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ARTIFICIAL INTELLIGENCE -DRIVEN COMPUTATIONAL SOCIAL NETWORKS IN DRIVING SUSTAINABLE E-COMMERCE IN THE ERA OF INFORMATION TECHNOLOGY

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ABSTRACT

The objective of this study is to examine the mediating role of environmental consciousness in the relationship between AI-driven computational social networks, information technology infrastructure, and sustainable e-commerce performance. To achieve this, an online survey was administered to 250 participants, and the collected data underwent structural equation modeling analysis. It is suggested that a good model should have an SRMR value below 0.08, and in this study, the SRMR value was 0.05, indicating an acceptable level of structural model fitness. The results demonstrate the significant influence of both AI-driven computational social networks and information technology infrastructure on sustainable e-commerce performance. Furthermore, the findings indicate that environmental consciousness partially mediates the connection between AI-driven computational social networks, information technology infrastructure, and sustainable e-commerce performance. By considering the partial moderating effect of environmental consciousness, it will shed light on the complex dynamics at play. The findings will offer valuable insights for businesses aiming to leverage AI-driven computational social networks and information technology infrastructure to enhance their sustainable e-commerce practices and performance.

KEYWORDS: Environmental Consciousness, AI-Driven Computational Social Network, Information Technology Infrastructure, Sustainable E-Commerce Performance

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1. INTRODUCTION

In today's digital era, AI-driven computational social network platforms and information technology infrastructure have revolutionized the way businesses operate, particularly in the realm of e-commerce. With the growing concern for environmental sustainability, businesses are increasingly focusing on integrating sustainable practices into their operations, including the realm of e-commerce. Sustainable e-commerce refers to the incorporation of environmentally conscious practices throughout the entire online shopping experience, from product sourcing to delivery. As businesses seek to capitalize on the benefits of sustainable e-commerce, understanding the role of AI-driven computational social networks and information technology infrastructure in driving sustainable e-commerce performance becomes crucial. Moreover, the moderating effect of environmental consciousness adds another layer of complexity to this relationship.

In the rapidly evolving landscape of e-commerce, the fusion of AI-driven computational social networks has emerged as a transformative force, revolutionizing the concept of sustainable business performance. These networks, powered by advanced artificial intelligence algorithms, are reshaping traditional paradigms by leveraging the immense potential of user-generated data for enhanced decision-making and strategic planning [1,2]. As consumer interactions and behaviors become intricately interwoven with online platforms, these networks harness the expansive data reservoirs to tailor product offerings, optimize supply chains, and cultivate eco-friendly practices [3,4].

[1] delve into the potential of AI-driven customer relationship management in fostering sustainable enterprise performance. By elucidating the role of AI in enhancing personalized interactions and product offerings, the study underscores its capacity to drive not only economic growth but also environmentally responsible practices. Similarly, [2] shed light on the fusion of AI and social networks, emphasizing its significance in shaping consumer engagement and sustainable e-commerce practices. The research by [3] expands the discourse by investigating AI-driven recommendation systems in the context of e-commerce sustainability, revealing their influence on both consumer satisfaction and ecological well-being. Furthermore, [4] contributes to the conversation by examining how AI-driven supply chain optimization contributes to sustainable e-commerce operations, thereby reducing waste and environmental impact.

In addition to AI-driven computational social

networks, the role of information technology infrastructure cannot be overlooked in shaping sustainable e-commerce performance. Information technology infrastructure encompasses the technological capabilities and systems that support e-commerce operations, including user interfaces, website design, mobile applications, and integrated features for sustainability [5]. A well-designed and user-friendly e-commerce platform with sustainability-related functionalities can enhance consumers' shopping experience and positively influence their perceptions and behaviors toward sustainable e-commerce [6,7]. Effective information technology infrastructure can facilitate seamless navigation, personalized recommendations, and transparent information about sustainable attributes, ultimately driving sustainable e-commerce performance.

However, the relationship between AI-driven computational social networks, information technology infrastructure, and sustainable e-commerce performance is not unidimensional. Individual characteristics and values, such as environmental consciousness, can moderate this relationship. Environmental consciousness refers to an individual's level of awareness, concern, and commitment to environmental sustainability [8]. Consumers with higher levels of environmental consciousness may be more receptive to sustainable e-commerce initiatives promoted through AI-driven computational social networks and information technology infrastructure, leading to stronger effects on their purchasing decisions and e-commerce performance [9]. Conversely, individuals with lower levels of environmental consciousness may exhibit weaker responsiveness to sustainability messages conveyed through AI-driven computational social networks and information technology infrastructure.

The objective of this study is to examine how AI-driven computational social networks and information technology infrastructure contribute to the success of sustainable e-commerce. It will investigate the impact of various AI-driven computational social network platforms like Facebook, Instagram, Twitter, and YouTube on consumer engagement and purchasing behavior within the context of sustainable e-commerce. Additionally, the research will explore how elements of information technology infrastructure, such as user interfaces, website design, and sustainability features, influence the performance of sustainable e-commerce.

Moreover, the study aims to assess the potential mediating effect of environmental consciousness on the relationship between AI-driven computational social networks, information technology infrastructure, and sustainable e-commerce performance. By investigating these factors, the research seeks to gain insights into the crucial role that AI-driven computational social networks and information technology play in driving sustainable practices within the e-commerce industry.

2. LITERATURE REVIEW

In recent years, the emergence of AI-driven computational social network platforms and the advancement of information technology infrastructure have significantly influenced the landscape of e-commerce. As businesses increasingly focus on incorporating sustainable practices, understanding the role of AI-driven computational social networks and information technology infrastructure in driving sustainable e-commerce performance becomes crucial. Additionally, the moderating effect of environmental consciousness adds complexity to this relationship. This literature review aims to explore existing research on the role of AI-driven computational social networks, information technology infrastructure, and the partial moderating effect of environmental consciousness in sustainable e-commerce performance.

Role of AI-driven Computational Social Network in Sustainable E-commerce Performance:

[10] delves into the Saudi Arabian context to explore the effects of AI-assisted social media marketing on the performance of small and medium enterprises (SMEs). Focusing on effective business management, the study assesses how AI integration in social media strategies impacts SME performance. This research contributes valuable insights into the evolving landscape of AI-driven marketing strategies and their implications for SMEs in a specific cultural and economic setting. In the context of sustainable e-commerce, AI-driven computational social network plays a crucial role in promoting sustainability initiatives, raising awareness about sustainable products, and influencing consumer purchasing decisions. AI's prowess in deciphering intricate customer behaviors, fostering tailored engagement, and facilitating sustainable product development. The integration of AI holds the promise of optimizing energy consumption and curbing wastage, aligning with sustainability imperatives [11]. AI's potential to revolutionize customer interactions aligns with the broader literature highlighting AI's significance in personalized engagement [12]. The interactive nature of AI-driven computational social network platforms facilitates dialogues and encourages consumers to participate in discussions surrounding sustainability, leading to increased sustainable e-commerce performance.

Information Technology Infrastructure and Sustainable E-commerce Performance:

Information technology infrastructure plays a vital role in enhancing sustainable e-commerce performance. Well-designed user interfaces, intuitive website navigation, and integrated sustainability features can positively influence consumer perceptions and behaviors toward sustainable e-commerce [13]. Effective information technology infrastructure provides consumers with seamless shopping experiences, personalized product recommendations, and transparent information about sustainable attributes [6]. Research suggests that the integration of sustainable features into e-commerce platforms can enhance consumer trust, satisfaction, and loyalty towards sustainable brands, consequently driving sustainable e-commerce performance [14].

The Moderating Effect of Environmental Consciousness:

Environmental consciousness, which pertains to an individual's understanding and dedication to environmental sustainability, has the potential to influence the connection between AI-driven computational social networks, information technology infrastructure, and the performance of sustainable e-commerce

[8,15]. Consumers who possess higher levels of environmental consciousness are inclined to interact more with sustainable e-commerce content on AI-driven computational social network platforms, respond positively to sustainability features embedded in information technology infrastructure, and demonstrate increased purchasing behavior when it comes to sustainable products [9,16]. On the other hand, individuals with lower levels of environmental consciousness may exhibit weaker responsiveness to sustainability messages conveyed through AI-driven computational social networks and information technology infrastructure.

This literature review highlights the significant role of AI-driven computational social networks and information technology infrastructure in driving sustainable e-commerce performance. AI-driven computational social network platforms provide a platform for businesses to raise awareness, engage consumers, and shape sustainable e-commerce behavior. Similarly, effective information technology infrastructure enhances user experiences, transparency, and personalized recommendations, contributing to sustainable e-commerce performance. However, environmental consciousness moderates the relationship, with individuals exhibiting varying degrees of responsiveness to sustainability initiatives. Understanding these dynamics is crucial for businesses seeking to leverage AI-driven computational social networks and information technology infrastructure to enhance their sustainable e-commerce practices and performance.

3. RESEARCH METHODOLOGY

This section describes the methodology adopted in this paper. The data was collected through the online survey and underwent structural equation modeling analysis.

3.1. Purpose

The primary aim of this study is to explore the mediating role of environmental consciousness in the relationship between AI-driven computational social networks, information technology infrastructure, and the performance of sustainable e-commerce.

3.2. Materials and Procedure

The study included a sample size of 250 respondents and the survey, 350 questionnaire was distributed through simple random sampling online mode to consumers, and 250 (as shown in Table I) were completed and returned, resulting in a response rate of 71%. In this study, the affect component was utilized to evaluate performance due to its appropriateness for research purposes. The measurement instrument for this component comprised 27 items. The AI-driven social network Questionnaire (SM) consisted of 7 items and had a Cronbach alpha value of .877 and was employed to evaluate founders' perceptions on the impact of the use of AI-driven social networks on the performance of e-commerce. There were 06 items for testing the Information technology (IT), which had a Cronbach alpha value of .896 was utilized to assess the use of information technology in e-commerce performance. Environmental Consciousness was measured using 05 items of the environmental consciousness Questionnaire (EC), which had a Cronbach alpha value of .944. The measurement instrument used a five-point Likert scale (ranging from "strongly disagree" to "strongly agree").

Demographics	Profile	N	%
Gender	Male	79	31.6
	Female	171	68.4
Age	Below 25	56	23
	25-35	94	38
	36-45	45	17
	Above 45	55	22
Educational Qualification	Graduate	140	56
	Post Graduate	64	26
	Other	46	18

Table 1: Demographic Information

3.3. Conceptual Framework

In this study following hypotheses have been framed which is reflected in Fig.1.

Hypothesis 1 (H1): There exists a positive relationship between AI-driven computational social networks and sustainable e-commerce performance.

Hypothesis 2 (H2): There exists a positive relationship between Information Technology Infrastructure and sustainable e-commerce performance.

Hypothesis 3 (H3a): Environmental Consciousness is positively related to sustainable e-commerce performance.

Hypothesis 3 (H3b): Environmental Consciousness mediates the relationship between AI-driven computational social networks and sustainable e-commerce performance.

Hypothesis 3 (H3c): Environmental Consciousness mediates the relationship between Information Technology Infrastructure and sustainable e-commerce performance.

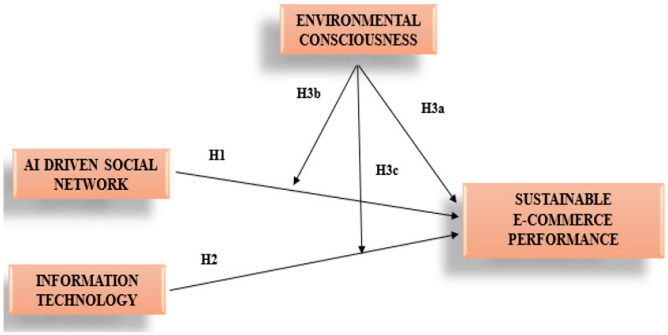

Figure 1: Conceptual Framework

4. DATA ANALYSIS

4.1. Measurement Model

The outcomes of factor loading, Cronbach's alpha, and composite reliability measures, along with the average variance extracted, are presented in Table II.

Constructs	Factor loading	Cronbach's α	rho_A	CR	AVE	VIF
AI Driven Social Network		**0.877**	**0.891**	**0.898**	**0.756**	**1.534**
SM1	0.911					
SM2	0.932					
SM3	0.861					
SM4	0.647					
SM5	0.879					
SM6	0.843					
SM7	0.854					
Information Technology		**0.896**	**0.902**	**0.913**	**0.782**	**1.673**
IT1	0.881					
IT2	0.865					
IT3	0.892					
IT4	0.834					
IT5	0.902					
IT6	0.924					
Environmental consciousness		**0.944**	**0.949**	**0.953**	**0.876**	**1.584**
EC1	0.846					
EC2	0.873					
EC3	0.889					
EC4	0.789					
EC5	0.898					
Performance		**0.951**	**0.956**	**0.963**	**0.643**	-
SEP1	0.828					
SEP2	0.941					
SEP3	0.906					
SEP4	0.956					
SEP5	0.943					
SEP6	0.856					
SEP7	0.878					
SEP8	0.845					
SEP9	0.903					

Table 2: Measurement Model

Based on previous studies [17,18,19], it is recommended that Cronbach's alpha values should be higher than .70, and composite reliability should exceed .80. In our research, the AI-driven computational social network construct showed a Cronbach's alpha of .877, the information technology construct exhibited a Cronbach's alpha of .896. Additionally, the environmental consciousness construct had a Cronbach's alpha of .944 whereas the performance construct displayed a Cronbach's alpha of .951. The composite reliability of an AI-driven computational social network is .898, while the composite reliability of information technology is .913. and the composite reliability of environmental consciousness is .953, and the composite reliability of performance is .963. As all these values surpassed the recommended standards for evaluating the reliability of the measurement model, we can consider our model to be reliable. Moreover, to assess convergent validity, we utilized the average variance extracted (AVE), where values above 0.50 are considered ideal. As indicated in Table II, all the AVE values exceeded the recommended threshold, confirming the model's acceptable convergent validity.

4.2. Common Method Bias

To test for common method bias variance in the study, Harman's single-factor test was conducted, following the approach suggested by [20]. As per [21], the existence of common method bias occurs when a single factor accounts for more than 50% of the eigenvalue of the variance in factor analysis. In this research, an un-rotated matrix was utilized, leading to the generation of five factors, with the first-factor eigenvalue explaining 40.95% of the variance.

4.3. Structural Equation Model

The Smart-PLS software was employed to evaluate the structural model, employing the bootstrap method and analyzing 5,000 subsamples, as recommended by [22,23]. The model's adequacy was evaluated by analyzing the "standardized root mean square residual" (SRMR) value and the coefficient of determination (R2). As per [24], a properly fitting model should have an SRMR value below 0.08. In this investigation, the SRMR value was 0.050, signifying a satisfactory level of structural model fitness. Additionally, the outcomes of the structural model are displayed in Table III, explaining 26.1% of the variance in environmental consciousness and 42.2% of the variance in sustainable e-commerce performance. [22] suggests that R2 values should be above .1 or 0 for a desirable model. Additionally, to evaluate the model's predictive relevance, the cross-validated redundancy measure Q2 was applied, as suggested by [25]. [26] recommend that Q2 values should be greater than zero. In this study, Table IV reveals that the values of Q2 were greater than 0.1, indicating positive predictive significance.

Constructs	R2	Adjusted R2
EC	0.261	0.258
SEP	0.422	0.362

Table 3: Strength Of Model

Constructs	SSO	SSE	$Q^2 = (1 - [SSE / SSO])$
EC	2563	2095.789	0.182
SEP	5267	4714.532	0.104

Table 4: Cross-Validation Redundancy

4.4. Testing of Hypotheses

Table V and Figure 2 present the findings of the structural model. With respect to H1, which posits a positive relationship between AI-driven computational social networks and performance, the results reveal a statistically significant and positive impact of AI-driven computational social networks on performance (β = .265, t = 4.327, p = .002). Thus, H1 is supported. As for H2, which proposes a positive connection between information technology and performance, the outcomes indicate a significant and positive effect of information technology on performance (β = .186, t = 3.076, p = .000). Therefore, H2 is confirmed. Moreover, the results provide support for H3, which suggests a positive association between environmental consciousness and performance. The outputs indicate that environmental consciousness has a statistically significant and positive effect on performance (β = .195, t = 3.893, p = .001). Thus, H3 is validated.

Hypotheses	Relationships	β	M	SD	T	Þ	Decision
Direct effects							
H1	SM --->SEP	0.265	0.263	0.043	4.327	0.002	Supported
H2	IT ----> SEP	0.186	0.189	0.052	3.076	0.000	Supported
H3	EC ----> SEP	0.195	0.196	0.058	3.893	0.001	Supported
Mediating effects							
H3b	SM--->EC----->SEP	0.064	0.059	0.022	2.576	0.004	Supported
H3c	IT--->EC----->SEPE	0.062	0.052	0.025	2.987	0.003	Supported

Table 5: Path Coefficients And Hypotheses Testing

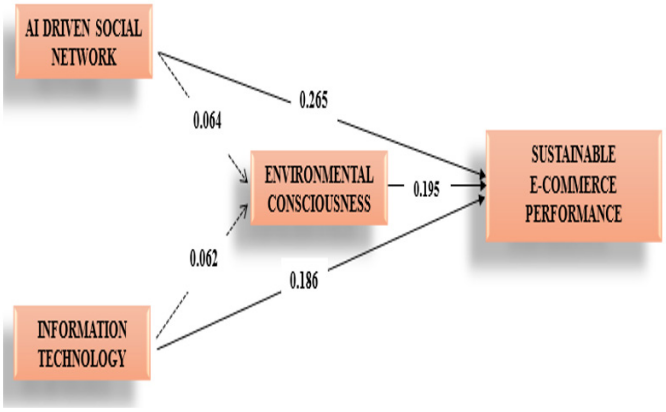

Figure 2: Structural Model

4.5. Mediation Analysis

To investigate hypotheses H3b and H3c, proposing that environmental consciousness serves as a positive mediator between AI-driven computational social networks, information technology, and performance, a mediation analysis was conducted. The results reveal that environmental consciousness has a statistically significant and positive indirect impact on the relationship between AI-driven computational social networks and performance (β = .064, t = 2.576, p = .004), as well as between IT and performance (β = .062, t = 2.987, p = .003). Additionally, the variance accounted for (VAF) was employed to gauge the level of mediation. As per [27], a VAF value below 0.8 indicates partial mediation, whereas a value above 0.8 signifies full mediation. The findings in Table VI show a VAF value below 0.8, indicating that environmental consciousness partially mediates the relationship between AI-driven computational social networks, information technology, and performance. Consequently, hypotheses H3c and H3b are supported.

Exo Variable	Direct Effect	Indirect effect	Total effect	VAF range	Mediation	Endogenous variables	Confidence interval	97.50%
SM	0.265	0.064	0.329	17.56	Partial	PE	0.024	0.087
IT	0.185	0.061	0.256	23.45	Partial	PE	0.022	0.108

Table 6: Mediation Analysis (Environmental Consciousness)

5. CONCLUSION

This study establishes a compelling link between AI-driven computational social networks, information technology infrastructure, and sustainable e-commerce performance, shedding light on their critical roles in shaping the business landscape of the digital era. The findings unequivocally demonstrate that AI-driven computational social network plays a pivotal role in bolstering sustainable e-commerce performance, providing businesses with a powerful platform to engage with environmentally conscious consumers and showcase their commitment to sustainability. Likewise, the study underscores the substantial impact of information technology infrastructure on sustainable e-commerce, emphasizing the importance of investing in advanced technological resources to optimize eco-friendly business practices and drive long-term success.

Moreover, the research reveals the significant mediating role of environmental consciousness in this relationship. As individuals' awareness and concern for environmental sustainability gain prominence, the influence of both AI-driven computational social networks and information technology on sustainable e-commerce performance is partially mediated by this vital factor. This highlights the importance of incorporating environmental considerations into marketing and technological strategies to resonate with conscious consumers and foster a more sustainable business ecosystem.

The implications of this study extend to businesses aiming to thrive in a digitally driven-world while promoting sustainable practices. By recognizing the interconnectedness of AI-driven computational social networks, information technology, and environmental consciousness, companies can craft comprehensive strategies that not only enhance their e-commerce performance but also contribute positively to environmental well-being.

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