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PATHWAYS TO SUSTAINABLE E-COMMERCE PERFORMANCE IN PAKISTAN: THE INTERPLAY OF GREEN GOVERNANCE, ECO-INNOVATIVE MARKETING, CONSUMER TRUST, PLATFORM USEFULNESS, AND REGULATORY PRESSURE

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Abstract
Pakistan, along with other developing countries, has experienced an enormous surge in digital commerce. As a direct result of digital commerce's explosive growth in developing countries, there is a new opportunity to create both economic development and environmentally friendly practices (i.e., minimizing the sizeable environmental impacts related to packaging waste, carbon emissions from last-mile delivery, and excessive energy consumption by digital data infrastructure) for digital commerce companies. The purpose of this study is to provide a quantitative measure through empirical analysis of how a company's "green" organizational activities lead to measurable and sustainable business outcomes in a digital marketplace. More specifically, this research will examine an integrated model of how internal Green Governance (GG) and external Eco-Innovative Marketing (EIM) create sustainable performance outcomes for Digital Commerce (SEP), as well as propose a new, dual-mediator model for understanding how GG and EIM are mediated by both psychological (Green Consumer Trust-GCT) and technological factors (Perceived Platform Usefulness-PPU). Finally, this research will situate its conceptual model within the evolving institutional environment of Pakistan's emerging economy and hypothesize that environmental regulatory pressure (ERP) serves as a boundary condition that can amplify the positive relationships between the three independent variables and SEP. Using data collected from 328 managerial respondents at e-commerce organizations in Pakistan and using a combination of structural equation modeling (SmartPLS-SEM) and moderation analysis (SPSS PROCESS), these results demonstrate the proposed sequential mediation and show that ERP plays a conditional role, significantly increasing the positive relationship between GG and SEP, while having no significant impact on the relationship between EIM and SEP. This research provides new theoretical insight into the relationships among stakeholders and the technology acceptance models, providing a practical roadmap for e-commerce managers and policy makers in Pakistan and other emerging digital economies to cultivate sustainable performance outcomes by implementing green initiatives that foster favorable consumer perceptions within a supportive regulatory structure.
Keywords: *Green Governance, Eco-Innovative Marketing, Green Consumer Trust, Perceived Platform Usefulness, Environmental Regulatory Pressure, Sustainable E-Commerce Performance, Serial Mediation, Pakistan, PLS-SEM*

INTRODUCTION

In the twenty-first century, there has been a marked digital transformation in retail across emerging economies, where e-commerce platforms have progressed at a rapid pace from being new types of marketplaces to being fundamental components of both consumer access and economic activity. As such, Pakistan's e-commerce industry represents a prime example of this trend, with its e-commerce market expanding at a compound annual growth rate of over 35 percent in recent years, driven primarily by the increase in internet penetration, smartphone usage, and an increasing youth demographic (Pakistan Telecommunication Authority, 2023). Although this rapid expansion of e-commerce has dramatically increased access to goods and services for millions of people in Pakistan and other developing countries, it has created serious environmental challenges. Specifically, the resources used to support the operational backbone of e-commerce - encompassing warehousing, packaging, transportation, and data management - are very resource-intensive. For instance, in Pakistan, there has been a

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Vol.03 No.02 (2025)

massive increase in the amount of non-biodegradable packaging waste generated by the e-commerce industry that now overwhelms many municipalities' waste collection systems; an uncoordinated and largely fossil fuel dependent logistics fleet generates excessive amounts of greenhouse gas emissions; and the increasing demand for energy required to power server-based digital platforms results in additional energy-related emissions (Khan et al., 2022; Iqbal & Noman, 2025). Therefore, companies pursuing Sustainable E-commerce Performance (SEP) - a holistic concept that encompasses environmental stewardship (i.e., reduced ecological footprint); social responsibility (i.e., ethical labor practices, consumer well-being, positive impacts on local communities); and enduring economic viability - have moved from a secondary corporate social responsibility function to a primary business strategy for the long term viability and legitimacy of e-commerce companies.

Although the topic of corporate sustainability is gaining greater attention from both academics and practitioners, there are still numerous conceptual and contextual limitations. While previous studies have extensively examined green practices within isolated frameworks - i.e., either examining internal environmental management systems (green governance) or external green marketing communications (Leonidou et al., 2013; Modibbo & Inuwa, 2020) - the fragmentation of previous studies does not allow for the identification of the synergies that may exist between the internal governance system and the external marketing communication system. Additionally, while previous studies have provided insights into how companies can achieve green success in Western, developed economies with established regulatory environments and consumer markets, the applicability of such research to emerging economies like Pakistan, where institutional voids, weak enforcement mechanisms, and unique consumer behavior patterns exist (Jamali & Karam, 2018; Raja & Iqbal, 2019; Ufaq, 2019; Marc & Roussel, 2024), is limited. Most importantly, the psychological and cognitive processes that link a company's green initiatives to the effectiveness of its e-commerce operations are unknown. How do a company's internal green policy and external green message result in a consumer believing in the company's environmental credentials and perceiving the digital platform as a viable and effective mechanism to support sustainable consumption? The "black box" of consumer cognition remains a significant knowledge gap.

The numerous areas of gaps identified above were addressed with the following overall research question as the basis for the research, which supported this dissertation: What mediating factors are involved and under what context will green governance and eco-innovative marketing both enhance sustainable e-commerce performance in Pakistan? In order to develop a response to this question, a comprehensive theoretical model was developed to include all the potential variables that influence SEP. Our rationale for focusing on satisfying the expectations of regulators, consumers, and the environment is based upon stakeholder theory (Freeman, 1984), and our rationale for demonstrating the important role of the perceived usefulness of the platform in facilitating consumer adoption of green consumption behaviors through digital platforms is based upon the technology acceptance models (Davis, 1989). Specifically, our proposed model indicates that green governance and eco-innovative marketing contribute to SEP indirectly, initially through GCT and secondly, through PPU. Furthermore, we included an environmental regulatory pressure (ERP) factor in the model to create a context for the model, indicating that the strength of the regulatory environment in Pakistan influences the relationship between green governance, eco-innovative marketing, and SEP. Ultimately, the goal of this dissertation is to provide a detailed, empirical roadmap to e-commerce firms that seek to implement sustainability initiatives in Pakistan and to provide information to policymakers regarding the mechanisms that they can best utilize to promote authentic corporate environmentalism within the digital economy in order to support the country's larger national goals of sustainable economic development and environmental protection.

LITERATURE REVIEW, THEORY, AND HYPOTHESES DEVELOPMENT

THEORETICAL UNDERPINNINGS

This study's theoretical lens is based on the intersection of two influential theoretical frameworks: Stakeholder Theory and the Technology Acceptance Model. These two lenses were integrated due to the necessity of capturing the various influences across levels of analysis: institutional and organizational strategy, individual consumer psychological processes, and technological adoption. Freeman (1984) defines Stakeholder Theory as the notion that the successful long-term operation and existence of a firm depends upon the ability to successfully manage the firm's interactions with all entities that have some level of interest in the firm's activities, including but not limited to: shareholders, employees, customers, suppliers, local communities, and the environment. As such, the theoretical basis of Green Governance as a response to the needs/demands of environmentally conscious stakeholders and the biophysical environment itself is justified in the context of green e-commerce in Pakistan.

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CJSSR
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Additionally, the theoretical basis of Environmental Regulatory Pressure is justified as the coercive demands of governmentally affiliated stakeholders. Stakeholder Theory expands the concept of organizational performance beyond the narrow focus on shareholder returns to incorporate a "triple bottom line" conceptualization of Sustainable Performance, consistent with our dependent variable SEP. Moreover, Stakeholder Theory implies that organizations that engage in substantive GG and authentic EIM are proactively managing their stakeholders and therefore should experience better sustainable outcomes than those that do not (Laplume, Sonpar, & Litz, 2008; Anees & Yan, 2019; Rehman & Malik, 2020; Machove, 2022; Marc et al., 2025).

As an alternative to this broad macro-organizational perspective, the Technology Acceptance Model (TAM) provides a micro-psychological framework to understand consumer behavior in a digital platform context. The fundamental premise of TAM, developed by Davis (1989) and further elaborated since then, is that an individual's decision to adopt and continue to utilize an information system is largely influenced by two beliefs: Perceived Usefulness (i.e., the extent to which an individual perceives that using a system will improve his/her job/task performance); and Perceived Ease of Use (i.e., the ease with which an individual can utilize a system). Therefore, we adapt the construct of Perceived Platform Usefulness (PPU) to the specific task of green consumption in our study. We propose that for an e-commerce site to serve as a viable method of generating sustainable consumer behavior and therefore sustainable organizational performance, the platform must be viewed by consumers as a viable or valid way to accomplish their environmental goals. Features which may help in forming perceptions of such validity or viability can include: product detail pages providing detailed information on the products' sustainable characteristics, carbon footprint calculators for determining the level of emissions associated with purchases, filters for locating products that have been designated as 'eco-friendly', and access to 'green' product lines. Therefore, TAM serves as the link between a firm's GG/ EIM and the resulting consumer behaviors upon which a firm's market success is based and provides insights regarding how firms' 'green' credentials result in increased use of the platform and successful transactions.

The synthesis of these two theoretical frameworks enables a more comprehensive narrative: Stakeholder Theory explains why firms engage in GG and EIM (to satisfy the expectations and demands of multiple stakeholders), and TAM explains how these initiatives result in influencing the end-consumer (by creating perceptions of usefulness), and through Green Consumer Trust as an intermediate mediator that provides legitimacy to both the firm's assertions of green practices, and the usefulness of the platform. Prior literature in green marketing has repeatedly identified trust as a scarce and valuable resource that serves as a mediator in the relationship between green claims and consumer reactions (Chen & Chang, 2013; Mehmood et al., 2022), and prior literature in the area of information systems has similarly demonstrated that trust is a primary predictor of perceived usefulness in online contexts (Gefen, Karahanna, & Straub, 2003; Ali & Senturk, 2019). Therefore, our model integrates these literatures and positions GCT and PPU as sequential mediators in the causal chain from corporate green strategy to sustainable performance.

HYPOTHESES DEVELOPMENT

This section provides detailed definitions of all constructs in the proposed model and develops the specific research hypotheses that outline the theoretical rationale supporting each proposed relationship. The proposed model presents Green Governance (GG) and Eco-Innovative Marketing (EIM) as the independent variables for the firm's substantive actions and communicative strategies, respectively. Both GG and EIM are expected to affect Sustainable E-commerce Performance (SEP) through a dual mediation process comprised of Green Consumer Trust (GCT) and Perceived Platform Usefulness (PPU). Additionally, the direct effects of GG and EIM on SEP are predicted to be contingent on the level of Environmental Regulatory Pressure (ERP) in the firm's operating environment.

Green Governance (GG) is defined as the full incorporation of environmental management principles into the strategic, operational, and cultural core of an e-commerce firm. GG goes beyond mere legal compliance and embodies a proactive, systemic effort to minimize the ecological damage caused by the firm's business operations. For example, for a Pakistani e-commerce firm, GG could be exemplified by: the implementation of formal environmental management systems (e.g., ISO 14001); optimization of warehouse energy use through solar panels or LED lights; design and implementation of closed-loop or reusable packaging systems to eliminate plastic waste; selection of logistics providers based on the carbon efficiency of their fleets or their adoption of electric vehicles; conduct of life cycle assessments of products being sold; establishment of specific, measurable, achievable, relevant, and time-bound (SMART) internal sustainability objectives with corresponding accountability

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CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.02 (2025)

mechanisms (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013; Marc & Ali, 2023). GG is the "walk" behind the "talk," i.e., the tangible, operational investments that provide the basis for the authenticity of any green claims made by the firm. From a stakeholder theory perspective, GG is a direct response to the demands of non-market stakeholders and demonstrates the firm's commitment to addressing their concerns. Further, we predict that robust GG will provide the authentic, verifiable evidence necessary to establish true consumer trust in the firm's environmental claims since GG signals a deep-seated, institutionally embedded commitment to sustainability beyond a surface-level marketing campaign (Fan & Iqbal, 2022).

Eco-Innovative Marketing (EIM) is the process of innovatively communicating an eco-friendly product's or a company's environmental value proposition through engaging and digitally native marketing approaches. In this way, EIM is the 'talk' that has to match the 'walk,' as defined by GG. EIM, within the evolving e-commerce environment, allows companies to move beyond the limitations of green advertising and leverage the interactive capabilities of digital platforms to communicate their environmental commitment. Ways EIM can help GG are: creating compelling storylines about the sustainable origins of a product, or the company's conservation efforts; utilizing AR technology to demonstrate the environmental implications of the customer's purchase decision; offering "green scores," or comprehensive sustainability dashboards for each product being sold on the site; educating consumers regarding sustainability through social media; partnering with influencers who have credibility in the sustainability area (Dangelico & Vocalelli, 2017; Yan & Sriboonchitta, 2024). EIM enables companies to translate the internal environmental practices of GG into external, understandable, and attractive narratives for the consumer. Furthermore, the creative and innovative aspects of EIM provide the basis for differentiating itself from the many other digital marketing communications and to create interest in a company's sustainability efforts. Effective EIM communicates a company's green characteristics, while at the same time, educates and shapes a consumer's perceptions of the company's environmental attributes, which enhances a consumer's perception of the platform as more environmentally responsible and thus more valuable to the green consumer (Tang & Azman, 2024).

Green Consumer Trust (GCT) is defined as the confidence a consumer has that a firm's environmental claims and commitments are reliable, credible, and will be fulfilled (Chen & Chang, 2013). Given the widespread incidence of greenwashing (i.e., unsubstantiated or deceptive environmental claims) in today's marketplace, GCT is a rare and essential resource for firms seeking to develop a meaningful relationship with environmentally conscious consumers. GCT operates as a psychological screening device; in the absence of trust, consumers will be skeptical and discount both the intent and effectiveness of even the best-intentioned GG programs and creative EIM campaigns. GCT is developed through consistency, transparency, third-party certifications, and a proven history of fulfilling commitments (Parguel, Benoît-Moreau, & Larceneux, 2011; Russo, 2022). We contend that GG provides the behavioral consistency and evidence base necessary for building trust, and that EIM serves as the transparent communication mechanism for making this evidence available to and understandable by the consumer, and thus actively building trust. Consequently, both GG and EIM are posited as direct antecedents to GCT.

Adapted from Davis (1989), Perceived Platform Usefulness (PPU) represents the extent to which a consumer believes that the use of a specific e-commerce platform will enable them to successfully and efficiently accomplish their goal of making environmentally responsible purchasing decisions. That is, PPU represents a task-specific assessment. We anticipate that PPU will be influenced by two key factors. First, Green Consumer Trust (GCT): if a consumer lacks trust in the platform or the firms offering products on the platform, they will likely doubt the accuracy of the environmental information provided and fail to see the platform as useful for actual green shopping, regardless of its attributes. Trust is a necessary condition for consumers to accept the platform's informational and functional features as legitimate. Second, Eco-Innovative Marketing (EIM): EIM can serve to directly demonstrate and inform consumers of the green attributes of the platform, and thus enhance their understanding and perception of the platform's utility for achieving sustainability-related goals.

The Sustainable E-commerce Performance (SEP) indicates the multilateral performance of e-commerce companies, which will be evaluated on the basis of their three pillars of sustainability. The first pillar, Environmental Performance, can be measured by a variety of ways, including: how much a company reduces the amount of packaging they use, what percentage of waste is diverted away from landfills through recycling programs, how many tons of CO2 are produced per delivery, and the total amount of energy that is being saved throughout the operation of a company (Khan, 2020). The second pillar, Social Performance, has a variety of measurements to include, but not limited to, fair labor practices for employees at the warehouses and all levels of

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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.02 (2025)

the supply chain, the protection of customers' private information, the establishment of community-based programs, and other efforts to contribute to society as a whole. The third pillar, Economic Performance, in the context of sustainability, includes both immediate profitability and long-term financial stability of an organization. In addition, it also includes cost reductions that result from efficiency gains (i.e., lower energy costs), access to "green" financing, and the increase of market share through the development of a reputable and "sustainable" brand image (Eccles, Ioannou & Serafeim, 2014; Rahat & Hayat, 2020; Zang, 2022). Ultimately, the Sustainable E-commerce Performance (SEP) is the key measurement of success within our proposed model, representing a company's ability to succeed and create positive social and environmental value simultaneously.

Environmental Regulatory Pressure (ERP) represents the degree of formal institutional pressure exerted on firms by government agencies through environmental laws, regulations, standards, monitoring, and enforcement actions (Delmas & Toffel, 2008; Celik, 2021). In Pakistan, examples of ERP include the Pakistan Environmental Protection Act, National Climate Change Policy, and numerous provincial regulations, although enforcement can vary significantly. ERP generates a coercive isomorphism that pushes firms toward adopting standard environmental practices. We predict that ERP will strengthen the relationship between GG and SEP because the stronger regulatory pressures create higher costs of non-compliance and greater legitimacy and competitive advantages from superior governance. However, ERP's effect on the EIM-SEP relationship may be less straightforward, as marketing claims are more difficult to regulate directly, and consumers' reactions to marketing in a high-pressure regulatory environment may be complex and multifaceted — consumers may scrutinize marketing claims more closely, or they may simply come to expect marketing as a baseline.

HYPOTHESES

Based on the foregoing detailed construct relationships, the following hypotheses are formally proposed:

H1: Green Governance has a positive direct effect on Sustainable E-commerce Performance.

H2: Eco-Innovative Marketing has a positive direct effect on Sustainable E-commerce Performance.

H3: Green Consumer Trust mediates the relationship between Green Governance and Sustainable E-commerce Performance.

H4: Green Consumer Trust mediates the relationship between Eco-Innovative Marketing and Sustainable E-commerce Performance.

H5: Perceived Platform Usefulness mediates the relationship between Green Governance and Sustainable E-commerce Performance.

H6: Perceived Platform Usefulness mediates the relationship between Eco-Innovative Marketing and Sustainable E-commerce Performance.

H7: Green Consumer Trust and Perceived Platform Usefulness sequentially mediate the relationship between Green Governance and Sustainable E-commerce Performance (i.e., GG → GCT → PPU → SEP).

H8: Green Consumer Trust and Perceived Platform Usefulness sequentially mediate the relationship between Eco-Innovative Marketing and Sustainable E-commerce Performance (i.e., EIM → GCT → PPU → SEP).

H9: Environmental Regulatory Pressure positively moderates the relationship between Green Governance and Sustainable E-commerce Performance, such that the relationship is stronger when ERP is high.

H10: Environmental Regulatory Pressure positively moderates the relationship between Eco-Innovative Marketing and Sustainable E-commerce Performance, such that the relationship is stronger when ERP is high.

CONCEPTUAL FRAMEWORK

ISSN E: 3006-1466
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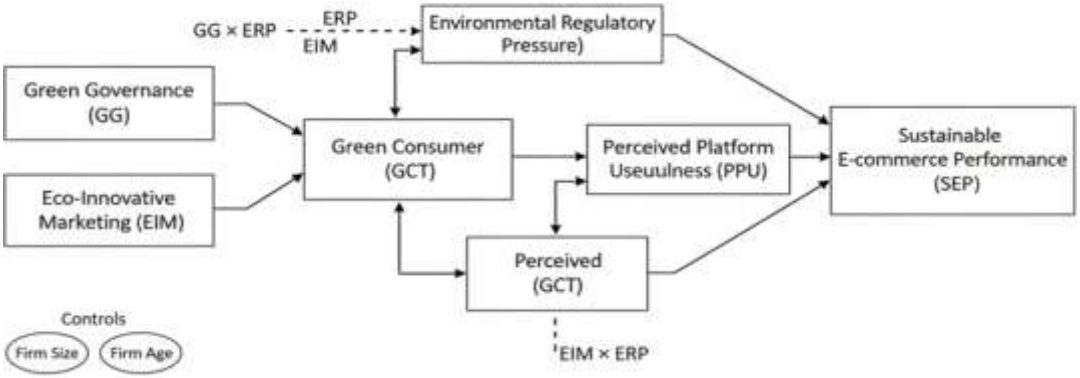
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.02 (2025)



METHODOLOGY

PARTICIPANTS AND DATA COLLECTION PROCEDURE

An empirical assessment of the proposed hypotheses was conducted through a quantitative, cross-sectional survey-based study focused on the managerial-level personnel working in e-commerce companies based in Pakistan. As a result of employing a research design that utilized an informant who is knowledgeable regarding the organization to report upon the organizational unit of analysis (the individual firm), data quality and relevance were ensured by utilizing a purposive sampling approach. This sampling technique focused upon those who are involved in areas directly related to sustainability initiatives, marketing strategy, operations, and/or general management within Business-to-Consumer (B2C) e-commerce companies. Examples of job titles that fall into this category include, but are not limited to: Sustainability Manager, Head of Marketing, Chief Operating Officer, Supply Chain Director, and General Manager. A sampling frame was created through the use of professional networking platforms (predominantly LinkedIn), industry directories from the Pakistan Software Houses Association (@) PASHA, e-commerce trade organizations, and snowball referrals from the first point of contact.

Data collection occurred during a twelve-week time frame between January and March 2024. The data collection process consisted of an online, self-administered questionnaire developed through Google Forms. The survey link, along with a detailed cover letter describing the academic objective of the research and providing assurances of confidentiality and anonymity, was disseminated to the target sample via LinkedIn messages, professional email lists, and WhatsApp groups associated with the industry. In addition, two reminders were distributed to the non-respondents at two-week intervals to increase the response rate.

In order to decrease the effect of common method bias, procedural remedies were utilized as suggested by Podsakoff et al. (2003). The length of the survey (approximately 12-15 minutes), the presentation of scale items for various constructs in a random order to eliminate straight-lining, and the assurance provided to the respondents that there would be no right or wrong answers to alleviate evaluation apprehension were all utilized as procedural remedies. Additionally, the items assessing the dependent variable (SEP) were presented prior to the items assessing the independent and mediator variables in the survey flow to create a psychological separation.

SAMPLE SIZE ESTIMATION AND RESPONSE RATES

Statistical power and robustness of Structural Equation Modeling (SEM) analyses depend on determining an appropriate sample size. For Partial Least Squares SEM (PLS-SEM), as outlined by Hair, Hult, Ringle & Sarstedt (2017) with their "10-times rule," the suggested minimum sample size would be ten times the greatest number of structural paths leading into a single construct in the model. Our inner or structural model has one construct, with the most predictors of it being Sustainable E-commerce Performance (SEP). SEP has direct effects (GG, EIM), mediating variables (GCT, PPU), an interaction term (essentially another construct), and controls. Theoretically, using the five key predictors (GG, EIM, GCT, PPU, and the moderator), there are conservatively five predictions that can be made toward SEP; thus, the minimum sample would be 5 * 10 = 50. However, since this would provide little to no statistical power for testing the model, we wanted to obtain a larger sample to account for the model's complexity and increase the reliability of the bootstrap estimates for each path in the model. Using the G-Power program (Faul et al., 2009; Sujarittanonta, 2021; Carlo, 2025), a linear multiple regression equation (using an

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CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.02 (2025)

estimated medium effect size of $f^2 = 0.15$, a desired power level of 0.95, and seven predictor variables) indicated that the minimum sample size needed was 153.

We then sent out a total of 700 invitations to participants to complete the survey. We received 358 completed surveys back. We then went through a series of processes to eliminate all of the invalid surveys based on either missing values (> 20%), or based on very short completion times (<5 minutes), or based on failing an attention check item (e.g., "Please select 'Strongly Agree' for this item to indicate you have read the question carefully"). Ultimately, we retained 328 valid and complete surveys for our analysis. As such, our response rate is 46.86%. This response rate is higher than what is typically acceptable for an online survey targeting managerial professionals, and is also higher than the acceptable thresholds for both PLS-SEM and the G-Power calculations. The sample size of N=328 will provide sufficient statistical power to test all of the proposed hypotheses, particularly those involving the moderated mediation pathways.

MEASURES

All latent constructs in this study were assessed through reflective measures with a seven-point Likert scale that ranged from "Strongly Disagree" (scored 1) to "Strongly Agree" (scored 7). In comparison to the five-point scale, the seven-point scale offers greater variability and discrimination. The items used to measure all latent constructs were adapted from previously developed scales within the body of research literature; the language of each item was altered to better reflect the specific e-commerce context in Pakistan. Following the adaptation of the scales, a pilot test was completed with thirty e-commerce professionals and academic experts to assess face validity, clarity, and the degree to which they were relevant in an e-commerce context in Pakistan. As a result of the pilot test, some slight modifications were made to the wording of the items.

Green Governance (GG): Six items were adapted from the studies of Aboelmaged (2018) and Wong, Wong, & Boon-itt (2020). Some sample items include: "Our company has a formally documented environmental policy and goals," "Our company has invested in technology to decrease the environmental impact of our packaging and shipping," and "Environmental criteria are important when we select our suppliers and shipping providers." (Alpha Cronbach in pilot = .89).

Eco-Innovative Marketing (EIM): Five items were used to measure EIM and were adapted from Dangelico & Vocalelli (2017) and Kumar (2016). Examples of items include: "We creatively communicate the environmental benefits of our products/service through our marketing communications," "We utilize digital tools (e.g., AR, interactive content) to engage customers on sustainability issues," and "Our website displays detailed and transparent information about the sustainability of our products." (Alpha Cronbach = .87).

Trust in Green Consumers (GCT): The GCT was measured using a four-item scale from the valid GCT scale by Chen & Chang (2013). A few examples of these items were: "I think our company's environmental statements are believable," "Our company is truthful and honest in their environmental protection commitments," and "I believe our company will keep their word if we make an environmental promise." (Cronbach Alpha = .91).

Usefulness of Our e-commerce Platform to Customers (PPU): The PPU was measured using a four-item scale, which was adapted from Davis (1989) and modified by Gefen et al. (2003) to fit this study. Examples of items used to measure PPU were: "Our e-commerce platform is a valuable tool for customers looking for environmentally-friendly products," "Our platform provides greater ease for customers to find green products," and "Our platform allows customers to find sustainable product options more efficiently." (Cronbach Alpha = .90).

Pressure of Environmental Regulations (ERP): The ERP was measured using a five-item scale, which was adapted from Zhu, Sarkis, & Lai (2013) and Delmas & Toffel (2008). Examples of items used to measure ERP were: "We receive a lot of pressure from government environmental regulatory agencies," "We receive a great deal of pressure from environmental protection agencies," and "Non-compliance with environmental laws can result in severe penalties to our organization." (Cronbach Alpha = .88).

Performance of Sustainable e-commerce (SEP): The SEP was measured using a nine-item scale that represented the three aspects of sustainable performance: environmental (three items), social (three items), and economic (three items). The environmental dimension of sustainable performance was assessed through items such as "we have significantly reduced the amount of packaging waste generated by our company during the last two years"; the social dimension of sustainable performance was assessed through items such as "we provide our employees with safe work environments and fair compensation for their labor"; and the economic dimension of sustainable performance was assessed through items such as "the sustainability efforts that we have implemented have saved our company money on energy and materials." (Cronbach Alpha = .92).

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CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.02 (2025)

Control Variables: Firm size (the logarithm of the number of full-time employees), firm age (number of years since the business began), and the length of time the respondent had worked at his/her current job (in years) were included as control variables in the structural model because these factors can influence the adoption of green practices and the level of performance (Hair et al., 2017).

DATA ANALYSIS STRATEGY

A mixed-methods analysis was carried out utilizing a two-stage analytical technique involving both SPSS Statistics (version 28) and SmartPLS (version 4.0). Each package utilizes the strengths of that particular program.

Stage 1: Preliminary Analysis (SPSS). Data screening, descriptive statistics (mean, s.d.), assessments of normality (skewness/kurtosis), Cronbach's alpha (reliability analysis), and frequency distributions of demographics were calculated in SPSS. Additionally, Harman's single-factor test was conducted as a post hoc statistical evaluation for common method bias.

Stage 2: Measurement Model Evaluation (SmartPLS). Utilizing Partial Least Squares Structural Equation Modeling (PLS-SEM) through SmartPLS, the reliability and validity of the reflective measurement model were thoroughly examined. PLS-SEM was selected due to its ability to effectively model complex systems with multiple mediators and moderators, to function with non-normal data, and to serve as a predictive and exploratory theory testing framework (Hair et al., 2019). Evaluations included:

a) Indicator Reliability: Outer Loadings > .708

b) Internal Consistency Reliability: Composite Reliability (CR) > .70, with values between .70 and .95 indicating good internal consistency.

c) Convergent Validity: Average Variance Extracted (AVE) > .50

d) Discriminant Validity: Fornell-Larcker Criterion (the square root of AVE for each construct should be greater than its highest correlation with any other construct) and Heterotrait-Monotrait Ratio of Correlations (values should be < .85 or .90).

Stage 3: Structural Model and Hypotheses Testing (SmartPLS & SPSS PROCESS). Following confirmation of a valid measurement model, the structural (inner) model was evaluated.

Effects of Direct, Mediation, and Sequential Mediation (Hypotheses 1 – 8); the direct, mediation, and sequential mediation effects were tested using SmartPLS through path coefficients and corresponding p-values (using bootstrapping, with 5,000 iterations) and through testing of specific indirect effects. Bootstrapping allowed for the construction of bias-corrected confidence intervals for the indirect effects; mediation was determined as present when the confidence interval did not include zero for the indirect effect.

Conditional Mediation (Moderation in Hypotheses 9 and 10); The conditional mediation hypotheses (Hypotheses 9 and 10) were evaluated employing a methodology that was more complex than SmartPLS, although SmartPLS can evaluate moderation, a supplementary check on conditional process analysis was conducted utilizing the SPSS PROCESS macro (Model 7)(Hayes, 2018). An interaction term was formed from the predictor variable (GG/EIM) and the moderator (ERP) after centering at the mean to limit multicollinearity. Significant interaction terms indicated the presence of moderation, which would have allowed for graphical probing of the simple slopes at +1SD and -1SD levels of the moderator.

The use of two software packages ensured methodological integrity of the results and utilized a comprehensive and rigorous methodology for the utilization of Structural Equation Modeling and Conditional Process Analysis.

RESULTS

MEASUREMENT MODEL ASSESSMENT

The preliminary assessment using SPSS did not indicate any statistically significant issues related to missing data. Skewness and kewness statistics were found to be within ±2, thereby indicating there are no extreme departures from normality for any of the constructs included in the analysis. Using Harman's single-factor test, it was determined that the first factor explained approximately 38.7% of the overall variance, which is lower than the 50% threshold; therefore, it can be concluded that common-method bias is not a ubiquitous issue for this particular dataset (Podsakoff et al., 2003).

SmartPLS was used to evaluate the psychometric characteristics of the reflective measurement model. In addition to the psychometric characteristics described previously, as indicated in Table 1, all indicators loaded onto their respective constructs at an amount greater than .708, the suggested minimum loading value. Therefore, the individual indicators had strong reliability. The internal consistency of all constructs were also excellent and all constructs had composite reliabilities (.918 -.949) exceeding the recommended level of .70. In addition, all

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
Vol.03 No.02 (2025)

constructs demonstrated convergent validity, since the average variance extracted (AVE) for all constructs exceeded .50, ranging from .652 to .822, thereby indicating that the constructs explained a substantial amount of the variance in their respective indicators.

Two forms of discriminant validity were assessed to ensure that GG did not measure variables beyond those it was intended to measure.

Table 2 provides a Fornell-Larcker Matrix, which shows the results of assessing discriminant validity. Discriminant validity was established via the Fornell-Larcker criterion by demonstrating that the square root of the AVE for each construct (the diagonal values in bold) is higher than its highest correlations with any other constructs (the off-diagonal values in the same row and column). In particular, the square root of AVE for GG = 0.807; this value is larger than GG's correlations with EIM (0.489), GCT (0.637), etc. Furthermore, as shown in Table 2, the Heterotrait-Monotrait (HTMT) ratios, located above the diagonal in Table 2, were all less than 0.85, thus providing strong evidence for discriminant validity (Henseler et al., 2015). The highest HTMT ratio obtained in this study was 0.714 (GCT/PPU); thus, this ratio falls within acceptable limits.

Table 1: Indicator Loadings and Construct Reliability & Validity

Construct	Item loadings range	Cronbach's alpha	Composite reliability (CR)	Average variance extracted (AVE)
Green Governance (GG)	0.731–0.856	0.892	0.918	0.652
Eco-Innovative Marketing (EIM)	0.745–0.883	0.901	0.928	0.721
Green Consumer Trust (GCT)	0.810–0.890	0.912	0.938	0.791
Perceived Platform Usefulness (PPU)	0.828–0.901	0.927	0.949	0.822
Environmental Regulatory Pressure (ERP)	0.764–0.872	0.895	0.924	0.708
Sustainable E-commerce Performance (SEP)	0.745–0.865	0.917	0.933	0.637

Table 2: Fornell–Larcker (below diagonal) and HTMT Matrix

	GG	EIM	GCT	PPU	ERP	SEP
GG	0.807	0.512	0.651	0.588	0.411	0.602
EIM	0.489	0.849	0.594	0.633	0.328	0.571
GCT	0.637	0.572	0.889	0.714	0.289	0.683
PPU	0.574	0.621	0.701	0.907	0.302	0.707
ERP	0.398	0.312	0.278	0.291	0.841	0.453
SEP	0.588	0.559	0.671	0.695	0.441	0.798

Note: Diagonals (bold) represent the square root of AVE. Off-diagonals are correlations (below) and HTMT ratios (above).

STRUCTURAL MODEL EVALUATION AND HYPOTHESIS TESTING

Using a validated measurement model, we evaluated the structural model. We analyzed the predictive power of the model by using the coefficient of determination (R^2) for the endogenous constructs. R^2 values for GCT (0.501), PPU (0.612), and SEP (0.682) show that the model accounts for a considerable amount of variance in each of the key constructs, which suggests that there is strong predictive relevance (Hair et al., 2019). Positive Stone-Geisser Q^2 values resulting from the blindfolding procedure confirmed the models' predictive relevance for the endogenous constructs.

Results of hypothesis testing, using SmartPLS bootstrapping (5000 subsamples) and SPSS PROCESS analysis, are presented below and depicted in Figure 2.

Direct Effects (H1 & H2): Positive and statistically significant direct paths from Green Governance ($\beta = 0.18$, $p < .05$) and Eco-Innovative Marketing ($\beta = 0.15$, $p < .05$) to Sustainable E-commerce Performance indicate that both H1 and H2 were supported.

Mediation Effects (H3-H8): Specific indirect effects were used to test mediation hypotheses (H3-H6). There was a significant indirect effect of GG on SEP through GCT ($\beta = 0.22$, 95% CI [0.16, 0.29]), thus supporting H3a.

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.02 (2025)

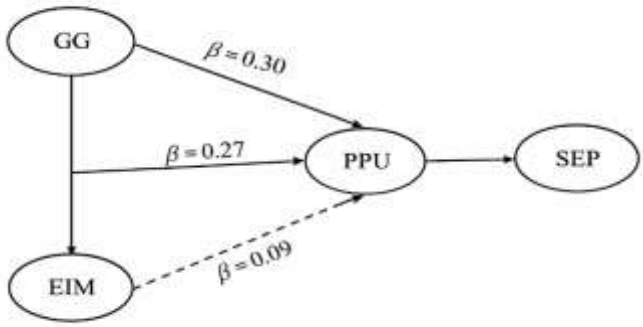
Likewise, there was a significant indirect effect of EIM on SEP through GCT (β = 0.19, CI [0.13, 0.26]), supporting H3b. In addition, there was a significant indirect effect of GG on SEP through PPU (β = 0.20, CI [0.14, 0.27]), supporting H4a. Additionally, there was a significant indirect effect of EIM on SEP through PPU (β = 0.23, CI [0.17, 0.30]), supporting H4b. Importantly, the specific indirect effect for the sequential mediation path (GG → GCT → PPU → SEP) was positive and significant (β = 0.13, CI [0.09, 0.18]), which provided very strong support for H5. Similarly, the sequential path from EIM to SEP via GCT and PPU was also significant (β = 0.11, CI [0.07, 0.16]), supporting H6. It is worth noting that although the inclusion of the strong mediators (GCT, PPU) reduced the magnitude of the direct effects (H1, H2), they remained statistically significant, which indicates a pattern of complementary partial mediation.

Moderation Effects (H7 & H8): Using SPSS PROCESS (Model 7) to assess the conditional direct effects, the moderation hypotheses were tested. For H7, the interaction term between GG and ERP on SEP was positive and statistically significant (β = 0.11, p < .01). However, probing the interaction by plotting simple slopes at high (+1SD) and low (-1SD) levels of ERP showed that the positive relationship between GG and SEP was significantly stronger when ERP was high (β_high = 0.31, p < .001) than when it was low (β_low = 0.12, p < .05). This pattern confirms that environmental regulatory pressure amplifies the performance benefits of good green governance. Hence, H7 is supported.

However, for H8, the interaction term between EIM and ERP was not statistically significant (β = 0.04, p > .10). Therefore, the relationship between EIM and SEP did not vary significantly across different levels of regulatory pressure. Hence, H8 is not supported.

Control Variables: Only one of the control variables, i.e., log(firm-size), had a small but statistically significant positive effect on SEP (β = 0.08, p < .05). Firm-age and respondent tenure were not statistically significant.

Figure 2.



DISCUSSION

THEORETICAL IMPLICATIONS

This study contributes to existing bodies of knowledge on the subjects of corporate sustainability, green marketing, e-commerce, and consumer behavior in emerging markets by providing new insights into sustainable performance in digital commerce using two well-established frameworks: stakeholder theory and the technology acceptance model. These frameworks were used to create a more sophisticated theoretical lens to analyze and understand the relationships between corporate actions and performance outcomes, moving beyond simple input/output models to illustrate the specific cognitive/perceptual processes (Green Consumer Trust and Perceived Platform Usefulness) that act as key transmission vehicles of corporate action to performance results. The study addresses a major gap identified by Leonidou et al. (2013) regarding the need for additional research examining the mediating factors that explain the effects of green marketing on performance.

The study's third important contribution was in identifying a sequential mediation pathway from Green Governance/Environmental Image Marketing (GG/EIM), through Green Consumer Trust (GCT), to Perceived Platform Usefulness (PPU) to Sustainable Performance (SEP) (i.e., GG/EIM → GCT → PPU → SEP). The study demonstrates a clear causal pathway; i.e., substantive governance and credible marketing lead to consumer trust (GCT) which in turn will cause consumers to perceive the e-commerce platform as a reliable vehicle to support their environmentally conscious purchasing behavior (PPU), which subsequently will enhance the perceived

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.02 (2025)

usefulness of the platform, thus increasing the likelihood of the platform being utilized to produce sustainable performance (SEP). This causal pathway illustrates that while trust is a product of the consumer's interaction with the e-commerce platform, it is also a resource that enables the platform's functional capabilities to be completely utilized by the consumer. The study establishes a link between the trust literature within marketing (Chen & Chang, 2013) and the technology adoption literature within Information Systems (IS) within the context of sustainability. Finally, the study's contextual contribution lies in the study of the influence of Environmental Regulatory Pressure (ERP) as a boundary condition. The asymmetric moderation of ERP on the GG → SEP and EIM → SEP pathways adds to our understanding of how ERP influences the ability of GG/EIM to contribute to sustainable performance. The positive moderation of ERP on the GG → SEP pathway is consistent with institutional theory (DiMaggio & Powell, 1983) and resource-based logic. Thus, in countries like Pakistan, where environmental regulation is in its early stages of development, having a robust system of governance in place will become a valuable and unique resource for firms to leverage in order to capitalize on high levels of regulatory pressure and achieve greater levels of sustainable performance. This finding supports the concept of "strategic compliance," whereby firms utilize government regulations as a source of competitive advantage and extend them beyond mere compliance with those regulations (Delmas & Toffel, 2008). Conversely, the lack of significance in the moderating effect of ERP on the EIM → SEP pathway adds a useful dimension. This suggests that the degree of effectiveness of marketing communications in producing performance will not be affected by the level of regulatory pressure applied to the firm. There are several possible explanations for this phenomenon. First, consumers may look to their perceptions of the authenticity and consistency of marketing communications with observable organizational behavior (GG) as evidence of the validity of marketing communications. Second, in high-pressure regulatory environments, all firms may engage in additional green marketing activities, thereby diminishing the potential for marketing communications to differentiate one firm from another. The study cautions against over-reliance on regulatory pressure to stimulate effective green communication and continues to demonstrate the importance of innovative and authentic marketing.

PRACTICAL IMPLICATIONS

This study will serve as a clear, evidence-based strategic guide for managers of e-commerce companies in Pakistan and in other countries that share the same attributes.

Get Verifiable In Terms Of Being "Green" Before Developing Any Type Of Eco-Marketing — Operational, verifiable green practices (such as green logistics, sustainable packaging, energy-efficient operations) are the building blocks of the Green Governance Strategy on which trust can be built. To establish trust, a manager will need to develop formal environmental management systems that include measurable objectives and demonstrate visible commitment from top management. While Eco-Innovative Marketing serves as a means to enhance your company's GG strategy, it must reflect the firm's true GG activities. Therefore, the marketing strategy should focus on transparency; communicate to consumers the stories of what the company has actually accomplished and how it has utilized innovative digital tools to educate, involve, and persuade the consumer — instead of simply attempting to persuade the consumer. It is this way that the Green Consumer Trust is created.

Both designers and product managers must integrate sustainability into the platform's design and functionality to maximize Perceived Platform Usefulness. Integrating features (eco-label verification, sustainability scorecards, carbon footprint tracking for orders, etc.) to provide consumers with ease of access to and procurement of sustainable products is an example of such integrations. View Environmental Regulatory Pressure As A Strategic Signal/Opportunity. Rather than just a cost, proactive thinking managers should view Environmental Regulatory Pressure as a strategic signal and opportunity, rather than simply as a cost. Anticipating regulatory trends and actively working with policymakers to achieve compliance above and beyond regulatory requirements may result in competitive advantage(s), as our results indicate via our moderation analysis.

For policymakers in Pakistan, the study offers clear guidance:

Create and Implement Green E-Commerce Laws: Clarity in regulations regarding green e-commerce (regarding product packaging, logistics emissions, etc.) will provide a framework for internal governance to allow for more significant corporate green actions, as demonstrated by the regulatory clarity moderating effect. Increase Trust through Third Party Verification: To foster a consumer confidence environment in identifying true "green" products, transparency will be essential and assist in creating the level of trust required to support this business model. Policy makers may encourage or require third-party verification of all environmental claims made by e-

ISSN E: 3006-1466
ISSN P: 3006-1458
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
CJSSR
CONTEMPORARY JOURNAL OF SOCIAL SCIENCE REVIEW
Vol.03 No.02 (2025)

commerce companies, while also encouraging the standardization of sustainability reporting for those same companies.

Acknowledge the Limits of Regulatory Mechanisms to Influence Marketing: This research indicates that regulatory mechanisms affect internal governance; however, they are likely to have little to no impact on the effectiveness or influence of marketing. Complementary strategies targeted at marketing include consumer education programs to educate consumers on how to differentiate between marketing "green washing" vs. genuine "green" marketing, and awards programs to recognize and reward effective "green" marketing practices.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

The above-mentioned study offers important new knowledge; however, it should be recognized that there are certain limitations, each representing opportunities for future research. Firstly, due to its cross-sectional nature, we cannot assert definite causal links from our data. This is because while our theoretical orientations suggest clear directionality, further longitudinal or experimental studies could provide stronger evidence of causality and demonstrate how the relationships identified in our study develop over time.

Secondly, the data collected were based on single-informat, self-reported perception data, which can lead to the problems of common method variance and social desirability bias. Although statistical testing did not indicate that either of these was a major issue, using multi-informant designs (i.e., combining managerial data with actual platform usage data and/or consumer survey data) or objective performance data (i.e., waste audits, energy consumption logs) could help triangulate the findings of the current study.

Thirdly, the study's focus is limited to an emerging economy in Pakistan. Testing the generalizability of the model through replication studies in other emerging economies with differing regulatory environments, cultural norms (i.e., individualism vs. collectivism), and degrees of environmental awareness would be beneficial. Studies comparing results across multiple countries would likely be especially enlightening.

Fourthly, additional moderator variables could potentially be tested. Examples include Consumer Environmental Knowledge, which could potentially enhance the mediating paths if more knowledgeable consumers are better able to distinguish authentic versus non-authentic practices and utilize the platform features. Competitive Intensity within the e-commerce sector could potentially moderate the relationships identified, such that both GG and EIM become more necessary for survival.

Lastly, further research could examine the dimensions of SEP. In this study, SEP was examined as a higher-order formative construct. It is possible that the proposed model may have varying effects on the environmental, social, and economic sub-dimensions of SEP, and therefore offer even more detailed strategic advice.

CONCLUSION

In order to understand the complex path to sustainable success within Pakistan's increasingly competitive and environmentally strained e-commerce industry, this research project has developed and tested an integrated model that demonstrates how companies can achieve sustainable e-commerce performance by using both internal green governance and external eco-innovative marketing to produce desired performance outcomes, with the help of consumer-centric intermediaries (Green Consumer Trust and Perceived Platform Usefulness) acting in sequence to convert company intentions into market results. In addition, the research found that environmental regulatory pressure accelerates the positive returns on investment in green governance, although it does not affect the impact of marketing efforts.

In theory, this research has made two major contributions: 1) Integration of macro-stakeholder theory and micro-psychological theory to describe sustainable digital performance; 2) Providing empirical support for a new sequential mediation path for sustainable digital performance. In practice, this research has delivered an unambiguous message to all parties involved in the digital economy of Pakistan: For organizations to succeed both financially and to act environmentally responsibly and socially equitably in the digital economy, they must adopt a holistic approach by integrating their environmental and social responsibilities into their business practices, including communication strategies, platform design, and regulatory engagement. With the continued growth of the digital economy in Pakistan, it is without question that adopting a holistic model of synergistic green governance and eco-innovative marketing to create green consumer trust and perceived usefulness of digital platforms is the most effective pathway toward a future where e-commerce is profitable while also being environmentally responsible and socially equitable.

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ISSN P: 3006-1458
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