Digital Culture and Education Review

ScienceIngress PUBLISHER

Vol.1, Issue.1, (2025)

Digital Culture and Education Review

Cultivating Sustainable Digital Literacy by Educational Pathways to Green Consumption in Thailand's Digital Age

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Article Information

Article Type: Research Article

Dates:
Received: 19 April 2025
Revised: 23 May 2025
Accepted: 30 May 2025
Available online: 15 June 2025

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ABSTRACT

This study explores how educational approaches in the digital age promote adopting green consumption behavior through digital tools, sustainability knowledge, and motivation. This study integrated the T.A.M and T-P-B to examine the interplay between environmental awareness, the perceived usefulness of digital tools, and the use of digital media for sustainability education. The data for Thailand's 169 educators, policymakers, and university teachers were analyzed using Smart PLS-SEM. Results demonstrate that environmental awareness, participants' motivation for green consumption, and their acquisition of sustainability knowledge significantly affect green consumption behavior. The results show strong relationships between the constructs and support for most hypothesized relationships. Environmental awareness positively and significantly influenced adopting Green-Consumption Behavior (H1a: $\beta = 0.051$, $p < 0.001$). Similarly, the Perceived Usefulness of Digital Tools significantly influenced the Adoption of Green-Consumption Behavior (H1b: $\beta = 0.018$, $p = 0.035$). The Use of Digital Media for Sustainability Education also significantly positively affected the Adoption of Green-Consumption Behavior (H1c: $\beta = 0.160$, $p = 0.001$). The findings of this study suggest that cognitive and digital resources play a critical role in actively shaping green consumption behaviors The challenge is identified as the technological barriers, which emphasize the importance of accessing and using user-friendly digital platforms. Furthermore, sustainability knowledge moderates the relationship between digital tools, environmental awareness, and Green-Consumption behavior, highlighting the importance of informed decision-making in sustainable practices. This research adds to the discussion on T.A.M and T-P-B by integrating sustainable education, providing theoretical and practical implications for facilitating sustainable consumption in the digital age. Research needs to expand to other populations in the future, and more advanced digital innovations are needed to improve sustainability education.

Keywords: Green-Consumption, Sustainability knowledge, Digital literacy, Environmental awareness, Digital tools

1. INTRODUCTION

In this modern and technology-motivated age, consumer behaviors have changed dynamically, while sustainable purchases are crucial in consumers' choices. green consumption is a concept of ethical responsibility at the consumer level to reduce ecological damage by making educated and green choices (Lo, 2024). Nevertheless, the integration of digital tools and platforms (specify with example) in daily life has made these decisions increasingly complex and affected consumers' need to have high digital literacy to make green-consumption decisions in the best way (Hu & Meng, 2023). What does the author mean by "digital tools"? In educational environments, this is particularly important since, through this approach, it is possible to foster sustainable education practices and develop digital literacy that will enable change in the future (Chen et al., 2024). Sustainable digital literacy (SDL) is core knowledge essential for educators to educate learners on critical comprehension and assessment of digital information, green processes, and environmentally conscious decisions (Algashami, 2019).

Satoshi Nakamoto (2009) created the first and most famous cryptocurrency, bitcoin, in 2009, an anonymous entity. Bitcoin is a decentralized peer-to-peer network that uses block-chain to carry transactions securely. The price of Bitcoin has seen considerable volatility since its inception, with important peaks and troughs linked to market demand, regulatory modifications, and technological developments (Nakamoto, 2009). Bitcoin was once seen to have prices approaching $100,000 per coin, and it has plunged in value. Although these changes exist, Bitcoin has developed into a broadly known digital asset and investment selection (Marthinsen & Gordon, 2022).

Bitcoin and other cryptocurrencies are not just stored as value or speculation; they are being investigated for everyday use in finance, supply chains, and digital identity verification. Furthermore, these kinds of cryptocurrencies are decentralized and present the opportunity to disrupt conventional financial systems by giving control and better privacy to users (Nakamoto, 2009). Although there is no doubt in understanding the technical and economic sides of Bitcoin, this study takes a more comprehensive view of the ramifications of digital currencies on consumer behavior, digital literacy, and consumer sustainability in the digital era (Marthinsen & Gordon, 2022). Fundamental approaches Theory of Planned Behavior (T-P-B) and Technology Acceptance Model (T.A.M) are utilized to explain the complex connection between attitudes, intentions, and behaviors associated with Green-Consumption practices in the digital ecosystem (Ajzen, 1991; Davis, 1989). The T-P-B asserts that intention is shaped by three core determinants: Subjective norms, perceived behavioral control, and attitude toward the behavior. Applying sustainable consumption in the digital era. What does the author mean by "digital tools"? The T-P-B stresses the role of a positive attitude in support of green behaviors, creating a supportive social environment, and the perceived control of green action (Merga, 2015). T.A.M., however, emphasizes the importance of perceived ease of use as one of the major reasons for people to accept and use new technology. Together these theories provide a robust theoretical foundation to investigate green-consumption and SDL dynamics in the digital age.

Shaping the attitudes and skills necessary for SDL is done through educational approaches. To be able to engage effectively in green consumption, learners are required to acquire an eco-awareness mindset (EA), digital media skills for evaluation (DMSE), and perceive the usefulness of digital tools (PUDT) (Hu & Meng, 2023). EA encapsulates environmental awareness and will towards sustainability. The ability to critically analyze, interpret, and evaluate digital content, which DMSE represents (Aliakbari et al., 2020).

T.A.M is perceived in value from digital tools to promote green consumption, and PUDT is the perceived value of digital tools for green consumption. The construct also serves to influence sustainable

knowledge acquisition (SKA), green behavior adoption (GBA), and overall sustainable management competencies (MGC).

A study concerning digital literacy and sustainable shopping habits has emerged because people need to learn about these topics in our technology-driven society. Consumer behaviors change due to the adoption of digital tools throughout daily life, making environmental choices more complex based on informed knowledge (Hu & Meng, 2023). Digital platforms and tools, which include mobile apps only, marketplaces, and social media, have opened new doors yet created hurdles for customers wishing to practice green behaviors. Digital tools require advanced digital literacy skills because they enhance the ability to search for and execute sustainable decisions. Despite numerous field studies about digital literacy, there is a lack of clarity on its connection to sustainable choices and effective educational methods for digital literacy development (Lo, 2024).

This investigation fills the identified gap by analyzing SDL connection to green consumption. This research examines educational strategies that promote eco-awareness through building evaluation skills for digital media and digital tool acceptability. The study applies TPB and T.A.M. to examine consumer digital-age attitudes, intentions, and behaviors through an integrated framework. This study aims to serve academic and practical needs because it aims to develop sustainable digital behavioral solutions for future digital world users. While SDL is gaining currency with many organizations, little is known about education's role in closing this gap between consumption and digital literacy. Previous studies have mainly studied the general effects of digital tools on consumer behavior but ignored green consumption. Additionally, T.A.M and T-P-B have been used to analyze a variety of contexts, but their integration to analyze SDL has been under-exploited. An analysis of how educational approaches can foster SDL and encourage green consumption practices is necessary to fill this gap in the literature.

This study examines the external factors and attitudes related to digital media, digital media skills, and digital tools' perceived usefulness that are drivers of sustainability knowledge acquisition, behavior adoption, and competency development. This study analyzes how these constructs come together in the theoretical context of T-P-B and T.A.M. To address the research gap, the study proposes the following research questions:

What determines Green-Consumption digital literacy, eco-awareness, digital media literacy skills for evaluation, and perceived usefulness of digital tools?

How does sustainability knowledge acquisition mediate the relationship between individual constructs (EA, DMSE, and PUDT) and green behavior adoption?

Through its findings, the research establishes key additions to Sustainable Digital Literacy (SDL) and green-consumption fields. The research integrates the Theory of Planned Behavior and the Technology Acceptance Model to bring practical value to sustainable consumption studies. The research benefits from these theoretical structures, which enable thorough investigations of their practical applications, specifically regarding digital-era environmental decision-making education. This research expands previous sustainability consumer behavior work by investigating how digital literacy drives green consumption behavior. New research opportunities exist at the point where digital literacy meets environmental sustainability to expand the investigation.

According to this study's findings, educational interventions are decisive in developing SDL studies. The framework provides educational institutions with complete guidance to help them incorporate three key elements into their curricula, so students develop essential digital navigation skills needed for

sustainability-oriented decisions in their digital environments. Such policy understanding draws from this analysis to build effective programs that combine digital literacy initiatives with green-consumption advocacy while establishing sustainability throughout educational contexts.

The research delivers concrete business applications to digital tool manufacturers, showing how their products should be adapted to boost green consumption. Creating stronger, sustainable digital tools stems from developers' ability to grasp user experiences with digital tools regarding functionality and usability. This leads to technological advancements that build sustainable practices and digital literacy proficiency for a sustainable digital environment.

2. LITERATURE REVIEW

The increasing complexity of digital ecosystems and environmental threats has motivated research on sustainable digital literacy (SDL). Conventionally, T.A.M, T-P-B are recognized as accepted frameworks for examining individual behavior of technology adoption and sustainable practices (Ajzen, 1991, 2020; Davis et al., 2005). Combining these two theories offers a solid premise for investigating the green-consumption dynamics in the age of digitization, especially education's importance for developing SDL.
T.A.M. explains how individuals accept and use technology through two primary constructs: perceived ease of use (PEOU) and perceived usefulness (PU) (Davis, 1989). PU measures how much a person believes using a specific system will help the person's performance, while PEOU measures how difficult it is to use the system. These constructs substantially influence attitudes and behavioral intentions and contribute to technology adoption (Lo, 2024). Understanding T.A.M in the context of SDL offers insights about how learners perceive, as well as how they engage with, digital tools for sustainable consumption. Therefore, for example, tools perceived as valuable and easy to use increase the individual’s willingness to engage in green practices in digital settings (Peattie, 2010).

On the other hand, T.A.M is completed by the cognitive and motivational aspects of behavior using T-P-B. The elements of the T-P-B are the consequence of intention, which is a consequence of attitude, subjective norms, and perceived behavioral control (PBC) (Peattie, 2010). An individual's attitude is assessed toward the behavior; subjective norms are measures of the social pressure to engage in the behavior; and PBC is assessed as the degree of perceived ease or difficulty in completing the behavior. T-P-B explains how eco-awareness, social influence, and perceived control influence intentions to adopt green-consumption practices in SDL (Sentosa & Mat, 2012).

This study analyze SDL through technological perception with behavioral and motivational factors by integrating the two theories, T.A.M. and T-P-B. This integration showed how digital tools can evidence green consumption's cognitive, emotional, and social dimensions. It emphasizes the role of educational interventions in sympathetic acts aimed at promoting sustainable practices. The present study bridges these frameworks to advance the theoretical and practical understanding of SDL(Abuhassna et al., 2024).

2.1 Research framework and hypotheses development

The past decade has witnessed growing scholarly interest in adopting green-consumption behaviors in the digital age due partly to sustainability goals (Hu & Meng, 2023). This study integrates theories such as the T.A.M and the Theory of T-P-B, extending to analyze how various cognitive, technological, and behavioral factors might impinge on individuals' engagement in sustainable consumption practices by way of digital literacy and education.

2.2 Perceived usefulness of digital tools and sustainable education

Being environmentally aware is the key concept that directly impacts consumption behaviors and moderately influences attitudes toward environmentally friendly practices. However, prior research has shown that greater awareness leads to more likely use of green behaviors since it makes individuals aware of the effects of their consumption habits (Ajzen, 2020; Chen et al., 2024). Furthermore, the perceived usefulness of digital tools encourages such behavior, as the normalized digital tool affords easier access to sustainable choices and information and lowers the perceived effort to make green decisions (Davis et al., 2005). Sustainable education, however, is digital media intensive in its delivery, spreading knowledge through interactive means of dissemination and engaging in green practices through electronic media. Thus, it is hypothesized:

H1a: *Adoption of Green-Consumption Behavior depends positively on Environmental Awareness.*

H1b: *The results also show that the Perceived Usefulness of Digital Tools positively influences the Adoption of Green-Consumption Behavior.*

H1c: *Using digital media in sustainable education positively influences the adoption of green consumption behavior.*

2.3 Sustainability knowledge acquisition and green-consumption behavior

Promoting Green-Consumption relies critically on sustainability knowledge acquisition. If individuals are given in-depth information about sustainability, then they are better geared to make decisions in compliance with ecologically sound practices. Knowledge increases awareness and fills the gap between knowing and doing (Lo, 2024; Ren & Luo, 2024). Establishing on its stem, the cognitive understanding of sustainability in Green-Consumption behavior had significantly given the impetus to the knowledge of adoption of Green-Consumption behavior (Hu & Meng, 2023). Therefore, it is hypothesized:

H2: *The adoption of Green-Consumption behavior is positively affected by Sustainability Knowledge Acquisition.*

2.4 Motivations for green consumption and green-consumption behavior

Green consumption behavior is driven by motivation. The study is rooted in the T-P-B framework. It uses intrinsic and extrinsic motivations such as environmental concern, social responsibility, and financial savings to motivate individuals to adopt sustainable practices (Nguyen et al., 2023). This is an important antecedent to Green-Consumption because motivated persons overcome barriers and expend the energy necessary for actions that are sustainable (Ng et al., 2024). Therefore, it is hypothesized:

H3: *The Adoption of Green-Consumption Behavior is positively related to Green-Consumption Motivation.*

2.5 Technological barriers and green-consumption behavior

Significant technological advancements enabled green consumption; however, the adoption is hindered by operation barriers, like accessibility, usability issues, and digital divides. While aware and motivated, these barriers inhibit sustainable practice (ALOMARI et al., 2022). Using T.A.M., we find that perceived ease of use is negatively affected by technological barriers, leading to a lower propensity for green behaviors (Van et al., 2024). Thus, it is hypothesized:

H4: *The Adoption of Green-Consumption Behavior is negatively influenced by Technological Barriers.*

2.6 Factors predicting sustainability knowledge acquisition

Environmental awareness is an initial topic for sustainability knowledge because people who know their environment are more likely to find and use educational resources. Like any other tools, the perceived

usefulness of digital tools supports knowledge acquisition by making sustainability information more accessible and actionable (Zhao & Qian, 2024). The interactive and engaging nature of digital media represents an effective medium to facilitate sustainable education. Hence, it is hypothesized:

H5a: *Sustainability Knowledge Acquisition depends on Environmental Awareness.*

H5b: *A positive influence on sustainability knowledge acquisition is observed when utilizing digital media for sustainability education.*

H5c: *The Perceived Usefulness of Digital Tools positively influences Sustainable Knowledge Acquisition.*

2.7 Motivation and technological barriers effects

The effect of motivation is enhanced by its interaction with sustainability knowledge acquisition on Green-Consumption behavior. Knowing how to disseminate information effectively motivates people to take advantage of and use their knowledge to inform their decision-making regarding sustainable practices (He et al., 2023; Lo, 2024). On the one hand, barriers to knowledge acquisition may temper the benefits of knowledge acquisition in that access to and usability of knowledge could create friction in the decision-making process(Zeng et al., 2024). Thus, it is hypothesized:

H6a: *Sustainability Knowledge Acquisition stimulates the Adoption of Green-Consumption Behavior but only if the latter is positively affected by Motivation for Green-Consumption.*

H6b: *The Impact of Technological Barriers on Adopting Green-Consumption Behavior mediated by Sustainability Knowledge Acquisition is negative.*

2.8 Mediating role of sustainability knowledge acquisition

The influence of environmental awareness on learning digital tools for sustainability education mediated the relationship between the use of digital media for sustainability education and the adoption of green behavior (Burke et al., 2021). Knowledge acquisition turns these predictors into actionable behavior using the proper cognitive framework (Wang & Wu, 2021). Hence, it is hypothesized:

H7a: *Sustainability Education, using digital media, favors acquiring sustainability knowledge and adopting green consumption behavior.*

H7b: *Sustainability Knowledge Acquisition mediates between the Influence of Environmental Awareness and the Adoption of Green-Consumption Behavior.*

H7c: *The findings show that the perceived usefulness of Digital Tools is positively affected by the Social Network Tie formation, leading to the Adoption of Green-Consumption Behavior through Sustainability Knowledge acquisition.*

Together, these hypotheses form the research model in Figure 1. The premise is this integrative approach of combining T.A.M. with T-P-B to understand the interplay between cognitive, motivational, and technological factors that lead to sustainable consumption behavior in the digital age. This study's contribution is to extend the literature by focusing on mediating and moderating the roles of sustainability knowledge acquisition and technological barriers in Consumers in an increasingly digitized world.

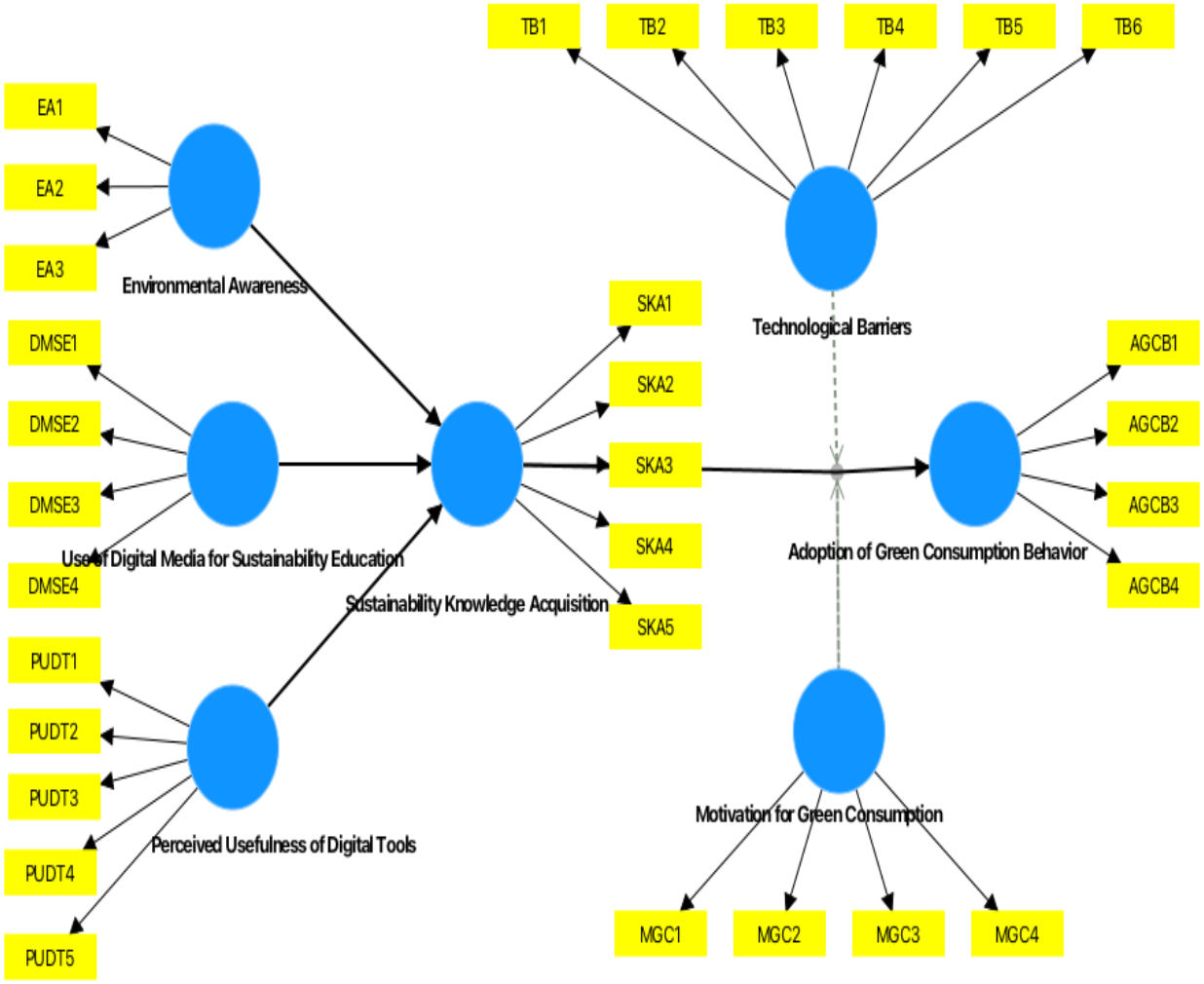

Figure 1: Research Framework

3. METHODOLOGY

This research relies on a quantitative approach to determine the relations between environmental awareness, digital tools, sustainability knowledge acquisition, and Green-Consumption behavior in the digital age. This research adopts the Technology Acceptance Model (T.A.M) and Theory of Planned Behavior (T-P-B) to exploit the variables of Sustainable Digital Literacy as a predictor of Green-Consumption adoption. This section describes the design, characteristics of the sample, data collection process, and measurement instruments.

3.1 Survey instrument development and design

An acceptable structured survey questionnaire based on validated constructs from existing pilot studies was designed for reliability and validity. The questionnaire comprised two sections: (1) demographic information and (2) key variables items of the study. A five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree) was utilized to measure all items to keep data collected uniform. Table 1 shows the constructs and the corresponding survey items.

To capture the multidimensional aspects of the constructs, the survey included the following variables:

Environmental Awareness (EA): Environmental Awareness is an individual's feeling and understanding of issues about sustainability, which affects one's behavior toward better sustainable activities. This variable is taken from studies studying sustainability awareness and measures how aware participants are of the environmental impacts of their actions (Bamberg & Möser, 2007).

Perceived Usefulness of the Digital Tools (PU): This variable measures participants' perception of how digital tools like mobile apps or online platforms can help sustain education and help make more informed decisions. The study is based on the T.A.M., which states that perceived usefulness affects adopting new technology (Davis, 1989).

Digital Media for Sustainability Education (DMSE): DMSE is part of evaluating the role of digital platforms in increasing knowledge and awareness about issues around ecosystem health, environmental care, consumerism, and other sustainability-related issues. The name of this variable is influenced by the growing engagement in digital media and sustainability campaigns in education (Chen et al., 2024).

Sustainability Knowledge Acquisition (SKA): Sustainability knowledge acquisition refers to the knowledge participants can gain on sustainability practices through digital tools and education. Its items relate to how much information the participants have learned and internalized about sustainable behaviors (Johnson, 2017).

Motivation for Green Consumption (MGC): Green consumption is motivated by intrinsic and extrinsic factors, which influence individuals to embrace the good practice of environmental consumption. Motivations lead to attitudes and intentions toward sustainable consumption based on the Theory of Planned Behavior (Ajzen, 1991).

Technological Barriers (TB): This variable looks at the issues people experience when they cannot use digital tools for sustainability, for example, because of technology, lack of access, and illiteracy in digital tools. It is derived from previous studies on digital adoption barriers and captures the barriers to digital adoption of Consumption solutions (Venkatesh et al., 2003).

Adoption of Green-Consumption Behavior (AGCB): Green Consumption Behavior measures are about adopting behavioral outcomes related to sustainable consumption, like recycling, energy conservation, and eco-friendly purchasing. These variable items are based on existing sustainability behavior scales that look at participants' involvement in adopting green practices in their routines (Merga, 2015).

Table 1: Survey Design

Constructs	Items	References
Environmental Awareness (EA)	EA1: I am aware of the importance of protecting the environment. EA2: I understand the impact of individual actions on environmental sustainability. EA3: I actively seek information about environmental issues.	(Ajzen, 2020)
Perceived Usefulness of Digital Tools (PU)	PU1: Digital tools make it easier to access sustainability-related information. PU2: Using digital platforms improves my ability to learn about sustainable practices. PU3: I find digital tools helpful for integrating sustainability into daily life.	(Davis et al., 2005)
	DMSE1: Digital media enhances my knowledge about sustainability practices.	(Onyejelem & Aondover, 2024)

Use of Digital Media for Sustainability Education (DMSE)	DMSE2: I use online platforms to learn about sustainable consumption. DMSE3: Digital tools encourage discussions on sustainable practices. DMSE4: Social media increases awareness about Green-Consumption.	
Sustainability Knowledge Acquisition (SKA)	SKA1: I have acquired in-depth knowledge about sustainability through digital tools. SKA2: Digital media has helped me understand the benefits of Green-Consumption. SKA3: I can identify sustainable practices thanks to digital platforms. SKA4: I feel confident in applying sustainability knowledge in my daily activities. SKA5: Digital resources enhance my understanding of global sustainability challenges.	(Castro & Lopes, 2022)
Motivation for Green Consumption (MGC)	MGC1: I am motivated to adopt sustainable practices to benefit the environment. MGC2: Green Consumption aligns with my values. MGC3: I feel a sense of responsibility to practice sustainability. MGC4: Social influence motivates me to adopt Green-Consumption practices.	(Rustam et al., 2020)
Technological Barriers (TB)	TB1: Lack of reliable internet access limits my ability to engage in sustainability education. TB2: Technical issues discourage me from using digital tools for sustainability purposes. TB3: The high cost of digital tools hinders my participation in green consumption. TB4: Limited digital literacy poses challenges in accessing sustainability-related resources. TB5: Digital tools can sometimes feel overwhelming when focusing on sustainability. TB6: I find it difficult to trust the credibility of online sustainability resources.	(He et al., 2023)
Adoption of Green-Consumption Behavior (AGCB)	AGCB1: I prioritize environmentally friendly products in my purchases. AGCB2: I actively try to reduce waste in my daily life.	(Asif et al., 2023)

	AGCB3: I encourage others to adopt sustainable consumption practices. AGCB4: I integrate Green-Consumption into my lifestyle.	

This survey table comprehensively lists the constructs and items utilized in this study, ensuring precise alignment with theoretical underpinnings and prior validated measures. Each item reflects the variables outlined in the research model.

3.2 Sample and data collection

Specific targets for the study were educationists and teachers in colleges and universities, as they significantly played a role in creating and inculcating sustainability education and digital literacy. A convenience sampling method collected 169 valid responses (Hair et al., 2019). The data collected from Thailand included educators, policymakers, and university teachers. As the survey is distributed online and through email and institutional networks, it was distributed to have the broadest reach and participation possible. This study was focused on Thailand mainly because Thailand comprises several key factors that would make this context a representative and relevant case to explore the link between digital literacy and green-consumption behaviors. Secondly, Thailand has witnessed excessive usage of digital technologies, with a high percentage of the Thai population utilizing mobile devices and the Internet (Srinuan et al., 2012). One of the countries with the highest internet penetration rate in Southeast Asia is the country (according to recent reports of Datareportal, 2023, over 80% of the population is internet users) (Pukdeewut & Setthasuravich, 2024; Srinuan et al., 2012; Vate-U-Lan, 2015). By using widely used digital tools as a lens into the study of digital literacy's influence on sustainable behaviors, this amount of digital use makes for an ideal environment.

The second, on the other hand, is that Thailand is undergoing increasing environmental problems such as waste management, the consumption of energy, as well as conservation. This has resulted in increased interest in elevating the practice of sustainable consumption and environmental awareness, particularly among the youth, who are more likely to be engaged in digital platforms for learning and awareness (Ping, 2011). Thus, these two contain a setting in which the impact of digital tools in ecological education is studied; namely, the Thai government and several non-governmental organizations (NGOs) have launched campaigns for ecological promotion in green behavior (Marks, 2011).

Second, the diverse demographic of Thailand, consisting of both urban and rural populations and varying levels of access to digital technologies, presents an opportunity to study different groups of people's responses to digital literacy and green-consumption behaviors (Marks, 2011; Wongboonsin et al., 2005) . This study selects Thailand to achieve understanding not only from the Thai context but also from dimensions of digital tools and sustainability in the context of other developing countries in Southeast Asia and elsewhere where digital tools and sustainability may be interlinked (Ping, 2011). A preliminary screening was conducted to remove incomplete or inconsistent entries and ensure the validity of respondents' responses. Table 2 shows the demographic characteristics of the respondents by sex, age, professional designation, and years of experience. I adopted a sample of education professionals from different academic institutions to obtain the perception and practice of sustainability education and green consumption.

3.3 Demographic profile of respondents

Table 2 presents the demographic profile of the respondents. Policymakers (25%), educationists (35%), and teachers (40%) in colleges and universities constituted the sample. The participants were divided

equally along gender lines, with 53% male and 47% female. Of the respondents, 65% were in the age group of 30–50 years, while 35% were above 50. As for professional experience, 58 percent responded that they had more than 10 years' experience in doing business on an educational and policy-making level.

Table 2: Demographic Characteristics of the Respondents

Demographic Variable	Category	Frequency (N)	Percentage (%)
Gender	Male	94	55.60%
	Female	75	44.40%
Age	18–25 years	30	17.80%
	26–35 years	65	38.50%
	36–45 years	51	30.20%
	Above 45 years	23	13.50%
Education Level	Bachelor's Degree	38	22.50%
	Master's Degree	81	47.90%
	Doctoral Degree	50	29.60%
Occupation	Policy Maker	45	26.60%
	Educator (College/University)	79	46.70%
	Teacher (School)	45	26.60%
Experience with Digital Tools	Less than 1 year	14	8.30%
	1–3 years	54	32.00%
	4–6 years	69	40.80%
	More than 6 years	32	18.90%

3.4 Measures and validation

Each construct used adapted survey items from prior research to ensure valid and reliable content. For example, environmental awareness items were adapted from T-P-B-based sustainability awareness measures, and Perceived Usefulness items were generated using T.A.M-based studies on technology adoption (Davis et al., 2005). Prior frameworks based on cognitive gains in sustainability education defined the Sustainability Knowledge Acquisition construct.

A pilot test with 20 respondents from the target population was performed to ensure construct reliability and validity. We verified internal consistency, with Cronbach's alpha values of each construct higher than 0.7. Factor analysis showed strong convergent and discriminant validity in the finalized survey instrument.

3.5 Ethical considerations

The study embodied ethical research practices, such as informed consent, confidentiality, and voluntary participation. No identifying information was collected, and respondents were told why the study was being conducted to ensure they remained anonymous. This provides a strong basis for studying how such a complex game of variables is played around green Consumption behavior within a digital literacy and sustainability education framework.

4. DATA ANALYSIS

The data analysis for this study is done to evaluate the research model and test the proposed hypotheses. Following up on the Anderson & Creanza suggestions, we used a two-step approach, assessing

the measurement and continuing with the structural model. Structural Equation Modeling (SEM) was done using Smart-PLS 4.0. This section details the measurement model with reliability, validity, and discriminant validity measures (Anderson & Creanza, 2022).

4.1 Measurement model

Reliability, convergent validity, and discriminant validity of the measurement model were assessed. The factor loadings, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) values for all constructs are shown in Table 3. The reliability and validity of each construct in the study were robust. Cronbach alpha and composite reliability (CR) method was used first to evaluate reliability. All constructs Cronbach's alpha values were larger than the recommended threshold of 0.70 (Perry et al., 2015). Also, the CR values of all constructs were above 0.70, and the scales showed internal consistency. Similarly, strong reliability was reported by an example construct, the adoption of green consumption behavior (AGCB), which reported Cronbach's alpha of 0.851 and CR of 0.900.

Since we assessed convergent validity with the help of the factor loadings and AVE values, we can say so. As shown in Table 3, all factor loadings were above the threshold of 0.70, indicating strong individual indicator reliability. In addition, the AVE values of all constructs were higher than the accepted minimum value of 0.50 (Ab Hamid et al., 2017). Thus indicating that all the constructs had enough convergent validity. For instance, the Acceptable Value of this study includes the Perceived Usefulness of Digital Tools (AVE=0.816) and Sustainability Knowledge Acquisition (AVE = 0.760), both higher than the standard.

Table 3: Factor loadings

	Items	Factor loadings	Cronbach Alpha	CR	AVE
Adoption of Green-Consumption Behavior	AGCB1	0.841	0.851	0.9	0.691
	AGCB2	0.825			
	AGCB3	0.835			
	AGCB4	0.824			
Use of Digital Media for Sustainability Education	DMSE1	0.775	0.824	0.895	0.739
	DMSE2	0.812			
	DMSE3	0.793			
	DMSE4	0.820			
Environmental Awareness	EA1	0.843	0.899	0.93	0.767
	EA2	0.877			
	EA3	0.858			
Motivation for Green-Consumption	MGC1	0.875	0.934	0.95	0.792
	MGC2	0.908			
	MGC3	0.854			
	MGC4	0.866			
Perceived Usefulness of Digital Tools	PUDT1	0.856	0.943	0.957	0.816
	PUDT2	0.887			
	PUDT3	0.918			
	PUDT4	0.898			
	PUDT5	0.888			

Sustainability Knowledge Acquisition	SKA1	0.873	0.937	0.95	0.76
	SKA2	0.922			
	SKA3	0.917			
	SKA4	0.928			
	SKA5	0.874			
Technological Barriers	TB1	0.879	0.814	0.877	0.64
	TB2	0.859			
	TB3	0.883			
	TB4	0.858			
	TB5	0.864			
	TB6	0.887			

Tables 4 and 5 provide the results of assessing discriminant validity using the Fornell-Larcker criterion and Heterotrait-Monotrait (HTMT) ratio. Suppose the square root of the AVE for each construct is greater than the correlation between that construct and any other construct. In that case, Discriminant validity is confirmed by the Fornell-Larcker criterion. Tables 4 and 5 show that all constructs met this criterion.

Table 4: Heterotrait-monotrait ratio (HTMT) - Matrix

	Adoption of Green-Consumption Behavior	**Environmental Awareness**	**Motivation for Green-Consumption**	**Perceived Usefulness of Digital Tools**	**Sustainability Knowledge Acquisition**	**Technological Barriers**
Adoption of Green-Consumption Behavior						
Environmental Awareness	0.421					
Motivation for Green-Consumption	0.733	0.287				
Perceived Usefulness of Digital Tools	0.247	0.406	0.241			
Sustainability Knowledge Acquisition	0.587	0.361	0.563	0.238		
Technological Barriers	0.527	0.575	0.414	0.240	0.477	
Use of Digital Media for Sustainability Education	0.299	0.422	0.195	0.425	0.305	0.318

For instance, the square root of the AVE 'Adoption of Green-Consumption Behavior' (0.831) was greater than correlations with other constructs such as Environmental Awareness (0.355) and Technological Barriers (0.471). Finally, this provided further evidence for discriminant validity as all ratios were below the recommended threshold of 0.85 by Henseler (2015) for the HTMT values. For example, the

discriminant validities for inter-item relationships were good since the HTMT values for Environmental Awareness and Adoption of Green-Consumption Behavior were 0.421.

Table 5: Fornell-Larcker criterion

	Adoption of Green-Consumption Behavior	**Environmental Awareness**	**Motivation for Green-Consumption**	**Perceived Usefulness of Digital Tools**	**Sustainability Knowledge Acquisition**	**Technological Barriers**
Adoption of Green-Consumption Behavior	0.831					
Environmental Awareness	0.355	0.860				
Motivation for Green-Consumption	0.643	0.247	0.876			
Perceived Usefulness of Digital Tools	0.220	0.354	0.220	0.890		
Sustainability Knowledge Acquisition	0.527	0.321	0.520	0.225	0.903	
Technological Barriers	0.471	0.507	0.382	0.224	0.451	0.872
Use of Digital Media for Sustainability Education	0.250	0.349	0.173	0.372	0.273	0.278

Figure 2 shows a conceptual picture of the measurement model, which connects constructs and indicators. Strong factor loadings and interrelations support the model's robustness. The structural relationships and testing of hypotheses in the following section are evaluated based on this robust measurement model. The data analysis suggests that the constructs are well-defined and adequately measure the theoretical constructs of interest.

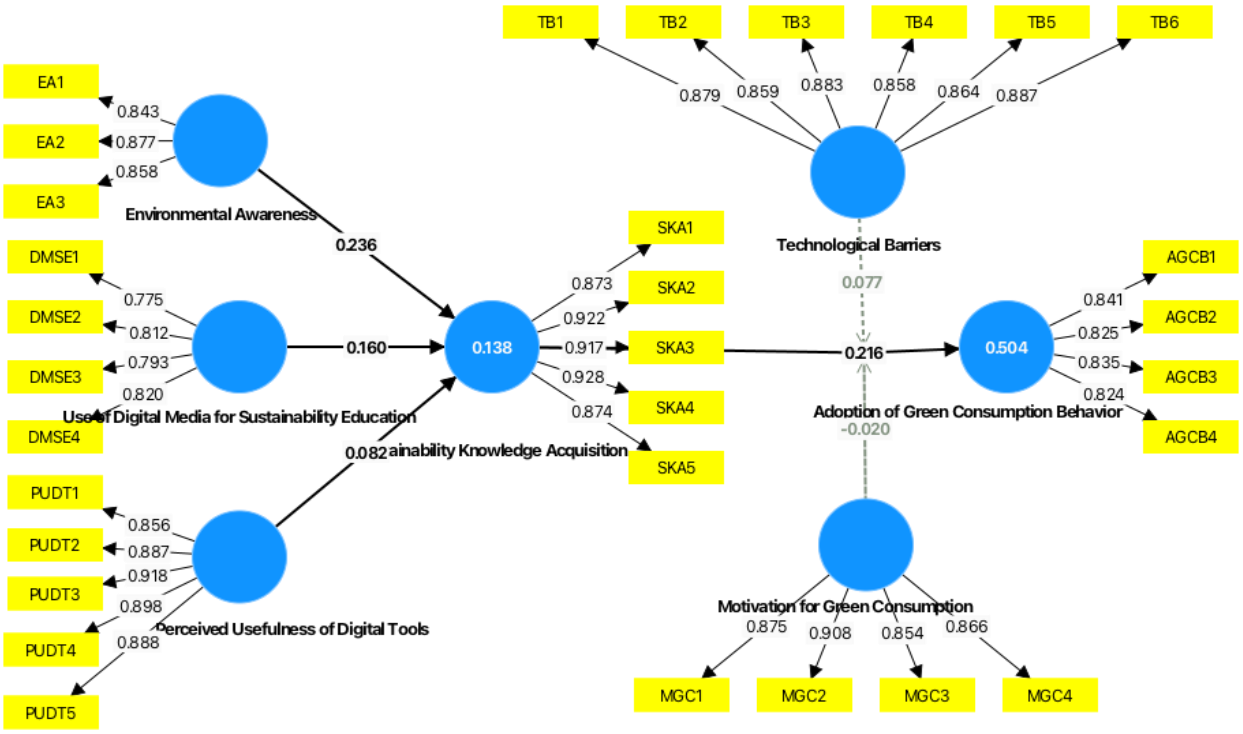

Figure 2: Measurement Model

4.2 Structural model

The relationships between the constructs and tests of the hypotheses formulated in the research model were evaluated by evaluating the structural model. The path coefficient was used to estimate whether the relationships are strong or weak and if there is a direction. In this case, the results are tabulated in Table 6, where the path coefficients, sample means, and significance levels are presented, while the structural model and its path are displayed in Figure 3.

The results show strong relationships between the constructs and support for most hypothesized relationships. Environmental awareness positively and significantly influenced adopting Green-Consumption Behavior (H1a: $\beta = 0.051$, $p < 0.001$). Similarly, the Perceived Usefulness of Digital Tools significantly influenced the Adoption of Green-Consumption Behavior (H1b: $\beta = 0.018$, $p = 0.035$). The Use of Digital Media for Sustainability Education also significantly positively affected the Adoption of Green-Consumption Behavior (H1c: $\beta = 0.160$, $p = 0.001$). The findings of this study suggest that cognitive and digital resources play a critical role in actively shaping green consumption behaviors.

Sustainability Knowledge Acquisition emerged as a strong predictor of adopting Green-Consumption Behavior (H2: $\beta = 0.216$, $p < 0.001$). Motivation for green consumption had the highest influence on adopting green consumption behavior (H3: Moreover, results suggest that individual drive enhances the likelihood of environmentally conscious practice ($\beta = 0.456$, $p < 0.001$). Technological Barriers also impact the Adoption of Green-Consumption Behavior significantly (H4: The results suggest that infrastructural and accessibility issues may impede sustainability ($\beta = 0.211$, $p < 0.001$).

Table 6: Path coefficients

	Original sample (O)	Sample mean (M)	P values
H1a:Environmental Awareness -> Adoption of Green-Consumption Behavior	0.051	0.052	0.000
H1b: Perceived Usefulness of Digital Tools -> Adoption of Green-Consumption Behavior	0.018	0.018	0.035
H1c: Use of Digital Media for Sustainability Education -> Adoption of Green-Consumption Behavior	0.160	0.036	0.001
H2:Sustainability Knowledge Acquisition -> Adoption of Green-Consumption Behavior	0.216	0.219	0.000
H3:Motivation for Green-Consumption -> Adoption of Green-Consumption Behavior	0.456	0.454	0.000
H4:Technological Barriers -> Adoption of Green-Consumption Behavior	0.211	0.212	0.000
H5a:Environmental Awareness -> Sustainability Knowledge Acquisition	0.236	0.236	0.000
H5b: Use of Digital Media for Sustainability Education -> Sustainability Knowledge Acquisition	0.160	0.162	0.000
H5c: Perceived Usefulness of Digital Tools -> Sustainability Knowledge Acquisition	0.082	0.081	0.019
H6:Motivation for Green-Consumption x Sustainability Knowledge Acquisition -> Adoption of Green-Consumption Behavior	-0.020	-0.020	0.578
H6:Technological Barriers x Sustainability Knowledge Acquisition -> Adoption of Green-Consumption Behavior	0.077	0.076	0.028

Relationships between antecedents and Sustainability Knowledge Acquisition were also examined. Environmental awareness positively influenced Sustainability Knowledge Acquisition (H5a: $\beta = 0.236$, $p < 0.001$). Similarly, using Digital Media for Sustainability Education significantly predicted Sustainability Knowledge Acquisition (H5b: $\beta = 0.160$, $p < 0.001$). The Perceived Usefulness of Digital Tools also contributed positively to Sustainability Knowledge Acquisition (H5c: $\beta = 0.082$, $p = 0.019$).

The Sustainability Knowledge Acquisition was tested for interaction effects to determine their moderating role. Motivation for Green-Consumption and Sustainability Knowledge Acquisition did not significantly affect the Adoption of Green-Consumption Behavior (H6: $\beta = -0.020$, $p = 0.578$). However, Technological Barriers and Sustainability Knowledge Acquisition demonstrated a significant interaction effect (H6: These variables interplay can influence Green-Consumption behavior ($\beta = 0.077$; $p = .028$).

4.3 Mediating effects

The mediating effects were assessed to investigate indirect relationships between antecedent variables and the Adoption of green Consumption Behavior via Sustainability Knowledge Acquisition. The results in Table 7 show that free provision of Sustainability Knowledge Acquisition constitutes robust evidence of that construct's mediating role. Below is a detailed analysis of indirect effects.

The mediating role of Sustainability Knowledge Acquisition between the Use of Digital Media for Sustainability Education and the Adoption of Green Consumption Behavior was found to be significant

(H7a: β = 0.035, p = 0.001). The finding suggests that knowledge acquired through digital platforms for sustainability education contributes to Green Consumption behavior. This underscores the need to engender sustainability knowledge and environmentally behavior-promoting capabilities through digital media.

Similarly, Sustainability Knowledge Acquisition significantly mediated the relationship between Environmental Awareness and the Adoption of Green-Consumption Behavior (H7b: β = 0.051, p < 0.001). This finding suggests that people with greater environmental awareness are more likely to gain knowledge about sustainability and then convert this knowledge into Green-Consumption activities. The importance of environmental education in the gap between awareness and behavior is stressed in this finding. Table 7 mentions all the specific indirect effects in detail.

Table 7: Specific indirect effects

	Original sample (O)	**Sample mean (M)**	**P values**
H7a: Use of Digital Media for Sustainability Education -> Sustainability Knowledge Acquisition -> Adoption of Green-Consumption Behavior	0.035	0.036	0.001
H7b:Environmental Awareness -> Sustainability Knowledge Acquisition -> Adoption of Green-Consumption Behavior	0.051	0.052	0.000
H7c: Perceived Usefulness of Digital Tools -> Sustainability Knowledge Acquisition -> Adoption of Green-Consumption Behavior	0.018	0.018	0.035

The mediating pathway from the Perceived Usefulness of Digital Tools to the Adoption of Green Consumption Behavior through Sustainability Knowledge Acquisition was also supported (H7c: β = 0.018, p = 0.035). It is shown that the perceived value of digital tools not only affects direct behavior but also results in greater sustainability knowledge that, in turn, promotes Green Consumption behavior. The result, therefore, points to the fact that digital tools need to be maximally deployed to benefit knowledge acquisition and sustainable practices. Overall, it offers an understanding of the central mediating role of Sustainability Knowledge Acquisition in adopting Green-Consumption behavior. It is a critical bridge between digital tools, environmental awareness, and learning about sustainability into tangible sustainable behaviors. This more profound understanding of how educational strategies combined with digital technologies can significantly affect pro-environmental behavior gives these insights.

The model's results confirm the importance of knowledge development as a route to achieving sustainable consumption goals, as demonstrated by the specific indirect effects. These results have implications for policymakers, educators, and organizations in their interventions to integrate knowledge-building strategies with technology-driven solutions to environmental challenges.

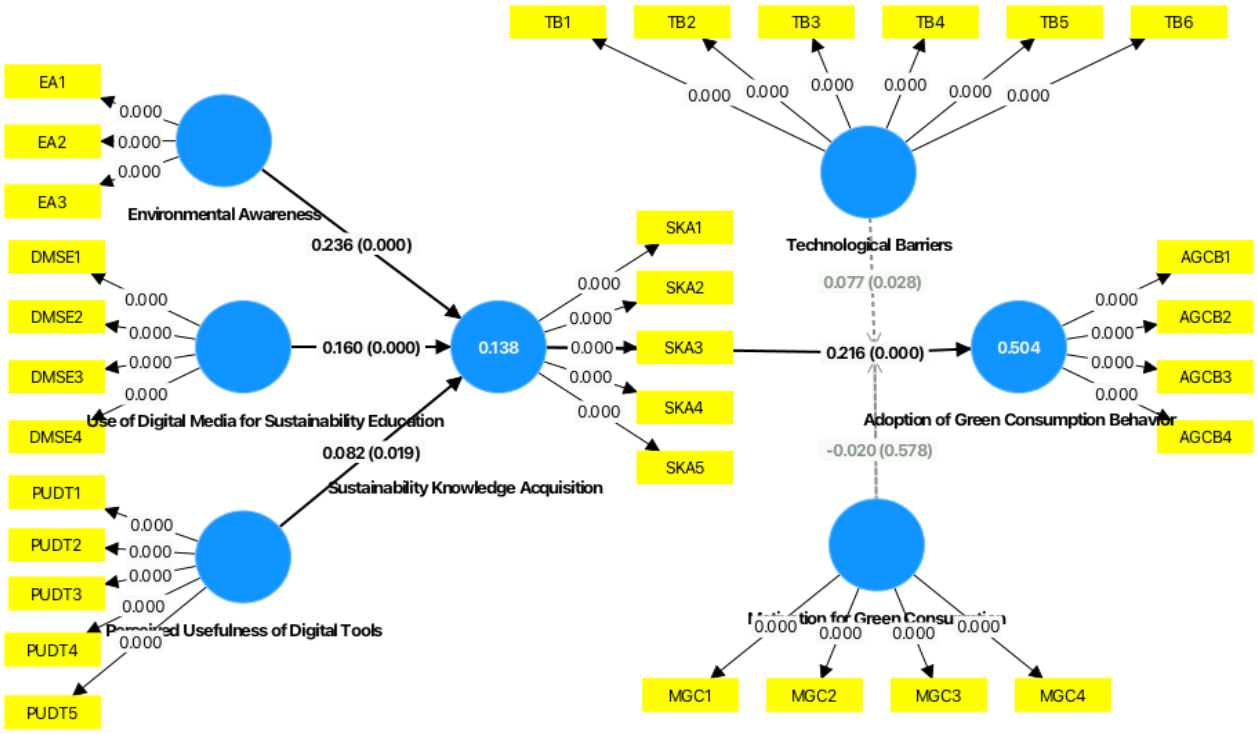

Figure 3: Structural model

5. DISCUSSION

This research contributes to understanding Green Consumption decisions in the digital era and their relation to educating about such decisions and integrating digital tools to support them. The evidence for the hypothesis (H1a) that environmental awareness positively affects adopting a Green Consumption behavior strengthens the importance of promoting environmental consciousness as a leading enabler of sustainable behavior. This agrees with previous research that states that environmental awareness is related to pro-environmental behavior (Bamberg & Möser, 2007). However, contrary to these results, past studies have also reported mixed results where the direct effect can be reduced when other influences, like motivation or perceived barriers are not considered (Nguyen et al., 2023; F. Rahmawati et al., 2023). This study presents the results that have important implications for understanding Green-Consumption choices in the digital age through educational approaches. We first support the hypothesis (H1a) that environmental awareness positively impacts adopting a Green-Consumption behavior, signifying the necessity to promote environmental awareness as an indispensable prerequisite for environmentally friendly behavior. This agrees with previous research on the importance of environmental consciousness in pro-environmental action (Bamberg & Möser, 2007). Just as the usefulness of digital tools was perceived (H1b) and the use of digital media for sustainability education (H1c) was associated with increased act Green-Consumption behavior. These results emphasize the importance of digital platforms in disseminating sustainability knowledge and closing the awareness of the action gap (Nguyen et al., 2023; F. Rahmawati et al., 2023). A second contribution of this study is to demonstrate that Green Consumption behavior is a central mediator (H2) between Green consumption information and Green Consumption behavior and environmental awareness and digital tools. This mediating effect highlights that knowledge has a mediating effect in favoring the behavioral change process, with previous studies showing that persons with higher sustainability knowledge are more predisposed to pro-environment behavior. However, previous work has

provided mixed results such that although sustainability knowledge is important, the knowledge alone might not have led to behavior change without other motivation or external factors (Cahigas et al., 2022). Green Consumption behavior was also influenced by the perceived usefulness of digital tools (H1b) and the use of digital media for Education for Sustainability (H1c). This points towards the significance of the digital platform in bridging the gap between awareness and action for the maintenance of the environment. Some studies indicate that digital tools on their own would not be able to drive behavior change without educational strategies (A. J. Rahmawati et al., 2023). But this research offers that digital media and sustainability education integration considerably enhances pro-environmental actions, thus answering the mixed outcomes in the literature.

Finally, the strong medium-ship effect of this sustainability knowledge acquisition on Green-Consumption behavior (H2) adds weight to the importance of knowledge as a mediator in behavioral change. This supports the idea that people who are better informed will take environmentally sustainable action. In addition, H3 (motivation for Green-Consumption) is the strongest predictor of behavior, suggesting that both intrinsic motivation is a key factor in Green-Consumption decisions (Barattucci et al., 2022; Cahigas et al., 2022). However, technological barriers (H4) were found to influence behavior negatively, highlighting the importance of addressing digital tool issues for sustainability education related to accessibility and usability.

The study also revealed a relationship between motivation for Green-Consumption (H3) and the fact that it is a key driver of Green Consumption behavior. This fits in with the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (T.A.M.), both stressing the role of cognitive and emotional factors in behavior. Although past research on motivation has a mixed record of being a strong influence on behavior (Barattucci et al., 2022). This study reconfirms that motivating factors, intrinsic and extrinsic, play an important role in bringing about sustainable consumption choices.

The results highlight interesting mediating pathways. The mediator variable sustainability knowledge acquisition mediated the relationships between environmental awareness, digital tools and digital media, and Green-Consumption behavior (H7a–H7c). This shows that knowledge is a fundamental bridge between knowledge of, or having access to tools, and their implementation behavior. These results are consistent with the Technology Acceptance Model and Theory of Planned Behavior, which focus on the interaction between cognitive, affective, and contextual factors that influence one's behavioral intention. This study highlights the need to empower Green-Consumption behaviors using the digital era integrated sustainability knowledge and digital literacy. This research examines the influence of various associated factors on sustainable consumption behavior by combining educational strategies, digital tools, and motivational factors. In this study, such mixed findings from past studies on the effects of environmental awareness, digital tools, and motivation on behavior are contextualized to explain more holistically how all these factors jointly influence pro-environmental actions.

The study takes a holistic, multidimensional approach to stimulating green consumption by merging educational strategies, digital tools, and motivational factors. Secondly, it presents empirical evidence that sustainability knowledge and digital literacy are needed to induce environmentally sustainable behavior in the digital age.

6. CONCLUSION

This study underscores the crucial role of digital tools, sustainability education, and intrinsic motivation in promoting Green-Consumption behavior in the digital era. By integrating the Technology Acceptance Model (T.A.M.) and the Theory of Planned Behavior (T-P-B), the research highlights how sustainability knowledge mediates the influence of environmental awareness and the perceived usefulness of digital tools on green consumption actions. The findings emphasize that fostering environmental consciousness, providing accessible digital platforms, and enhancing motivation are essential components for encouraging sustainable consumption. A central finding is that environmental awareness positively impacts the adoption of green consumption behavior. This confirms prior research that stresses environmental consciousness as a fundamental prerequisite for pro-environmental behavior. However, this awareness alone does not guarantee behavior change; motivation and the effective use of digital tools are equally necessary to bridge the gap between knowledge and action. This synergy of factors is particularly important in today's digital context where information alone may not suffice for behavioral shifts. The study also reveals that the perceived usefulness of digital tools and active engagement with digital media for sustainability education substantially boost green consumption behavior. Digital platforms serve not only as avenues for information dissemination but also as crucial enablers that translate environmental knowledge into real-world sustainable practices. This finding addresses mixed results in previous literature by showing that digital media, when combined with educational strategies, effectively promote pro-environmental behavior.

Sustainability knowledge acquisition emerges as a key mediator connecting environmental awareness, digital tool usage, and green consumption. This affirms that individuals who are better informed are more likely to engage in sustainable actions, as knowledge empowers informed and confident decision-making. Additionally, motivation both intrinsic and extrinsic stands out as the strongest predictor of green consumption behavior. This highlights the importance of psychological and emotional factors in sustaining long-term sustainable behavior, suggesting that motivational strategies must accompany educational and technological initiatives. Despite these positive findings, technological barriers present a significant challenge. Issues such as accessibility and usability can hinder the effectiveness of digital platforms aimed at sustainability education. The study emphasizes the need for user-friendly, accessible, and well-promoted digital tools to maximize their impact on green consumption behaviors. Policymakers and educators must therefore prioritize overcoming these barriers to ensure inclusive and effective sustainability education.

While the study offers valuable insights, it is limited by its sample size and focus on educators and policymakers. Future research should expand to include diverse populations such as general consumers and students, and examine socioeconomic and cultural factors influencing green consumption behavior. Longitudinal and experimental methods could further clarify causal pathways. Additionally, future exploration of AI-driven technologies, gamification, personalized learning, and the expansion of digital sustainability education in underserved communities could enhance the reach and effectiveness of these strategies. In conclusion, this study confirms that integrating educational approaches with digital tools and motivational strategies is key to promoting green consumption in the digital age. The combination of awareness, knowledge, motivation, and accessible technology forms a strong foundation for encouraging sustainable consumer behavior and advancing global sustainability efforts.

6.1 Policy implications

This study contributes theoretically and practically to skills for promoting sustainable consumption behavior in the age of digitality.

6.1.1 Theoretical Implications

The Theory of Planned Behavior (T-P-B) and the Technology Acceptance Model (T.A.M) were expanded in this research, with sustainability knowledge incorporated as a mediator. The study shows how environmental awareness and perceived usefulness of digital tools lead to Green-Consumption behavior through knowledge acquisition, extending T.A.M and T-P-B. Additionally, it elaborates on the importance of including psychological and motivational aspects in traditional technology adoption frameworks to understand Green-Consumption. This integration complements the knowledge of how educational inputs and digital tools shape pro-environmental behavior.

6.1.2 Practical Implications

The findings for policymakers highlight the need to facilitate sustainability knowledge through digital media. In order to conquer technological barriers and increase digital literacy, there must be investments in developing accessible and user-friendly educational platforms. Despite having digital tools and sustainability-focused curricula in our educational institutions, we must create awareness and develop knowledge. Organizations that hope to encourage Green-Consumption further must dedicate much effort to motivational strategies, such as rewards or incentives, which would be needed to change behavior. To allow for the spread of digital tools for sustainability education, it is important to tackle technological barriers such as usability and accessibility issues. Digital tools should also be marketed with another audible message highlighting their perceived usefulness in driving sustainable practices.

6.1.3 Future insights and limitations

This study has some limitations but does contribute. The findings are generalizable to broader populations because of their restriction on 169 respondents, primarily educators and policymakers. Future research should expand the sample to include general consumers, and there are students, as this represents a non-divergent perspective toward Green Consumption behavior. Secondly, the study focused on digital tools and educational strategies but not on the role of socio-cultural and economic factors. The cultural norms and economic incentives involved in Green Consumption behavior will be further studied in different contexts. Another limitation is that the data is cross-sectional, so causality cannot be inferred. We recommend longitudinal studies to examine the evolution of knowledge and behavior regarding sustainability. Furthermore, the study depended on self-reported data, a source that is difficult to escape from social desirability bias. The findings could be improved by incorporating either behavioral experiments or observational methods.

Future research should also study the interactions between AI-driven technologies in using education on sustainability education and how gamification or personalizing learning experiences can further boost motivation and knowledge gain. The scalability of digital tools in rural or underprivileged areas could give us a hint at bridging the digital divide. Finally, considering the study in industry-specific contexts, such as green marketing or eco-friendly product development, enables us to see sustainable practice developments in other industries.

Acknowledgements: The authors would like to express their sincere gratitude to the institutions and individuals who have supported this research. **Lamphai Trakoonsanti** from the College of Logistics and Supply Chain, Suan Sunandha Rajabhat University, Bangkok, Thailand (email: lamphai.tr@ssru.ac.th),

and **Qaiser Abbas** from the Department of Economics, College of Political Science and Economics, Korea University, Seoul, Republic of Korea (email: qabbas@korea.ac.kr), jointly contributed to this work.

Author Contributions: Qasir Abbas: Conceptualization, writing the original draft. : Variable construction and methodology. **Lamphai Trakoonsanti:** supervision, funding acquisition. **Qasir Abbas:** Formal analysis and data handling. **Lamphai Trakoonsanti:** Writing review and editing. All authors have read and agreed to the published version of the manuscript.

Ethical Statement: This study involved human participants who provided informed consent prior to their involvement. All procedures performed in this research adhered to the ethical standards of the institutional research committee. Ethical approval was obtained from Suan Sunandha Rajabhat University, Bangkok, Thailand, ensuring that the rights, safety, and well-being of the participants were fully protected throughout the study.

Consent to Participate: Before conducting this research study, the researcher has taken permission from the host department at **Suan Sunandha Rajabhat University, Bangkok, Thailand**, The researcher explained the objectives of the study before interviewing the respondents. The respondents were assured that the information would only be used for research purposes. The respondents were told that they could withdraw at any stage from the interview if they felt uneasy or did not want to continue the interview.

Competing Interests: No conflict of interest among authors is applicable

Grant/Funding information: No funding applicable

Data Availability Statement: The related data available on request

Declaration Statement of Generative AI: No AI tool is used

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