sustainability

MDPI

Article

Stakeholder Engagement in Digital Marketing and Environmental Management

Quang Linh Huynh [1] and Van Kha Nguyen [2,*]

[1] Faculty of Business Administration, Ho Chi Minh City University of Industry and Trade, Ho Chi Minh City 700000, Vietnam; linhhq@huit.edu.vn
[2] Center for High School Education, Ho Chi Minh City University of Industry and Trade, Ho Chi Minh City 700000, Vietnam
* Correspondence: khanv@huit.edu.vn

Abstract

This research analyzes the relationship between digital marketing, stakeholder engagement, environmental management accounting, and environmental performance of listed businesses in Vietnam. It is based on institutional theory, stakeholder theory, legitimacy theory, and signaling theory to discuss how digital tools are used not only as promotional platforms but also as strategic drivers of sustainability. Out of 500 businesses contacted, 393 valid responses were obtained from individuals responsible for marketing and sustainability decisions. Regression and mediation analyses show that digital marketing activities have a positive impact on stakeholder engagement, which in turn drives the adoption of environmental management accounting and improves environmental performance. Stakeholder engagement mediates the effects of digital marketing activities on environmental management accounting practices as well as on environmental performance. The findings suggest that unless accompanied by more significant stakeholder engagement, which helps translate such activities into formal environmental accounting practices and measurable improvements in the environment, though digital platforms enhance communication on transparency efforts. This study contributes to the integration of marketing, accounting, and sustainability research by demonstrating how digital strategies and stakeholder relations jointly influence organizational performance. In practice, it emphasizes the need for businesses to harmonize digital marketing efforts with stakeholder management to institutionalize environmental practices and enhance legitimacy perceptions among regulators, investors, and the general public.

Keywords: environmental management accounting; environmental performance; stakeholder engagement; Vietnam

check for updates

Academic Editor: Flavio Boccia

Received: 8 September 2025
Revised: 12 October 2025
Accepted: 13 October 2025
Published: 16 October 2025

Citation: Huynh, Q.L.; Nguyen, V.K. Stakeholder Engagement in Digital Marketing and Environmental Management. *Sustainability* **2025**, *17*, 9157. https://doi.org/10.3390/su17209157

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

In recent years, the integration of digital transformation and sustainability has largely redefined corporate strategies across the globe. As businesses meet increasing stakeholder, regulatory, and societal pressures for more sustainable practices, the role that digital marketing and environmental management accounting play in both research and practice has grown substantially. The digital wave has changed how fast businesses can relay their messages to their stakeholders by creating avenues for real-time communication, transparent reporting, and dissemination of corporate values can be made known to all concerned parties.

These tools not only increase brand awareness but also act as mechanisms to strengthen accountability and credibility in sustainability efforts [1,2]. Environmental management accounting has developed as a very efficient process of identifying, measuring, and communicating environmental costs and benefits to enable businesses to make decisions on the consumption of resources and generation of wastes, as well as general environmental performance [3]. Increasingly pressured externally, businesses are being called upon to validate their environmental commitments, which they digitally communicate. Thus, environmental management accounting lies at the intersection of sustainability communication and actual operations to ensure that adequate evidence supports corporate claims.

Drawing on institutional theory, stakeholder theory, legitimacy theory, and signaling theory, this study examines how digital marketing activities contribute to the adoption of environmental management accounting and enhance environmental performance in dynamic business environments. Stakeholder engagement plays a pivotal role in this process. According to stakeholder theory, businesses that actively consider the needs and expectations of investors, regulators, customers, and communities are more likely to adopt proactive environmental strategies [4]. Empirical evidence also shows that businesses facing greater stakeholder pressure are more likely to implement environmental management accounting to maintain legitimacy and competitiveness [5,6]. Digital marketing intensifies this engagement by creating two-way communication channels, enabling stakeholders not only to receive information but also to provide feedback and exert influence on organizational practices. This dynamic interaction fosters accountability and motivates businesses to integrate sustainability more deeply into their strategies, including the adoption of environmental management accounting [7,8]. Institutional theory further explains how external pressures from regulators, industry norms, and societal expectations push businesses toward environmental practices such as the adoption of environmental management accounting [9]. Digital marketing enhances this institutional pressure by increasing corporate visibility and exposing businesses to greater public scrutiny.

Despite these theoretical linkages, there remains a notable research gap in understanding the causal relationships between digital marketing, stakeholder engagement, environmental management accounting, and environmental performance; particularly in the context of emerging economies [10–12]. Though individual relations of these elements have been studied, few works empirically tested how they interrelate and collectively influence the environmental outcome [13,14]. This paper attempts to fill this gap in the literature by studying how digital marketing, stakeholder engagement, and environmental management accounting interact in affecting the environmental performance of businesses. There is no empirical evidence on such interacting dynamics in a rising market context where digital transformation pressure coexists with sustainability pressure, as is happening in Vietnam. Specifically, it is set to (1) determine how digital marketing enhances stakeholder engagement; (2) assess how these two factors (digital marketing and stakeholder engagement) influence the adoption of environmental management accounting and environmental performance; (3) evaluate the role of stakeholder engagement as a mediator in the research model.

Vietnam offers a very convincing empirical context for this study due to the fast economic growth that has been accompanied by increasing degradation of the environment and recently tightened regulatory frameworks on corporate sustainability. Listed Vietnamese businesses, in particular, are under mounting pressure to balance profitability with environmental responsibility, while also meeting evolving stakeholder expectations [15,16]. The country's trajectory mirrors broader trends in many emerging economies, making it an ideal setting to explore how modern communication tools and management practices converge to impact sustainability.

This study collected the quantitative data of a representative sample of listed Vietnamese businesses to provide evidence about how businesses operating under similar institutional and business environments are conducting navigation between digital transformation and sustainability imperatives. The findings offer both theoretical insights and actionable implications for managers looking to leverage digital marketing to foster stakeholder trust and institutionalize environmental accounting practices for improved sustainability performance. In addition to advancing theoretical understanding of the interplay among communication, accountability, and sustainability, this study also offers practical guidance. Businesses can utilize digital marketing not only as a promotional tool but as a strategic mechanism to strengthen stakeholder relationships and support the institutionalization of environmental accounting, ultimately leading to measurable improvements in environmental performance.

2. Literature Review

2.1. Theoretical Background

This study draws on institutional theory, stakeholder theory, legitimacy theory, and signaling theory to examine how digital marketing activities contribute to the adoption of environmental management accounting and environmental performance in dynamic business environments.

Institutional theory explains how businesses are shaped by external pressures, norms, and expectations in their operating environment. According to DiMaggio and Powell [9], businesses often conform to institutional pressures, such as coercive, mimetic, or normative pressures, in order to gain legitimacy and ensure survival. In the context of sustainability, regulators, industry bodies, consumers, and the wider community are increasing their pressure on businesses to practice that demonstrates commitment to environmental responsibility. These pressures are heightened by digital marketing because there is greater transparency, faster diffusion of norms, and greater exposure of businesses to public scrutiny. This is supported by legitimacy theory, which proposes that businesses engage in socially accepted practices (environmental management) to maintain stakeholder approval and societal acceptance.

Signaling theory explains how digital marketing serves as a channel to convey environmental values to external stakeholders, signaling authenticity and compliance. These perspectives enrich the understanding of how visibility and communication pressures influence the adoption of environmental management accounting and environmental strategies. Stakeholder theory, as articulated by Freeman [4], emphasizes that businesses must consider the interests and expectations of a wide range of stakeholders. In the sustainability context, stakeholders are increasing their demands for accountability, transparency, and proof of better environmental performance. Digital marketing supplies businesses with tools for interactive communication on sustainability commitments to the market, and on engagement being fostered, while environmental management accounting provides mechanisms to internally track and report environmental costs. Together, these mechanisms help businesses maintain legitimacy, meet stakeholder expectations, and align internal practices with external demands.

It is better to contextualize these theories into the Vietnamese market and describe how digital marketing, stakeholder engagement, and environmental management accounting particularly function as institutional mechanisms in the process of gaining legitimacy and accountability. In a fast-growing and increasingly regulated environment like Vietnam's market, digital marketing can be seen as one such institutional mechanism that enhances transparency by making visibility possible for businesses to show their commitment towards sustainability while meeting the changing regulatory expectations.

Stakeholder engagement serves as a channel of communication and accountability fostering trust and collaboration among a wide range of groups from government regulators to customers to local communities which happens to be critical in Vietnam's collective culture. Environmental management accounting is an internal institutional mechanism because it enables systematic tracking and reporting of environmental costs to the members in business, thereby generating credible evidence toward stakeholders on the business's responsibility for its environment. This supports compliance with national environmental standards. This mechanism creates an enabling institutional environment where external factors bring in legitimacy pressure and internal factors fuse into a sustainability accountability practice to drive sustainable business behavior within the context of Vietnam.

This study develops a multi-theoretical foundation about how digital marketing activities can facilitate making sustainability-related initiatives known externally and internally through stakeholder engagement, which mediates between corporate practices and environmental outcomes. It does so by applying institutional theory, stakeholder theory, legitimacy theory, and signaling theory.

2.2. Digital Marketing and Stakeholder Engagement

Dundua [17] noted that the digital environment has undergone vast transformations, opening up new strategic opportunities for the simultaneous fulfillment of marketing goals and the carrying out of corporate social responsibilities. Interactive communication affords transparency to augment corporate image building and stakeholder engagement, as Manetti and Bellucci [1] averred. Scholars further underscore that businesses exploit social media avenues for interaction with stakeholders in two ways: one that helps them control what goes into the sustainability report, and another less consultative toward building democratic consensus around particular issues of corporate social responsibility or sustainability reporting, but draws competing sociopolitical perspectives.

Braga et al. [2] described digital marketing as useful in building brand reputation and fostering stakeholder engagement through emotionally engaging, clear, and specific content that enhances stakeholder trust and the strength of perceived legitimacy on sustainability efforts. They further argue that sustainability communication is grounded in institutional theory and stakeholder theory, the communication of corporate social responsibility and its effectiveness, green advertising, ethical consumption and marketing strategies, and social marketing for sustainable consumption. The findings by Yuen et al. [10] also indicate that social media is a determining factor for business success since it offers opportunities for stakeholder engagement. Businesses operating under a highly competitive environment can use the social media platform to interact with stakeholders and increase their engagement. However, stakeholder engagement can vary, with some posts generating greater engagement than others.

Kamyabi et al. [11] asserted that digital marketing strategies are crucial for increasing customer engagement, promoting brands, and ensuring sustainability. This study brings out the effects of digital marketing on customer engagement and brand promotion within the dynamic tourism and hospitality industry while discussing significant gaps that have been found regarding the inclusion of employee position as a moderator. The major findings recapitulate that indeed, digital marketing strategies can enhance customer engagement. Participatory and ethical digital marketing fosters inclusive communication, thereby building trust and enhancing stakeholder relationships across platforms. Based on stakeholder theory, the following hypothesis is proposed:

Hypothesis 1. *Digital marketing has a positive impact on stakeholder engagement.*

2.3. Digital Marketing and Environmental Management Accounting

Digital marketing is a strategic instrument in the communication of corporate values and environmental commitments. As stakeholder expectations on sustainability heighten, businesses aggressively utilize digital platforms to showcase their environmental performance. This then creates an external pressure for proven practices like environmental management accounting. The adoption of environmental management accounting provides a systematic approach to identifying and reporting environmental costs and supports data-driven decision-making regarding resource consumption, waste, and ecological impacts [3].

As transparency expectations increase, digital marketing creates informal pressures for businesses to back claims with measurable data, thus fueling environmental management accounting adoption [12]. Furthermore, Banerjee [18] declared that environmental issues are becoming increasingly prominent in organizational theory and practice. He found that stakeholder engagement, amplified by digital marketing, influences management decisions regarding environmental responsibility. Pomering and Johnson [19] indicated the rise in image-based advertising based on corporate social responsibility and explored why such communication approaches are susceptible to consumer skepticism. They examined the message elements that inhibit this persuasive cognitive response. They also concluded that businesses that promote online corporate social responsibility often incorporate sustainability into their core integration strategy.

By engaging in corporate social responsibility activities, businesses can not only foster positive attitudes and gain greater support among stakeholders, but also, in the long term, enhance their corporate image, strengthen stakeholder–company relationships, and improve stakeholder lobbying [20]. Digital ways act as informal accountability pressure for businesses to assimilate external communication with internal practices, like the adoption of environmental management accounting. Sustainable marketing strategies increasingly rely on digital tools to engage environmentally conscious consumers and integrate sustainability across corporate functions, reinforcing the link between digital marketing and environmental management accounting [21]. Drawing on institutional and legitimacy theories, the following hypothesis is proposed:

Hypothesis 2. *Digital marketing has a positive impact on the adoption of environmental management accounting.*

2.4. Digital Marketing and Environmental Performance

In addition to advertising, digital marketing plays a strategic role in improving environmental performance. Through real-time data collection, stakeholder feedback, and sustainability reporting, digital platforms enhance the relevance and responsiveness of environmental management accounting [22,23]. Environmental management accounting may be integrated with digital marketing to harmonize the marketing plan together with environmental strategies. As part of such tools and systems, it may include, for example, customer relationship management, artificial intelligence analytics, and network metrics that can input information regarding optimization of environmental and operational performance [24]; hence fulfilling the objective of environmental management accounting in linking environmental and financial performances [25].

Also, online sites help make clear talks about keeping things good and build trust [26]. Two-way communication via the internet facilitates obtaining real-time feedback from stakeholders, thereby promoting the adoption of environmental management accounting practices within business and improving environmental performance [27]. Digital platforms

also encourage cross-functional collaboration, promote a culture of sustainability, and provide timely data for better decision-making [12,28,29].

Leonidou et al. [30] developed a theoretical model in an attempt to predict the possible way through which green marketing programs would impact environmental performance. They stated that businesses who apply marketing approaches usually reflect more profound organizational efforts to integrate sustainability, creating a feedback loop between external information and internal systems. Growing sensitivity toward environmental sustainability is fast-changing competitive landscape. It puts businesses under pressure to implement an evaluation regarding the cost and benefit of their digital marketing efforts. Anchored in institutional and signaling theories, which stress the role of legitimacy pressures and message transmission, the following hypothesis is proposed:

Hypothesis 3. *Digital marketing has a positive impact on environmental performance.*

2.5. Stakeholder Engagement and Environmental Management Accounting

Stakeholder engagement is a key driver of environmental management accounting adoption. According to stakeholder theory [4], businesses must consider the expectations of various stakeholders (investors, regulators, customers, suppliers, and communities), who are increasingly demanding environmental responsibility. Empirical research confirms that businesses facing greater stakeholder pressure are more likely to adopt proactive environmental strategies. Buysse and Verbeke [5] found that businesses that consider stakeholders strategically important are more likely to implement environmental management accounting to maintain legitimacy and competitiveness. Environmental management accounting enables businesses to internally track environmental costs and respond to these external demands.

Burritt and Saka [6] also observed that stakeholder pressure often drives the implementation of environmental management accounting, particularly improvements in eco-efficiency and sustainability reporting. Qian and Schaltegger [7] also argued that dialog with sustainability-oriented stakeholders helps facilitate the integration of EMA. On the other hand, Cucari et al. [8] found that effective mechanisms for engaging stakeholders are related to the adoption of sustainability-oriented accounting practices. Recent regional studies [15,16,31] further supported the causal link between stakeholder engagement and the adoption of environmental management accounting, especially in developing markets. Businesses that actively engage with stakeholders are more likely to adopt environmental management accounting to respond to external expectations and improve environmental decision-making. Based on stakeholder theory, the following hypothesis can be proposed:

Hypothesis 4. *Stakeholder engagement has a positive impact on the adoption of environmental management accounting.*

2.6. Stakeholder Engagement and Environmental Performance

Stakeholder engagement improves environmental performance by ensuring alignment with external expectations and enhancing transparency, responsiveness, and decision-making quality [4,32]. This relationship is supported by the underlying theory. Clarkson [13] and Gray et al. [32] argued that a business's environmental performance depends on the nature and quality of its stakeholder relationships. Building on this perspective, Buysse and Verbeke [5] conducted an empirical analysis of the relationship between environmental strategy and stakeholder management. Their results showed that more proactive environmental strategies are associated with deeper and broader stakeholder coverage. When a business faces strong stakeholder pressure, it will adopt a more proactive environ-

mental management approach, which in turn can improve environmental performance. Similarly, Freeman [4] emphasized that long-term success depends on considering stakeholder interests. Schaltegger and Burritt [14] further suggested that proactive stakeholder communication can provide more reliable environmental information, enabling businesses to gain better environmental performance.

Le et al. [33] and Nguyen [34] highlighted how engagement facilitates regulatory compliance and cost management, improving sustainability outcomes. Pham et al. [15] also examined the relationship between stakeholder pressure and the adoption of environmental management accounting and concluded that active stakeholder engagement can improve environmental performance by improving data quality, environmental sustainability, and organizational legitimacy. Effective stakeholder engagement enables feedback loops, better risk management, and a more accurate environmental management accounting application, which enhances performance. Based on stakeholder theory, which suggests that long-term success and legitimacy are tied to stakeholder satisfaction, the following hypothesis can be proposed:

Hypothesis 5. *Stakeholder engagement has a positive impact on environmental performance.*

2.7. Mediation Role of Stakeholder Engagement

Stakeholder engagement plays a critical mediating role between digital marketing and both environmental management accounting adoption and environmental performance. Digital marketing fosters interactive and transparent communication, which increases corporate visibility and allows stakeholders, such as customers, regulators, and NGOs, to more actively monitor and influence organizational behavior [35,36]. This digital visibility not only informs stakeholders but empowers them to exert pressure on businesses to adopt environmentally responsible practices [37,38].

Drawing on both stakeholder theory and legitimacy theory, businesses are compelled to meet heightened stakeholder expectations and maintain legitimacy through the adoption of credible sustainability tools like environmental management accounting. Digital marketing initiates this process by amplifying sustainability claims, while stakeholder engagement ensures that these claims are scrutinized, reinforced, and translated into internal organizational changes [39,40]. This accountability loop makes businesses adopt environmental management accounting practices to gain trust and credibility. Signaling theory also complements, suggesting that digital sustainability communications serve as signals of organizational intent. Stakeholder recipients of these signals react either by supporting or challenging the businesses, thereby further emphasizing the need for measurable internal practices such as environmental management accounting [41]. In this sense, stakeholder engagement channels external expectations into internal organizational behavior and performance.

Moreover, stakeholder engagement mediates the link between digital marketing and environmental performance by facilitating feedback, trustbuilding, and participatory problem-solving [42,43]. Data-driven evidence of environmental efforts is a requirement from businesses by engaged stakeholders, thus pushing businesses to align their environmental management accounting systems with environmental goals [44]. This therefore increases the credibility and effectiveness of sustainability initiative implementation as well as better resource use, reporting accuracy and achieving performance outcomes [45].

Overall, stakeholder engagement acts as a conduit through which digital marketing pressures translate into internal sustainability actions and improved environmental outcomes. Through enhanced communication, responsiveness, and accountability, stakeholder engagement strengthens the impact of digital visibility on both environmental management

accounting adoption and environmental performance. Thus, the following hypotheses can be proposed:

Hypothesis 6. *Stakeholder engagement mediates the relationship between digital marketing and the adoption of environmental management accounting.*

Hypothesis 7. *Stakeholder engagement mediates the relationship between digital marketing and environmental performance.*

2.8. Theoretical Model

To clarify the theoretical framework guiding this study, Figure 1 presents the conceptual model that illustrates the relationships among digital marketing (DM), stakeholder engagement (SE), environmental management accounting (EMA), and environmental performance (EP). The model hypothesizes direct effects of DM on SE, EMA, and EP (Hypotheses 1, 2 and 3), as well as direct effects of SE on EMA and EP (Hypotheses 4 and 5). Furthermore, SE is proposed to mediate the relationships between DM and EMA, and between DM and EP (Hypotheses 6 and 7). This multi-theoretical framework integrates institutional theory, stakeholder theory, legitimacy theory, and signaling theory to explain how digital marketing influences environmental outcomes through stakeholder engagement and internal accounting practices.

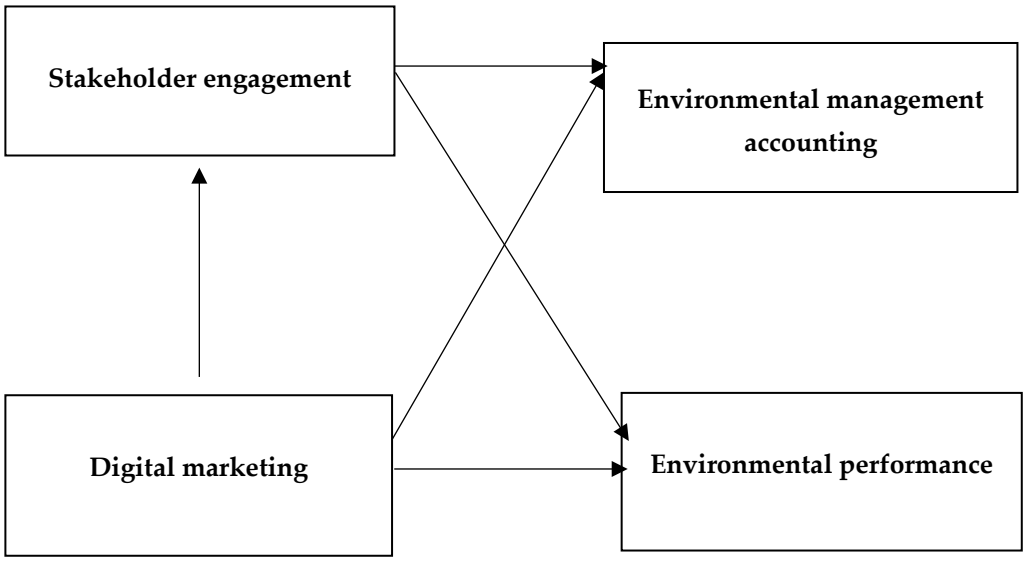


Figure 1. Research model.

3. Methodology

3.1. Research Model

Those hypotheses direct the development of the proposed research model. Insights derived from the aforementioned reviewed literature are employed in articulating the theoretical relationships between main variables in the research model, by which a logically sound case for empirical testing may be developed. In explicitly specifying those relationships found implicit in previous research works, such a framework does not merely consolidate existing knowledge but rather organizes an avenue through which its effectiveness can be tested. This is the projected model that has been graphically set out in Figure 1 as a guide to the following analyses.

3.2. Measurements

3.2.1. Adoption of Digital Marketing (DMA)

Digital marketing encompasses promotional activities conducted through internet technologies and digital platforms. Digital marketing encompasses all aspects of leveraging the internet, digital media, and marketing technologies to achieve integrated multichannel marketing objectives [22]. Digital marketing enables businesses to engage with target audiences locally, nationally, and even globally. Through digital marketing methods, businesses can reach a wider audience than through traditional marketing [22]. This study uses eight items (DMA1 to DMA8) to examine digital marketing applications and rates them according to their degree of use. Ratings are based on a 5-point Likert scale ranging from 1 (not used at all) to 5 (extensive use). This variable was modified based on the findings of Nga and Khoi [46] and Phan et al. [47]. See Appendix A.

3.2.2. Stakeholder Engagement (STE)

Stakeholder engagement refers to the involvement of individuals, groups, or businesses with an interest in a project, business, or decision [4]. These stakeholders can influence and be influenced by project outcomes [48]. This study measured stakeholder engagement using six items (STE1 to STE6). These items were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) and adhered to established stakeholder engagement assessment frameworks [4,48,49] as detailed in Appendix A.

3.2.3. Adoption of Environmental Management Accounting (EMA)

Environmental management accounting is a form of accounting that focuses on the identification, collection, analysis, and use of financial and non-financial information to support internal decisions regarding environmental performance and sustainable resource management [14]. EMA is the process by which organizations integrate environmental considerations into their accounting and decision-making systems [50]. EMA supports businesses in tracking environmental costs and performance to improve sustainability and financial performance [25]. Based on research by Christ and Burritt [51] and Latan et al. [52], EMA usage is assessed using 13 items (EMA1 to EMA13). This variable is estimated based on the degree of usage, using a 5-point Likert scale ranging from 1 (not used at all) to 5 (extensive use), as shown in Appendix A.

3.2.4. Environmental Performance (ENP)

Environmental performance describes the extent to which an organization, product, or system manages its environmental impacts. It encompasses the measurement and evaluation of various factors of environmental sustainability [53]. This study uses eight items (ENP1 to ENP8) to measure environmental performance. These items focus on compliance with applicable environmental regulations, environmental impacts, and the benefits of environmental activities. These items were rated on a 5-point Likert scale in the range between 1 (very poor) and 5 (excellent), as adapted from Chuang and Huang [54] and are shown in Appendix A.

3.3. Data Collection

This study used publicly listed businesses in Vietnam. As of April 2025, there were 1608 businesses comprising the research population. Of this number, 391 were listed on the Ho Chi Minh City Stock Exchange (HoSE), and 329 were on the Hanoi Stock Exchange (HNX), while 888 were on the Unlisted Companies Market (UPCoM).

Eligible businesses were defined based on the following criteria: businesses must have active marketing strategies as evidenced by documented marketing activities, have

published reliable and accessible financial statements for the last two fiscal years, and operate within industries where environmental management accounting is applicable. Based on these requirements, a sample of 500 businesses was selected.

Respondents were primarily senior marketing managers or executives involved in marketing decision-making. To ensure respondents possessed adequate knowledge of environmental management accounting and environmental performance, the survey included screening questions verifying their familiarity with these concepts or involvement in cross-functional teams that handle environmental or sustainability reporting. Additionally, some questions were designed to be answered based on the respondents' access to relevant internal reports or collaboration with accounting and sustainability departments.

Data collection took place over 12 weeks from April 2025 to June 2025. Of the 500 businesses contacted, 393 provided usable responses, for a response rate of 78,6%. Incomplete or inconsistent responses were excluded before analysis. The final dataset encompassed businesses from a wide range of industries. To address potential common method bias (CMB), the study employed procedural remedies such as assuring respondents of anonymity and confidentiality to reduce social desirability bias and separating the measurement of predictor and criterion variables in the questionnaire. Correspondingly, Harman's single-factor test was used in the post hoc analysis, and results provided evidence in the fact that since no single factor accounted for the major variance, CMB is not a valid concern.

The sample size follows the recommendations by Hair et al. [55] on structural equation modeling that advance a minimum sample size of 200 or a ratio of at least ten observations per parameter estimated. The sample size of 393 exceeded these thresholds, providing sufficient statistical power for reliable regression and mediation analyses.

Moreover, considering the diversity of industries represented, industry-level effects were controlled for in the regression models by including industry dummy variables as control variables to isolate the effects of the main independent variables on outcomes, thus accounting for potential industry heterogeneity in digital marketing adoption and environmental management accounting practices. To assess potential nonresponse bias, we compared the demographic characteristics of participating businesses with the total number of publicly listed businesses. No significant differences were found (not tabulated), indicating that the sample was representative.

3.4. Data Analyses

Prior to testing the causal relationships postulated in the research model, reliability analyses were used to check internal consistency and reliability of the measure. In general, these analyses check and assess the stability and reliability of the scale with reference to time. It results in error detection, quality improvement, informed maintenance decisions, optimized design, and validated reliability of collected data. High interitem correlations show that there is strong internal consistency and that measurement is consistent across the scale.

Exploratory factor analysis was subsequently used as another check on scale validity. It is this technique that brings to the surface the underlying structure of a large dataset by reducing many observed items to fewer latent scales. This shows whether there are meaningful patterns in the relationships among items, bringing to light the latent scales.

In other words, it helps confirm that measurement follows the theory used by this study. Once the measurement instrument had been found to be reliable and valid, regression analyses were performed in order to test the hypothesized causal linkages between the study variables. It is this analysis that reports both direct and indirect effects within the model.

To explore potential mediating effects, we conducted mediation analyses to examine whether organic organizational structure mediates the relationship between effective organizational culture and organizational performance. This analysis follows established guidelines [56,57] to conduct three key regression steps.

Step 1: Regression analysis was performed on the dependent variable against the independent variable to determine whether a significant total relationship existed.
Step 2: Regression analysis was performed on the mediator against the independent variable to determine whether the independent variable significantly predicted the mediator.
Step 3: Regression analysis was run of the dependent variable on the independent and mediator to test whether the mediator significantly predicted the dependent variable and to test whether the total effect of the independent variable decreases. The t-statistics were computed based on regression coefficients to check whether mediation is significant.

This analytical method offered a more detailed look at how digital marketing affects the use of environmental management accounting and its effects on environmental performance, plus it also helped to better show the mediating role of stakeholder engagement in this research model.

4. Results

4.1. Descriptive Statistics and Correlation Analysis

Before proceeding with reliability analyses, descriptive statistics including means, standard deviations, and the correlation matrix for all constructs (digital marketing adoption (DMA), stakeholder engagement (STE), environmental management accounting (EMA), and environmental performance (ENP)) are presented in Table 1. The correlation matrix is used to preliminarily check relationships among variables and assess multicollinearity risks. All constructs exhibit means and standard deviations within reasonable ranges (Means between 2.5 and 4.5 are generally considered reasonable, while standard deviations (SDs) ranging from 0.60 to 1.30 indicate healthy variation without extreme dispersion), suggesting no extreme response patterns. All correlations were positive and significant at the 1% level, indicating suitable conditions for further analyses.

Table 1. Descriptive statistics and correlation analysis.

Variables	Mean	SD	1	2	3	4
DMA	2.9688	0.83035	1	0.377 **	0.389 **	0.409 **
STE	3.7163	0.73695	0.377 **	1	0.554 **	0.509 **
EMA	3.7882	0.79972	0.389 **	0.554 **	1	0.623 **
ENP	3.4679	0.69577	0.409 **	0.509 **	0.623 **	1

** Correlation is significant at the 0.01 level. Source: Authors' own work.

4.2. Reliability Analyses

Reliability analysis aims to assess the internal consistency of research variables. This study only examines constructs measured using multiple items: digital marketing adoption (DMA), stakeholder engagement (STE), environmental management accounting (EMA), and environmental performance (ENP). The results of this analysis are shown in Table 2. Cronbach's alpha (α) shall be the major indicator of reliability. Methodological standards denote that an α value above 0.70 can be considered acceptable, hence reflecting a good level of internal consistency between measurement items. This study also calculated α values after deleting any item to ensure that no single item could improve construct reliability if deleted. Ideally, these should be lower than the overall α value for each variable.

Table 2. Reliability Analyses.

Variables	Highest Cronbach's αs "If Item Removed"	Cronbach's αs	AVE	√AVE	Fornell-Larcker	Number of Items
DMA	0.888	0.899	0.55	0.74	0.63	8
STE	0.881	0.897	0.58	0.76	0.63	6
EMA	0.923	0.928	0.57	0.75	0.61	13
ENP	0.886	0.897	0.54	0.73	0.61	8

Source: Authors' own work.

All constructs surpassed the minimum threshold of 0.70. Cronbach's α began at 0.897 for STE and ENP, up to 0.928 for EMA, thus showing high reliability for all constructs. Also, for every variable, the "if item removed" coefficient was less than the overall Cronbach's α, confirming that all items positively contributed to the reliability of each construct.

These results prove the strong internal consistency of the constructs tested. Therefore, DMA, STE, EMA, and ENP have good reliability that qualifies them as appropriate measures to be used in further statistical analyses like factor analysis and regression modeling. This reliability has to be established to validate research findings since it ensures that the measurement of constructs is consistent and not accompanied by any substantial errors.

In addition to Cronbach's alpha, the Average Variance Extracted (AVE) was calculated for each construct to assess convergent validity. AVE values for all constructs were above the recommended threshold of 0.50, confirming that more than 50% of the variance in the indicators is explained by the latent construct. Furthermore, the Fornell-Larcker criterion was employed to test discriminant validity, whereby the square root of each construct's AVE was greater than its correlation with other constructs, supporting the distinctiveness of each construct. These results are summarized in Table 2.

4.3. Exploratory Factor Analysis

Exploratory factor analysis was conducted to examine the construct validity of the measurement items and to classify them according to their respective variables. This procedure is crucial because it ensures that the observed indicators are grouped according to their theoretical structure, thereby validating the measurement model before subsequent analyses. The results of exploratory factor analysis are shown in Table 3, only displaying the loadings larger than the 0.3 level. The results prove the structural sanity of the variables. The current research used factor loadings to check convergent validity. Normal standards need factor loadings above 0.4 to show that an item properly reflects its basic idea. In this study, all item loadings were above 0.6, well above the minimum threshold, indicating strong convergent validity.

Discriminant validity was assessed using the cross-loading criterion. Cross-loadings above 0.3 may indicate a lack of clear differentiation between different constructs. Although the cross-loadings in this analysis exceeded the 0.3 benchmark, the items consistently loaded higher on their intended factors than on other constructs. This confirms that the constructs are empirically distinct from one another, thus establishing discriminant validity. Item commensurability was also considered when assessing item suitability for retention. A commensurability value above 0.5 is considered acceptable by most people, meaning that the variance of each item has been well accounted for by the extracted factors. As seen in

Table 3, all item commensurability values were above 0.5; this proves that retained items and latent factors corresponding to them adequately explain variance.

Table 3. Exploratory Factor Analyses.

Items	Loadings				Communalities
	1	2	3	4	
DMA1		0.737			0.590
DMA2		0.754			0.600
DMA3		0.730			0.601
DMA4		0.720			0.570
DMA5		0.731			0.590
DMA6		0.741			0.582
DMA7		0.758			0.608
DMA8		0.735			0.582
STE1				0.755	0.667
STE2				0.724	0.659
STE3				0.738	0.639
STE4				0.768	0.663
STE5				0.754	0.694
STE6				0.719	0.664
EMA1	0.664				0.559
EMA2	0.688				0.532
EMA3	0.695				0.547
EMA4	0.689				0.564
EMA5	0.675				0.528
EMA6	0.670				0.523
EMA7	0.673				0.559
EMA8	0.678				0.539
EMA9	0.690				0.545
EMA10	0.680				0.529
EMA11	0.648				0.538
EMA12	0.665				0.556
EMA13	0.699				0.582
ENP1			0.666		0.579
ENP2			0.644		0.558
ENP3			0.670		0.570
ENP4			0.662		0.592
ENP5			0.737		0.610
ENP6			0.735		0.624
ENP7			0.696		0.587
ENP8			0.688		0.572
KMO/χ^2/p_{value}			0.947/7815.664/0.000		

Source: Authors' own work.

The dataset's suitability for factor analysis was tested by the use of the Kaiser–Meyer–Olkin (KMO) sampling adequacy measure and Bartlett's test of sphericity. The KMO value came to 0.947, much above even the recommended minimum value of 0.7 for demonstrating that the sample is adequate to extract factors from it. This was with the Bartlett test coming out highly significant as well ($\chi^2 = 7815.664$, $p < 0.001$). This confirms that the correlation matrix is not the identity matrix and is therefore suitable for factor analysis. Taken together, these results provide strong statistical evidence that the data meet the necessary conditions for exploratory factor analysis.

The results summarized in Table 3 indicate that the measurement model is both reliable and valid. In particular, items related to DMA (digital marketing adoption), STE (stakeholder engagement), EMA (environmental management accounting), and ENP (environmental performance) successfully clustered within their hypothesized factors, with loadings consistently above 0.60. This empirically supports the distinctiveness and structural validity of each construct.

To further ensure the robustness of the measurement model, the Variance Inflation Factor (VIF) scores were computed to assess multicollinearity among the constructs. All VIF values ranged between 1.28 and 1.99—well below the commonly accepted limit of 3; thus confirming that multicollinearity is not a concern in this dataset. Overall, the scale shows high convergent and discriminant validity plus correct sample selection. The results not only confirm the theoretical links between the items and their corresponding scales but also make sure the dataset is fit in a statistical sense for later confirmatory checks and hypothesis test is fit in a statistical sense for later confirmatory checks and hypothesis tests. These results further demonstrate the robustness of the research framework and provide a solid foundation for subsequent empirical research.

4.4. Investigation of Research Hypotheses

4.4.1. Testing the Destructive Relationships

The preceding analyses of reliability and exploratory factor structures established the robustness of the measurement model. Each construct demonstrated satisfactory internal consistency, as indicated by Cronbach's alpha values above the recommended threshold, and achieved both convergent and discriminant validity. Table 4 provides a clear summary of all regression models, including standardized coefficients (β), significance levels (p values), F-statistics, and R^2 values.

Building on this foundation, the next step was to test the hypothesized causal relationships between digital marketing activities (DMA), stakeholder engagement (STE), environmental management accounting (EMA), and environmental performance (ENP). Summated scores of the validated constructs were used as input variables in a series of regression analyses. To rule out multicollinearity issues in regression analysis, VIF values were calculated and found to be below 3 for all variables, confirming acceptable levels.

The results reveal that all three regression models are statistically significant at the 1% level and provide meaningful explanatory power for the dependent variables. Specifically, the F-statistics of 64.829, 102.700, and 89.392 for Models 1, 2, and 3, respectively, are all significant at the 1% level, indicating that the explanatory variables collectively account for substantial variance in the outcomes.

Table 4. Regression Analyses.

Model	Dependent	Independent	Unstandardized Coefficients (β)	S.E.	Standardized Coefficients (B)	t	P_t	F	P_F	R^2
1	STE	(Constant)	2.723	0.128		21.247	<1%	64.829	<1%	0.142
		DMA	0.335	0.042	0.377	8.052	<1%			
2	EMA	(Constant)	5.513	0.774		7.123	<1%	102.700	<1%	0.345
		DMA	0.875	0.185	0.210	4.737	<1%			
		STE	2.235	0.208	0.475	10.741	<1%			
3	ENP	(Constant)	3.697	0.424		8.720	<1%	89.392	<1%	0.314
		DMA	0.566	0.101	0.253	5.593	<1%			
		STE	1.042	0.114	0.414	9.139	<1%			

Source: Authors' own work.

4.4.2. Digital Marketing Activities and Stakeholder Engagement (Model 1)

In Model 1, DMA was regressed against STE. The results show that DMA explains 14.2% of the variance in stakeholder engagement ($R^2 = 0.142$). The standardized regression coefficient ($\beta = 0.377$, $p < 0.01$) is significant at the 1% level, thus proving that digital marketing activities have a strong positive effect on the extent to which businesses engage their stakeholders. Although $R^2 = 0.142$ may appear modest, in applied business research, especially in the context of behavioral or perception-based constructs, this level of explanatory power is considered acceptable and meaningful.

These results provide clear empirical support for Hypothesis H1, confirming that digital marketing activities significantly enhance stakeholder engagement. Digital channels, such as social media, websites, and interactive applications, allow businesses to share sustainability-related information more transparently to express feedback possibilities and a two-way dialog. These activities create opportunities for businesses to strengthen trust, accountability, and collaborative problem-solving with various stakeholder groups.

The findings are in line with previous studies that suggested digital transformation has reshaped the dynamics of stakeholder communication. A study by Kaplan and Haenlein [26], as well as more recent studies on digital sustainability reporting, reiterated that businesses that use digital platforms are transparent to a great extent and inclusive in their stakeholder relations. Therefore, the positive effect of DMA on STE underscores the enabling role that digital technologies play in embedding sustainability practices within corporate communication strategies.

4.4.3. Effects on Environmental Management Accounting (Model 2)

Model 2 assessed the impacts of DMA and STE on EMA. The results indicate that these two independent variables jointly explain 34.5% of the variance in EMA ($R^2 = 0.345$), with both DMA ($\beta = 0.210$, $p < 0.01$) and STE ($\beta = 0.475$, $p < 0.01$) contributing significantly at the 1% level. The R^2 value of 0.345 represents moderate explanatory power in applied contexts, indicating that a substantial portion of variation in EMA practices can be explained through digital and stakeholder-related activities.

These empirical results support Hypotheses H2 and H4, confirming that both digital marketing activities and stakeholder engagement significantly improve environmental management accounting practices. Businesses can collect and disseminate environmental

data through the use of digital platforms as repositories of metrics and performance indicators on their environment. It will, therefore, be possible to track environmental costs accurately within the businesses, resource efficiency monitoring in the businesses, and sustainability information integration into decision-making.

Moreover, the stronger coefficient of STE underscores that stakeholder involvement is even more influential in shaping EMA practices. When businesses respond to stakeholder concerns about ecological responsibility, they are more likely to adopt systematic approaches for identifying, measuring, and reporting environmental costs. This aligns with research by Burritt and Schaltegger [25], who highlight that stakeholder pressure is a critical driver of EMA implementation. Overall, digital marketing can initiate the process by raising awareness and providing information, but stakeholder engagement provides the necessary momentum that pushes businesses toward institutionalizing EMA practices.

4.4.4. Effects on Environmental Performance (Model 3)

Model 3 evaluated the impacts of DMA and STE on ENP. The regression analysis shows that DMA ($\beta = 0.253$, $p < 0.01$) and STE ($\beta = 0.414$, $p < 0.01$) both have significant positive effects on environmental performance at the 1% level, jointly explaining 31.4% of the variance ($R^2 = 0.314$). This R^2 value is also acceptable in applied sustainability studies, particularly in areas affected by multiple exogenous variables such as regulations, market forces, and cultural attitudes.

These results validate Hypotheses H3 and H5, confirming that both DMA and STE have direct positive effects on environmental performance. Businesses using digital channels actively for sustainability communication and engagement are most probably the ones to attain such concrete results as reduced emissions, improved resource efficiency, and better waste management.

The results restate the earlier proof that businesses with robust digital contact and clear communication with all parties do better on their green scores. In essence, DMA provides the tools for visibility and transparency, while STE ensures accountability and collaborative action, both of which are necessary for achieving genuine performance improvements.

4.4.5. Synthesis of Direct Effects

Taken together, the results of Models 1–3 suggest a clear causal chain. Digital marketing activities directly enhance stakeholder engagement (H1). DMA and STE jointly foster the adoption and application of environmental management accounting practices (H2, H4). Environmental performance is also influenced by DMA and STE (H3, H5). This gives a picture where DMA has both direct and indirect routes to sustainability outcomes, direct influence on EMA and ENP, as well as shaping STE, which then exerts further effects on both EMA and ENP. This, therefore, sets up the mediation analysis to assess the extent to which STE functions as a bridging mechanism.

4.5. Investigating Mediation Effects

4.5.1. Analytical Approach

To further probe the mechanisms underlying these relationships, mediation tests were conducted following the methodological frameworks of Baron and Kenny [56] and Sobel [57], but also supported by bias-corrected bootstrapping procedures with 5000 resamples, as recommended by Preacher and Hayes [58]. These procedures decompose total effects into direct and indirect components, revealing whether stakeholder engagement mediates the impact of digital marketing activities on environmental management accounting and environmental performance.

4.5.2. Mediation of DMA–EMA Relationship

The results in Table 5 confirm that Hypothesis H6 is supported. Stakeholder engagement mediates the relationship between DMA and EMA. Specifically, the bootstrapped indirect effect of DMA on EMA through STE is significant (β = 0.749, $p < 0.01$). The total effect of DMA on EMA is β = 1.623 ($p < 0.01$), but when STE is included in the model, the direct effect is reduced to β = 0.874 ($p < 0.01$).

Table 5. Mediation analyses.

Mediators	Links	β	S.E.	t	Pt
1. STE	DMA → STE → EMA				
	Total effect	1.623	0.194	8.346	<1%
	Direct effect	0.874	0.185	4.737	<1%
	Indirect effect	0.749	0.117	6.405	<1%
2. STE	DMA → STE → ENP				
	Total effect	0.914	0.103	8.869	<1%
	Direct effect	0.566	0.101	5.593	<1%
	Indirect effect	0.348	0.058	6.009	<1%

Source: Authors' own work.

This finding indicates that while DMA directly contributes to environmental management accounting practices, its influence is significantly amplified when mediated through stakeholder engagement. Businesses that use digital tools to connect with stakeholders are more likely to perceive external expectations, adopt systematic environmental accounting practices, and report sustainability information in a structured manner.

4.5.3. Mediation of DMA–ENP Relationship

Similarly, Hypothesis H7 is supported (Table 5). The analysis shows that STE mediates the relationship between DMA and ENP. The bootstrapped indirect effect is β = 0.348 ($p < 0.01$). The total effect of DMA on ENP is β = 0.914 ($p < 0.01$), which decreases to a direct effect of β = 0.566 ($p < 0.01$) after accounting for the mediating role of STE.

This suggests that stakeholder engagement not only complements but also strengthens the influence of digital marketing on environmental performance outcomes. Digital platforms by themselves can raise awareness, but with active stakeholder dialog, they become real environmental improvements, such as meeting regulatory standards to be in compliance with easily achievable certification or even when aligning with global sustainability initiatives.

4.5.4. Overall Interpretation of Mediation Results

The mediation analysis underscores the strategic importance of stakeholder engagement in linking digital marketing with sustainable business outcomes. The use of bootstrapping adds robustness and statistical reliability to the mediation findings. DMA provides the infrastructure for communication and data dissemination, but it is the engagement of stakeholders that transforms this information into action, monitoring, and accountability.

These findings resonate with stakeholder theory [4], which posits that organizational performance depends not only on internal strategies but also on the quality of relationships with external parties. Furthermore, the results are consistent with recent sustainability research, which highlights that stakeholder dialog is a crucial enabler of organizational change toward sustainability [57].

Thus, the mediation analysis provides robust evidence that STE serves as a partial mediator. DMA retains direct effects on EMA and ENP, but these effects are significantly strengthened through stakeholder engagement. This shows in two ways that businesses that want to obtain the most out of digital marketing's effect on sustainability need to work on making engagement strategies better for finding, telling, and helping their stakeholders.

5. Discussion

The study is based on institutional theory, stakeholder theory, legitimacy theory, and signaling theory. Theories help to understand the contribution of digital marketing activities towards the diffusion of environmental management accounting and environmental performance in highly dynamic business environments. Institutional pressures in the presence of digital tools dynamism with stakeholders to shape sustainability outcomes are coherently and empirically explained by the results.

First, results confirm that digital marketing positively and significantly affects stakeholder engagement (H1). In view of the stakeholder theory, this means that digital marketing goes beyond its usual role of promotion to include transparency and space for inclusivity and meaningful dialog with stakeholders. In view of stakeholder theory, this implies that digital marketing goes beyond its traditional role of promotion to encompass transparency, inclusivity, and meaningful dialog with stakeholders. This reinforces the view that sustainability communication is no longer unidirectional but dialogical, reflecting a genuine shift toward participatory engagement. These results are in line with Kaplan and Haenlein [26] and Manetti and Bellucci [1], who argued that online platforms support more interactive and democratic forms of participation. Evidence in this case proves digital marketing assists businesses to incorporate sustainability issues within their communication strategies, hence resulting in trust and participation. Theoretically, it emphasizes how digital marketing changes stakeholder engagement by creating institutional settings that are transparent and participatory. Therefore, it adds value to stakeholder theory by demonstrating that businesses not only respond to stakeholder demands but also proactively shape stakeholder salience and expectations through digital narratives. It will also provide empirical support to signaling theory regarding how businesses signal their legitimacy and accountability to external audiences through digital means. This finding demonstrates that businesses use digital tools both as reactive mechanisms to address stakeholder concerns and as proactive instruments to construct legitimacy and trust.

Second, results revealed a direct positive impact of digital marketing on environmental management accounting adoption (H2) and environmental performance (H3). From an institutional theory point of view, it can be said that digitalization increases the visibility of corporate practices under the scrutiny of external pressures for greater accountability and legitimacy. This enhanced visibility pushes businesses toward greater transparency and formalized sustainability reporting practices. This finding goes on to confirm earlier assertions by Burritt and Schaltegger [25] that digitalization increases the visibility of environmental information, whereby systematic accounting practices can be facilitated. Positive linkage with environmental performance is also found by Leonidou et al. [30]. Businesses' green marketing initiatives bring substantial improvement in their environmental performance. Thus, digital marketing is not only a reputational tool but also a transformative force for internal sustainability practices. This validates legitimacy theory because digital marketing is seen as fulfilling normative expectations about sustainability, thereby satisfying organizational legitimacy. Furthermore, viewing signaling theory, digital marketing becomes obvious to act as a signal of environmental responsibility towards regulators, investors, and the whole society, translating communicative actions into tangible institutional credibility.

Third, stakeholder engagement appears as a decisive driver in environmental management accounting adoption (H4) and environmental performance (H5). This finding underscores that stakeholder engagement functions as the critical mechanism translating digital efforts into concrete sustainability actions. Among dimensions measured, specific types of digital engagement were particularly effective. Active dialog through social media interactions and participatory feedback tools significantly strengthen stakeholder engagement. Transparent disclosure via websites and sustainability reports help institutionalize trust on the part of the stakeholders. Correspondingly, open talk during a crisis added to seen fairness and responsibility of the group. These match with the items used to measure stakeholder engagement, which were clear talk, answer to stakeholders, and how often interactive chat happens. So, digital marketing plans that push for two-way link and nonstop stakeholder involvement, not just one-way data spread, work best in leading sustainability results. This finding strengthens the stakeholder theory argument that stakeholder pressure is a critical determinant of proactive environmental strategies [5,7]. Simultaneously, from an institutional perspective, it shows how stakeholder expectations become institutionalized within business, prompting the integration of environmental management accounting into formal management systems. The higher influence of stakeholder engagement compared to digital marketing in explaining environmental management accounting adoption suggests that, although digital tools raise awareness, it is stakeholder participation and demand that catalyze genuine organizational change. This advances institutional theory by demonstrating that stakeholder engagement is a means through which institutional norms and expectations are internalized into actual organizational behavior.

Fourth, the mediation analyses provide nuanced insights into the mechanisms at play. Stakeholder engagement was shown to mediate the relationships between digital marketing and environmental management accounting (H6) as well as digital marketing and environmental performance (H7). This underscores the fact that stakeholder engagement is not a matter of some complementary factor but rather as the very necessary condition through which digital marketing could precipitate tangible sustainability outcomes. This implies that improved environmental performance of the business cannot be achieved through digital marketing alone. Instead, consistent with the provisions of stakeholder theory, it is through an engagement process with stakeholders that transparency and communication will eventually turn into substantial action. Simultaneously and in consistency with institutional theory, stakeholder engagement reflects external pressure and norms in legitimizing the adoption of environmental management accounting and sustainability practices. The results resonate with Delmas and Toffel [37] as well as Shahzad et al. [41], who emphasized that stakeholder dialog is transformed communication into accountable and measurable sustainability outcomes. Furthermore, the results strengthen signaling theory by showing that stakeholder engagement provides critical feedback loops—turning external sustainability signals into internal strategic responses.

The study offers three theoretical contributions. First, it builds on stakeholder theory by showing how digital marketing raises the changing role of stakeholders in institutional settings; these give them power to drive sustainability strategies rather than just respond to them. Second, it develops the institutional theory by illustrating how digital visibility and institutional pressure are internalized as part of environmental management accounting as a formal mechanism that provides legitimacy and accountability. Third, it bridges the marketing–accounting interface by showing that digital communication tools, when situated within stakeholder and institutional contexts, facilitate the operationalization of sustainability through improved environmental performance. By incorporating legitimacy theory plus signaling theory, this study moves further toward a holistic perspective regard-

ing how businesses utilize digital tools to manage the perceptions of external parties and satisfy normative expectations.

The results offer valuable implications for managers. Businesses have long considered digital marketing efforts as part of promotions, whereas in reality and practice, it is a strategic platform for stakeholder dialog, transparency, and collaborative value creation. Managers should content and mechanism improve regarding how to communicate sustainability more effectively while simultaneously strengthening the mechanisms for stakeholder feedback and participation. This study recommends businesses to match their digital strategies with environmental accounting practices and sustainability goals using real-time digital analytics on stakeholder responses in order to adjust any actions taken. Such integration will help institutionalize sustainability as a core organizational process rather than a peripheral initiative.

However, certain limitations need to be noted. First, since the study is based on regression analysis, it limits making causal inferences and completely unpacking complex dynamic relationships. Second, since the study pertains to listed businesses in Vietnam, a context with its unique peculiar institutional and regulatory contextual features, this may limit the generalizability of applying such findings to SMEs and the informal sector or businesses operating in less regulated environments or outside Asian contexts. Third, digital marketing was considered as an overarching construct; future studies should decompose it into specific dimensions such as social media, website transparency, and new technologies to determine their individual roles in environmental initiatives.

Future research can build on this framework in several ways. Long-term causal relationships between digital marketing, stakeholder engagement, and sustainability performance can be developed in future studies based on this framework. The degree to which the type or intensity of stakeholder engagement mediates the impact that digital marketing has on the organization's sustainability practices can be determined as well. Different digital tools differentially impact stakeholder influence and organizational change, which shall be critically assessed. In addition, this can bring out how the institutional context in a country moderates the effectiveness of corporate strategies related to sustainability through digital means across industries or countries.

6. Conclusions

This study explored how digital marketing, stakeholder engagement, and environmental management accounting jointly influence environmental performance in Vietnamese listed businesses. Evidence provides support for the fact that it is through digital marketing that strategic pathways towards environmental sustainability are opened by promoting stakeholder engagement and pushing for the adoption of environmental management accounting which improves environmental performance. In essence, such an approach transforms digital marketing from being just a promotional tool to a transparency, accountability, and strategic conversation channel between a business and its legitimacy building to keep up with changing stakeholder expectations.

The key theoretical insight is that digital marketing, stakeholder engagement, and institutional pressures interact to embed sustainability into core organizational practices. This reinforces and extends stakeholder theory by elucidating how digital platforms intensify the potency of stakeholder forces to drive sustainability strategies—transforming transparency into meaningful dialog and external pressure into actual change in businesses. It also contributes to institutional theory by showing how visibility in the digital domain heightens coercive, mimetic, and normative pressures such that businesses feel compelled to institutionalize environmental management accounting as part of their accountability systems. These views show how outside pressures and insider games join to push for

changes that focus on sustainability. Also, this study links marketing and accounting by proving that digital tools are not just means of sharing info but ways to keep track of, build trust, and boost performance. Even though this study does make an attempt to give concrete and valuable insights, it should be very mindful of the limitations that arise due to the sampling process and method of data collection. Certain ambiguities in these areas may tilt the reliability and validity of results. Therefore, future studies should endeavor to have a more explicit and transparent sampling procedure alongside a formidable data collection method to sustain the empirical vigor of the proposed framework.

In practice, businesses should blend digital marketing with stakeholder engagement plans to embed sustainability in their choices. This calls for a move from simple talks to interactive, feedback-led setups that help turn stakeholder input into real and accountable green actions. Policymakers can work together on pushing for rules about online openness and join the effort when help is needed for skill building by putting steps for online sustainability reporting in growing markets.

This study establishes a framework where digital marketing functions as both a signaling and engagement mechanism, stakeholder dynamics act as the driving force for change, and institutional pressures embed sustainability within organizational systems.

This model thus provides a basis of how digitalization, engagement and accountability could interact to bring green transformation in businesses while at the same time emphasizing the indispensability of methodological clarity in subsequent studies. Future research should implement this model empirically in various contexts and technologies, discussing the place of particular digital tools in the changing nexus between communication, engagement, and sustainability.

Author Contributions: Conceptualization, Q.L.H. and V.K.N.; methodology, Q.L.H.; data collection, V.K.N.; formal analysis, Q.L.H.; writing—original draft preparation, Q.L.H. and V.K.N.; writing—review and editing, Q.L.H.; visualization, Q.L.H.; supervision, Q.L.H. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A. Study Factors and Their Related Items

Factor	Item	Statement
DMA	DMA1	Social media marketing
	DMA2	Search engine optimization
	DMA3	Email marketing
	DMA4	Content marketing
	DMA5	Influencer marketing
	DMA6	Online advertising
	DMA7	Affiliate marketing
	DMA8	Mobile marketing

Factor	Item	Statement
STE	STE1	Frequency of interaction
	STE2	Quality of communication
	STE3	Stakeholder participation
	STE4	Trust and relationship strength
	STE5	Stakeholder satisfaction
	STE6	Stakeholder influence
EMA	EMA1	Identification of environment-related costs
	EMA2	Estimation of environment-related contingent liabilities
	EMA3	Classification of environment-related costs
	EMA4	Allocation of environment-related costs to production processes
	EMA5	Allocation of environment-related costs to products
	EMA6	Introduction or improvement to environment-related cost management
	EMA7	Creation and use of environment-related cost accounts
	EMA8	Development and use of environment-related key performance indicators
	EMA9	Product life-cycle cost assessments
	EMA10	Product inventory analyses
	EMA11	Product impact analyses
	EMA12	Product improvement analysis
	EMA13	Assessment of environmental impacts associated with capital investment decisions
ENP	ENP1	Business satisfaction with performance in reducing pollution
	ENP2	Business satisfaction with performance in reducing environmental fines
	ENP3	Business satisfaction with performance in improving relations with the community
	ENP4	Business satisfaction with reduction in workplace accidents
	ENP5	Business satisfaction with an increase in image related to environmental protection
	ENP6	Business satisfaction with an increase in products with an environmentally friendly design
	ENP7	Business satisfaction with performance-strengthening internal environmental management and communication
	ENP8	Business satisfaction with performance in awareness and understanding of current trends in environmental regulations

Source: Authors' own work.

References

1. Manetti, G.; Bellucci, M. The use of social media for engaging stakeholders in sustainability reporting. *Account. Audit. Account. J.* **2016**, *29*, 985–1011. [CrossRef]
2. Braga, L.D.; Tardin, M.G.; Perin, M.G.; Boaventura, P. Sustainability communication in marketing: A literature review. *RAUSP Manag. J.* **2024**, *59*, 293–311. [CrossRef]
3. Burritt, R.L.; Schaltegger, S. Eco-efficiency in corporate budgeting. *Environ. Manag. Health* **2001**, *12*, 158–174. [CrossRef]
4. Freeman, R.E. *Strategic Management: A Stakeholder Approach*; Cambridge University Press: Cambridge, UK, 2010.
5. Buysse, K.; Verbeke, A. Proactive environmental strategies: A stakeholder management perspective. *Strateg. Manag. J.* **2003**, *24*, 453–470. [CrossRef]
6. Burritt, R.L.; Saka, C. Environmental management accounting applications and eco-efficiency: Case studies from Japan. *J. Clean. Prod.* **2006**, *14*, 1262–1275. [CrossRef]
7. Qian, W.; Schaltegger, S. Revisiting carbon disclosure and performance: Legitimacy and management views. *Br. Account. Rev.* **2017**, *49*, 365–379. [CrossRef]
8. Cucari, N.; Esposito De Falco, S.; Orlando, B. Diversity of board of directors and environmental social governance: Evidence from Italian listed companies. *Corp. Soc. Responsib. Environ. Manag.* **2018**, *25*, 250–266. [CrossRef]
9. DiMaggio, P.J.; Powell, W.W. The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *Am. Sociol. Rev.* **1983**, *48*, 147–160. [CrossRef]

10. Yuen, K.F.; Lee, J.D.; Nguyen, C.T.; Wang, X. Leveraging Social Media for Stakeholder Engagement: A Case on the Ship Management Industry. *Information* **2024**, *15*, 693. [CrossRef]
11. Kamyabi, M.; Özgit, H.; Ahmed, J.N. Sustaining Digital Marketing Strategies to Enhance Customer Engagement and Brand Promotion: Position as a Moderator. *Sustainability* **2025**, *17*, 3270. [CrossRef]
12. Schaltegger, S.; Burritt, R. Sustainability accounting for companies: Catchphrase or decision support for business leaders? *J. World Bus.* **2010**, *45*, 375–384. [CrossRef]
13. Clarkson, M.E. A stakeholder framework for analyzing and evaluating corporate social performance. *Acad. Manag. Rev.* **1995**, *20*, 92–117. [CrossRef]
14. Schaltegger, S.; Burritt, R. *Contemporary Environmental Accounting: Issues, Concepts and Practice*; Routledge: London, UK, 2017.
15. Pham, V.H.T.; Vu, T.K.A.; Van Ha, T.T.; Nguyen, T.T.H. Stakeholders' pressures and manager awareness toward the implementation of environmental cost management accounting: Empirical evidence in Vietnam paper enterprises. In *Economic Sustainability and Social Equality in the Technological Era*; Routledge: London, UK, 2025; pp. 1–14.
16. Jayanti, A.D.; Mutmainah, S. Analysis of Relationship Among Stakeholder Pressures, Environmental Management Accounting Use, Strategy, and Innovation: An Empirical Evidence From Indonesia. *Diponegoro J. Account.* **2013**, *2*, 497–511. [CrossRef]
17. Dundua, E. Digital Marketing and Corporate Social Responsibility: Strategies for Brand Building and Stakeholder Engagement. In *International Scientific-Practical Conference*; Springer Nature: Cham, Switzerland, 2023; pp. 269–282.
18. Banerjee, S.B. Managerial perceptions of corporate environmentalism: Interpretations from industry and strategic implications for organizations. *J. Manag. Stud.* **2001**, *38*, 489–513. [CrossRef]
19. Pomering, A.; Johnson, L.W. Advertising corporate social responsibility initiatives to communicate corporate image. *Corp. Commun. Int. J.* **2009**, *14*, 420–439. [CrossRef]
20. Du, S.; Bhattacharya, C.B.; Sen, S. Maximizing business returns to corporate social responsibility (CSR): The role of CSR communication. *Int. J. Manag. Rev.* **2010**, *12*, 8–19. [CrossRef]
21. Widiastuti, E.; Sukesi, S.; Sarsiti, S. Sustainable Marketing in the Digital Age: A Systematic Review of the Latest Strategies and Tactics. *Int. J. Econ. Bus. Account. Res.* **2024**, *8*, 1–12. [CrossRef]
22. Chaffey, D.; Ellis-Chadwick, F. *Digital Marketing*; Pearson: London, UK, 2019.
23. Kumar, V.; Aksoy, L.; Donkers, B.; Venkatesan, R.; Wiesel, T.; Tillmanns, S. Undervalued or overvalued customers: Capturing total customer engagement value. *J. Serv. Res.* **2010**, *13*, 297–310. [CrossRef]
24. Tiago, M.T.P.M.B.; Veríssimo, J.M.C. Digital marketing and social media: Why bother? *Bus. Horiz.* **2014**, *57*, 703–708. [CrossRef]
25. Burritt, R.L.; Schaltegger, S. Sustainability accounting and reporting: Fad or trend? *Account. Audit. Account. J.* **2010**, *23*, 829–846. [CrossRef]
26. Kaplan, A.M.; Haenlein, M. Users of the world, unite! The challenges and opportunities of Social Media. *Bus. Horiz.* **2010**, *53*, 59–68. [CrossRef]
27. Lamberton, G. Sustainability accounting—A brief history and conceptual framework. *Account. Forum* **2005**, *29*, 7–26. [CrossRef]
28. Epstein, M.J. *Making Sustainability Work: Best Practices in Managing and Measuring Corporate Social, Environmental and Economic Impacts*; Routledge: London, UK, 2018.
29. Frost, G.R.; Seamer, M. Adoption of environmental reporting and management practices: An analysis of New South Wales public sector entities. *Financ. Account. Manag.* **2002**, *18*, 103–127. [CrossRef]
30. Leonidou, C.N.; Katsikeas, C.S.; Morgan, N.A. "Greening" the marketing mix: Do firms do it and does it pay off? *J. Acad. Mark. Sci.* **2013**, *41*, 151–170. [CrossRef]
31. Gerged, A.M.; Zahoor, N.; Cowton, C.J. Understanding the relationship between environmental management accounting and firm performance: The role of environmental innovation and stakeholder integration–Evidence from a developing country. *Manag. Account. Res.* **2024**, *62*, 100865. [CrossRef]
32. Gray, R.; Owen, D.; Adams, C. *Accounting & Accountability: Changes and Challenges in Corporate Social and Environmental Reporting*; Prentice Hall: Upper Saddle River, NJ, USA, 1996.
33. Le, T.T.; Nguyen, T.M.A.; Phan, T.T.H. Environmental management accounting and performance efficiency in the Vietnamese construction material industry—A managerial implication for sustainable development. *Sustainability* **2019**, *11*, 5152. [CrossRef]
34. Nguyen, T.H. Factors affecting the implementation of environmental management accounting: A case study of pulp and paper manufacturing enterprises in Vietnam. *Cogent Bus. Manag.* **2022**, *9*, 2141089. [CrossRef]
35. Morsing, M.; Schultz, M. Corporate social responsibility communication: Stakeholder information, response and involvement strategies. *Bus. Ethics A Eur. Rev.* **2006**, *15*, 323–338. [CrossRef]
36. Lamberton, C.; Stephen, A.T. A thematic exploration of digital, social media, and mobile marketing: Research evolution from 2000 to 2015. *J. Mark.* **2016**, *80*, 146–172. [CrossRef]
37. Delmas, M.; Toffel, M.W. Stakeholders and environmental management practices: An institutional framework. *Bus. Strategy Environ.* **2004**, *13*, 209–222. [CrossRef]

38. Burritt, R.; Christ, K. Industry 4.0 and environmental accounting: A new revolution? *Asian J. Sustain. Soc. Responsib.* **2016**, *1*, 23–38. [CrossRef]
39. Martínez-Conesa, I.; Soto-Acosta, P.; Palacios-Manzano, M. Corporate social responsibility and its effect on innovation and firm performance: An empirical research in SMEs. *J. Clean. Prod.* **2017**, *142*, 2374–2383. [CrossRef]
40. Swalih, M.M.; Ram, R.; Tew, E. Environmental management accounting for strategic decision-making: A systematic literature review. *Bus. Strategy Environ.* **2024**, *33*, 6335–6367. [CrossRef]
41. Shahzad, M.F.; Xu, S.; An, X.; Asif, M.; Jafri, M.A.H. Effect of stakeholder pressure on environmental performance: Do virtual CSR, green credit, environmental and social reputation matter? *J. Environ. Manag.* **2024**, *368*, 122223. [CrossRef] [PubMed]
42. Aghayari, J.; Valmohammadi, C.; Alborzi, M. The impact of digital transformation on sustainability: A case of the Iranian telecom industry. *Int. J. Res. Ind. Eng.* **2023**, *12*, 306–320.
43. Feroz, A.K.; Zo, H.; Chiravuri, A. Digital transformation and environmental sustainability: A review and research agenda. *Sustainability* **2021**, *13*, 1530. [CrossRef]
44. Chatterji, A.K.; Levine, D.I.; Toffel, M.W. How well do social ratings actually measure corporate social responsibility? *J. Econ. Manag. Strategy* **2009**, *18*, 125–169. [CrossRef]
45. Laine, M.; Tregidga, H.; Unerman, J. *Sustainability Accounting and Accountability*; Routledge: London, UK, 2021.
46. Nga, N.T.N.; Khoi, B.H. Influencing digital marketing and marketing performance on the business sustainability of small and medium enterprises. *Int. J. Appl. Econ. Financ. Account.* **2025**, *21*, 76–86. [CrossRef]
47. Phan, T.H.N.; Truong, H.M.D.; Ho, T.H.N.; Vu, H.N.H.; Vo, T.V.; Tran, N.H. Impact of digital transformation on business efficiency of Vietnam private enterprises. *J. Financ.—Mark. (Tạp Chí Nghiên Cứu Tài Chính—Mark. Vietnam)* **2023**, *14*, 13–24.
48. Greenwood, M. Stakeholder engagement: Beyond the myth of corporate responsibility. *J. Bus. Ethics* **2007**, *74*, 315–327. [CrossRef]
49. Bourne, L. *Stakeholder Relationship Management: A Maturity Model for Organisational Implementation*; Routledge: London, UK, 2016.
50. Jasch, C. The use of Environmental Management Accounting (EMA) for identifying environmental costs. *J. Clean. Prod.* **2003**, *11*, 667–676. [CrossRef]
51. Christ, K.L.; Burritt, R.L. Environmental management accounting: The significance of contingent variables for adoption. *J. Clean. Prod.* **2013**, *41*, 163–173. [CrossRef]
52. Latan, H.; Jabbour, C.J.C.; de Sousa Jabbour, A.B.L.; Wamba, S.F.; Shahbaz, M. Effects of environmental strategy, environmental uncertainty and top management's commitment on corporate environmental performance: The role of environmental management accounting. *J. Clean. Prod.* **2018**, *180*, 297–306. [CrossRef]
53. Hart, S.L. A Natural-Resource-Based View of the Firm. *Acad. Manag. Rev.* **1995**, *20*, 986–1014. [CrossRef]
54. Chuang, S.P.; Huang, S.J. The effect of environmental corporate social responsibility on environmental performance and business competitiveness: The mediation of green information technology capital. *J. Bus. Ethics* **2018**, *150*, 991–1009. [CrossRef]
55. Hair, J.F.; Black, W.C.; Babin, B.J.; Anderson, R.E. *Multivariate Data Analysis (7th Edn Pearson New International Edition)*; Pearson Education: Harlow, UK, 2014.
56. Baron, R.M.; Kenny, D.A. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *J. Personal. Soc. Psychol.* **1986**, *51*, 1173–1182. [CrossRef]
57. Sobel, M.E. Asymptotic confidence intervals for indirect effects in structural equation models. *Sociol. Methodol.* **1982**, *13*, 290–312. [CrossRef]
58. Preacher, K.J.; Hayes, A.F. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav. Res. Methods* **2008**, *40*, 879–891. [CrossRef]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.