2025

JOINETECH Journal

UTAMED

N° 01

International Journal of Economic and Technological Studies

Digitization Meets Sustainability: The Role of Marketing Analytics in Transforming E-Commerce

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Citation:
Shatila, K., Yela Aránega, A., & Gómez García, J. A. (2025). Digitization Meets Sustainability: The Role of Marketing Analytics in Transforming E-Commerce. ***Joinetech (International Journal of Economy and Technology),*** 14(1), 28–40. UTAMED.

ARTICLE INFO

Keywords: Customer Trust, Corporate Sustainability Communication, Technology Adoption, Consumer Purchase Intention, Regulatory Framework.

ABSTRACT

This study examines the relationships between customer trust, corporate sustainability communication, technology adoption, and consumer purchase intention in Middle Eastern e-commerce, focusing on the moderating role of the regulatory environment. Using a quantitative methodology, data were collected through an online survey of 750 consumers across the Middle East. Structural equation modeling (SEM) was employed to analyze the data and test five hypotheses. The results confirm that customer trust in digital platforms, clear corporate sustainability communication, and the adoption of advanced technologies significantly enhance consumer purchase intention. The findings also demonstrate that a robust regulatory environment, such as those under initiatives such as Saudi Vision 2030 and the Green Economy initiative of the United Arab Emirates (UAE), positively moderates the perceived value of sustainability efforts, further increasing purchase intention. The study contributes to the literature by integrating the technology acceptance model (TAM) and institutional theory within the sustainability context and offering practical insights for businesses and policymakers. Limitations include the reliance on self-reported data and the regional focus, suggesting a need for future cross-regional and longitudinal studies.

1. Introduction

The intersection of digital engagement and sustainability has emerged as a central topic in e-commerce (Jalil et al., 2024). As more and more companies transition to the online market, there is growing emphasis on integrating sustainability into both their operations and communication (Yu et al., 2021). Specifically, digital platforms offer valuable opportunities for companies to engage with consumers in real time, share information, and explain their sustainability activities (Dabbous et al., 2020). Simultaneously, customers are becoming increasingly aware of environmental and social issues and expect companies to reflect these concerns in their practices. This has led to a growing theoretical foundation linking digital sustainability engagement with consumer behavior, particularly regarding the perceived value of such efforts and their influence on purchasing decisions (Esfahbodi et al., 2022). Digital tools are essential in this context, as they allow the company to communicate about sustainability efforts (Lin et al., 2021). The importance of corporate sustainability communication has been well-documented (Attar et al., 2021). Transparent and clear communication can significantly benefit businesses by enhancing brand reputation and consumer trust (Haryanti & Subriadi, 2022). However, the globalization of communication and the digital environment introduces both opportunities and challenges for businesses (Chen et al., 2021). In particular, understanding how consumers perceive these communication efforts is vital, especially in highly regulated markets where companies struggle to uphold their ethical commitments (Malekian et al., 2023).

An appropriate context for studying this problem is the Middle Eastern context. The advantage of this context for this study lies in the region's distinctive and rapidly evolving regulatory frameworks, which are actively addressing emerging sustainability challenges (Ahmad & Zhang, 2020). Eastern governments have adopted several regulations intended to increase the levels of sustainability—most notably, Saudi Arabia's Vision 2030, which places strong emphasis on advancing environmental sustainability as a core pillar of economic development (Shareef et al., 2019). These practices taken on the state level create a favorable regulatory environment, promoting the adoption of state-level initiatives; this environment encourages the adoption and communication of sustainability practices, providing a valuable foundation for examining consumer perceptions of such efforts. Moreover, high internet penetration and a tech-savvy, youthful population contribute to growing digital engagement across the region (Hewei & Youngsook, 2022; Mehta & Handriana, 2024). With the rapid expansion of e-commerce, consumers in the Middle East increasingly rely on digital platforms to make informed purchasing decisions (Chuah et al., 2020). This convergence of regulatory momentum and rising consumer awareness around sustainability creates an ideal context for exploring how companies can leverage digital communication strategies to promote sustainable practices in the region (Leonidou et al., 2020).

Focusing on the Middle East not only deepens understanding within the region but also extends the relevance of the findings to other developing countries undergoing similar regulatory and technological transformations (Abu Afifa et al., 2020). Despite growing interest in sustainability and digital engagement in e-commerce, academic literature addressing these topics in the Middle Eastern context remains limited. While some studies have explored these dynamics in developed markets, emerging markets, with their distinct regulatory structures and consumer behavior patterns, have received comparatively little attention. This study seeks to address that gap by examining the moderating role of the regulatory environment in shaping consumer perceptions of corporate sustainability efforts.

This research aims to address the identified gap by examining the moderating role of the regulatory environment in the relationship between digital engagement with sustainability drivers and consumer perceptions of sustainability initiatives in the Middle East. Specifically, the study explores how businesses in the region can utilize digital platforms to communicate their sustainability efforts and how regulatory frameworks influence consumers' interpretations of these messages. Furthermore, our research investigates how such perceptions impact consumer purchase intentions, offering valuable insights into the effectiveness of sustainability communication strategies within emerging market contexts.

Therefore, the paper is structured as follows: The first section introduces the research topic and outlines the identified gap. The second section presents a comprehensive literature review, followed by the development and justification of the study's hypotheses (H). The third section details the research methodology employed. In the fourth section, the results are analyzed and interpreted through the validation of a statistical model. The fifth section offers a discussion of the findings and concludes the study, highlighting its limitations and practical and theoretical contributions and suggesting directions for future research.

2. Theoretical Framework

The technology acceptance model (TAM) emphasizes the importance of perceived ease of use. If a company's digital platforms are easy to navigate and provide straightforward access to information, consumers are more likely to engage with these platforms (Esfahbodi et al., 2022). Conversely, if the platform is challenging to use, it can deter engagement, reducing the perceived value of the initiatives. When digital platforms make it easy for consumers to understand and interact with sustainability initiatives, their perceived value increases (Lin et al., 2021). For instance, an e-commerce platform that integrates interactive tools enhances the perceived usefulness of these initiatives. The initiatives are more valuable if consumers find the platform intuitive and the sustainability information helpful in purchasing (Attar et al., 2021). This, in turn, increases their likelihood of purchasing products from companies that promote sustainability.

In contrast, institutional theory explores how organizations conform to established norms, rules, and societal frameworks to gain legitimacy and stability (Haryanti & Subriadi, 2022). In the context of sustainability, institutional theory helps explain why companies adopt sustainability initiatives and how external factors, such as the regulatory environment, influence the perceived value of these initiatives (Chen et al., 2021). As environmental and sustainability regulations become more stringent, companies must comply and demonstrate their efforts to stakeholders, including consumers, to maintain legitimacy and competitive advantage (Malekian et al., 2023). Institutional theory suggests that the regulatory environment exerts coercive pressure on organizations, compelling them to adopt sustainability practices to comply with legal standards (Ahmad & Zhang, 2020).

2.1. Hypotheses Development

The effectiveness of corporate sustainability communication in influencing consumer purchase intention remains contested, with some scholars highlighting potential risks (Dabbous et al., 2020). One major concern is consumer skepticism toward greenwashing, where companies exaggerate or misrepresent their environmental efforts, undermining trust in sustainability claims (Miao et al., 2022). When consumers perceive such communication as insincere or manipulative, they are more likely to share negative word of mouth, which in turn diminishes their intention to purchase (Esfahbodi et al., 2022). This skepticism is particularly prevalent in industries with a history of environmental harm, where companies' credibility is already in question.

Furthermore, Lin et al. (2021) argue that the impact of sustainability communication on purchase intention is contingent on consumers' environmental engagement. They distinguish between eco-conscious consumers and those indifferent to ecological issues, concluding that sustainability messaging has little effect on the latter group, who do not perceive personal relevance in such initiatives. Similarly, Attar et al. (2021) found that, while consumers often express concern for environmental issues in surveys, this concern does not always translate into actual purchasing behavior, especially when environmentally friendly products are more expensive than conventional alternatives.

Haryanti and Subriadi (2022) argue that the relationship between technology acceptance in e-commerce and consumer behavior is not necessarily positive. Chen et al. (2021) also suggest that, while certain technologies may be initially embraced, they are often later abandoned if consumers perceive them as manipulative or intrusive. For instance, Malekian et al. (2023) contend that automated recommendation systems may enhance corporate performance but do little to support corporate social responsibility (CSR) efforts. Although such systems can increase the likelihood of purchase by suggesting relevant products, many consumers are uncomfortable with the idea of algorithms controlling what they see, viewing it as a form of digital gatekeeping (Ahmad & Zhang, 2020).

Customer trust in digital platforms is one of the most mentioned factors driving consumer purchase intention in e-commerce environments. Trust is believed to reduce the perceived risks of online shopping and to convince the consumer to engage in online transactions (Jalil et al., 2024). Consumers are willing to share their personal information and make payments and purchases on the basis of ease and their trust in the online retailer. Trust lowers the perceived risks of experiencing privacy violations, being a victim of fraud, and having a lousy purchase experience. But trust is not enough to ensure an online sale. Yu et al. (2021) contend that trust alone is insufficient to guarantee consumer purchase intention; the perceived ease of use of the information system plays a relevant role too.

Moreover, some researchers argue that technological limitations alone do not fully explain the low conversion rates in e-commerce. Shareef et al. (2019) emphasize the importance of viewing technology not merely as a tool or platform but as part of a broader ecosystem that shapes purchasing behavior. They suggest that, when it comes to restricted or high-consideration products, consumer hesitation cannot be overcome solely through innovation. Understanding such behavior requires deeper insight into psychological, financial, and contextual factors—an area where simplistic assumptions often fall short.

Hewei and Youngsook (2022) highlight a core paradox: Despite e-commerce technologies being convenient, low-cost, and labor-saving, they often fail to convert users into buyers at expected rates. This raises important questions about why consumers adopt certain technologies and how that adoption translates, or fails to translate, into purchasing behavior. Mehta and Handriana (2024) propose that a key missing link in this equation is consumers' financial constraints, suggesting that even the most advanced technological solutions cannot overcome the basic issue of limited purchasing power.

These insights collectively inform the development of the following hypothesis:

H1: There is a positive relationship between (a) customer trust in digital platforms, (b) corporate sustainability communication, and (c) technology adoption in e-commerce and consumer purchase intention.

Shareef et al. (2019) suggest that the perceived value of sustainability initiatives can substantially impact consumer purchase intention. The underlying reason is that consumers have significantly heightened concerns about environmental and social matters, making numerous buyers willing to make economic decisions regarding sustainability. For instance, Hewei & Youngsook (2022) stated that, when a company's sustainability initiatives seem positive, it will raise buyer intention. In this case, such initiatives can include reducing one's carbon footprint, utilizing environmentally safe substances, and participating in fair exchange (Chuah et al., 2020). When a consumer notices such initiatives, they are prompted to believe that the firm is more accountable, ethical, and harmonious with their commitments, which will increase their intent to purchase. A similar reflection was made by Abu Afifa (2022), who also studied the impact of corporate social responsibility on consumer attitudes. When consumers note that a company is sustainable, the perception is that the company may also improve the living standards in the area (Abbas, 2024). Thus, a consumer internalizes the value in question, strengthening their intention of purchase. Due to the relatively low cost of clothing and related products, companies must adopt more refined strategies to encourage effective consumer engagement and utilization, rather than relying on differentiation alone among numerous similar offerings (Abdi et al., 2022). For individuals who do not associate clothing with personal identity, purchasing decisions are more likely to be driven by aesthetic appeal rather than symbolic or functional significance. This led to the development of the following hypothesis:

H2: There is a positive relationship between (a) customer trust in digital platforms, (b) corporate sustainability communication, and (c) technology adoption in e-commerce and the perceived value of sustainability initiatives.

The importance of the perceived value of sustainability initiatives in shaping consumer purchase intention has been emphasized by Zhang et al. (2019). While much of the existing literature supports the positive impact of sustainability on consumer behavior, brand perception, and goodwill, this relationship appears to strengthen as environmental and social issues become more prominent. Consumers are increasingly inclined to support companies that demonstrate a strong commitment to sustainability. For instance, Abbas (2024) found that sustainability initiatives not only enhance brand support but also significantly increase perceived brand value, ultimately leading to higher purchase intention (Hewei & Youngsook, 2022). This effect is often influenced by the alignment between consumers' personal values and a company's commitment to ecological and social responsibility. Shareef (2019) argues that, when organizations communicate their sustainability goals transparently and integrate them authentically into their core operations, they foster a deep emotional and ethical bond with consumers (Malekian et al., 2023). This connection can further strengthen purchase intention, particularly among consumers who align their identities with moral and environmental values (Jalil et al., 2024). As a result, companies that publicly commit to sustainability are more likely to be perceived as socially responsible and to attract greater consumer support.

Furthermore, Dabbous et al. (2020) argue that, beyond enhancing brand value and increasing the purchase intention of the average consumer, sustainability initiatives also create a distinctive value that sets a company apart from its competitors (Miao et al., 2022). When sustainability is perceived as a core element of a company's value proposition, consumers tend to associate the brand not only with ecological responsibility but also with product quality and ethical standards (Esfahbodi, 2022). This unique value proposition can serve as a key driver of purchasing behavior, particularly in markets where consumers link price perception with product quality and overall value, thereby increasing their willingness to buy (Lin et al., 2021). Consequently, companies that lead in sustainability performance can leverage this perceived value to both attract and retain consumers (Attar et al., 2021). However, one key criticism of the direct influence of sustainability initiatives on purchasing decisions is the presence of the called attitude–behavior gap, where positive attitudes toward sustainability do not always translate into actual consumer behavior. It is the gap between consumers' perceived environmental and social consciousness and their actual purchasing behavior. Shareef et al. (2019) observed that, although many consumers express ethical intentions and cite sustainability as a factor in their decision-making, their real behavior often contradicts these claims. In practice, factors such as cost, convenience, and product quality tend to outweigh sustainability considerations in everyday consumption decisions (Hewei & Youngsook, 2022). Even when individuals value ethical consumption in principle, the higher cost of sustainable alternatives often leads them to opt for more affordable, less sustainable options (Mehta & Handriana, 2024). Cost, therefore, emerges as a major barrier preventing the translation of perceived sustainability value into actual purchasing behavior. Chen et al. (2021) also found that, while consumers may support ethical consumption in theory, they are often unwilling to pay a premium, even for products they buy regularly, such as coffee (Ahmad & Zhang, 2020). This price sensitivity is particularly evident with low-involvement or commodity products, where sustainability is often a lower priority than cost and quality (Shareef et al., 2019). As a result, despite general consumer support for sustainability in principle, price remains the dominant factor influencing final purchase decisions. In any case, although the price and quality are always considered when purchasing a good or service, sustainability initiatives can also enter into the criteria for making that decision. This led to the development of the following hypothesis:

H3: The perceived value of sustainability initiatives positively influences consumer purchase intention.

The regulatory environment of a country or region plays a crucial role in shaping how businesses engage with sustainability initiatives, as well as how consumers perceive the value of these efforts (Zhang et al., 2019). In highly regulated markets, companies are often compelled to adopt more sustainable practices, which they frequently communicate through digital platforms. Abdi et al. (2022) propose a model illustrating that regulatory frameworks influence the perceived value of sustainability initiatives in two key ways.

First, by establishing a baseline for compliance, regulation can enhance the credibility and perceived authenticity of corporate sustainability efforts (Mehta & Handriana, 2024). When consumers are aware that a company operates within a stringent regulatory context, they are more likely to trust its sustainability claims, which in turn increases the perceived value of those initiatives (Hewei & Youngsook, 2022). Moreover, digital engagement, through social media, websites, and mobile applications, is often more impactful in such environments, as companies face reputational and financial risks for failing to meet sustainability standards. This pressure incentivizes more transparent and proactive communication, which consumers recognize and value (Ahmad & Zhang, 2020).

Second, regulatory environments help standardize sustainability metrics, enabling clearer and more consistent digital communication (Yu et al., 2021). This standardization allows consumers to compare sustainability performance across companies or industries, making sustainability claims more concrete and verifiable (Haryanti et al., 2022). In such contexts, consumers may not only expect compliance with regulations but also appreciate companies that go beyond legal requirements, thereby perceiving greater value in their sustainability efforts (Jalil et al., 2024).

However, it remains unclear whether regulation universally strengthens the relationship between digital engagement, sustainability drivers, and perceived value. Some studies suggest that this moderating effect may vary depending on the context or industry (Dabbous et al., 2020). This ambiguity leads to the formulation of the following hypothesis:

H4: The regulatory environment moderates the relationship between digital engagement, sustainability drivers, and the perceived value of sustainability initiatives.

Another essential factor moderating the relationship between the perceived value of sustainability initiatives and customer purchasing is the regulatory environment. Abbas (2024) suggests that consumers are more likely to act on their perceptions of sustainability when operating within a highly regulated context. In such structured environments, individuals tend to align their purchasing decisions more closely with the perceived value of sustainability efforts (Abdi et al., 2021). This is particularly evident under strict environmental regulations, which increase consumer awareness of sustainability and enhance demand for sustainably labeled products. When sustainability claims are supported by government bodies or industry standards, consumers are more likely to view them as credible and valuable (Jalil et al., 2024).

Research further indicates that trust in a firm's sustainability initiatives can be bolstered by regulatory frameworks that emphasize transparency and corporate responsibility. This trust plays a crucial role in shaping sustainability as a key purchasing criterion. Consequently, consumers in countries with stronger public expectations for corporate sustainability, such as pressure for firms to publicize their sustainability actions, are more likely to reward these efforts with increased purchase intention (Haryanti & Subriadi, 2022). This societal pressure appears to be embedded across the sample studied.

However, in highly regulated environments, there is also a risk of regulatory capture, where firms exert influence over regulatory bodies, either directly or indirectly (Esfahbodi et al., 2022). This can undermine the credibility of sustainability initiatives. While companies may attempt to leverage sustainability attributes for competitive advantage, the cost of consumer backlash can be significant if these efforts are perceived as disingenuous. When consumers become aware of such manipulation—particularly when sustainability claims are used to justify price premiums—they may reduce their purchase intention (Yu et al., 2021). Importantly, this decline in intent stems not from a diminished perception of sustainability's intrinsic value but from consumer skepticism toward corporate motives and the regulatory landscape (Dabbous et al., 2020). As awareness of sustainability norms grows (Miao et al., 2022), industry-wide regulation may standardize sustainability expectations, embedding them into baseline consumer demand.

This context leads to the development of the following hypothesis:

H5: The regulatory environment moderates the relationship between the perceived value of sustainability initiatives and customer purchase intention.

Figure 1 represents the hypotheses developed on the basis of previous literature.

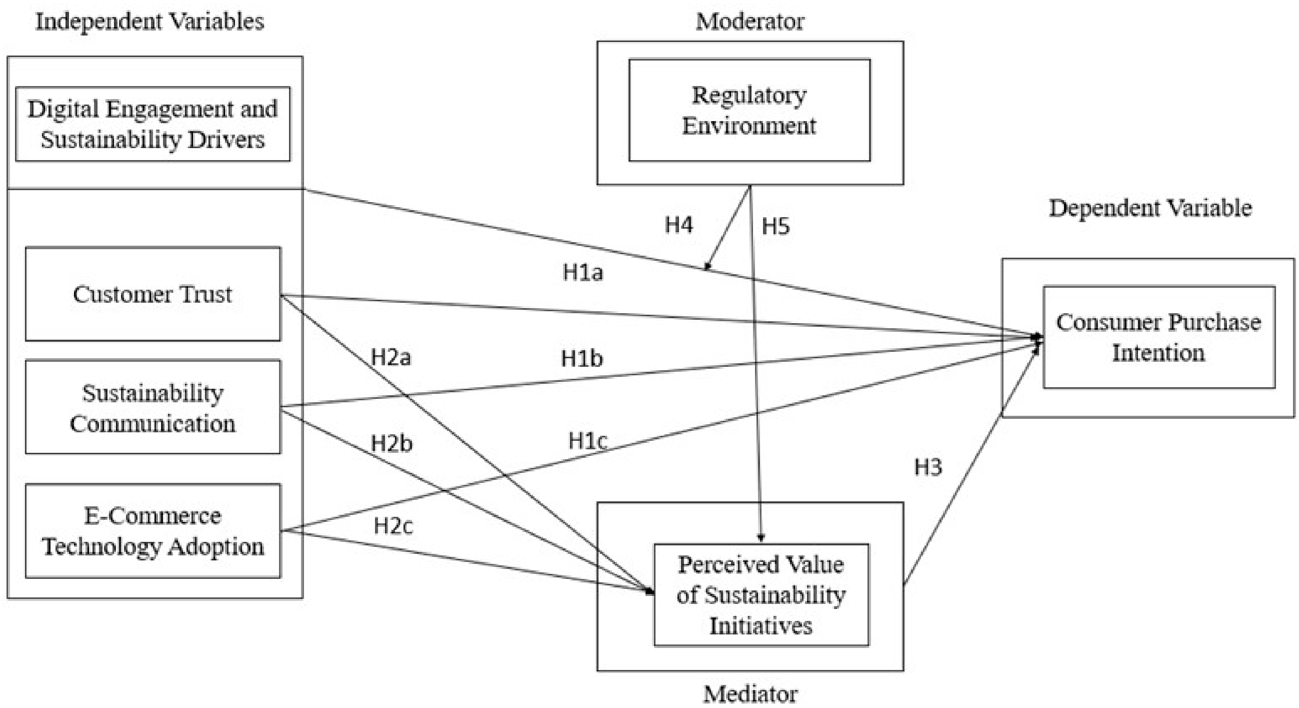

Fig. 1. Research model.

3. Methodology

This study investigates the moderating role of the regulatory environment on the relationship between digital engagement with sustainability initiatives and consumer purchase intention. Specifically, it focuses on how businesses can use digital platforms to communicate their sustainability efforts and how these initiatives influence consumer behavior in the Middle East. To achieve these objectives, the study adopts a quantitative methodology to gather and analyze data related to consumer perceptions of sustainability initiatives and their purchasing behaviors. Data for this study were collected through an online survey administered via Google Forms. This method is well suited to the research objectives, as it enables efficient data collection from a wide audience that is geographically dispersed across the Middle East. A convenience sampling approach was employed to recruit participants from the region. This sampling method is appropriate given the study's aim to quickly and efficiently gather insights from a specific demographic: consumers who engage with e-commerce platforms. The target sample size was 750 respondents, which is sufficient to support robust statistical analyses. To ensure a broad representation of perspectives, participants were drawn from multiple countries within the Middle East, contributing to a diverse and meaningful dataset.

The measurement scales used in this study were carefully adapted from established and validated sources to ensure reliability and construct validity. The items measuring customer trust in digital platforms were adapted from Gefen et al. (2003), who integrated trust into the technology acceptance model for online shopping. The scale for corporate sustainability communication was derived from Pomering and Dolnicar (2009), focusing on consumer awareness and perception of CSR initiatives. To measure technology adoption, we used the core constructs of perceived usefulness and ease of use from the technology acceptance model (TAM) from Davis (1989). The construct for the perceived value of sustainability initiatives was informed by Chen and Chang (2012), emphasizing green trust, value, and consumer perception. Regulatory environment was operationalized on the basis of the institutional frameworks outlined by Scott (2001), reflecting external pressures on organizational legitimacy. Finally, consumer purchase intention was measured using items grounded in the theory of planned behavior by Ajzen (1991), capturing the likelihood of ethical and sustainability-oriented consumer behavior.

Once data were collected, they were cleansed to ensure accuracy and consistency. This involves removing incomplete responses and outliers that could skew the results. Data were screened for errors such as duplicate entries, missing responses, or nonsensical answers, ensuring that only high-quality data were used for analysis. For data analysis, the researchers used AMOS, a powerful statistical software tool well suited for structural equation modeling (SEM). SEM was selected as the primary analytical method because it allows for the simultaneous examination of complex relationships between multiple variables. In this study, SEM enabled the researchers to analyze the direct effects of perceived sustainability value on purchase intention and the moderating role of the regulatory environment.

Table 1. Sample profiling

Variable	Category	Frequency (n)	Percentage (%)
Participants Sex	Male	390	52
	Female	360	48
Age	18–24 years	210	28
	25–34 years	300	40
	35–44 years	150	20
	45 years and above	90	12
Experience in online shopping	Less than 1 year	60	8
	1–3 years	180	24
	4–6 years	240	32
	More than 6 years	270	36
Industry of employment	E-commerce retailer	180	24
	Digital marketing/ advertising	150	20
	Logistics and delivery	120	16
	E-payment/fintech	105	14
	IT and platform development	75	10
	Customer service and support	120	16

Notes: Fintech, financial technology.

Table 1 presents the demographic profiling of the 750 respondents who participated in the study. The sample comprised 52% male and 48% female respondents, indicating a nearly balanced sex representation. The majority of respondents were aged 25–34 years (40%), followed by 18–24 years (28%), 35–44 years (20%), and 45 years and above (12%), reflecting a predominantly young and digitally active population. In terms of experience with online shopping, a significant portion had more than 6 years of experience (36%), while 32% had 4–6 years, 24% had 1–3 years, and 8% had less than 1 year, illustrating a well-experienced online consumer base. The industry distribution shows that respondents were engaged in various e-commerce-related sectors, with 24% working in e-commerce retail, 20% in digital marketing/advertising, 16% in logistics and delivery, 14% in e-payment/financial technology (fintech), 10% in IT and platform development, and 16% in customer service and support. These figures highlight the relevance and diversity of the sample in capturing insights from individuals actively involved in different dimensions of the e-commerce ecosystem.

4. Findings

Table 2. Principal component matrix

	Factor loadings
CTR1	0.834
CTR2	0.840
CTR3	0.833
CTR4	0.819
CTR5	0.883
SC1	**0.484**
SC2	0.764
SC3	0.814
SC4	0.779
SC5	0.673
TA1	0.793
TA2	0.726
TA3	0.700
TA4	0.709
TA5	**0.325**
PV1	0.763
PV2	0.740
PV3	0.750
PV4	0.831
PV5	0.709
RE1	0.799
RE2	0.766
RE3	0.776
RE4	0.880
RE5	0.790
PI1	**0.375**
PI2	0.702
PI3	0.796
PI4	0.827
PI5	0.816

Notes: CTR, customer trust; PI, purchase intention; PV, perceived value; RE, regulatory environment; SC, sustainability communication; TA, technology adoption. Factor loadings < 0.5 had been excluded from analysis.

The principal component matrix, as shown in Table 2, presents the factor loadings for various constructs, including customer trust (CTR), sustainability communication (SC), technology adoption (TA), perceived value (PV), regulatory environment (RE), and purchase intention (PI). Factor loadings represent the correlation between each item and its underlying construct, with higher values indicating a stronger relationship. In this analysis, any factor loadings below 0.5 were considered weak and were excluded from further analysis. Specifically, the items SC1 (0.484), TA5 (0.325), and PI1 (0.375) fell below this threshold, indicating that they do not contribute meaningfully to their respective constructs. Consequently, they have been removed from further examination to improve the overall reliability and validity of the measurement model. By focusing on items with loadings above 0.5, the study ensures a more robust and reliable set of measures, as these items exhibit stronger relationships with their respective factors. All other items demonstrate strong loadings, ranging from 0.673 to 0.883, indicating they are suitable for further analysis in this research. This selective approach strengthens the factor structure and ensures that the retained items contribute meaningfully to the study's objectives.

Table 3. Robustness tests

Variable	CR	AVE	SQRTAVE	CA	KMO
CTR	0.924	0.709	0.842	0.839	0.793
SC	0.833	0.508	0.712	0.736	
TA	0.822	0.780	0.883	0.836	
PV	0.871	0.577	0.759	0.719	
RE	0.9	0.645	0.803	0.837	
PI	0.838	0.523	0.723	0.718	

Notes: AVE, average variance extracted; CA, Cronbach's alpha; CR, composite reliability; KMO, Kaiser–Meyer–Olkin; SQRTAVE, square root of AVE.

Table 3 presents the robust tests for each variable, including composite reliability (CR), average variance extracted (AVE), square root of AVE (SQRTAVE), Cronbach's alpha (CA), and Kaiser–Meyer–Olkin (KMO) values. These tests are essential for assessing the reliability and validity of the measurement model. For composite reliability (CR), all variables exhibit values above 0.7, indicating that the constructions have good internal consistency. The average variance extracted (AVE) values for all constructs except SC exceed 0.5, meaning that the latent constructs explain significant variance in the indicators. SQRTAVE values are all higher than the inter-construct correlations, which confirms the discriminant validity of the model. Cronbach's alpha (CA) values are above the commonly accepted threshold of 0.7 for all variables, showing strong reliability, with CTR, TA, and RE exceeding 0.8, indicating excellent internal consistency. The KMO measure of sampling adequacy for most variables is close to or above 0.7, suggesting that the data are suitable for factor analysis.

Table 4. Discriminant validity

	CTR	SC	TA	PV	RE	PI
CTR	1					
SC	0.779*	1				
TA	0.716*	0.704*	1			
PV	0.760*	0.701*	0.851*	1		
RE	0.761*	0.709*	0.779*	0.737*	1	
PI	0.656*	0.708*	0.711*	0.725*	0.799*	1
*Correlation is significant at the 0.01 level (two-tailed)						

Table 4 illustrates the discriminant validity between the variables customer trust (CTR), sustainability communication (SC), technology adoption (TA), perceived value (PV), regulatory environment (RE), and purchase intention (PI). Discriminant validity is established when the square root of the average variance extracted (SQRTAVE) for each construct is higher than the correlations between that construct and others. The table shows that all correlation values between constructs range from 0.656 to 0.851, which is significant at the 0.01 level. Importantly, these correlations are lower than the SQRTAVE values provided in Table 3 for each respective construct. This indicates that each construct is more closely related to its indicators than others, confirming discriminant validity. The results confirm that the model adequately distinguishes between the latent constructs, ensuring that each variable is unique and captures distinct aspects of the phenomenon under study.

Table 5. Model fit indices

Fit indices	CFI	GFI	RMSEA	AGFI	TLI	NFI	χ^2/df	SRMR	IFI
Model values	0.94	0.91	0.06	0.9	0.93	0.92	2.1	0.05	0.93

Notes: AGFI, adjusted goodness of fit index; χ^2/df, chi-squared/degrees of freedom ratio; CFI, comparative fit index; GFI, goodness of fit index; IFI, incremental fit index; NFI, normed fit index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual; TLI, Tucker–Lewis index

Table 5 presents the model fit indices for the structural equation model used in this study, assessing how well the proposed model fits the data. The comparative fit index (CFI) value of 0.94 suggests a perfect fit, as values above 0.90 are considered acceptable, with 0.95 being ideal. The goodness of fit index (GFI) is also satisfactory at 0.91, indicating an excellent fit to the data. The root mean square error of approximation (RMSEA) is 0.06, within the acceptable range (below 0.08), demonstrating that the model does not deviate significantly from a perfect fit.

The adjusted goodness of fit index (AGFI) of 0.90 is at the threshold for acceptable fit, while the Tucker–Lewis index (TLI) and normed fit index (NFI) values of 0.93 and 0.92, respectively, confirm the model's robustness, as both are above the commonly accepted threshold of 0.90. The chi-squared/degrees of freedom ratio (χ^2/df) is 2.1, below 3, indicating an acceptable fit. The standardized root mean square residual (SRMR) is also 0.05, well within the recommended range of $\leq$ 0.08, reinforcing the model's strong fit. Finally, the incremental fit index (IFI) being at 0.93 confirms that the model captures the relationships between variables well. Together, these indices indicate that the model is well-specified and fits the data well, supporting the validity of the research findings.

Figure 2 shows the relationships between several independent variables, a mediator, a moderator, and a dependent variable, all playing pivotal roles in determining consumer purchase intention in digital engagement and sustainability initiatives. Below is an in-depth examination of these relationships and their broader implications.

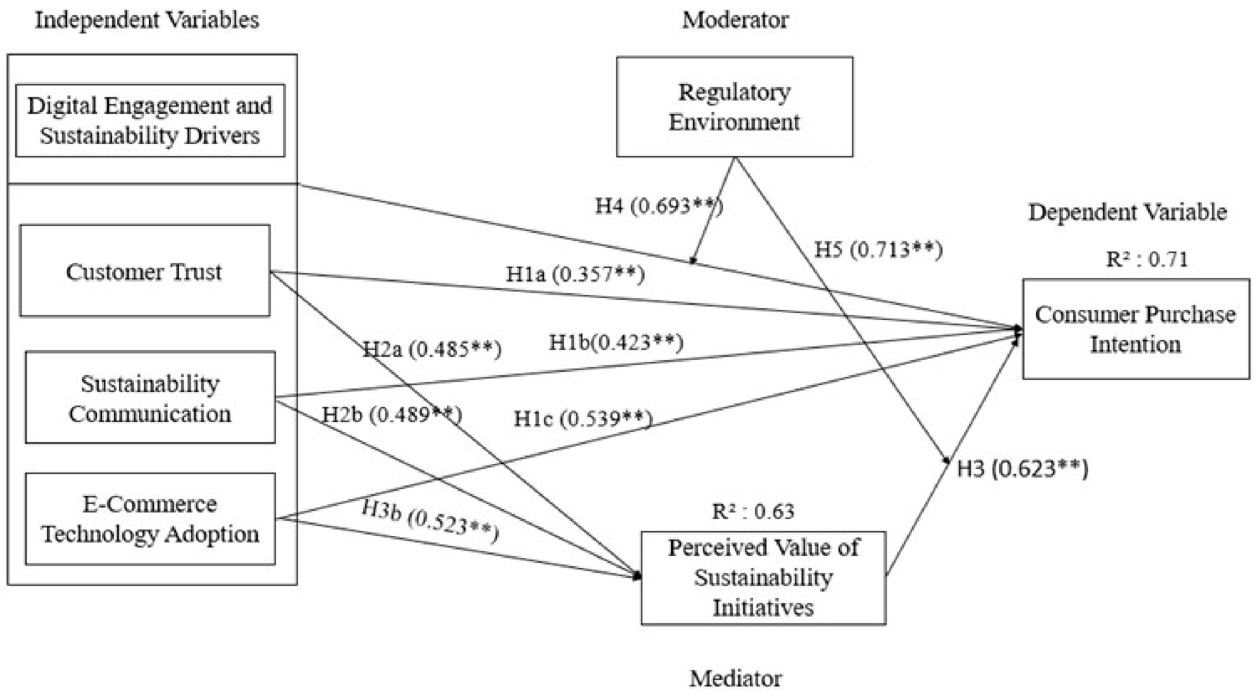

Fig. 2. Mediation–moderation analysis

First, the model highlights the direct relationship between customer trust and consumer purchase intention, with a path coefficient of 0.357. This suggests that customer trust significantly impacts a consumer's decision to purchase from a company. Trust in digital platforms fosters a sense of security, reducing perceived risks associated with online transactions and directly encouraging consumers to buy. Although this relationship is moderate, it is critical in e-commerce, where trust in a platform's credibility and security measures is essential for consumer confidence. Higher levels of trust typically equate to an increased likelihood of purchasing, reinforcing that trust is foundational to consumer behavior in online environments.

Similarly, sustainability communication positively influences consumer purchase intention, with a path coefficient 0.423. This implies that, when companies effectively communicate their sustainability initiatives, such as eco-friendly practices or ethical sourcing, consumers are more inclined to purchase from them. Effective sustainability communication strengthens a company's image as socially responsible, appealing to the growing consumer demographic that values ethical consumption. By aligning their sustainability messaging with consumer values, companies can enhance brand loyalty and encourage purchase behaviors.

The relationship between e-commerce technology adoption and consumer purchase intention is solid, with a coefficient of 0.539, indicating that technological advancements significantly boost consumer buying behavior. This strong relationship can be attributed to consumers relying on seamless, user-friendly technology to navigate e-commerce platforms. Technologies such as personalized recommendations, virtual try-ons, and frictionless payment options make the online shopping experience more convenient and enhance the likelihood of purchase. Consumers who find the technology accessible to adopt and helpful in terms of simplifying their shopping experience are more likely to follow through with their purchases.

Moving to the indirect effects, customer trust significantly impacts the perceived value of sustainability initiatives, as evidenced by a path coefficient of 0.485. This indicates that, when consumers trust a company, they are more likely to attribute greater value to its sustainability efforts. Trust enhances the perception that the company's sustainability initiatives are genuine and impactful rather than merely marketing tactics. As a result, consumers tend to assign more value to sustainability initiatives when they have confidence in the company's integrity and ethical behavior, showing that trust extends beyond transactional interactions to encompass broader corporate practices, including sustainability.

Similarly, sustainability communication strongly impacts the perceived value of sustainability initiatives, with a path coefficient 0.489. This means that clear and consistent communication about sustainability significantly boosts how consumers perceive the value of these initiatives. Effective sustainability communication helps consumers understand tangible and intangible benefits, such as reducing carbon footprints or supporting social causes. When companies communicate their sustainability practices transparently and engagingly, they elevate the perceived value of these initiatives in the minds of consumers. This enhances the company's reputation and strengthens the consumer's belief that purchasing from it aligns with their ethical or environmental values.

E-commerce technology adoption also positively impacts the perceived value of sustainability initiatives, with a path coefficient of 0.523, making this one of the stronger relationships in the model. When companies use advanced technologies to communicate or support their sustainability efforts, for example, through sustainability dashboards or eco-friendly product recommendations, consumers tend to perceive greater value in these initiatives. Technology can serve as a facilitator that enhances how consumers understand and engage with a company's sustainability efforts, thereby making these initiatives more relevant and accessible.

The perceived value of sustainability initiatives has a solid and positive relationship with consumer purchase intention, as reflected by the path coefficient of 0.623. This suggests that the more consumers perceive sustainability initiatives to be valuable, the more likely they are to purchase. This highlights the importance of perceived value as a crucial determinant of consumer behavior. When consumers believe that a company's sustainability efforts are authentic and impactful—whether through environmental benefits or social responsibility—they are more inclined to support that company through their purchases.

The model demonstrates partial mediation by the perceived value of sustainability initiatives of the relationship between the independent variables (customer trust, sustainability communication, and e-commerce technology adoption) and consumer purchase intention. This is evident because the direct paths from these independent variables to consumer purchase intention remain significant, even when the mediator (perceived value of sustainability initiatives) is introduced. For example, while sustainability communication directly influences consumer purchase intention (0.423), it also has an indirect effect through the perceived value of sustainability initiatives. The fact that both the direct and indirect paths are significant suggests that the perceived value of sustainability initiatives partially mediates the relationship, meaning that it explains part, but not all, of the independent variables' effect on purchase intention. This partial mediation underscores the complexity of the relationship, indicating that, while sustainability perceptions are important, other factors (such as trust and technology adoption) also directly drive purchase behavior.

The regulatory environment plays a crucial moderating role in this model, particularly in enhancing the relationship between the perceived value of sustainability initiatives and consumer purchase intention, with a path coefficient of 0.713. This suggests that, in regions or contexts where the regulatory environment is stricter and emphasizes sustainability, the perceived value of these initiatives becomes even more influential in driving consumer behavior. Regulatory frameworks that mandate sustainability reporting or penalize noncompliance can raise consumer expectations, making them more likely to respond positively to companies that meet and exceed regulatory standards. Consumers focus on sustainability initiatives in such environments more, which is integral to corporate responsibility.

Furthermore, the regulatory environment moderates the direct relationship between digital engagement and sustainability drivers and consumer purchase intention, with a path coefficient of 0.693. This means that, in more regulated environments, the effectiveness of digital engagement and sustainability communication is heightened. Consumers in these regions are likely more attuned to sustainability issues owing to regulatory pressures, making them more receptive to digital sustainability messaging. In contrast, in less regulated environments, the impact of sustainability communication may not be as pronounced, as consumers may not hold companies to the same environmental and social responsibility standards.

The ***R***-squared (R^2) values reflect the proportion of variance explained in each endogenous variable by its respective predictors. Specifically, the model explains 63% of the variance in the perceived value of sustainability initiatives (R^2 = 0.63), indicating that customer trust, sustainability communication, and e-commerce technology adoption collectively have a substantial explanatory influence on how consumers perceive sustainability initiatives. Furthermore, the model accounts for 71% of the variance in consumer purchase intention (R^2 = 0.71), demonstrating strong predictive power and confirming that both the direct predictors and the mediating role of perceived sustainability value significantly shape consumer behavior. These high R^2 values indicate a well-specified model with strong explanatory power, which is consistent with best practices in SEM and reinforces the robustness of the underlying theoretical framework.

5. Discussions and Conclusions

The research validates the first hypothesis (H1), which states that there is a positive relationship between (a) customer trust in digital platforms, (b) corporate sustainability communication, and (c) technology adoption in e-commerce and consumer purchase intention. The results show that customer trust notably decreases the perceived risks in online transactions, increasing consumer purchase intention. Considering the context of the Middle East, where regulatory movements, such as Saudi Vision 2030 and the Green Economy initiative of the United Arab Emirates (UAE), stress the themes of transparency and security, developing trust in digital platforms is vital. Moreover, trust can be built by aligning entities' corporate sustainability communication with local regulations and in areas where the countries focus their efforts, such as environmental conservation and social welfare. Technology adoption influences consumer purchase intention since the region has high internet connectivity and a young, tech-savvy population. Regular functions and perceived benefits that customers receive from advanced technology, such as personalized reorganization of content and one-click payment options, significantly steer actions taken in purchasing. This agrees with the findings of Jalil et al. (2024), Hewei and Youngsook (2022), and Esfahbodi et al. (2022).

The second hypothesis (H2) asserts that there is a positive relationship between (a) customer trust, (b) corporate sustainability communication, and (c) technology adoption and the perceived value of sustainability initiatives. The data revealed that the hypothesis was correct: Trust in a company has a substantial positive impact on the perceived value of its sustainability initiatives to an extent. In the Middle Eastern context, trust is primarily cultivated through alignment with Islamic principles that emphasize ethical business conduct and environmental stewardship. Therefore, it is essential that sustainability initiatives resonate with these cultural and religious values. The effectiveness of communicating such efforts is significantly enhanced when supported by governmental frameworks, such as the Dubai Clean Energy Strategy, which lend credibility and ensure alignment with national sustainability goals. Additionally, the use of accessible technologies that help consumers understand corporate sustainability efforts, such as personalized carbon footprint calculators or recommendations for commonly used green products, can further enhance perceived value, especially when these tools are culturally tailored.

The third hypothesis (H3) posits that the perceived value of sustainability initiatives positively influences consumer purchase intention. The study also validated this interaction, indicating that individuals are more prone to uphold companies whose sustainability initiatives are perceived as accurate. Consequently, a wave of sustainability is overtaking the Middle Eastern market owing to state directives and a proactive community. Therefore, the public perception of the significance of these initiatives may sway a customer's decision-making in favor of a retailer. To most efficiently disseminate this communication, a business must tie its sustainability issues to matters relating to the region, such as water preservation or green energy. Furthermore, a corporation must match the social issues it focuses on to the cultural conventions of society so that the bond between the company and the client can be more profound, thereby raising customer satisfaction and customer purchase intention. This agrees with the findings of Jalil et al. (2024), Chen et al. (2021), and Attar et al. (2021).

The fourth hypothesis (H4) explores the moderating role that the regulatory environment plays in the relationship between digital engagement and sustainability drivers and the perceived value of sustainability initiatives. The findings illustrate that having a stringent regulatory framework may help the average consumer appreciate the value of sustainability campaigns. Countries in the Middle East provide a very regulatory-friendly environment in terms of sustainability. Governments in this region are very active in promoting sustainability through initiatives such as the UAE's Green Economy initiative and Saudi Arabia's focus on developing Vision 2030. The environment compels entities to practice sustainability and communicate the same to consumers. By capitalizing on the backing of certifications and ensuring that the national strategy and goals of the countries in which they operate align with their financial records, business entities in the Middle East can further establish the credibility of their sustainability campaigns, and thereby entrench this credibility in the mind of the consumer. This agrees with the findings of Jalil et al. (2024), Chen et al. (2021), and Attar et al. (2021).

The fifth hypothesis (H5) suggests that the regulatory environment moderates the relationship between the perceived value of sustainability initiatives and consumer purchase intention. This hypothesis was again supported: With a strong regulatory environment, consumers are more likely to act on the basis of the perceived sustainability value when making purchase decisions. It is argued that, in the Middle Eastern context, where sustainability is mainly the government's task, consumers are more likely to consider sustainability initiatives credible when they involve regulatory bodies. Such regulatory influence reduces skepticism, ensuring sustainability claims are considered sincere rather than greenwashing. This agrees with the findings of Jalil et al., (2024), Hewei & Youngsook (2022) and Esfahbodi et al. (2022). Therefore, companies aligning their sustainability initiatives with stringent regulatory standards are more likely to positively impact consumer purchase intention, as these initiatives are part of a more significant, government-endorsed movement toward sustainable economic growth.

5.1. Limitations

The focus on the Middle Eastern context, as previously discussed, might imply certain limitations in terms of the generalizability of this study's implications to other regions. The countries where sustainability initiatives have become increasingly embedded in the government agenda, for example, through Saudi Vision 2030 and the UAE's Green Economy initiative, have specific regulatory frameworks, cultural peculiarities, and the unique economic landscapes; therefore, the results found in this study might not apply to regions with a different regulatory and consumer understanding of sustainability. For instance, in areas where sustainability is less government-driven or where technological understanding is more fragmented, the relationships might not be as pronounced as within the context of the current paper.

The study also heavily relies on defined cultural values as the primary driver of consumer perceptions of sustainability initiatives. While such values are critically important to understanding consumers in the Middle East, they might be less impactful in contexts with alternative cultural perspectives. Moreover, owing to different interpretations of these values across countries in this region, the consumer might react differently to sustainability initiatives. The research does not capture how changes in regulation over time could influence consumer perceptions, even though it examines the moderating role of regulatory environments. In places where the regulatory framework is still in development, such as the Middle East, future policy developments, changes in how policies are implemented, or international trade actions could strengthen or weaken the relationships identified in this research. Developing technology and sustainability standards might eliminate the current regulatory framework, leading to difficulties in understanding consumers' behavior in the long run.

5.2. Contributions

The research findings significantly contribute to the understanding of the relationship between consumers' behavior, e-commerce, and sustainability within the Middle Eastern context. Most importantly, the study synthesizes customer trust, corporate sustainability communication, and technology adoption into a comprehensive context of purchase intention. Scholars have not previously examined these elements in e-commerce settings simultaneously but rather have focused on studying only one of these components. The research findings show that trust in digital platforms and efficient corporate sustainability communication improve purchase intention and have significant implications for businesses that seek to enhance their e-commerce performance. The existing literature on consumers' attitude toward sustainability and reactions to the policies developed to preserve the environment mainly reflects the Western perspective; thus, the current study fills this critical gap and provides insights into how Middle Eastern consumers perceive efforts to introduce sustainability to e-commerce. By considering the regional peculiarities, such as the priorities of Saudi Vision 2030 or the UAE's Green Economy initiative, this research is valuable for the businesses and policymakers operating in these countries.

This research uniquely explores Middle Eastern values and their compatibility with Sustainable Development Goals and thus contributes to the debates surrounding ethical consumerism. In the Middle East, the topic is especially critical for policymakers and companies since our findings stress the significance of regulatory actors in increasing consumer confidence and reducing skepticism about corporate sustainability. The study also helps businesses understand how to enhance purchase intention by employing technology. Since technology is becoming an inseparable part of consumers' everyday lives, companies that develop user-friendly, innovative solutions should gain a competitive edge over others while shaping online consumer behavior. From an academic point of view, this study offers insight into how sustainability can affect consumer behavior through the lenses of trust and regulation. The results of this study provide valuable information for extant studies on environmental sustainability in terms of multidimensionality that integrates the psychological dimension (trust), the technological dimension (technology adoption), and the institutional dimension (regulatory compliance).

This research presents several critical practical contributions that are directly relevant to practitioners, policymakers, and platform developers operating in the Middle Eastern e-commerce ecosystem. By integrating customer trust, corporate sustainability communication, and technology adoption within the broader context of a digitally engaged and regulatory-sensitive environment, the study offers actionable insights for firms aiming to enhance consumer purchase intention while aligning with regional sustainability goals. The findings offer clear strategic guidance for e-commerce managers and marketers seeking to boost purchase intention among environmentally and socially aware consumers. The study demonstrates that customer trust, when cultivated through transparent communication and user-centric technological platforms, can significantly enhance the perceived value of sustainability initiatives. E-commerce platforms should therefore invest in building digital trust by ensuring website security, offering transparent return policies, and protecting customer data. These trust-building mechanisms not only reduce consumers' perceived risks but also encourage ethical consumption behavior, which is increasingly relevant in sustainability-driven marketplaces.

In addition, the study's emphasis on corporate sustainability communication has direct implications for communication strategy development. The results suggest that clear, credible, and consistent communication of environmental and social initiatives is vital in shaping consumer perceptions. This includes disclosing efforts such as reducing carbon emissions, sustainable packaging, and fair-trade sourcing. E-commerce companies should adopt digital storytelling and certification labels, using websites and apps to share sustainability narratives that align with the values of the region, especially in countries such as Saudi Arabia and the UAE, where national vision and green economic strategies shape consumer expectations. Sustainability information should be prominently featured at key decision-making points—such as product pages and checkout interfaces—to reinforce environmentally conscious behavior at the point of purchase. The research underscores the role of technology adoption as an enabler of sustainability communication and behavioral change. Features such as personalized eco-friendly product recommendations, carbon footprint calculators, and green badges for sustainable vendors not only elevate the shopping experience but also signal a firm's commitment to ethical practices. As the study shows, user-friendly, intuitive technology increases both the perceived usefulness of digital platforms and the perceived value of corporate sustainability efforts. Practitioners are advised to adopt a user experience (UX)-oriented design philosophy, ensuring that digital sustainability tools are easy to navigate and meaningful for end users. Moreover, one of the most significant contributions of this study lies in its attention to the regulatory environment as a moderating factor. Policymakers in the Middle East, particularly those involved in sustainability, commerce, and digital transformation, can benefit from these insights. The research shows that a robust and transparent regulatory environment enhances consumer trust and amplifies the impact of sustainability initiatives on purchase intention. This finding supports further development of national sustainability certifications, consumer education initiatives, and digital compliance standards. By fostering a regulatory ecosystem that promotes business transparency, governments can actively shape consumer behavior toward more responsible consumption while also incentivizing companies to align with sustainability goals. Finally, this research provides a template for cross-sector collaboration between governments, industry, and civil society. For instance, sustainability benchmarks integrated into e-commerce platforms could be co-developed with regulators and civil organizations, ensuring both credibility and impact. In addition, public–private partnerships could be established to promote digital sustainability literacy, especially among small and medium-sized enterprises (SMEs) seeking to transition into e-commerce while aligning with national sustainability mandates.

5.3. Further Research

Given the commonality in dynamics, the underlying model can also be helpful for future research in the region and beyond. First, the model can be replicated and tested in a different context to assess the consistency of the relationship between trust, sustainability communication, technology, and purchasing intention. Researchers can compare Western and Middle Eastern results and see how similar underlying values and regulations may affect consumer perceptions and preferences. Moreover, since the model was tested cross-sectionally, following the trend of environmental practices, other constraints can also be expected to change. A longitudinal research design would be the best fit for tracking the change in trust, perception of the sustainability issue, regulation, and consumption over time. Using technology to promote sustainability and the development of sustainable behavior will significantly impact this change. Moreover, a longitudinal research design would allow for an understanding of how long it takes for consumers to adapt to new ideas. Since the research was limited to the larger general audience of the Middle East, future research can also further segment the audience into more specific groups.

More targeted research would allow businesses to tailor their communication strategies to different groups. More related research could be done on e-commerce trust-building as the industry gets more advanced. New technologies, such as augmented reality, or new payment options, such as cryptocurrencies or digital-only banks, will become more personalized; the relationship between trust and behavior will only get more complicated. Future transactions will rely on more personal trust cues than in the past. To a lesser degree, it could be interesting to see the impact of corporate governance on promoting sustainability and how individuals perceive brands that disclose and are transparent about their sustainability.

Conflict of Interest: The researchers declare that there is no conflict of interest with any party and that the manuscript is original and has not been submitted to any journal.

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