

CORPORATE SOCIAL RESPONSIBILITY IN LINKING GREEN FINANCE, DIGITALIZATION, AND SUSTAINABLE BUSINESS PERFORMANCE OF SMES IN EMERGING ECONOMIES

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ABSTRACT

This study investigates the role of Corporate Social Responsibility (CSR) in linking Green Finance, Digitalization, and Sustainable Business Performance (SBP) among Small and Medium Enterprises (SMEs) in emerging economies like Pakistan. It examines in depth the direct and mediating relationships among the selected variables green finance, digitalization, CSR, and SBP, with a clear focus on how the combined effect of these factors can boost the sustainability and distinct competitiveness of SMEs. In order to collect data from 250 SMEs, the research used a structured questionnaire survey from different targeted sectors. The main focus was to test direct and indirect relations among all selected variables; we used structural equation modelling (PLS-SEM) with SmartPLS-4 and the Statistical Package for the Social Sciences (SPSS). The outcomes point out that green finance has a positive influence on CSR, but it does not have a direct, noteworthy impact on sustainable business performance. Digitalization to some extent, has a stronger positive influence on both CSR and SBP, emphasizing its critical role in refining operational efficiency and market competitiveness. CSR was found out to be important factor in improving CSR practices, but did not markedly mediate the relationship between green finance, digitalization, and SBP. These results suggest that while green finance and digitalization are key drivers of sustainability in SMEs, the combination of CSR practices requires further development to translate these practices into measurable financial outcomes. In this study, an impactful contribution has been made to the literature on sustainable business practices in SMEs, giving powerful insights and advice for SME owners, policymakers, and financial institutions to enhance sustainability through better integration of green finance, digital tools, and CSR. Above all, this research work supports the Sustainable Development Goals of the United Nations' 2030 Agenda for Sustainable Development.

Keywords: Digitalization, green finance, CSR activities, sustainable business performance, SMEs, PLS-SEM

1. INTRODUCTION

In this contemporary business world, small and medium enterprises are actively making their commanding position in the global market (Al-Omush et al., 2023). SMEs are widely considered important contributors to employment, innovation, competitiveness, and economic development (Ye & Dela, 2023). In developing economies, SMEs are notably important because they are working as

generators, such as supporting income generation, creating opportunities for entrepreneurship, and local industrial growth. However, SMEs are also actively facing immense pressure to upgrade their environmental, social, and economic performance (Rehman et al., 2023). So about 90% of firms are attributed to SMEs and also help in generating 50% of employment in the global market, as explained in the considered literature, which points to

their strong economic role and their importance in sustainable development discussions (Al-Omush et al., 2023; Ye & Dela, 2023). Environmental decline is linked with air emissions, resource depletion, harmful materials, water pollution, climate change, and energy consumption, which makes sustainability a major concern for firms and policymakers (Rehman et al., 2023).

The study mainly focuses on Corporate Social Responsibility in Linking Green Finance, Digitalization, and Sustainable Performance of SMEs (Abidin et al., 2025; Wang et al., 2023). Taken as selected independent variables are Green finance and digitalization because they provide financial and technological support for sustainability (Khababa & Jalingo, 2023). And taken as selected dependent variable is Sustainable business performance, because it reflects the economic, environmental, and social outcomes of SMEs (Abidin et al., 2025; Costa Melo et al., 2023).

Strong pressure has been placed on firms by the global sustainability agenda to align their activities with the Sustainable Development Goals (Al-Omush et al., 2023), emphasizing environmental protection and accountable business conduct that ensures goodwill for the company. Firms are expected to integrate environmental, social, and governance in their strategies (Al-Omush et al., 2023). Sustainable performance requires businesses to create longer-term value while minimizing adverse effects on society and the natural environment (Ye & Dela, 2023).

It is extensively stated in the literature that a firm's ability is linked to attaining lifelong success in terms of sustainability while lessening its harsh environmental and social impact (Abidin et al., 2025). It also connects sustainable performance with ESG-related risks and opportunities, stakeholder value, and responsible decision-making. For SMEs, the pressure they face is significant because they often operate with limited resources yet collectively have a lasting impact on employment, production, innovation, and local economies.

A broader framework for sustainability-oriented business practices is devised by the Sustainable Development Goals. The green finance literature links SME sustainability and green

finance with SDG 13, climate action, by explaining how SMEs can use green finance to improve sustainability performance and environmentally responsible practices. Therefore, SMEs are increasingly expected to adopt green finance, digitalization, and CSR practices to support sustainable development.

2. LITERATURE REVIEW

2.1 Green Finance: Definition, Instruments, Relevance to SMEs

Green finance refers to financial products, services, and investment mechanisms that support environmentally responsible projects and sustainable business activities (Khababa & Jalingo, 2023). It contains financial support for renewable energy, energy efficiency, cleaner production, green technologies, waste reduction, and activities that help lessen environmental damage. It also describes that green finance contains instruments such as green bonds, green loans, green equity, microfinance, sustainable funds, active ownership, and credits for sustainable development. These mechanisms provide funding for environmentally friendly projects and businesses.

Green finance is relatable for SMEs because many SMEs face hurdles in financing sustainable investments (Ye & Dela, 2023). Restricted financial resources can hinder SMEs from adopting cleaner technologies, improving energy efficiency, or implementing environmental management practices. Green finance helps SMEs by guiding them on how to invest in environmentally friendly projects and improve long-term business viability (Khababa & Jalingo, 2023). It can also enhance unique competitiveness by guiding firms on how to reduce waste, boost energy efficiency, and meet stakeholder expectations.

2.2 Digitalization and SME Competitiveness: Fintech, Cloud, E-commerce

Digitalization refers to the use of digital technologies to improve business processes. Digitalization is endorsed to use different digital technologies, communications, operations, innovations, and decision-making (Bensalem et al., 2024; Raihan, 2024). For SMEs, digitalization can improve competitiveness by reducing costs, increasing flexibility, improving

customer engagement, supporting market access, and strengthening operational efficiency (Al-Omush et al., 2023). The digitalization literature elaborates that digital transformation has drastically changed business procedures, way of working, and organizational culture.

Digital tools that are relevant and may help in process ease for SMEs include cloud computing, big data expert analysis, artificial intelligence, digital platforms, e-commerce, e-banking, online communication, customer engagement tools, electronic records, business intelligence systems, and decision support tools (Raihan, 2024). Digitalization is also connected side by side with sustainability because digital tools can support real-time data, refine resource monitoring, strengthen decision making, and reduce operational inefficiencies (Raihan, 2024). Therefore, digitalization can help SMEs to improve sustainable business performance when it is implemented strategically and responsibly.

2.3 Corporate Social Responsibility in SMEs: From Compliance to Strategy

Corporate Social Responsibility alludes to the responsibility of firms to act ethically, protect the environment, contribute to society, and respond to stakeholder expectations (Rehman et al., 2023; Wang et al., 2023). In SMEs, CSR may begin as compliance with social and environmental expectations, but it can become a strategic practice when it is integrated into business decisions (Ashfaq, Akhtar, Akhlaq, et al., 2026). The CSR literature elaborated that firms have the selling rights of products, but they also have an accountability to sell products ethically (Ashfaq, Akhtar, Akhlaq, et al., 2026). It further stated that CSR has become a progressively important business practice because environmental concerns are growing worldwide (Ashfaq, Akhtar, & Ullah, 2026). These practices are also important for SMEs because SMEs usually face resource constraints and may struggle to maintain performance without responsible practices.

In this study, CSR is important because it acts as the link between green finance, digitalization, and sustainable business performance. Green finance contributes financial resources, and digitalization provides technological capabilities. CSR helps in leading these resources towards social responsibility, environmental protection,

employee welfare, community benefit, and stakeholder trust (Ashfaq, Akhtar, Akhlaq, et al., 2026). In this way, CSR is not only a social activity but also a whole mechanism for enhancing sustainable performance.

2.4 Sustainable Business Performance of SMEs: TBL Perspective

Sustainable business performance is defined as a firm's ability to achieve long-term economic success while also safeguarding the environment and contributing to society (Costa Melo et al., 2023). It is generally described through the Triple Bottom Line perspective, which includes economic, environmental, and social performance (Abidin et al., 2025). The literature explains that the Triple Bottom Line goes beyond financial performance and contains social, environmental, and economic dimensions (Costa Melo et al., 2023). It also puts light on the fact that business success should not be linked only to profitability but also to the firm's influence on society, the environment, and long-term sustainability (Abidin et al., 2025).

For SMEs, economic performance mainly focuses on profitability, growth, productivity, and cost efficiency (Raihan, 2024). Environmental performance may include energy efficiency, waste reduction, emissions control, and responsible resource use (Shamim Akhtar et al., 2024). Therefore, sustainable business performance in this study is understood as the ability of SMEs to balance financial success, environmental responsibility, and social contribution (Shamim Akhtar et al., 2024).

2.5 SME Sector in Pakistan: Economic Role, SBP & SMEDA Green Initiatives

Pakistan provides an important context for this study, as the country is emerging in the business aspect, and SMEs play a pivotal role in the country's economy, employment, and business activity (Hissan et al., 2024). The Pakistan-based SME digitalization study states that more than 90% of SMEs in Pakistan make this sector highly important, but research on digitalization in this sector remains limited. It also explains that SMEs in Pakistan need digital capabilities to innovate their business models and improve performance (Akhtar et al., 2023).

The Pakistani SME environment is described as volatile, where firms having advanced technologies and digital skills are much anticipated to outperform others. The considered Pakistan-based study advised that government officials should promote effective digitalization strategies among SMEs. It also states that SMEDA should arrange training campaigns and awareness courses about digitalization and digital culture, and provide technological support to SMEs while digitizing business operations (Ashfaq, Akhtar, Akhlaq, et al., 2026).

2.6 Research Gap: Lack of Empirical Evidence on CSR as Link between GF, Digitalization → SBP in SMEs

The literature shows that green finance, digitalization, CSR, and sustainable performance have been studied in different contexts, but their combined relationship still needs further research in SMEs (Bilal et al., 2024). Some studies examine green finance and sustainable performance, while others examine digitalization and sustainable competitive performance (Bensalem et al., 2024). However, only a few studies integrate green finance and digitalization as independent variables, CSR as a mediating variable, and sustainable business performance as the dependent variable in one SME based model (Butt et al., 2025).

However, the digitalization literature points out that research on digitalization and sustainable competitive performance in emerging SMEs remains limited; more research needs to be done. The Pakistan-based SME study states that most research on digitalization and firm performance has been conducted in developed markets and large firms, while the role of digitalization in emerging SMEs remains underexplored.

Thus, the study grasps an important gap by testing out how CSR links green finance and digitalization with sustainable business performance in SMEs, especially in emerging economies. It also responds to the need for more evidence from Pakistan, where SMEs need stronger access to green finance, digital capabilities, and responsible business practices.

3. THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

3.1 Theoretical Framework

The theoretical foundation stands on Stakeholder Theory, Resource-Based View, Institutional Theory, Legitimacy Theory, Natural Resource-Based View, and Dynamic Capabilities Theory.

Stakeholder Theory describes that firms must consider the high expectations of different stakeholders, including owners, employees, customers, communities, regulators, investors, and society (Wang et al., 2023). Green finance and digitalization may provide financial and technological resources, but only when CSR helps SMEs align these resources with stakeholder expectations. Therefore, CSR is treated as a linking mechanism between green finance, digitalization, and sustainable business performance.

The Resource-Based View describes that firms achieve better performance when they possess valuable resources and capabilities (Abidin et al., 2025). In this study, green finance and digitalization are considered strategic resources. Green finance gives SMEs access to financial support for sustainable projects, while digitalization provides technological capability for innovation, efficiency, and competitiveness. Digital strategy and digital capability collectively support long-term success and sustainable competitive performance (S Akhtar et al., 2024; Hardin, 1974). The RBV is suited best for this study because SMEs often face resource limitations (Brown et al., 1975).

Institutional Theory elaborates that firms adopt practices because of pressure from external institutions such as governments, regulators, financial institutions, customers, competitors, and society (Duarte & Amaro, 2018). Institutional pressure encourages firms to adopt green finance, digitalization, CSR, and sustainability reporting, as explained in sustainability research. Literature supports the broader argument that institutional support and regulatory pressure are important for SME sustainability (Hassan et al., 2023).

Legitimacy Theory suggests that society expects firms to act in order to maintain their trust, reputation, and acceptance. Firms actively adopt CSR and sustainability practices to show that their operations are socially acceptable and

environmentally responsible. It also states that as CSR becomes more important, if there is an increasing demand for transparency and information sharing about sustainability performance (Khurshid et al., 2022). Legitimacy Theory backs the role of CSR. Green finance and digitalization may improve resources and operations, but CSR helps SMEs demonstrate ethical behavior, social responsibility, and environmental care (Majewski et al., 2022). This strengthens the legitimacy of SMEs in the eyes of stakeholders.

The view of NRBV theory is extended by focusing on environmental resources and capabilities. It explains that firms can gain a sustainable advantage by reducing pollution, protecting natural resources, and developing environmental capabilities. NRBV is used to measure sustainable performance through environmental resources and capabilities. This study is guided by NRBV because green finance facilitates SMEs to fund environmental projects, digitalization guides better resource monitoring and efficiency, and CSR guides firms to act

accordingly toward the environment and society (Pesaran et al., 2001).

Dynamic Capabilities Theory explains how firms adapt, integrate, and restructure internal and external resources in changing environments. This theory is essential for SMEs to grasp the patterns because they often operate in uncertain markets and must constantly upgrade their capabilities. Al-Omush et al. (2023) used the Dynamic Capabilities Theory to explain the role of digital strategy, digital capability, and digital culture in achieving sustainable competitive performance. The study defines dynamic capabilities as the ability of a firm to integrate, build, and reconfigure internal and external competences to respond to rapidly changing environments (Frimpong et al., 2026). This theory backs the digitalization aspect of the modern-day study.

The conceptual framework contains green finance and digitalization as two independent variables, corporate social responsibility as one mediating variable, and the sustainable business performance of SMEs. The framework consists of five direct and two mediation paths:

Direct paths:

- Green Finance → Sustainable Business Performance
- Digitalization → Sustainable Business Performance
- Green Finance → Corporate Social Responsibility
- Digitalization → Corporate Social Responsibility
- Corporate Social Responsibility → Sustainable Business Performance

Mediation paths:

- Green Finance → Corporate Social Responsibility → Sustainable Business Performance
- Digitalization → Corporate Social Responsibility → Sustainable Business Performance

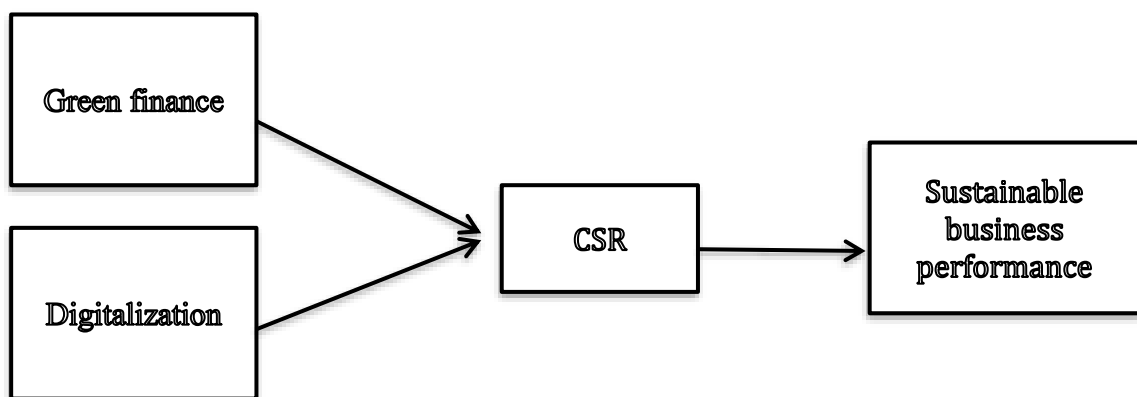


Figure:1 Conceptual Model

Source: Authors' own elaboration.

3.2 Hypotheses Development

3.2.1 Green Finance and Sustainable Business Performance of SMEs

Green finance refers to financial products, services, and investment mechanisms that support environmentally responsible business activities (Oduro, 2024; Zhang et al., 2021). Green finance can be explained through economic, environmental, and social dimensions. The Triple Bottom Line framework to explain how social, economic, and environmental dimensions of green financing affect sustainability performance in SMEs (Zhang et al., 2021).

Green finance provides SMEs with financial resources for environmentally responsible projects such as renewable energy, cleaner production, energy efficiency, and waste reduction. Empirical evidence supports the relationship between green finance and sustainable business performance. Green finance positively influences the financial sustainability performance of SMEs. SMEs accessing green finance can reduce carbon emissions, energy consumption, and waste generation, while investments in renewable energy and eco-friendly production can lead to cost savings and profitability (Pokhariyal, 2019). Therefore, green finance is expected to influence the sustainable business performance of SMEs.

H1: Green finance has a positive and significant influence on the sustainable business performance of SMEs.

3.2.2 Digitalization and Sustainable Business Performance of SMEs

Digitalization is the use of digital technologies to improve business operations, communication, decision making, innovation, and value added. Digital transformation has changed business procedures and organizational culture worldwide. SMEs face both challenges and opportunities when digitizing existing business procedures to sustain competitiveness. For SMEs, digitalization is most important because it helps them improve productivity, market access, customer interaction, operational efficiency, and innovation (Ashfaq, Akhtar, Akhlaq, et al., 2026). Digital transformation can support sustainability because SMEs need digital competencies to address economic,

environmental, and social aspects of sustainability.

Digitalization has been found to support SME performance by improving efficiency, competitiveness, innovation, and adaptability. Digital strategy positively influences the sustainable competitive performance of manufacturing SMEs, and digital capability partially mediates this relationship. Digital transformation can help SMEs address economic, environmental, and social aspects of sustainability (Nesirov et al., 2022; Rashid et al., 2025). Therefore, digitalization is expected to positively influence the sustainable business performance of SMEs.

H2: Digitalization has a positive and significant influence on the sustainable business performance of SMEs.

3.2.3 Green Finance and Corporate Social Responsibility in SMEs

Green finance and CSR are so closely related because both promote sustainability, environmental responsibility, and stakeholder value. Green finance supports sustainable business projects and uses credit to promote sustainable development. Green finance instruments are financial tools that support sustainable projects. Green bonds, green loans, green equity, microfinance, sustainable funds, benefit assets, active ownership, and credits for sustainable development are green finance approaches (Zhang et al., 2021). For SMEs, green loans can provide funds for energy-efficient equipment, renewable energy, waste reduction, and cleaner production (Ullah et al., 2018).

Firms investing in green finance are more likely to participate in CSR initiatives, which may improve brand image and financial performance (Lohan et al., 2018). Green finance supports CSR because both focus on sustainable development and responsible business practices. Wang et al. (2023) elucidate that green finance and CSR are aligned in their objectives and that firms investing in green finance are more likely to participate in CSR initiatives. Therefore, green finance is expected to positively influence CSR in SMEs.

H3: Green finance has a positive and significant influence on Corporate Social Responsibility in SMEs.

3.2.4 Digitalization and Corporate Social Responsibility in SMEs

Digitalization can enhance transparency, reporting, monitoring, stakeholder communication, and information sharing, which are important for CSR practice application. Raihan (2024) describes that SMEs need digital distinctive competencies to address economic, environmental, and social aspects of sustainability. CSR requires transparency, accountability, ethical behavior, and information sharing on sustainability performance (Ashfaq, Akhtar, Akhlaq, et al., 2026). Based on the sources, digitalization can support CSR by upgrading the systems through which SMEs plan, monitor, and communicate responsible and effective business practices.

AI-aided tools guide SMEs to boost operations and can reinforce sustainability when used to reduce waste, improve resource use, and strengthen decision-making (Brown et al., 1975). CSR may be more formal in large firms than in SMEs, but it is still important because SMEs are closely connected to employees, customers, communities, suppliers, and local markets (Eikelenboom & de Jong, 2019; Shakoor et al., 2023). Digitalization backs CSR by improving transparency, monitoring, reporting, and stakeholder communication. SMEs need digital competencies to address economic, environmental, and social sustainability dimensions.

H4: Digitalization has a positive and significant influence on Corporate Social Responsibility in SMEs.

3.2.5 Corporate Social Responsibility and Sustainable Business Performance of SMEs

CSR is competent to enhance sustainable business performance by building stakeholder trust, improving reputation, supporting environmental responsibility, and bolstering long-term business value. CSR practices guide SMEs to align operations with sustainable goals and can level up stakeholder engagement, reputation, and overall sustainable performance. CSR practices are important for enhancing organizational performance, notably in SMEs that face resource restrictions. The outcomes of CSR and firm performance are unresolved, and researchers have advised using mediators or

moderators to better investigate the relationship (Muller et al., 2011).

Environmental factors of CSR include pollution reduction, resource conservation, recycling, waste reduction, and environmentally responsible operations (Shen et al., 2025). CSR practices can enhance stakeholder engagement, reputation, and overall sustainable performance in SMEs.

H5: Corporate Social Responsibility has a positive and significant influence on the sustainable business performance of SMEs.

3.2.6 Mediating Role of CSR between Green Finance and SBP in SMEs

CSR can mediate the relationship between green finance and sustainable business performance because green finance provides financial help for eco-friendly projects; in the meantime, CSR makes sure that those resources are utilized wisely for environmental and social benefits. Wang et al. (2023) determined that CSR mediates the relationship between green finance and sustainable performance in Chinese SMEs. CSR equips a framework for firms to align financial and environmental aims, combining sustainability into decision-making, and promotes long-term sustainability through eco-friendly projects and practices (Shen et al., 2025; Ul Hassan et al., 2024; Zheng et al., 2014).

A green finance ecosystem normally includes regulators, commercial banks, fintech firms, and SME-support institutions (Zheng et al., 2014). Government officials and SMEDA should help in digitalization strategies, awareness programs, and technological support for SMEs in Pakistan (Iftikhar et al., 2024; Srivastava, 2020). Green finance may improve sustainable performance more effectively when supported by CSR.

H6: Corporate Social Responsibility mediating the relationship between green finance and the sustainable business performance of SMEs.

3.2.7 Mediating Role of CSR between Digitalization and SBP in SMEs

The literature gives fewer direct empirical proofs on CSR as a mediator between digitalization and sustainable business performance. However, digitalization can help CSR through good communication, monitoring, transparency, and data management. CSR can then translate digital methods into wider sustainable results.

Raihan (2024) focuses on how digitalization plays a vital role in company sustainability by guiding firms in dealing with economic, environmental, and social sustainability aspects. CSR contributes to transparency, ethical conduct, stakeholder engagement, and sustainable performance. The Pakistan-based study notes that most digitalization research has focused on developed markets and large firms, while the role of digitalization in the sustainable competitive performance of emerging SMEs remains less explored (Hussain et al., 2017). Therefore, this study fills a gap by testing CSR as a mediator between digitalization and sustainable business performance.

Sustainable performance calls for businesses to combine sustainability practices into inner most operations to balance economic development, environmental conservation, and social well-being (Rehman et al., 2023). Literature points out that digitalization promotes sustainability, while CSR promotes stakeholder engagement, transparency, and responsible performance.

H7: Corporate Social Responsibility mediates the relationship between digitalization and sustainable business performance of SMEs.

4. MATERIAL AND METHODS

4.1 Design of the research

This study employs a causal, mediation-based model that is analyzed using partial least squares structural equation modeling (PLS-SEM). PLS-SEM is developed owing to the study's predictive focus, theoretical expansion, and model complexity, which combines many exogenous constructs with a mediating mechanism. A stratified random sampling technique was used to select the samples. The analysis was completed on SmartPLS-4.0; the data file contained 250 valid responses. The model consisted of 24 observed indicators: five items for Corporate Social Responsibility, nine items for Digitalization, five items for Green Finance, and five items for Sustainable Business Performance. All 250 responses were used in the final SmartPLS-4 analysis.

The SmartPLS-4 analysis data file shows that the total number of distributed questionnaires was 300, and the total number of returned questionnaires was 250. Therefore, the exact response rate can be calculated as 83.33% same

as. The usable sample size for analysis was 250 (Krejcie & Morgan, 1970).

4.2 Data Analysis and Results

This analysis is conducted for detecting and identifying incomplete responses. The dataset contained no missing values across the 24 measurement items, the same as (Hassan et al., 2023). Therefore, no response was removed due to missing data. The absence of missing values indicates that the dataset was complete and appropriate for further analysis.

4.3 Outlier Detection: Univariate and Multivariate

To identify unusual responses, outlier analysis was conducted. First, univariate outliers were assessed using standardized values. No univariate outlier was found because no case exceeded the $+3.29$ threshold. Second, multivariate outliers were assessed using Mahalanobis distance. Based on 24 indicators, the chi-square threshold at $p < 0.001$ was 51.179. Fifteen cases exceeded this threshold and were flagged as potential multivariate outliers. However, all responses were within the valid Likert scale range of 1 to 5, and there was no evidence of data entry error. Therefore, these cases were retained. The results show that no response was removed because the detected multivariate outliers reflected valid respondent variation rather than incorrect data.

4.4 Normality Assessment: Skewness and Kurtosis

Normality was assessed using skewness and kurtosis. Although PLS-SEM does not require strict normality, normality assessment helps understand the distribution of the data. The skewness values ranged from -0.982 to -0.089 , while kurtosis values ranged from -0.675 to 0.529 . These values indicate that the data were reasonably normal and suitable for further analysis. Moreover, PLS-SEM is appropriate for survey data and does not require strict normality assumptions.

4.5 Common Method Bias Test: Harman's Single Factor

The data were collected through a single questionnaire from the same respondents; that's why common method bias was assessed.

Harman's single-factor test was conducted using all 24 indicators. The first factor explained 50.13% of the total variance. This value is slightly above the commonly used 50% threshold. Therefore, common method bias should be treated cautiously. However, the value is only marginally above the threshold, and procedural remedies such as anonymity, clear wording, and separation of constructs were used to reduce bias. The result suggests that common method bias is not severe, but it should be acknowledged as a limitation.

4.6 Demographic Profile of SMEs and Respondents

The demographic information related to respondents was collected in a questionnaire, including gender, education, working experience, age, and employment level. It did not collect firm-level demographic information such as industry type, firm age, number of employees, or annual turnover.

Table 1: Gender of Respondents

Gender	Frequency	Percentage
Male	140	56%
Female	110	44%
Others	0	0
Total	250	100%

Table 2: Education of Respondents

Education	Frequency	Percentage
14 years	30	12%
16 years	150	60%
18 years	50	20%
Above 18 years	20	8%
Total	250	100%

Table 3: Working Experience of Respondents

Experience	Frequency	Percentage
0-2 years	30	12%
3-5 years	130	52%
6-8 years	60	24%
Above 8 years	30	12%
Total	250	100%

Table 4: Age of Respondents

Age	Frequency	Percentage
21-30	50	20%
31-40	120	48%
41-50	60	24%
Above 50	20	8%
Total	250	100%

Table 5: Employment Level of Respondents

Employment level	Frequency	Percentage
Junior	65	26%
Middle	85	34%
Senior	100	40%
Total	250	100%

The questionnaire used for data collection did not collect firm-level demographic information; the demographic analysis is restricted to respondent-level characteristics.

4.7 Descriptive Statistics: Descriptive Analysis of Green Finance, Digitalization, CSR, and SBP

To conclude the entire response pattern for the main constructs, a descriptive statistics analysis was conducted. The highest mean value for sustainable business performance results as (Mean 3.518 & SD: 0.883), accompanied by digitalization (Mean 3.452 & SD: 0.826), CSR (Mean 3.440 & SD: 0.902), and green finance (Mean 3.098 & SD: 0.927). This explains that SMEs reported a moderate level of sustainable performance and digitalization; in the meantime, green finance practices were somewhat less developed compared to other

constructs. The descriptive outcomes show that sustainable business performance had the highest mean value, accompanied by digitalization, CSR, and green finance.

4.8 Correlation Matrix of Study Variables

To examine the association among the study variables, correlation analysis was conducted. A positive association among all constructs is indicated by the correlation analysis. Digitalization had the strongest correlation with sustainable business performance (r 0.760), followed by CSR and sustainable business performance (r 0.697), and green finance and sustainable business performance (r 0.619). These results suggest that SMEs with stronger digitalization, CSR, and green finance practices tend to report better sustainable business performance.

4.9 Measurement Model Assessment

After confirming the measurement model, the structural model will be tested.

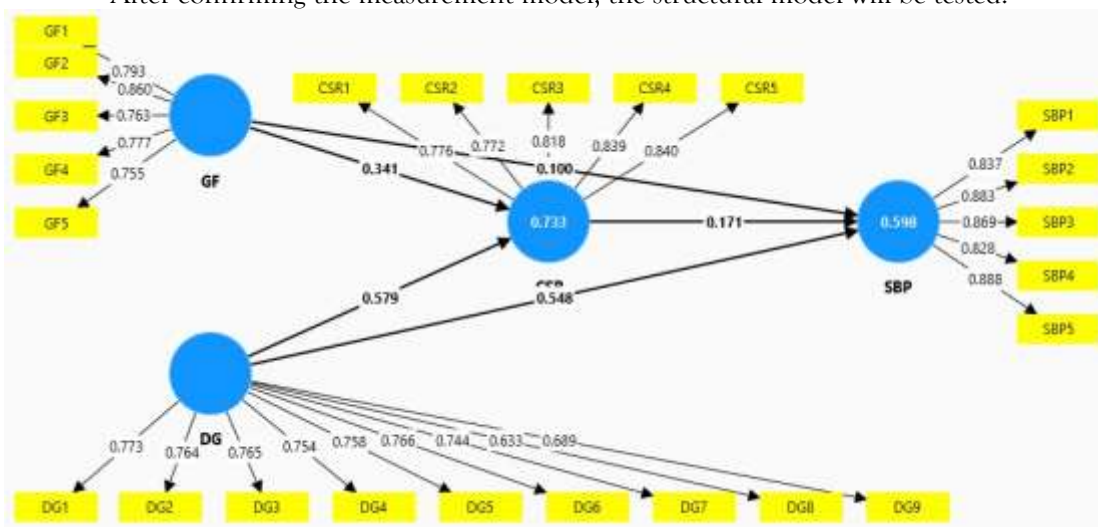


Figure 2 Structural Model

Source: Author's own elaboration from SmartPLS-4

To examine indicator reliability, internal consistency reliability, convergent validity, and discriminant validity, the measurement model was assessed.

4.10 Indicator Reliability

Through outer loadings, the indicator reliability was assessed. A loading value of 0.70 or above is preferred. However, items that were slightly below 0.70 may be retained when the overall reliability and average are acceptable.

4.11 Outer Loadings of Green Finance Constructs

Table 6: Outer Loadings of Green Finance

Code	Item summary	Outer loading	Decision
Gf1	Policies for environmentally sustainable financing	0.793	Retained
Gf2	Budget specified for green projects	0.860	Retained
Gf3	Investment in green bonds or similar instruments	0.763	Retained
Gf4	Financing received for green projects	0.777	Retained
Gf5	Advocacy or lobbying for green financing	0.755	Retained

All green finance items had loadings above 0.70. Therefore, all items were retained.

4.12 Outer Loadings of CSR

Table 7: Outer Loadings of CSR

Code	Item summary	Outer loading	Decision
CSR1	Initiative for societal safety	0.776	Retained
CSR2	Sustainable growth for future generation	0.772	Retained
CSR3	Support NGOs in troubled regions	0.818	Retained
CSR4	Protecting customer rights beyond legal requirements	0.839	Retained
CSR5	Compliance with legal regulations	0.840	Retained

All CSR indicators had acceptable loadings and were retained.

4.13 Outer Loadings of Digitalization

Table 8: Outer Loadings of Digitalization

Code	Item summary	Outer loading	Decision
DG1	Digital technologies to understand customers	0.773	Retained
DG2	Marketing and selling through digital channels	0.764	Retained
DG3	Customer service through digital channels	0.765	Retained
DG4	Linking customer facing and operational processes	0.754	Retained
DG5	Automated core process	0.758	Retained

DG6	Integrated operational and customer information	0.766	Retained
DG7	Analytics for operational decision	0.744	Retained
DG8	Digital technologies increase the value of product/services	0.633	Retained with caution
DG9	New business model based on digital technologies	0.689	Retained with cautions

Most digitalization items are loaded above 0.70. DG8 and DG9 were below 0.70 but above 0.60. All items were retained, since the construct

reliability and AVE of digitalization were acceptable.

4.14 Outer Loadings of SBP Constructs

Table 9: Outer Loadings of Sustainable Business Performance

Code	Item summary	Outer loading	Decision
SBP1	Net profit margin increased	0.837	Retained
SBP2	Return on investment increased	0.883	Retained
SBP3	Profitability growth exceptional	0.869	Retained
SBP4	Profitability surpassed competitor	0.828	Retained
SBP5	Overall financial performance outperformed competitors	0.888	Retained

All selected variable items, such as green finance, CSR, and SBP, had acceptable outer loadings. Most digitalization items also had acceptable loadings. DG8 and DG9 were below 0.70 but above 0.60; therefore, they were retained because the overall reliability and AVE of the digitalization construct were acceptable.

reliability was investigated. All Cronbach's Alpha values were above 0.70, which indicates acceptable reliability. All Composite Reliability values were above 0.70, showing that the constructs had strong internal consistency. All Rho_A values were above 0.70, further confirming construct reliability. Convergent validity was assessed through AVE. AVE values above 0.50 indicate acceptable convergent validity.

4.15 Internal Consistency Reliability

Through Cronbach's Alpha, Composite Reliability, and rho_A, internal consistency

Table 10: Reliability and Convergent Validity

Construct	Cronbach's Alpha	Rho A	Composite reliability	AVE
CSR	0.868	0.869	0.905	0.655
Digitalization	0.896	0.898	0.916	0.547
Green finance	0.851	0.859	0.893	0.625

Sustainable business performance	0.913	0.914	0.935	0.742
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The results show that the recommended reliability and convergent validity criteria were met by all constructs. Therefore, the measurement model was acceptable in terms of internal consistency and convergent validity.

4.16 Discriminant Validity

Through the Fornell-Larcker criterion, the HTMT ratio, and cross loadings, discriminant validity was assessed (Fornell & Larcker, 1981).

Fornell-Larcker Criterion

Table 11: Fornell-Larcker Criterion

Construct	CSR	Digitalization	Green finance	Sustainable business performance
CSR	0.809	-		
Digitalization	0.822	0.740		
Green finance	0.754	0.712	0.790	
Sustainable business performance	0.697	0.760	0.619	0.861

The square root of AVE is shown on the diagonal. Green finance and sustainable business performance met the Fornell-Larcker criterion. However, CSR and digitalization showed a discriminant validity concern because their correlation was higher than the square root

of AVE for digitalization. These results suggest that CSR and digitalization may overlap conceptually in the sample, possibly because digital tools are being used for transparency, reporting, stakeholder communication, and CSR-related practices.

4.17 Heterotrait-Monotrait Ratio

Table 12: HTMT Ratio

Relationship	HTMT
Digitalization \leftrightarrow CSR	0.921
Green finance \leftrightarrow CSR	0.868
Green finance \leftrightarrow Digitalization	0.802
SBP \leftrightarrow CSR	0.782
SBP \leftrightarrow Digitalization	0.835
SBP \leftrightarrow green finance	0.686

Most HTMT values were below 0.90. However, the HTMT value between digitalization and CSR was 0.921, which is slightly above the strict 0.90 threshold. This supports the Fornell-

Larcker result and indicates a minor discriminant validity concern between CSR and digitalization.

4.18 Cross Loadings

Table 13: Cross Loadings

Items	CSR	Digitalization	Green finance	Sustainable business performance
CSR1	0.776	0.597	0.675	0.558
CSR2	0.772	0.591	0.734	0.503

CSR3	0.818	0.693	0.525	0.568
CSR4	0.839	0.681	0.586	0.608
CSR5	0.840	0.760	0.540	0.580
DG1	0.748	0.773	0.549	0.581
DG2	0.724	0.764	0.557	0.567
DG3	0.565	0.765	0.569	0.520
DG4	0.528	0.754	0.539	0.497
DG5	0.574	0.758	0.523	0.481
DG6	0.594	0.766	0.560	0.511
DG7	0.623	0.744	0.526	0.610
DG8	0.567	0.633	0.432	0.630
DG9	0.486	0.689	0.478	0.631
GF1	0.619	0.624	0.793	0.540
GF2	0.653	0.626	0.860	0.571
GF3	0.510	0.455	0.763	0.361
GF4	0.505	0.492	0.777	0.381
GF5	0.651	0.578	0.755	0.538
SBP1	0.561	0.654	0.480	0.837
SBP2	0.609	0.669	0.534	0.883
SBP3	0.581	0.621	0.562	0.869
SBP4	0.627	0.631	0.549	0.828
SBP5	0.623	0.696	0.543	0.888

Most items loaded highest on their respective constructs. DG8 showed a very small difference between its loading on digitalization and SBP, but its own construct loading was still slightly higher. Overall, the cross-loading results were to some extent acceptable, although the earlier Fornell-Larcker and HTMT results suggest some overlap between digitalization and CSR.

4.19 Structural Model Assessment

After confirming reliability and validity, the structural model was assessed. The assessment included collinearity, direct effects, mediation effects, R², f², Q², and model fit.

Collinearity Assessment: Inner VIF Values

Table 14: Inner VIF Values

Relationship	VIF
CSR→SBP	3.750
Digitalization→CSR	2.030
Digitalization→SBP	3.289
Green finance→CSR	2.030
Green finance→SBP	2.466

All VIF values were below 5. Therefore, multicollinearity was not a serious issue in the structural model.

Hypothesis Testing: Direct Effects

Direct effects were tested using bootstrapping.

Table 15: Direct Effects and Hypothesis Testing

Hypothesis	Path	Beta	St dev	T-value	P-value	Decision
H1	GF→SBP	0.100	0.073	1.375	0.169	Not supported
H2	DG→SBP	0.548	0.095	5.740	<0.001	Supported
H3	GF→CSR	0.341	0.049	7.003	<0.001	Supported

H4	DG→CSR	0.579	0.047	12.305	<0.001	Supported
H5	CSR→SBP	0.171	0.099	1.730	0.084	Not supported at 5% level

Hypothesis Testing: Mediation Effects

Table 16: Mediation Effects

Hypothesis	Indirect path	Beta	St dev	T-value	P-value	2.5%CI	97.5%CI	Decision
H6	GF→CSR→SBP	0.058	0.035	1.652	0.099	-0.008	0.132	Not supported
H7	DG→CSR→SBP	0.099	0.058	1.689	0.090	-0.013	0.217	Not supported

Coefficient of Determination: R² for CSR and SBP

Table 17: Coefficient of Determination

Endogenous construct	R ²	Adjusted R ²	Interpretation
CSR	0.733	0.731	Strong explanatory power
Sustainable business performance	0.598	0.593	Moderate to strong explanatory power

Green finance and digitalization explained 73.3% of the variance in CSR. Green finance, digitalization, and CSR explained 59.8% of the

variance in sustainable business performance. This shows that the model has good explanatory power.

Effect Size: f²

Table 18: Effect Size f²

Relationship	f ²	Interpretation
CSR→SBP	0.019	Very small effect
Digitalization→CSR	0.620	Large effect
Digitalization→SBP	0.227	Medium effect
Green finance→CSR	0.215	Medium effect
Green finance→SBP	0.010	Very small effect

The strongest effect among all was found for digitalization on CSR. Digitalization also showed a medium effect on sustainable business

performance. Green finance showed a medium effect on CSR but a very small effect on sustainable business performance.

Predictive Relevance: Q²

Through blindfolding, predictive relevance was assessed.

Table 19: Predictive Relevance

Construct	SSO	SSE	Q ²
CSR	1250.000	657.062	0.474
Digitalization	2250.000	2250.000	0.000
Green finance	1250.000	1250.000	0.000
Sustainable business performance	1250.000	704.948	0.436

The Q² values for CSR and sustainable business performance were greater than zero. This denotes that the model has predictive relevance

for both endogenous constructs. Digitalization and green finance had Q² values of zero because they were exogenous constructs.

4.20 Model Fit: SRMR, NFI

Table 20: Model Fit

Fit index	Saturated model	Estimated model	Interpretation
SRMR	0.082	0.082	Marginally above 0.08 threshold
NFI	0.741	0.741	Moderate fit

The SRMR value was 0.082, which slightly indicates above the strict 0.08 threshold but close to the acceptable range. The NFI value was 0.741, picturing a moderate model fit. Since PLS-SEM is mainly a prediction oriented, the model was further evaluated through R^2 , f^2 , Q^2 , and path significance.

5. DISCUSSION ON FINDINGS

H1 proposed that green finance significantly influences the sustainable business performance of SMEs. The result showed a positive but insignificant effect (beta 0.100, p 0.169). Therefore, H1 was not supported. This finding signifies that green finance alone may not directly improve sustainable business performance in the sampled sector SMEs. Although green finance provides financial support for green projects, its direct impact may depend on how effectively SMEs use such finances. In many SMEs, green finance may still be at an early stage, and firms may face barriers and difficulty in using such finances, may lack awareness, limited financial literacy, lack skills to handle complicated procedures, or have weak implementation capacity.

H2 projects that digitalization greatly influences the sustainable business performance of SMEs. The result gives a strong positive and important effect (beta 0.548, p < 0.001). Hence, H2 was supported. These outcomes explain well that SMEs with higher digitalization are likely to attain good, sustainable business performance. Digitalization can level up operational efficiency, customer communication, decision making, innovation, and market adaptability. This refinement can help SMEs reduce costs, enhance productivity, manage resources, and compete more effectively and efficiently.

H3 that green finance significantly influences CSR in SMEs. The result presents a positive and significant effect (beta 0.341, p < 0.001). Therefore, H3 was supported. The findings show that SMEs that adopted green finance are more likely to engage in CSR practices. Green

finance encourages firms to consider environmental and social outcomes in financial decisions. When SMEs approach or avail green finance, they may become enlightened in the context of environmental responsibility, stakeholder expectations, and sustainable investment priorities.

H4 projects that digitalization has an important impact on CSR in SMEs. The result shows a positive and significant effect (beta 0.579, p < 0.001). Hence, H4 was supported. Here, the finding shows that digitalization guides SMEs to upgrade their CSR practices. Digital tools and technical skills can help ease in operations, transparency, monitoring, reporting, stakeholder communication, employee management, and environmental tracking. Through digital and social media platforms and information systems, SMEs can have fine communication with customers, employees, suppliers, and communities.

H5 projects that CSR greatly have an influence on the sustainable business performance of SMEs. The finding shows a positive but not worthy effect at the 5% level (beta 0.171, p 0.084). Hence, H5 was not supported at the 5% significance level. The findings represent that CSR has a positive direction, but it was not strong enough to greatly describe sustainable business performance in this sample. One reasonable explanation is that CSR activities in SMEs may still be unofficial, restricted, or not fully combined into business strategy. SMEs may carry out CSR-related practices, but these may not instantly translate into measurable financial, environmental, and social performance results.

H6 proposed that CSR mediates the relationship between green finance and sustainable business performance. The mediation results show positive but insignificant (beta 0.058, p 0.099). Therefore, H6 was not supported at the 5% significance level. The results indicate that green finance significantly influenced CSR, but CSR did not significantly influence sustainable business performance.

Because the CSR to SBP path was weak, the indirect effect was also insignificant. This denotes that green finance may encourage CSR practices, but CSR may not yet be strong enough to convert green finance into sustainable business performance in the sampled SMEs.

H7 proposed that CSR mediates the relationship between digitalization and sustainable business performance. The mediation result shows a positive but insignificant (beta 0.099, p 0.090). Therefore, H7 was not supported at the 5% significance level. The direct effect of digitalization on sustainable business performance was strong and significant, and the effect of digitalization on CSR was also significant. However, CSR did not significantly have an influence SBP at the 5% level. Therefore, the indirect effect through CSR was not significant.

6. CONCLUSION

In this study, the first hypothesis investigates whether green finance significantly influences the sustainable business performance of SMEs. The result shows a positive but insignificant relationship. Therefore, green finance did not directly improve the financial/economic dimension of sustainable business performance in the sampled SMEs. The findings explain that green finance alone may not be enough to immediately improve SME profitability, return on investment, or financial performance. SMEs may require better awareness of the finances, easier access to green finance, technical support, and stronger implementation capacity before green finance can produce measurable performance outcomes. The result differs from some considered studies that discover green finance positively affects SME sustainability performance, but it is understandable in the context of SME where green finance adoption is still finite.

The second hypothesis investigates whether digitalization significantly influences the sustainable business performance of SMEs. The result points to a positive and significant relationship. Therefore, digitalization was found to be an essential predictor of sustainable business performance. This explains that SMEs using digital technologies, digital channels, analytics, automation, customer information systems, and digital business models are more

likely to enhance financial/economic performance. The findings are consistent with the considered Pakistan-based SME study, which found that digital strategy refines sustainable competitive performance in manufacturing SMEs.

The third hypothesis investigates whether green finance significantly influences CSR in SMEs. The result points to a positive and significant relationship. Therefore, green finance supports CSR practices in SMEs. The findings denote that SMEs that are involved in green finance are more likely to adopt responsible practices such as sustainable growth orientation, legal compliance, customer rights protection, and social initiatives. The results are consistent with the considered recent studies literature, which explains that green finance and CSR both share sustainability-related objectives and that firms investing in green finance are more likely to take part in CSR initiatives.

The fourth hypothesis investigates whether digitalization significantly influences CSR in SMEs. The result points to a positive and significant relationship. Therefore, digitalization boosts CSR practices in SMEs. This explains that digital tools may help SMEs enhance their transparency, communication, operational control, customer service, and stakeholder engagement. Digitalization can aid CSR by helping firms manage information, respond to customers, and improve responsible business practices. The considered recent literature also supports the view that digitalization helps SMEs address economic, environmental, and social dimensions of sustainability.

The fifth hypothesis investigates whether CSR significantly influences the sustainable business performance of SMEs. The result points to a positive but insignificant result at the 5% level. Therefore, CSR did not significantly enhance the financial/economic dimension of sustainable business performance in the sampled SMEs. The findings explain that CSR activities may not immediately produce financial results such as higher profitability, improved ROI, or stronger financial performance compared with competitors. CSR may create long-term reputation, trust, and stakeholder benefits, but these benefits may take a longer time span to appear in financial performance. The results are consistent with evidence showing that CSR does

not always have a direct significant effect on performance and that the CSR performance relationship can be inconclusive.

The sixth hypothesis investigates whether CSR mediates the relationship between green finance and sustainable business performance. The mediation effect points to a positive but insignificant. Therefore, CSR did not significantly mediate the relationship between green finance and sustainable business performance. The result explains that green finance significantly improves CSR, but CSR does not significantly convert green finance into financial/economic sustainable performance. The main reason for that is that CSR practices in SMEs are still informal, weakly integrated, or not directly connected with financial outcomes. The result differs from the considered research on Chinese SMEs, where CSR mediated the relationship between green finance and sustainable performance.

The seventh hypothesis investigates whether CSR mediates the relationship between digitalization and sustainable business performance. The mediation effect points as positive but insignificant. Therefore, CSR did not significantly mediate the relationship between digitalization and sustainable business performance. The results denote that digitalization boosts sustainable business performance mainly through a direct route rather than through CSR. Digitalization appears to create more immediate financial/economic benefits through digital selling, customer service, automation, analytics, and better operational decisions. CSR may be backed by responsible business conduct, but it was not strong enough to justify the link between digitalization and financial/economic performance in this study.

7. IMPLICATIONS OF THE STUDY

7.1 Theoretical Implications

In this study, stakeholder theory contributes by showing that green finance and digitalization significantly influence CSR in SMEs. This explains that when SMEs adopt green financing practices and digital tools, they become more involved in socially responsible actions. Stakeholder Theory is backed because CSR reflects the firm's responsibility toward customers, society, legal requirements, and future generations.

However, CSR did not significantly influence sustainable business performance. This explains that stakeholder-oriented practices may not immediately create financial/economic gains in SMEs. Therefore, Stakeholder Theory may need to be applied with caution in SME contexts where CSR benefits may appear over a longer time span.

This study also aids the Resource-Based View by showing that digitalization is a game-changer strategic resource for SMEs. Digital tools and capabilities significantly enhanced sustainable business performance. This concludes that digital resources can help SMEs improve competitiveness and performance.

The study contributes to CSR literature by testing CSR as a mediator between green finance, digitalization, and sustainable business performance. Earlier studies already supported CSR as a mediator between green finance and sustainable performance, but this study found that not a worthy mediation in the sampled SMEs.

The results add value because it shows that CSR may not always act as a sturdy mediator, particularly when sustainable business performance is studied through financial/economic metrics. It also stresses that CSR may need stronger established support, formalization, and strategic alignment before it levels up SME performance.

7.2 Managerial Implications

SME owners and managers should have intense focus on digitalization because, as the findings show, it was the primary driver of sustainable business performance in this study. SMEs should often invest in digital platforms, customer service platforms, analytics, automation, unified information systems, and digital business models and ideas.

Managers should also work on their understanding and try their best to grasp more knowledge of green finance. Although green finance did not directly improve financial/economic performance, it significantly refined CSR. This explains that green finance can help SMEs become more responsible, but managers must ensure that green finance is linked with clear business benefits, cost savings, energy efficiency, and long-term performance goals.

Commercial banks and fintech companies should design green finance products that are easier for SMEs to access and handle. Since SMEs often face limitations in green finance adoption, banks should design easy-to-handle procedures, provide awareness sessions, and offer financing products for green equipment, energy efficiency, and sustainable projects. Fintech companies can back SMEs by providing digital finance platforms, online lending, digital payment systems, and tools for financial tracking.

CSR consultants and auditors can help by providing expert advice to owners on how to connect both SMEs and CSR with business strategy, customer trust, legal compliance, employee welfare, and long-term performance. CSR consultants should also help SMEs measure their CSR outcomes. Instead of treating CSR as only a donation or compliance, SMEs should more often evaluate whether CSR is improving customer loyalty, reputation, operational efficiency, and stakeholder trust.

7.3 Policy Implications

The State Bank of Pakistan should have encouraged more SME friendly green finance options through commercial banks recently. Green financing procedures should be simplified so that small firms can understand and access them, provided by banks that are involved in green finance. Banks should also provide awareness programs explaining how green finance can support energy efficiency, cleaner production, and cost reduction. But still, SMEs are hesitant to opt for green finance.

SMEDA should develop training programs for SMEs on digitalization, CSR, and green finance. The uploaded Pakistan-based SME study also recommends that SMEDA and government officials should arrange training, awareness programs, and technological support for SME digitalization. SMEDA can help SMEs by giving them practical workshops on digital selling, customer handling systems, analytics, automation, and CSR planning. These courses can guide SMEs to upgrade competitiveness and responsible business conduct.

SECP may ponder creating a simplified ESG or CSR reporting framework or model for SMEs. Since SMEs often lack formal reporting systems, a simple reporting format can help them disclose

basic information about legal compliance, customer rights, employee welfare, community support, and environmental activities.

The Ministry of Industries and Production should support SME sustainability by developing programs that combine green finance, digitalization, and CSR. Support may include subsidies for energy-efficient machinery, digital transformation grants, CSR awareness programs, and sector-specific sustainability training.

8. Limitations of the study

This study used a quantitative survey method. Although this method is suitable for testing hypotheses, it does not provide detailed explanations of why some relationships were insignificant. For example, the study found that CSR did not significantly mediate the relationship between green finance, digitalization, and sustainable business performance, but qualitative interviews could provide deeper insight into why this happened.

The study was part taken in context of Pakistani SMEs. Thus, the results may not be fully applicable to SMEs in other countries. SMEs in Pakistan may face various financial, digital, institutional, and CSR-related hurdles compared with SMEs in developed economies or other developing markets.

The study used cross-sectional data, meaning responses were collected at one point in time. Therefore, the study cannot fully explain long-term changes in green finance, digitalization, CSR, and sustainable business performance. The questionnaire studied sustainable business performance through financial/economic metrics only, such as net profit margin, ROI, profitability growth, and overall financial performance. Thus, future studies should contain environmental and social performance metrics to grab the full Triple Bottom Line.

9. Future Research Directions

Future researchers must use longitudinal models in examining how green finance, digitalization, and CSR have a strong impact on sustainable business performance over time. CSR and green finance may ask for time before their performance effects become clear. Future studies can analyze SMEs and large firms to study whether green finance, digitalization, and CSR

work differently across firm sizes. Large firms may have more resources, well-structured CSR systems, and a better approach to green finance, while SMEs may rely more on informal practices. Future research must keenly focus on specific SME sectors such as sports goods, surgical goods, leather, textiles, and manufacturing clusters in Sialkot, Gujranwala, and Lahore. Also, sector-specific detailed studies can provide more practical findings because sustainability challenges contrast across industries. Future studies can add on moderating variables such as government aid, entrepreneurial posture, environmental issues, digital culture, or management commitment. The prior Pakistan-based digitalization study discovered that digital culture empowers the relationship between digital strategy and digital capacities, which advised that moderating variables can enhance understanding of SME performance. Future researchers can take in qualitative case studies of SMEs that effectively utilize green finance, digital tools and skills, and CSR practices. Interviews with SME owners, bank officers, CSR consultants, and policymakers can elucidate how SMEs practically adopt sustainability methods and what restrictions they face.

REFERENCES

- Abidin, Z. u., Thirumalareddy, J., Gupta, J. S., & Abdul Jabbar, A. B. (2025). Disparities in COVID-19 mortality in the United States, 2020–2023. *BMC Public Health*, 25(1), 3257.
- Akhtar, S., Ashraf, N., Alvi, M. A., & Naseem, M. A. (2023). Examining the interplay of access to finance, financial literacy, and SMEs growth: A comprehensive analysis. *NICE Research Journal*, 16(1), 26-45.
- Akhtar, S., Cui, Y., Frimpong, S., & Rafi, N. (2024). Unlocking the path to sustainable competitive performance of agro-based small and medium enterprises: Evidence from the South Asian Association for Regional Cooperation countries. *Agric. Econ.-Czech*, 70, 309-319.
- Akhtar, S., Sharif, S., Frimpong, S. E., & Cui, Y. (2024). Financial Technology and Financial Literacy: The Key to Post-COVID Success for E7 Agro-SMEs. *NICE Research Journal*, 17(2), 33-44.
- Al-Omush, A., Momany, M. T., Hannon, A., & Anwar, M. (2023). Digitalization and sustainable competitive performance in small-medium enterprises: a moderation mediation model. *Sustainability*, 15(21), 15668.
- Ashfaq, M., Akhtar, S., Akhlaq, M., Yousaf, A., & Ullah, K. (2026). Integrating Digitalization, Corporate Social Responsibility, and Human Capital for Environmental Sustainability: The Strategic Role of Green Finance in Commercial Banks. *International Journal of Energy Economics and Policy*, 16(1), 902.
- Ashfaq, M., Akhtar, S., & Ullah, K. (2026). Driving Sustainable Performance of Banks through CSR, Green HRM, and Green Banking Practices: Mediation of Employee Green Behavior and Moderation of FinTech Adoption. *Indonesian Journal of Sustainability Accounting and Management*, 10(1), 57-79.
- Bensalem, S., Henni, A., Chouana, T., Hidouci, S., & Azib, S. (2024). Removal of pollutants from aquaculture wastewater using chitosan/bentonite composite beads. *Journal of Environmental Engineering and Science*, 19(3), 189-199. <https://doi.org/10.1680/jenes.23.00012>
- Bilal, M., Alawadh, A., Rafi, N., & Akhtar, S. (2024). Analyzing the impact of vision 2030's economic reforms on Saudi Arabia's consumer price index. *Sustainability*, 16(21), 9163.
- Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society Series B: Statistical Methodology*, 37(2), 149-163.
- Butt, S., Ashfaq, M., Chohan, M. A., Ramakrishnan, S., Shahzad, M. F., & Almazyad, T. (2025). Green finance enablers: A bibliometric approach. In *Green economics and strategies for business*

- sustainability (pp. 123-150). IGI Global Scientific Publishing.
- Costa Melo, I., Alves Junior, P. N., Queiroz, G. A., Yushimito, W., & Pereira, J. (2023). Do we consider sustainability when we measure small and medium enterprises' (SMEs) performance passing through digital transformation? *Sustainability*, 15(6), 4917.
- Duarte, P., & Amaro, S. (2018). Methods for modelling reflective-formative second order constructs in PLS: An application to online travel shopping. *Journal of Hospitality and Tourism Technology*, 9(3), 295-313.
- Eikelenboom, M., & de Jong, G. (2019). The impact of dynamic capabilities on the sustainability performance of SMEs. *Journal of Cleaner Production*, 235, 1360-1370.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- Frimpong, S. E., Akhtar, S., Agyapong, D., Idun, A. A., & Ofori, D. (2026). Sustainable Water Futures: Infrastructure Investment for Freshwater Production and Conservation in Developing Nations. *Sustainable Development*.
- Hardin, G. (1974). The tragedy of the commons. *Crowding and Behavior*, 162(8.5699198).
- Hassan, M. K., Rabbani, M. R., Brodmann, J., Bashar, A., & Grewal, H. (2023). Bibliometric and Scientometric analysis on CSR practices in the banking sector. *Review of Financial Economics*, 41(2), 177-196.
- Hissan, R. U., Shafiq, H., Nassani, A. A., Parveen, N., Hussain, B., & Radulescu, M. (2024). Assessment of spatio-temporal dynamics of land degradation and desertification in Pakistan and its impact on agriculture productivity. *Environment, Development and Sustainability*, 26(12), 32337-32357. <https://doi.org/10.1007/s10668-024-05224-x>
- Hussain, M., Malik, R. N., Taylor, A., & Puettmann, M. (2017). Hazardous pollutants emissions and environmental impacts from fuelwood burned and synthetic fertilizers applied by tobacco growers in Pakistan. *Environmental technology & innovation*, 7, 169-181. <https://doi.org/10.1016/j.eti.2017.02.003>
- Iftikhar, R., Ashfaq, M., Akhtar, S., & Frimpong, S. E. (2024). Empowering Sustainable Development: The Role of Financial Literacy and Social Capital in Bridging Financial Inclusion in Developing Nations. *Journal of Innovative Research in Management Sciences*, 5(2), 61-80.
- Khababa, N., & Jalingo, M. U. (2023). Impact of green finance, green investment, green technology on SMEs sustainability: role of corporate social responsibility and corporate governance. *International Journal of Economics and Finance Studies*, 15(3), 438-461.
- Khurshid, N., Khurshid, J., Shakoor, U., & Ali, K. (2022). Asymmetric effect of agriculture value added on CO2 emission: Does globalization and energy consumption matter for pakistan. *Frontiers in Energy Research*, 10, 1053234. <https://doi.org/10.3389/fenrg.2022.1053234>
- Krejcie, R. V., & Morgan, D. W. (1970). Table for determining sample size from a given population. *Educational and Psychological Measurement*, 30(3), 607-610.
- Lohan, S. K., Jat, H. S., Yadav, A. K., Sidhu, H. S., Jat, M. L., Choudhary, M., Peter, J. K., & Sharma, P. C. (2018). Burning issues of paddy residue management in north-west states of India. *Renewable and Sustainable Energy Reviews*, 81, 693-706. <https://doi.org/10.1016/j.rser.2017.08.057>
- Majewski, S., Mentel, G., Dylewski, M., & Salahodjaev, R. (2022). Renewable Energy, Agriculture and CO2 Emissions: Empirical Evidence From the Middle-Income Countries. *Frontiers in Energy Research*, 10, 921166.

- <https://doi.org/10.3389/fenrg.2022.921166>
- Muller, C., Cramer, W., Hare, W. L., & Lotze-Campen, H. (2011). Climate change risks for African agriculture. *Proc Natl Acad Sci U S A*, 108(11), 4313-4315. <https://doi.org/10.1073/pnas.1015078108>
- Nesirov, E., Karimov, M., & Zeynalli, E. (2022). Does the Agricultural Ecosystem Cause Environmental Pollution in Azerbaijan? *Economic and Environmental Geology*, 55(6), 617-632. <https://doi.org/10.9719/eeeg.2022.55.6.617>
- Oduro, S. (2024). Eco-innovation and SMEs' sustainable performance: a meta-analysis. *European Journal of Innovation Management*, 27(9), 248-279.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, 16(3), 289-326. <https://doi.org/10.1002/jae.616>
- Pokhariyal, G. (2019). Importance of moderating and intervening variables on the relationship between independent and dependent variables. *International Journal of Statistics and Applied Mathematics*, 4(5), 1-4.
- Raihan, A. (2024). A review of the potential opportunities and challenges of the digital economy for sustainability. *Innovation and Green Development*, 3(4), 100174.
- Rashid, A., Baloch, N., Rasheed, R., & Ngah, A. H. (2025). Big data analytics-artificial intelligence and sustainable performance through green supply chain practices in manufacturing firms of a developing country. *Journal of Science and Technology Policy Management*, 16(1), 42-67.
- Rehman, A., Alam, M. M., Ozturk, I., Alvarado, R., Murshed, M., Işık, C., & Ma, H. (2023). Globalization and renewable energy use: how are they contributing to upsurge the CO2 emissions? A global perspective. *Environmental Science and Pollution Research*, 30(4), 9699-9712.
- Shakoor, N., Hussain, M., Adeel, M., Azeem, I., Ahmad, M. A., Zain, M., Zhang, P., Li, Y., Quanlong, W., Horton, R., & Rui, Y. (2023). Lithium-induced alterations in soybean nodulation and nitrogen fixation through multifunctional mechanisms. *Sci Total Environ*, 904, 166438. <https://doi.org/10.1016/j.scitotenv.2023.166438>
- Shen, Y., Fang, Y., Vancov, T., Sun, X., Du, H., Li, Y., Yu, B., Chang, S. X., & Cai, Y. (2025). Surface soil organic carbon accumulation in urban parks increases with urbanization intensity: a case study for Hangzhou, China. *Plant and Soil*, 513(1), 673-690. <https://doi.org/10.1007/s11104-025-07207-x>
- Srivastava, A. (2020). Overview of methods to address heteroscedasticity in factor analysis. *Economic and Social Development: Book of Proceedings*, 103-112.
- Ul Hassan, M. I., Wu, M., Yasir, R., & Gates, C. M. (2024). Finding the Relationship between Agriculture and Carbon Emissions in Pakistan: An Empirical Investigation. *Quantitative Economics and Management Studies*, 5(2), 297-315. <https://doi.org/10.35877/454RI.gems2463>
- Ullah, A., Khan, D., Khan, I., & Zheng, S. (2018). Does agricultural ecosystem cause environmental pollution in Pakistan? Promise and menace. *Environ Sci Pollut Res Int*, 25(14), 13938-13955. <https://doi.org/10.1007/s11356-018-1530-4>
- Wang, J., Chitsaz, F., Derbyshire, M. K., Gonzales, N. R., Gwadz, M., Lu, S., Marchler, G. H., Song, J. S., Thanki, N., & Yamashita, R. A. (2023). The conserved domain database in 2023. *Nucleic acids research*, 51(D1), D384-D388.

- Ye, J., & Dela, E. (2023). The effect of green investment and green financing on sustainable business performance of foreign chemical industries operating in Indonesia: the mediating role of corporate social responsibility. *Sustainability*, 15(14), 11218.
- Zhang, X.-h., Chen, J., Han, M.-Z., Huang, H., Jiang, E.-l., Jiang, M., Lai, Y.-r., Liu, D.-h., Liu, Q.-F., & Liu, T. (2021). The consensus from The Chinese Society of Hematology on indications, conditioning regimens and donor selection for allogeneic hematopoietic stem cell transplantation: 2021 update. *Journal of hematology & oncology*, 14(1), 145.
- Zheng, C., Jiang, Y., Chen, C., Sun, Y., Feng, J., Deng, A., Song, Z., & Zhang, W. (2014). The impacts of conservation agriculture on crop yield in China depend on specific practices, crops and cropping regions. *The Crop Journal*, 2(5), 289-296. <https://doi.org/10.1016/j.cj.2014.06.006>

