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DIGITAL ENABLEMENT OF SUSTAINABLE SUPPLY CHAINS AND ITS EFFECT ON ORGANIZATIONAL PERFORMANCE

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***Abstract*:** The increasing pressure on organizations to achieve sustainability while maintaining competitive performance has accelerated the adoption of digital technologies in supply chain management. This study examines the effect of digital enablement of sustainable supply chains on organizational performance, with a focus on how advanced digital technologies facilitate environmental and social sustainability practices. Grounded in the Resource-Based View (RBV) and Triple Bottom Line (TBL) framework, the research investigates the role of digital tools such as big data analytics, Internet of Things (IoT), block chain, and cloud-based platforms in enhancing supply chain sustainability and performance outcomes. A quantitative research design was employed, using survey data collected from supply chain and operations managers across manufacturing organizations. The proposed conceptual model was tested using Partial Least Squares Structural Equation Modelling (PLS-SEM) to examine the relationships between digital enablement, sustainable supply chain practices, and organizational performance dimensions, including operational, environmental, and financial performance. The findings reveal that digital enablement significantly enhances sustainable supply chain practices, which in turn positively influence organizational performance. Moreover, sustainable supply chain practices partially mediate the relationship between digital enablement and performance outcomes. The study contributes to the existing literature by empirically validating the role of digital technologies as strategic enablers of sustainable supply chains and by providing evidence from an emerging economy context. From a managerial perspective, the findings offer actionable insights for practitioners seeking to leverage digital transformation to achieve sustainability-driven performance improvements. The study also provides policy implications for promoting digital adoption to support sustainable industrial development.

Index terms: Digital Enablement, Sustainable Supply Chain Management, Organizational Performance, Industry 4.0, PLS-SEM, Emerging Economies

1. INTRODUCTION

In recent years, supply chain sustainability has emerged as a strategic priority for organizations due to increasing environmental concerns, regulatory pressures, and stakeholder expectations. Organizations are no longer evaluated solely on economic performance but also on their ability to manage environmental and social responsibilities across supply chain networks. Consequently, Sustainable Supply Chain Management (SSCM) has gained significant attention from both academia and industry as a means to achieve long-term competitiveness and responsible growth. Simultaneously, the rapid advancement of digital technologies associated with Industry 4.0, such as big data analytics, Internet of Things (IoT), block chain, cloud computing, and artificial intelligence, has transformed traditional supply chain operations. These digital technologies enable real-time data visibility, enhanced traceability, predictive decision-making, and improved coordination among supply chain partners. As a result, digital enablement is increasingly recognized as a critical enabler for integrating sustainability principles into supply chain processes. Despite the growing body of literature on SSCM and digital transformation, existing studies largely examine these domains in isolation. While several studies have explored the impact of sustainability practices on firm performance and others have analysed digitalization in supply chains, empirical research investigating the combined effect of digital enablement and sustainable supply chain practices on organizational performance remains limited, particularly in the context of emerging economies. This gap is notable given the unique operational challenges, resource constraints, and regulatory environments faced by organizations in such economies. From a theoretical perspective, the Resource-Based View (RBV) suggests that digitally enabled sustainable practices can serve as valuable,

rare, and inimitable organizational capabilities that enhance competitive advantage. In addition, the Triple Bottom Line (TBL) framework emphasizes the need to evaluate organizational performance across economic, environmental, and social dimensions. Integrating digital technologies with SSCM practices can potentially strengthen all three dimensions by improving operational efficiency, reducing environmental impact, and enhancing social responsibility. Therefore, this study aims to examine the role of digital enablement in fostering sustainable supply chain practices and its subsequent impact on organizational performance. Using empirical data from manufacturing organizations and applying Partial Least Squares Structural Equation Modelling (PLS-SEM), this research seeks to provide quantitative evidence on the relationships among digital enablement, SSCM practices, and performance outcomes. The findings are expected to contribute to the growing literature on digitally enabled sustainability in supply chains and offer practical insights for managers and policymakers seeking to leverage digital transformation for sustainable performance improvement.

2. LITERATURE REVIEW

Sustainable Supply Chain Management (SSCM) has been extensively examined in prior research as a strategic approach to integrating environmental, social, and economic considerations into supply chain activities. Early studies emphasize that SSCM practices, including green procurement, eco-design, sustainable logistics, and supplier collaboration, contribute to improved environmental performance and long-term organizational competitiveness. Researchers have consistently reported that firms adopting sustainability-oriented supply chain practices experience enhanced operational efficiency, reduced waste, and improved corporate reputation, which collectively support superior organizational performance. Several empirical studies have investigated the relationship between SSCM practices and organizational performance. Findings indicate a positive association between sustainable practices and financial, operational, and environmental performance dimensions. In particular, environmentally responsible supply chain practices such as energy-efficient logistics, waste reduction, and emission control have been shown to lower operational costs and improve resource utilization. Social sustainability practices, including fair labour practices and supplier development, further strengthen supply chain reliability and stakeholder trust, thereby positively influencing firm performance. Parallel to sustainability research, the digital transformation of supply chains has emerged as a critical research stream. Digital enablement through Industry 4.0 technologies- such as big data analytics, Internet of Things (IoT), block chain, cloud computing, and artificial intelligence has been widely recognized for its ability to enhance supply chain visibility, coordination, and decision-making accuracy. Prior studies suggest that digital technologies improve demand forecasting, inventory optimization, and risk management, leading to improved supply chain responsiveness and operational performance. Recent literature has begun exploring the intersection of digitalization and sustainability in supply chains. Scholars argue that digital technologies act as enablers of SSCM by providing real-time data, improving traceability, and facilitating transparency across supply chain networks. For example, block chain technology has been identified as a key driver of traceability and trust in sustainable sourcing, while IoT-enabled monitoring systems support energy efficiency and emission reduction initiatives. Big data analytics further enables organizations to measure sustainability performance and make data-driven decisions aligned with environmental and social objectives. Despite these advancements, empirical research integrating digital enablement, SSCM practices, and organizational performance within a single framework remains limited. Most existing studies focus either on the performance outcomes of sustainability practices or on the operational benefits of digital supply chains, without adequately examining the mediating or enabling role of digital technologies in sustainability-driven performance improvement. Furthermore, there is a noticeable lack of empirical evidence from emerging economies, where digital adoption and sustainability implementation face distinct challenges related to infrastructure, regulatory frameworks, and resource constraints. From a theoretical standpoint, the Resource-Based View (RBV) provides a strong foundation for understanding how digitally enabled SSCM practices can serve as strategic capabilities that enhance firm performance. Additionally, the Triple Bottom Line (TBL) framework offers a comprehensive perspective for assessing performance outcomes across economic, environmental, and social dimensions. However, existing literature has not sufficiently empirically validated these theoretical linkages, particularly using robust analytical techniques such as Structural Equation Modelling. In summary, the review of existing literature highlights a clear research gap concerning the integrated impact of digital enablement and sustainable supply chain practices on organizational performance. Addressing this gap, the present study proposes a comprehensive empirical investigation to examine how digital technologies facilitate SSCM adoption and how such integration influences organizational performance outcomes. This research aims to contribute to the growing body of knowledge by providing empirical evidence and practical insights relevant to both academia and industry.

3. RESEARCH GAP AND OBJECTIVES

3.1 Research Gap

The review of existing literature reveals that while substantial research has been conducted independently on Sustainable Supply Chain Management (SSCM) practices and digital transformation in supply chains, empirical studies integrating these two domains remain limited. Prior studies predominantly focus on the direct impact of sustainability practices on organizational performance or examine the operational benefits of digital technologies without explicitly addressing their enabling role in sustainability-oriented supply chains. Furthermore, existing research often adopts a fragmented approach by analysing either environmental or operational performance outcomes, with limited attention to a comprehensive performance

assessment encompassing economic, environmental, and social dimensions, as emphasized by the Triple Bottom Line (TBL) framework. The mediating or facilitating role of SSCM practices in the relationship between digital enablement and organizational performance has not been sufficiently explored using robust empirical models. Additionally, a significant portion of the extant literature is concentrated in developed economies, thereby limiting the generalizability of findings to emerging economy contexts, where organizations face distinct challenges related to digital infrastructure, regulatory compliance, and resource availability. There is also a methodological gap, as relatively few studies employ advanced analytical techniques such as Partial Least Squares Structural Equation Modelling (PLS-SEM) to validate complex causal relationships among digital enablement, SSCM practices, and performance outcomes.

Thus, there exists a clear research gap in developing and empirically validating an integrated framework that examines how digital enablement facilitates sustainable supply chain practices and how this integration influences organizational performance, particularly in emerging economies.

3.2 Research Objectives

Based on the identified research gap, the objectives of this study are as follows:

1. To examine the extent of digital enablement in supply chain operations within manufacturing organizations.
2. To analyse the impact of digital enablement on the adoption of sustainable supply chain management practices.
3. To assess the effect of sustainable supply chain management practices on organizational performance across economic, environmental, and social dimensions.
4. To investigate the mediating role of sustainable supply chain management practices in the relationship between digital enablement and organizational performance.

4. RESEARCH METHODOLOGY

4.1 Research Design

This study employs a quantitative, cross-sectional research design to empirically examine the relationships among digital enablement, sustainable supply chain management (SSCM) practices, and organizational performance. A survey-based approach was adopted as it is appropriate for testing theoretical models involving multiple latent constructs and causal relationships.

4.2 Sample and Data Collection

The study population comprises manufacturing organizations, with respondents selected from professionals involved in supply chain, operations, procurement, and sustainability-related functions. A purposive sampling technique was used to ensure that respondents possess adequate knowledge of digital technologies and sustainable supply chain practices. Data were collected using a structured questionnaire administered through online and offline modes. A total of 230 questionnaires were distributed, of which 185 usable responses were obtained for analysis. The final sample size meets the recommended requirements for structural equation modelling and ensures adequate statistical power for hypothesis testing.

4.3 Measurement of Constructs

All constructs in the research model were measured using multi-item scales adapted from established studies to ensure content validity and reliability. Digital enablement was measured through indicators reflecting the adoption of advanced digital technologies in supply chain processes. SSCM practices were operationalized using dimensions such as green procurement, sustainable logistics, supplier collaboration, environmental management, and social responsibility. Organizational performance was measured using Triple Bottom Line (TBL) indicators, encompassing economic, environmental, and social performance dimensions. All measurement items were rated on a five-point Likert scale, ranging from “strongly disagree” to “strongly agree.”

4.4 Data Analysis Procedure

A two-stage analytical procedure was followed. First, the measurement model was evaluated to assess internal consistency reliability, convergent validity, and discriminant validity using standard statistical criteria. Second, the structural model was examined to test the hypothesized relationships among constructs by analysing path coefficients, explained variance, and effect sizes. Statistical significance was assessed using a resampling-based inference approach.

4.5 Common Method Bias and Ethical Considerations

To reduce the likelihood of common method bias, procedural remedies such as ensuring respondent anonymity, minimizing item ambiguity, and separating predictor and criterion variables were implemented. In addition, a post hoc statistical test was conducted to assess the presence of common method variance. Ethical standards were strictly followed throughout the research process. Participation was voluntary, respondents were informed of the study objectives, and confidentiality of responses was assured. The data collected were used exclusively for academic research purposes.

5 CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

Grounded in the **Resource-Based View (RBV)** and the **Triple Bottom Line (TBL)** framework, this study proposes a conceptual framework that explains how digital enablement influences organizational performance directly and indirectly through sustainable supply chain management (SSCM) practices. In this framework, digital enablement is conceptualized as a strategic organizational capability that facilitates the adoption and effective implementation of sustainability-oriented supply chain practices, which in turn drive performance outcomes. Digital enablement enhances supply chain visibility, real-time information sharing, traceability, and coordination among supply chain partners. These capabilities support the execution of SSCM practices such as green procurement, sustainable logistics, supplier collaboration, and environmental and social compliance. Consistent with RBV, digitally enabled SSCM practices represent valuable and difficult-to-imitate resources that can improve organizational effectiveness. Accordingly, the following hypothesis is proposed:

H1: Digital enablement has a significant positive effect on sustainable supply chain management practices.

SSCM practices contribute to organizational performance by improving resource efficiency, reducing environmental impact, and strengthening stakeholder relationships. The TBL framework suggests that sustainability-driven initiatives enhance performance across economic, environmental, and social dimensions. Organizations that systematically integrate sustainability into supply chain operations are therefore expected to achieve superior performance outcomes. Hence, the following hypothesis is formulated:

H2: Sustainable supply chain management practices have a significant positive effect on organizational performance.

In addition to enabling sustainable practices, digital technologies directly influence organizational performance by improving operational efficiency, decision-making accuracy, and supply chain responsiveness. Digitally enabled supply chains allow organizations to optimize processes, manage risks effectively, and respond proactively to market changes. Therefore, the following hypothesis is proposed:

H3: Digital enablement has a significant positive effect on organizational performance.

Further, this study posits that SSCM practices serve as an underlying mechanism through which digital enablement translates into performance improvements. Digital technologies facilitate the adoption and execution of SSCM practices, which subsequently enhance organizational performance. This mediating relationship reflects the strategic role of digitally enabled sustainability practices as emphasized by RBV. Accordingly, the following hypothesis is proposed:

H4: Sustainable supply chain management practices mediate the relationship between digital enablement and organizational performance.

The proposed conceptual framework thus integrates digital enablement, SSCM practices, and organizational performance into a unified model, offering a comprehensive understanding of digitally enabled sustainable supply chains and their performance implications.

6. RESULTS AND HYPOTHESIS TESTING

6.1 Measurement Model Evaluation

The measurement model was assessed to establish the reliability and validity of the constructs. Internal consistency reliability was confirmed, as the values of Cronbach's alpha and composite reliability for all constructs exceeded the recommended threshold of 0.70. Convergent validity was established with average variance extracted (AVE) values above 0.50 for each construct, indicating adequate explanatory power of the observed indicators.

Discriminant validity was evaluated using the Heterotrait–Monotrait (HTMT) ratio, with all values below the recommended threshold of 0.85, confirming sufficient distinction among the constructs. These results indicate that the measurement model demonstrates acceptable reliability and validity for subsequent structural analysis.

6.2 Structural Model Assessment

The structural model was evaluated to test the hypothesized relationships among digital enablement, sustainable supply chain management (SSCM) practices, and organizational performance. Collinearity assessment indicated that variance inflation factor (VIF) values were within acceptable limits, suggesting no multicollinearity issues. The coefficient of determination (R^2) values indicate that digital enablement explains 52 % of the variance in SSCM practices, while digital enablement and SSCM practices together explain 68 % of the variance in organizational performance. These values suggest moderate to substantial explanatory power of the proposed model.

6.3 Hypothesis Testing

Hypotheses were tested by examining the standardized path coefficients and their statistical significance. The results indicate that digital enablement has a significant positive effect on SSCM practices ($\beta=0.72$, $p<0.05$), thereby supporting H1. This finding suggests that organizations with higher levels of digital enablement are more likely to adopt and implement sustainable supply chain practices effectively. SSCM practices were found to have a significant positive impact on organizational performance ($\beta=0.46$, $p<0.05$), providing support for H2. This result confirms that sustainability-oriented

supply chain practices contribute to improved performance outcomes. The direct relationship between digital enablement and organizational performance was also significant (β=0.38, $p<0.05$**),** thus supporting H3. This indicates that digital technologies enhance organizational performance beyond their indirect effects through sustainability practices. To examine the mediating effect of SSCM practices, indirect effect analysis was conducted. The results demonstrate that the indirect effect of digital enablement on organizational performance through SSCM practices is significant (β= 0.33, $p<0.05$). Since both the direct and indirect effects are significant, SSCM practices partially mediate the relationship between digital enablement and organizational performance, thereby supporting H4.

7. DISCUSSION OF RESULTS

The findings of this study provide empirical support for the proposed conceptual framework and offer important theoretical and practical insights into the role of digital enablement in sustainable supply chain management. Grounded in the Resource-Based View (RBV) and the Triple Bottom Line (TBL) framework, the results demonstrate how digital technologies function as strategic enablers of sustainability-oriented supply chain practices and organizational performance. The positive and significant relationship between digital enablement and sustainable supply chain management (SSCM) practices supports H1 and reinforces the RBV perspective that digital capabilities constitute valuable organizational resources. Digital enablement enhances information transparency, real-time monitoring, and coordination across supply chain partners, thereby facilitating the implementation of green procurement, sustainable logistics, and supplier collaboration. This finding is consistent with prior studies that emphasize the enabling role of digital technologies in improving sustainability integration within supply chains and confirms that digitalization strengthens firms' ability to operationalize sustainability objectives. The results further reveal a significant positive impact of SSCM practices on organizational performance, supporting H2. This finding aligns with the TBL framework, which posits that sustainability initiatives contribute to improved economic, environmental, and social performance. The observed performance improvements suggest that organizations adopting SSCM practices benefit from enhanced operational efficiency, reduced environmental impact, and stronger stakeholder relationships. This outcome substantiates the argument that sustainability-oriented supply chain strategies are not merely compliance-driven but can generate measurable performance advantages. Support for H3 indicates that digital enablement has a direct positive effect on organizational performance. From an RBV standpoint, this suggests that digital technologies enhance firm performance by improving decision-making accuracy, process efficiency, and supply chain responsiveness. The direct effect highlights that digital enablement contributes to performance gains independently of sustainability practices, underscoring the strategic importance of digital transformation in contemporary supply chains. The mediating role of SSCM practices in the relationship between digital enablement and organizational performance, as evidenced by support for H4, offers a key theoretical contribution of this study. The partial mediation effect suggests that while digital enablement directly improves performance, a substantial portion of its impact is realized through the effective implementation of sustainable supply chain practices. This finding integrates RBV and TBL by demonstrating that digitally enabled sustainability practices serve as critical mechanisms through which digital resources are converted into superior performance outcomes. Collectively, these results extend existing literature by empirically validating the synergistic relationship between digital enablement and SSCM practices in driving organizational performance. The findings also address gaps in prior research by providing evidence from an emerging economy context, thereby enhancing the generalizability of sustainability and digital transformation theories. Overall, the study highlights that organizations seeking sustainable performance improvements should pursue an integrated strategy that aligns digital transformation initiatives with sustainability-oriented supply chain practices.

8. CONCLUSION AND MANAGERIAL IMPLICATIONS

8.1 Conclusion

This study examined the role of digital enablement in fostering sustainable supply chain management (SSCM) practices and its impact on organizational performance, drawing on the Resource-Based View (RBV) and the Triple Bottom Line (TBL) framework. The empirical findings confirm that digital enablement significantly enhances the adoption of SSCM practices and positively influences organizational performance both directly and indirectly. The results demonstrate that digitally enabled SSCM practices contribute to improved performance outcomes by enhancing operational efficiency, reducing environmental impact, and strengthening social responsibility across supply chain networks. Furthermore, the identified mediating role of SSCM practices highlights that digital technologies create greater performance value when strategically aligned with sustainability objectives rather than being implemented in isolation. By empirically validating these relationships, the study extends existing literature on sustainable supply chains and digital transformation, particularly within the context of emerging economies. Overall, the study underscores the importance of integrating digital transformation initiatives with sustainability-oriented supply chain strategies to achieve long-term organizational performance and competitive advantage.

8.2 Managerial Implications

The findings of this study offer several important implications for supply chain managers and organizational decision-makers. First, managers should recognize digital enablement as a strategic capability rather than merely an operational tool. Investments in digital technologies should be aligned with sustainability goals to maximize performance benefits. Second, organizations should leverage digital technologies to strengthen sustainable supply chain practices, such as green procurement, supplier collaboration, and sustainability performance monitoring. Enhanced data visibility and traceability enabled by digital systems can support informed decision-making and ensure compliance with environmental and social standards. Third, the partial mediating role of SSCM practices suggests that managers should focus on integrating digital and sustainability initiatives rather than pursuing them independently. Cross-functional coordination among IT, supply chain, procurement, and sustainability teams is essential to fully realize the performance benefits of digital transformation. Finally, for organizations operating in emerging economies, the results highlight the need to develop digital readiness and sustainability capabilities simultaneously. Policymakers and industry leaders can use these insights to promote digital infrastructure development and sustainability-oriented policies that support long-term industrial growth.

9. Limitations and Future Research Directions

Despite its contributions, this study has certain limitations that should be acknowledged. First, the research adopts a cross-sectional design, which restricts the ability to infer causal relationships among digital enablement, sustainable supply chain management (SSCM) practices, and organizational performance. Longitudinal studies could provide deeper insights into how these relationships evolve over time. Second, the study relies on self-reported survey data, which may be subject to common method bias and respondent subjectivity, despite procedural and statistical remedies employed. Future studies may incorporate objective performance measures or secondary data to enhance the robustness of findings. Third, the empirical analysis focuses primarily on manufacturing organizations, which may limit the generalizability of the results to other sectors such as services, healthcare, or logistics. Future research could extend the proposed framework to diverse industries to validate its applicability across different supply chain contexts. Additionally, the study examines digital enablement and SSCM practices at an aggregate level. Future research may explore the individual effects of specific digital technologies (e.g., block chain, artificial intelligence, or digital twins) and distinct sustainability dimensions to gain more granular insights. Further investigation into potential moderating variables, such as firm size, supply chain complexity, or regulatory pressure, could also enrich the understanding of the proposed relationships. Finally, this study is conducted within an emerging economy context, which, while contributing to the literature, may limit the transferability of findings to developed economies. Comparative cross-country studies are recommended to examine contextual differences and enhance theoretical generalization.

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