawa, Poland, 2007.
3. Lamberti, G.; Lopez-Sintas, J.; Katz-Gerro, T. Access to Digital Culture as a Driver of Social and Cultural Openness: European Evidence. *Humanit. Soc. Sci. Commun.* **2025**, *12*, 180. [\[CrossRef\]](#)
4. Theodoridis, K. Digital media, consumer culture and the city: An investigation of the relationship between youth lifestyles and cultural spaces. *Envisioning Future Commun.* **2025**, *2*, 58–70.
5. Możdżeń, M.; Strycharz, J. *Analiza Determinantów Popytu na Usługi Projektu E-Muzea. Trendy i Pozycja Strategiczna Przedsięwzięcia*; Narodowy Instytut Muzealnictwa i Ochrony Zbiorów: Kraków, Poland, 2014.
6. Janssen, S.; Kristensen, N.N.; Verboord, M.; Marquart, F.; Lamberti, G. Europeans' digital cultural participation: Diversification, democratization, barriers, and affordances. *Int. J. Commun.* **2024**, *18*, 4031–4096.
7. Wolny, R. *Rynek e-Usług w Polsce. Funkcjonowanie i Kierunki Rozwoju*; Wydawnictwo Uniwersytetu Ekonomicznego: Katowice, Poland, 2013.
8. Vuorikari, R.; Kluzer, S.; Punie, Y. *DigComp 2.2: The Digital Competence Framework for Citizens*; EUR 31006 EN; Publications Office of the European Union: Luxembourg, 2022. [\[CrossRef\]](#) [\[PubMed\]](#)
9. Brečko, B.; Ferrari, A. *Ramy Kompetencji Cyfrowych Dla Konsumentów*; Vuorikari, R., Punie, Y., Eds.; EUR 28133 PL; Publications Office of the European Union: Luxembourg, 2016. [\[CrossRef\]](#)

10. Paprzycka, A. Znaczenie praktyki dla badacza kultury cyfrowej. *Acta Univ. Lodz. Folia Litter. Pol.* **2021**, *60*, 79–91. [CrossRef]
11. Gnanasekaran, V.; Fridtun, H.T.; Hatlen, H.; Langøy, M.M.; Syrtstad, A.; Subramanian, S.; De Moor, K. Digital carbon footprint awareness among digital natives: An exploratory study. *Nor. IKT-Konf. Forsk. Utd.* **2021**, *1*, 99–112.
12. Barragán-Sánchez, R.; Corujo-Vélez, M.-C.; Palacios-Rodríguez, A.; Román-Graván, P. Teaching digital competence and eco-responsible use of technologies: Development and validation of a scale. *Sustainability* **2020**, *12*, 7721. [CrossRef]
13. Wu, D.Y.; Zhang, Y. Exploring the impact of digital media use on pro-environmental behavior: Evidence from China. *Appl. Ecol. Environ. Res.* **2025**, *23*, 9739–9758. [CrossRef]
14. Bugowski, Ł.K.; Trzaska, K. Rola kompetencji cyfrowych w zrównoważonym rozwoju. In *Mechanizmy Zrównoważonego Rozwoju*; Proniewski, M., Kielczewski, D., Eds.; Wydawnictwo Uniwersytetu w Białymstoku: Białystok, Poland, 2023; pp. 161–175.
15. Leary, R.B.; Vann, R.J.; Mittelstaedt, J.D.; Murphy, P.E.; Sherry, J.F. Changing the marketplace one behavior at a time: Perceived marketplace influence and sustainable consumption. *J. Bus. Res.* **2014**, *67*, 1953–1958. [CrossRef]
16. Sheoran, M.; Kumar, D. Benchmarking the barriers of sustainable consumer behavior. *Soc. Responsib. J.* **2022**, *18*, 19–42. [CrossRef]
17. Krzysztofek, K. Konsumpcja kultury, czyli wdrażanie do ról przez rynek. *Kult. Współcz.* **1998**, *17–18*, 6–17.
18. Guzowska, B. Status nowych mediów w kulturze współczesnej. *Colloq. Wydz. Nauk. Humanist. Społ.* **2014**, *16*, 61–72.
19. Bomba, R.; Czarnecki, S.; Stunża, G.D. Tylko dostęp. Koniec kultury uczestnictwa? *Kult. Współczesna. Teor. Interpret. Prakt.* **2016**, *89*, 9–13.
20. Bagaeva, I.; Levina, A.; Voronova, O. Formation of requirements for the competency model of a university graduate in the digital economy. In *Proceedings of the International Conference on Digital Technologies in Logistics and Infrastructure (ICDTLI 2019)*, St. Petersburg, Russia, 10–11 October 2019; Atlantis Highlights in Computer Sciences; Atlantis Press: Amsterdam, The Netherlands, 2019; Volume 1, pp. 333–338. [CrossRef]
21. Gallardo-Echenique, E.E.; Minelli de Oliveira, J.; Marques-Molias, L.; Esteve-Mon, F. Digital competence in the knowledge society. *MERLOT J. Online Learn. Teach.* **2015**, *11*, 1–16.
22. Ministerstwo Cyfryzacji. Definicja i Poziomy Kompetencji Cyfrowych. Available online: <https://kompetencjocyfrowe.gov.pl/aktualnosci/wpis/definicja-i-poziomy-kompetencji-cyfrowych> (accessed on 25 June 2026).
23. Ministerstwo Cyfryzacji. Kompetencje Cyfrowe. 2020. Available online: <https://www.gov.pl/web/cyfryzacja/kompetencje-cyfrowe> (accessed on 25 June 2026).
24. Shelest-Szumilas, O. Digital competencies of young people: The results of a study of secondary-school students in the Greater Poland Province. *Sci. Pap. Sil. Univ. Technol. Organ. Manag. Ser.* **2022**, *159*, 377–392. [CrossRef]
25. Jasiewicz, J. Relacyjny model kompetencji cyfrowych i jego implikacje metodologiczne. *Stud. Mediozn.* **2018**, *73*, 117–128. [CrossRef]
26. Höppner, S. Rok ChatGPT. Między Fascynacją a Rozczarowaniem. *Deutsche Welle*, 30 November 2023. Available online: <https://www.dw.com/pl/rok-chatgpt-miedzy-fascynacja-a-rozczarowaniem/a-67592146> (accessed on 25 June 2026).
27. Włodarczyk-Śpiewak, K. Nowoczesne technologie—Wyzwanie dla współczesnych konsumentów. *Stud. Mater. Pol. Stow. Zarz. Wiedzą* **2011**, *51*, 142.
28. Kawalec, P. Transformacja cyfrowa: Szanse i wyzwania dla przedsiębiorstw. *Nowe Tend. Zarz.* **2021**, *1*, 45–69. [CrossRef]
29. Kaczorowska-Spychalska, D. Digital technologies in the process of virtualization of consumer behaviour—Awareness of new technologies. *Management* **2018**, *22*, 187–204. [CrossRef]
30. Perifanou, M.; Economides, A.A. An Instrument for the Digital Competence Actions Framework. In *Proceedings of the 12th Annual International Conference of Education, Research and Innovation (ICERI2019)*; IATED Academy: Seville, Spain, 2019; pp. 1139–1145.
31. United Nations General Assembly. *Transforming Our World: The 2030 Agenda for Sustainable Development*; Resolution A/RES/70/1; United Nations General Assembly: New York, NY, USA, 2015. Available online: <https://docs.un.org/en/A/RES/70/1> (accessed on 25 June 2026).
32. Wolter, E. Kształtowanie świadomości ekologicznej w kulturze polskiej. *Semin. Poszuk. Nauk.* **2013**, *34*, 231–239. [CrossRef]
33. Skowron, S. Świadomość ekologiczna klientów i jej pomiar. *Pr. Nauk. Univ. Ekon. Wroc.* **2016**, *460*, 9–18. [CrossRef]
34. Patrzalek, W. Znaczenie świadomości ekologicznej w zachowaniach konsumenckich. *Pr. Nauk. Univ. Ekon. Wroc.* **2017**, *501*, 11–23.
35. Kłos, L. Świadomość ekologiczna Polaków—Przegląd badań. *Stud. Pr. WNEiZ US* **2015**, *42*, 35–44. [CrossRef]
36. Al-Mannai, A.A.M.; Jawasreh, M.; Abita, M.A.M.; Chatti, C.B.; Mahdi, Y. Exploring social representations of climate change among Qatari university youth: A comprehensive analysis of environmental awareness and behavior. *Sustainability* **2025**, *17*, 10370. [CrossRef]
37. Amjad, A.I.; Javaid, S.; Saira, S.; Akhter, S.; Khasawneh, M.; Al-Kahlan, T. Influence of digital media use, environmental awareness, and eco-anxiety on university students' mental health. *Discov. Psychol.* **2026**, *6*, 103. [CrossRef]
38. Hrei, V.; Otych, D.; Krivokulska, N.; Bohach, Y.; Homlia, L. The role of communication in developing environmental awareness and concern for environmental issues. *Grassroots J. Nat. Resour.* **2024**, *7*, s270–s289. [CrossRef]

39. Figueroa-Barra, A.; Guerrero-Mardones, D.; Vargas-Castillo, C.; Millalonco-Martínez, L.; Roco-Videla, A.; Méndez, E.; Flores-Carrasco, S. Intersection between eco-anxiety and lexical labels: A study on mental health in Spanish-language digital media. *Behav. Sci.* **2025**, *15*, 1102. [\[CrossRef\]](#) [\[PubMed\]](#)
40. Liao, C.-H. Exploring social media determinants in fostering pro-environmental behavior: Insights from social impact theory and the theory of planned behavior. *Front. Psychol.* **2024**, *15*, 1445549. [\[CrossRef\]](#) [\[PubMed\]](#)
41. Meng, Y.; Chung, D.; Zhang, A. The effect of social media environmental information exposure on the intention to participate in pro-environmental behavior. *PLoS ONE* **2023**, *18*, e0294577. [\[CrossRef\]](#) [\[PubMed\]](#)
42. Shen, J.; Liang, H.; Zafar, A.U.; Shahzad, M.; Akram, U.; Ashfaq, M. Influence by osmosis: Social media green communities and pro-environmental behavior. *Comput. Hum. Behav.* **2023**, *143*, 107706. [\[CrossRef\]](#)
43. Mańkowska-Wróbel, L. Ekologiczne uwarunkowania zachowań konsumenckich. *Hand. Wewn.* **2015**, *354*, 141–150.
44. Sobocińska, M. Zachowania polskich konsumentów a kultura odpowiedzialności. *Humanit. Zarz.* **2021**, *22*, 101–114.
45. Gajdzik, B.; Jaciow, M.; Wolny, R. Types of e-consumers and their implications for sustainable consumption—A study of the behavior of Polish e-consumers in the second decade of the 21st century. *Sustainability* **2023**, *15*, 12647. [\[CrossRef\]](#)
46. Wolny, R. Zmiany zachowań nabywczych polskich e-konsumentów. *Stud. Ekon. Zesz. Nauk. Uniw. Ekon. Katow.* **2016**, *270*, 285–293.
47. Li, C.-H. Confirmatory factor analysis with ordinal data: Comparing robust maximum likelihood and diagonally weighted least squares. *Behav. Res. Methods* **2016**, *48*, 936–949. [\[CrossRef\]](#) [\[PubMed\]](#)
48. Flora, D.B.; Curran, P.J. An empirical evaluation of alternative methods of estimation for confirmatory factor analysis with ordinal data. *Psychol. Methods* **2004**, *9*, 466–491. [\[CrossRef\]](#) [\[PubMed\]](#)
49. Nunnally, J.C.; Bernstein, I.H. *Psychometric Theory*, 3rd ed.; McGraw-Hill: New York, NY, USA, 1994.
50. Hair, J.F.; Black, W.C.; Babin, B.J.; Anderson, R.E. *Multivariate Data Analysis*, 8th ed.; Cengage: Andover, UK, 2019.
51. Hu, L.; Bentler, P.M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equ. Model.* **1999**, *6*, 1–55. [\[CrossRef\]](#)
52. Kline, R.B. *Principles and Practice of Structural Equation Modeling*, 5th ed.; Guilford Press: New York, NY, USA, 2023.
53. Schreiber, J.B.; Nora, A.; Stage, F.K.; Barlow, E.A.; King, J. Reporting structural equation modeling and confirmatory factor analysis results: A review. *J. Educ. Res.* **2006**, *99*, 323–338. [\[CrossRef\]](#)
54. Henseler, J.; Ringle, C.M.; Sarstedt, M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *J. Acad. Mark. Sci.* **2015**, *43*, 115–135. [\[CrossRef\]](#)
55. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [\[CrossRef\]](#)
56. Hayes, A.F. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*, 3rd ed.; Guilford Press: New York, NY, USA, 2022.
57. R Core Team. *R: A Language and Environment for Statistical Computing*; R Foundation for Statistical Computing: Vienna, Austria, 2025. Available online: <https://www.R-project.org/> (accessed on 15 December 2025).
58. Rosseel, Y. lavaan: An R package for structural equation modeling. *J. Stat. Softw.* **2012**, *48*, 1–36. [\[CrossRef\]](#)
59. Rosseel, Y.; Jorgensen, T.D.; De Wilde, L. *lavaan: Latent Variable Analysis*; R Package Version 0.6-20; Ghent University: Ghent, Belgium, 2025. [\[CrossRef\]](#)
60. Jorgensen, T.D.; Pornprasertmanit, S.; Schoemann, A.M.; Rosseel, Y. *semTools: Useful Tools for Structural Equation Modeling*; R Package Version 0.5-7; University of Amsterdam: Amsterdam, The Netherlands, 2025. Available online: <https://CRAN.R-project.org/package=semTools> (accessed on 15 December 2025).
61. Revelle, W. *psych: Procedures for Psychological, Psychometric, and Personality Research*; R Package Version 2.5.6; Northwestern University: Evanston, IL, USA, 2025. Available online: <https://CRAN.R-project.org/package=psych> (accessed on 15 December 2025).
62. Korkmaz, S.; Goksuluk, D.; Zararsiz, G. MVN: An R package for assessing multivariate normality. *R J.* **2014**, *6*, 151–162. [\[CrossRef\]](#)
63. Epskamp, S. *semPlot: Path Diagrams and Visual Analysis of Various SEM Packages' Output*; R Package Version 1.1.7; University of Amsterdam: Amsterdam, The Netherlands, 2025. [\[CrossRef\]](#)
64. Cheung, G.W.; Cooper-Thomas, H.D.; Lau, R.S.; Wang, L.C. Reporting reliability, convergent and discriminant validity with structural equation modeling: A review and best-practice recommendations. *Asia Pac. J. Manag.* **2024**, *41*, 745–783. [\[CrossRef\]](#)
65. Gomez-Zapata, J.I.; Rodriguez-Gomez, J. Sustainability in cultural organizations: A systematic literature review. *Sustainability* **2026**, *18*, 3907. [\[CrossRef\]](#)
66. Jenkins, H.; Ford, S.; Green, J. *Spreadable Media: Creating Value and Meaning in a Networked Culture*; New York University Press: New York, NY, USA, 2013.
67. Zhao, L.; Chen, X.; Li, M. How digital cultural heritage learning affects sustainable tourism practices: A case analysis of the Great Wall of China. *Sustainability* **2026**, *18*, 1401. [\[CrossRef\]](#)

68. Wolny, R.; Kol, J.; Stolecka-Makowska, A.; Szojda, G. Digital consumer behavior in Poland and its environmental impact within the framework of sustainability. *Sustainability* **2025**, *17*, 4691. [[CrossRef](#)]
69. Zhao, Y.; Pinto Llorente, A.M.; Sánchez Gómez, M.C. Digital competence in higher education research: A systematic literature review. *Comput. Educ.* **2021**, *168*, 104212. [[CrossRef](#)] [[PubMed](#)]
70. Nikou, S.; De Reuver, M.; Mahboob Kanafi, M. Workplace literacy skills—How information and digital literacy affect adoption of digital technology. *J. Doc.* **2022**, *78*, 371–391. [[CrossRef](#)]
71. Chen, Y.; Gao, H. Exploring the impact of digital literacy on art education teachers' ICT integration intention: Based on the extended technology acceptance model. *SAGE Open* **2025**, *15*, 21582440251378790. [[CrossRef](#)]
72. Śledziewska, K.; Włoch, R.; Wilamowski, M. Adapting to digital transformation: Determinants of training motivation in response to digital automation among workers in six EU countries. *Acon. Copernic.* **2025**, *16*, 523–555. [[CrossRef](#)]
73. Khalufi, N.A.M. Digital nudges and environmental concern in shaping sustainable consumer behavior aligned with SDGs 12 and 13. *Sustainability* **2025**, *17*, 11292. [[CrossRef](#)]
74. Carrington, M.; Neville, B.; Whitwell, G. Why ethical consumers don't walk their talk: Towards a framework for understanding the gap between ethical purchase intentions and actual buying behavior of ethically minded consumers. *J. Bus. Ethics* **2010**, *97*, 139–158. [[CrossRef](#)]

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