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Green Supply Chain Operations and Networking: Digital Pathways to Sustainable Performance

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Abstract: Digital technologies have been recognised as reformative agents in evolving Supply Chain Management (SCM) practices. Green SCM (GSCM) includes environmental thinking into traditional supply chain strategies. It is a commonly recognised green strategy where companies prioritise competitiveness with environmental stewardship. However, the integral role of digitisation in facilitating GSCM and driving sustainability in developing economies remains underexplored. Hence, the current research was designed to analyse the impact of Digital Green Operations (DGO) and Digital Green Networking (DGN) on Sustainable Performance (SP) dimensions, i.e., social, economic, and environmental performance. The study was supported by primary data, gathered from 195 manufacturing companies operating in Khurdha district of Odisha using a multi-stage random sampling technique. The study was descriptive and analytical in nature. Correlation-Based Structural Equation Modelling (CB-SEM) technique was employed to validate the proposed hypotheses through SPSS v25 and AMOS v29 software. The findings signified the growing importance of digitalised GSCM in achieving SP. It highlighted that 'DGO' and 'DGN' positively influenced SP outcomes. DGO significantly enhanced environmental, economic, and social dimensions, whereas DGN contributed positively to environmental and economic performance, with relatively weaker effects on the social dimension of SP. The analysis offered practical insights for stakeholders of GSCM by establishing the fact that prioritising DGO and DGN enhances overall SP.

1. Introduction

Cross-border industries are progressively acknowledging the necessity to harmonise growth with sustainability as supply chains are confronted with pressures from consumers, regulators, and other stakeholders (Seuring & Muller, 2008; Sarkis et al., 2017; Dubey et al., 2017). According to IBEF (2024) and Odisha Economic Survey (2024-25), the manufacturing sector is the most prioritised industry as it contributes to industrial output and helps in employment generation. However, the sector also impacts the environment through its supply chain activities. In contemporary society, companies are often embedding digital strategies in green supply chain practices in order to achieve sustainability (Wamba et al., 2019; Bag et al., 2021). Digital Green Operations (DGO) and Digital Green Networking (DGN) in supply chains are two such digital interventions. They portray the complementary facets of digital GSCM. Within the framework of GSCM, DGO pertains to the assimilation of smart tools into internal processes of the supply chain activities in order to enhance efficiency, reduce emissions, and optimise resource usage (Zhu et al., 2005; Srivastava, 2007; Diabat & Govindan, 2011). Some of the modern-day digital solutions, such as Blockchain Technology (BT), automation, Internet of Things (IoT), and predictive analytics, can help in optimising green operations, thus strengthening the operational aspect of GSCM, as stated by Dubey et al. (2017) and Jabbour et al. (2019). On the other hand, DGN highlights the significance of virtual platforms and smart technologies in boosting transparency among the supply chain partners (Saberi et al., 2019). Queiroz et al. (2020) and Mubarik et al. (2021) further add that digital collaboration techniques, such as BT and cloud-based accounting systems, coordinate sustainability initiatives, help to track adherence with environmental standards, and ensure ethical practices across stakeholders. Despite the emerging relevance of DGO and DGN, studies examining the impact of DGO and DGN at the individual level continue to be limited, particularly in the manufacturing industry (Wamba et al., 2019; Yadav et al., 2020). Hence, the current study bridges the gap by probing into how DGO and DGN at particular levels influence the social, economic, and environmental performance of the manufacturing sector. The results are projected to offer both academic insights and applied recommendations for fostering supply chain practices in the digital landscape. The study is underpinned by the Resource-Based View (RBV) theory, which signifies that companies attain long-term strategic advantage by optimally utilising valuable, rare, and inimitable resources (Wernerfelt 1984; Barney 1991). Within the framework of SCM, digital technologies depict innovation-driven strategic resources that facilitate companies to maintain transparency, coordination, and environmental monitoring across the supply chain. When the tech-enabled resources are combined with green supply chain activities and joint networking practices, companies can foster core competencies that optimise both environmental and operational performance. Hence, the RBV theory facilitates an appropriate theoretical lens for knowing how digital pathways enable the deployment of GSCM practices and enhance SP. To address the identified research gap, the paper seeks to respond to the research questions such as what is the impact of DGO on the SP of the manufacturing sector? And what is the impact of DGN on the SP of the manufacturing sector?

By addressing the above-mentioned research questions, the study seeks to make key contributions in two broad perspectives. First, from the conceptual point of view, it will contribute to understanding how DGO and DGN at individual levels impact SP, adding to the existing literature. Second, from the practical viewpoint, the study is likely to provide valuable insights to the supply chain professionals, policymakers, and the manufacturing sector in particular by emphasising how DGO and DGN in GSCM can be streamlined as strategic practices to enhance SP. In this background, it has the following two objectives: (i)To examine the impact of DGO on the SP of the manufacturing sector. (ii)To examine the impact of DGN on the SP of the manufacturing sector.

2. Literature Review

The fusion of smart technologies with green supply chains is important for understanding how manufacturing companies maintain sustainability. Two evolving practices, namely, DGO and DGN in GSCM, play crucial roles in the integration of smart and green practices. DGO mainly focuses on leveraging digital tools in the internal operations of GSCM, such as the use of BT, IoT, automation, etc., to boost eco-friendly operations, reduce environmental impacts, and mitigate resource usage (Dubey et al., 2017; Jabbour et al., 2019). DGN focuses on the usage of digital platforms in the external practices of GSCM, such as enhancing transparency, collaboration, and knowledge sharing among the stakeholders (Saberi et al., 2019). DGO explicitly adapts to operational efficiency and environmental outcomes, whereas DGN supports ethical adherence, social accountability, and stakeholder engagement, which can enhance SP (Yadav et al., 2020; Sarkis, 2020). Collectively, these mechanisms signify that digital GSCM operates as a vital parameter of balanced SP, forming the base for further empirical validation. Although prior research highlights the role of digital technologies in enabling GSCM practices, the majority of the research considers digitalisation as a broad construct without differentiating the operational and networking frameworks. Moreover, existing research often examines GSCM practices in collective forms, impeding the understanding of how particular digital-enabled practices, such as DGO and DGN, individually impact SP. Additionally, empirical studies with the SEM technique have predominantly focused on green practices instead of digitally enabled practices within the manufacturing sector. Thus, it is imperative to empirically explore the individual roles of DGO and DGN in influencing SP.

2.1. DGO and SP dimensions

DGO is the practice of aligning digital technologies with the core operational activities of supply chain practices. Such alignment enhances eco-efficiency and promotes overall SP. In the context of green supply chain practices, DGO primarily focuses on automating production processes, stock management, logistics, waste reduction techniques, etc., which leads to enhanced resource optimisation and environmentally efficient practices (Dubey et al., 2017). Numerous studies (Saberi et al., 2019; Bag et al., 2021) prioritised that digital tools such as BT, Predictive Analytics, and IoT facilitate real-time tracking of operational energy use and its emissions. Dubey et al. (2017) and Jabbour et al. (2019) stated that embedding digital practices within supply chain practices improves performance. Nevertheless, these studies primarily explore technology tools as operational enablers within broader supply chain mechanisms rather than specifically structuring DGO as a distinct operational competence. In spite of these findings, existing empirical research often depends on conceptual analyses and examines GSCM practices without empirically testing DGO using advanced statistical techniques such as SEM. Consequently, exploring the impact of DGO on SP dimensions persists as a key research focus. Backed by the previous findings, the following hypotheses are put forward:

H_{1a}: DGO has a significant impact on social performance.

H_{1b}: DGO has a significant impact on economic performance.

H_{1c}: DGO has a significant impact on environmental performance.

2.2. DGN and SP dimensions

DGN relates to the usage of digital technologies to enable communication, collaboration, and knowledge sharing among supply chain stakeholders with a focus on maintaining SP. Under the scope of GSCM, DGN encourages suppliers, manufacturers, distributors, and other supply chain partners to coordinate various green initiatives and ensure adherence to social and environmental standards (Queiroz & Wamba, 2019; Saberi et al., 2019). Digital tools such as BT, cloud-based accounting systems, and integrated digital platforms enhance traceability, accountability, and transparency, making supply chains sustainable and resilient (Queiroz et al., 2020; Mubarik et al., 2021). The implementation of DGN impacts the SP dimensions. Social performance improves as integration strengthens compliance with regulatory compliance, corporate social responsibility, and ethical practices, whilst enhancing stakeholder participation and knowledge sharing (Sarkis, 2020; Yadav et al., 2020). Economic performance is improved through optimum resource utilisation, reduced inefficiencies, and cost effectiveness achieved through an integrated planning approach and information sharing practices (Jabbour et al., 2019; Bag et al., 2021). Environmental performance is improved from optimised monitoring and collaboration across the supply chain practices, minimising waste, emissions, and environmental impacts (Zhu et al., 2005; Dubey et al., 2017). Organisations adopting DGN gain a competitive advantage due to optimised network integration, accountability, and transparency. Queiroz & Wamba (2019) stated that digital networking improves knowledge sharing and real-time collaboration, which in turn uplifts competitive advantage and SP. DGN in GSCM enhances traceability, supply chain visibility, and ensures compliance with ethical standards, which ultimately supports social and environmental outcomes (Saberi et al. 2019). Even though existing studies recognised the significance of digital networking for improved coordination and transparency in supply chain practices, most of them focused on digital integration rather than particularly DGN as a distinct capability influencing SP. In addition, empirical studies examining the multidimensional impact of DGN on SP dimensions using the SEM technique continue to be limited, primarily in the manufacturing sector. Evidenced by the prior studies, the following hypotheses are put to test:

H_{2a}: DGN has a significant impact on social performance.

H_{2b}: DGN has a significant impact on economic performance.

H_{2c}: DGN has a significant impact on environmental performance.

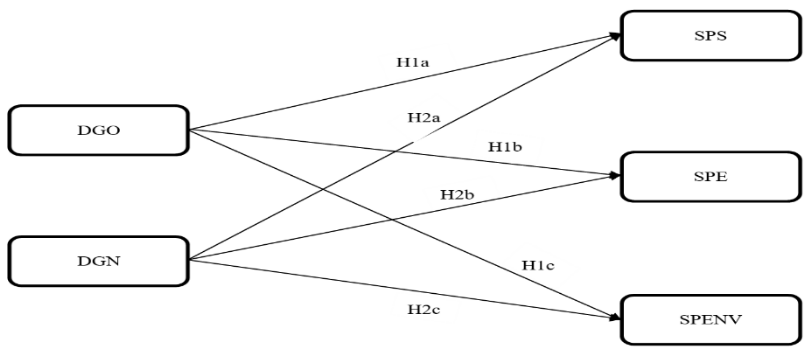

Figure 1: Conceptual Model
Source: Authors' work.

3. Research Methodology

The study was carried out among the manufacturing companies operating in Khurdha district of Odisha, including micro, small, medium, and large companies across various sub-sectors, such as metals and allied, polymer and rubber, textiles, apparel, and other manufacturing sub-divisions (Table 1). According to 'Invest Odisha', a Government of Odisha initiative, the population of registered manufacturing companies in Khurdha is 1,601. As per Taro Yamane (1967), with a 5% margin of error, a sample of 320 companies using a multi-stage random sampling technique was considered as adequate for the study. Out of the 320 companies approached purposively, 195 companies returned the duly filled questionnaires, yielding a 60.94% response rate (Table 1). Of the remaining 125 companies, 70 returned incomplete questionnaires, 35 could not be contacted despite repeated efforts, and 20 declined participation due to confidential reasons. The study focused on those companies that had practical experience with operational practices prospectively shaped by GSCM initiatives and digitisation. Out of the 195 questionnaires that were returned. 45 responses were removed during the process of data screening as respondents lacked adequate knowledge of DGO and DGN practices, making them unsuitable for the study. Hence, the final sample size for data analysis consisted of 150 valid responses. The questionnaire was answered by the key decision makers of the companies, such as the Managing Director, Director of Operations and Production, General Manager, Supply Chain Manager, IT Manager, etc., who are considered competent about the company's operational practices and digital green initiatives. Primary data were gathered through a well-structured questionnaire adapted from past literature. The construct items employed in the study were adapted from validated scales in the GSCM and digital supply chain literature. Items for DGO were adapted from literature analysing the incorporation of digital technologies in sustainable supply chain practices (Dubey et al., 2017; Jabbour et al., 2019; Bag et al., 2021). DGN construct was measured with items derived from prior studies focusing on transparency, information sharing, and digital collaboration across supply chain networks (Queiroz & Wamba, 2019; Saberi et al., 2019; Mubarik et al., 2021). SP was measured using its three parameters, i.e., social, economic, and environmental performance, adapted from literature based on sustainability (Wamba et al., 2019; Yadav et al., 2020; Sarkis, 2020). A 7-point Likert scale varying from 1 (Strongly Disagree) to 7 (Strongly Agree) was employed to quantify key constructs related to DGO, DGN, and SP. The questionnaires were circulated through a combination of scheduled appointments, Google Forms, and personal visits to industrial areas, including Chandaka, Mancheswar, Khurdha, and Rasulgarh. Even though online circulation helped in covering a wider pool of companies, personal visits were still a necessity to improve participation and validate accurate and quality data collection. The resultant sample of 150 responses offered a solid base for empirical analysis. The study deployed a CB-SEM technique for data analysis in order to examine the hypothesised relationships among digital green supply chain practices and SP.

Prior to the full-scale data collection, pilot testing was done in two stages for questionnaire validation. Initially, the instrument was reviewed by academic experts in SCM to validate its content, clarity, relevance, and suitability. Based on the feedback received, minor revisions were made to improve the wording and understandability of certain items. In the second stage validation, the revised questionnaire was administered to 46 respondents from manufacturing companies to evaluate its practical relevance and establish construct validity. Construct validation was examined using Pearson's correlation analysis in SPSS software, where items were considered valid if they showed a significant and positive correlation coefficient (Amalia & Nugraha, 2021). The results of pilot testing confirmed that all items were valid according to the criteria.

Table 1: Respondents' Profile

Category	Frequency	Percentage
Micro	25	12.82
Small	41	21.03
Medium	71	36.41
Large	58	29.74
Total	**195**	**100**
Sub-Sector		
Metals and Allied	45	23.08
Energy, Electrical, and Electronics	35	17.95
Chemicals and Chemical Products	34	17.44
Food and Beverages	27	13.84
Polymer and Rubber	30	15.38
Textiles and Apparels	24	12.31
Total	**195**	**100**

Source: Self-compiled.

4. Data Analysis

4.1. Exploratory Factor Analysis

While performing Exploratory Factor Analysis (EFA), the initial step is to check the sample adequacy. It was accessed with the help of the Kaiser-Meyer-Olkin (KMO) statistic. The KMO value was found to be 0.760, indicating the adequacy of data for performing factor analysis (Hair et al., 2006). Consequently, an assessment of data normality was conducted. The skewness values of all the variables fell within the acceptable range of ± 2, and kurtosis values of all the variables remained within the acceptable range of ± 7 (Hair et al, 2010; Bryne, 2010). To assess the validity of items, EFA technique was executed, employing 'Principal Component Analysis' (PCA) along with the 'varimax' rotation method. The PCA clearly showed a pattern matrix having five separate factors. The eigenvalues of all five factors were more than one, cumulatively accounting 80.632% of the total variance explained. The items distinctly loaded onto their factors, ranging from 0.682 to 0.902. As per Hair et al (2010), for a sample size of 150, the minimum factor loading should be 0.45. Hence, the loadings surpassed the minimum acceptable threshold, indicating good construct representation.

4.2. Bias Testing

For testing the biasness of the data, 'Harman's Single Factor Test' was used to do the PCA. The percentage of variance was found to be 44.679, which is less than 50% (Podsakoff et al., 2003), and hence no threat of Common Method Bias was detected.

4.3. Multicollinearity

It analyses the degree of association among the independent variables. Analysing multicollinearity ensures that the hypothesis results are valid.

Table 2: Multicollinearity

Variable	Tolerance	VIF	Interpretation
DGO	0.881	1.136	No Concern
DGN	0.881	1.136	No Concern

Source: SPSS v25.

To check the multicollinearity between the predictor variables, 'Variance Inflation Factor' (VIF) and 'Tolerance' values were examined. In all three regression models (SPS, SPE, and SPENV), the VIF values for the predictors (DGO and DGN) were 1.136, and the corresponding Tolerance values were 0.881. According to Hair et al. (2010), a VIF value of less than 5 and a Tolerance value above 0.2 indicate an acceptable level of multicollinearity. As the obtained values were well within these acceptable ranges, it can be concluded that there is no multicollinearity present in the models.

4.4. Confirmatory Factor Analysis

Subsequent to the outcomes of EFA, the Confirmatory Factor Analysis (CFA) was executed. CFA is a statistical technique specifically used for validating the construct. CFA tests the reliability and validity of the constructs being measured using AMOS 29 software. In CFA, the model, specifically known as the 'Measurement Model' (Figure 2), details the relationships between the latent constructs and the observed variables. Model fit indices comprised of the following metrics, i.e., Chi-square/degrees of freedom (CMIN/df;1.125), Goodness of Fit Index (GFI; 0.978), Confirmatory Fit Index (CFI; 0.968), Standardised Root Mean Square Residual (SRMR; 0.043), and Root Mean Square Error of Approximation (RMSEA; 0.034). The findings reflected a robust conformity between the data, furnishing empirical evidence for the studied constructs. The derived CMIN/df value of 1.125 stipulated satisfactory fit scores as the value was below the maximum prescribed value of 3.0 (Bentler, 1990). The CFI and GFI scores surpassed the minimum threshold value of 0.90, indicating a good model fit, the RMSEA value at 0.032, being less than 0.05, and the SRMR value at 0.043, being less than 0.09, underlined acceptable values (Hu & Bentler, 1999). Hence, the reported results exhibited a strong model fit, affirming the fitness of the outlined theoretical model (Fig.1) and can further be employed for SEM. Composite Reliability (CR) scores of more than 0.70 demonstrated good reliability among the constructs (Hair et al., 2014) as indicated in Table 3. For each latent (unobservable) variable, the convergent validity was examined by computing the scores of Average Variance Extract (AVE). Convergent validity was achieved with satisfactory results. The values for AVE were greater than the minimum recommended value of 0.50 (Hair et al., 2014). Discriminant validity was examined using the Fornell-Larcker criteria by ensuring that the square root of each construct's AVE value is greater than the other correlation values (Fornell & Larcker, 1981). Furthermore, discriminant validity was measured by ensuring that Maximum Shared Variance (MSV) scores are lower than AVE, CR scores are greater than AVE scores, and Maximum Reliability (H) or MaxR(H) scores are greater than 0.80 (Hu & Bentler, 1999). Every criterion exhibited in Table 3 met the recommended thresholds, assuring good discriminant validity.

Table 3: Reliability and Validity

	CR	AVE	MSV	MaxR(H)	SPE	DGO	DGN	SPS	SPENV
SPE	0.929	0.767	0.491	0.952	**0.876**				
DGO	0.970	0.889	0.491	0.979	0.701	**0.943**			
DGN	0.852	0.592	0.185	0.880	0.401	0.356	**0.770**		
SPS	0.846	0.595	0.176	0.954	0.154	0.271	0.072	**0.771**	
SPENV	0.905	0.706	0.377	0.930	0.593	0.614	0.430	0.420	**0.840**

Source: SPSS AMOS v29.

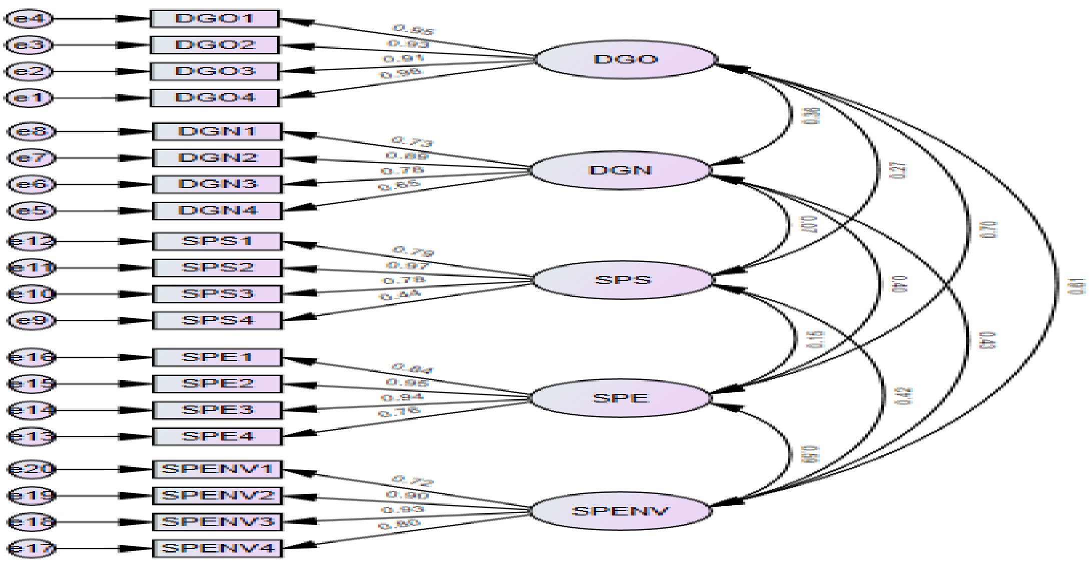

Figure 2: Measurement Model
Source: SPSS AMOS v29.

4.5. Structural Equation Modelling (SEM)

SEM or Path Analysis is a data-driven approach that examines the relationships between observed variables and latent constructs through a series of equations. It permits simultaneous testing of multiple relationships, confirming a comprehensive understanding of the model.

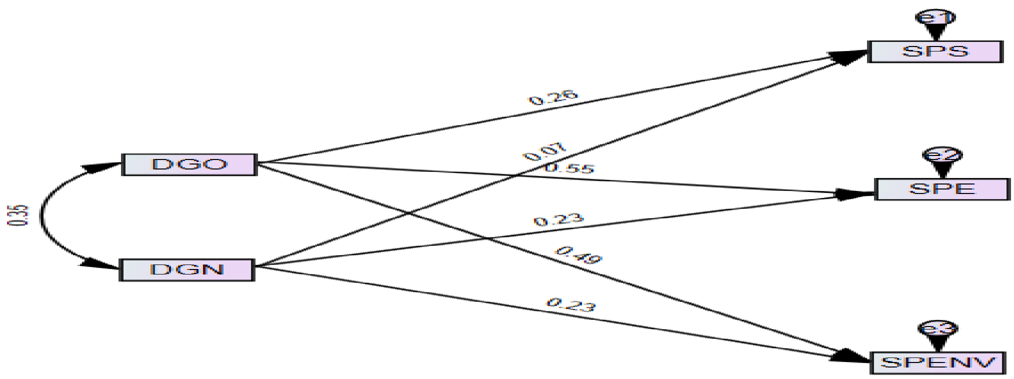

Figure 3: Structural Model
Source: SPSS AMOS v29.

Preceding hypothesis testing, a model fit analysis was performed on the structural model. The CMIN/df value was found to be 2.304, the CFI was 0.968, and the RMSEA was 0.034. Acceptable limit for CMIN/df is less than 3, CFI is 0.90 or higher, and for RMSEA is 0.05 or less (Bryne,2010; Hair et al., 2010). The model fit estimates of the structural model were within the recommended ranges. Hence, it can be inferred that the examined data are fit for hypothesis testing.

4.6. Hypotheses Testing Results

The model (Fig. 3) constructed by applying the SEM technique analyses the impact of a particular independent variable (exogenous variable) on a particular dependent variable (endogenous variable). Table 4 below summarises the results of the hypothesis testing.

Table 4: Hypotheses Testing

Relationship	Estimate	P-Value	Significance	Result
SPS <--- DGO	0.261	.002	Significant	H1a-Accepted
SPE <--- DGO	0.552	***	Significant	H1b-Accepted
SPENV <--DGO	0.491	***	Significant	H1c-Accepted
SPS <--- DGN	0.072	.434	Non-significant	H2a- Rejected
SPE <--- DGN	0.234	***	Significant	H2b- Accepted
SPENV <--DGN	0.233	***	Significant	H2c- Accepted

Note: DGO=Digital Green Operations, DGN= Digital Green Networking, SPS=Sustainable Performance Social, SPE= Sustainable Performance Economic, SPENV= Sustainable Performance Environmental, and ***Represents significance level at 0.001 (two-tailed)
Source: SPSS AMOS v29.

As per Table 4, DGO has a significant and positive influence on the social, economic, and environmental aspects of SP. This means that the incorporation of digital technologies with green operational activities empowers manufacturing companies to optimise efficient use of resources, strengthen socially responsible practices, and minimise environmental impacts. Specifically, DGO shows the strongest impact on SPE (Estimate=0.552; p-value<0.001), followed by SPENV (Estimate=0.491; p-value<0.001) and SPS (Estimate=0.261; p-value<0.005), resulting in the acceptance of H1a, H1b, and H1c. This demonstrates that digitally driven green practices strengthen operational effectiveness and optimisation of costs in manufacturing companies, which primarily contributes to improved economic performance while supporting environmental as well as social performance. In contrast, the effect of DGN on SPS (Estimate=0.072; p-value=0.434) is found to be non-significant, resulting in rejection of H2a. This signifies that digital networking among supply network participants may not directly impact social performance, as such outcomes mostly depend on internal organisational practices, employee performance, and corporate responsibility practices rather than external digital collaboration independently. However, DGN has significant positive effects on SPE (Estimate=0.234; p-value<0.001) and SPENV (Estimate=0.233; p-value<0.001), supporting the acceptance of H2b and H2c. This highlights that digital collaboration among supply chain practitioners improves transparency, resource management, and coordination, which contributes to improved economic efficiency as well as environmental sustainability. As a whole, these findings directly respond to the research questions by indicating that both DGO and DGN contribute positively to SP. DGO exerts a stronger influence across all dimensions, whereas DGN's role is more limited to economic and environmental aspects.

5. Conclusion

The paper focuses on the pivotal role of digitalised GSCM in driving holistic SP. By examining DGO and DGN, the research highlights that DGO consistently enhances social, economic, and environmental outcomes, while DGN selectively improves economic and environmental performance, with limited impact on social aspects. The findings also contribute to the digital supply chain literature and comply with the RBV theory, stating that digitally enabled operational and networking capabilities in supply chains can function as a strategic tool that enhances SP. From the perspective of SP, the results suggest that companies should prioritise DGO practices while strategically leveraging DGN for external collaboration and partnership. The empirical results stress the importance of prioritising DGO initiatives for balanced sustainability, augmented by strategic use of DGN to foster collaboration, external connectivity, and knowledge sharing. Operationally, the study offers guidance for government, managers, policymakers, researchers, and academicians in planning effective digital GSCM strategies to optimise operational effectiveness, resource utilisation, and SP. Despite these contributions, the study exhibits certain constraints as it is confined to the manufacturing sector in a single district of Odisha and considers only DGO and DGN while excluding other forms of digital innovation. In the context of the real world, the study provides key perspectives for companies, policymakers, and supply chain specialists by highlighting how DGO can strengthen internal efficiencies, resource utilisation, and sustainable practices, while DGN enhances collaboration, knowledge sharing, and external connectivity. However, future research may expand the scope by examining other industries and regions, integrating multiple digital technologies, and employing longitudinal designs to capture long-term sustainability effects.

Conceptually, the study made notable contributions by expanding the existing body of knowledge on the digitalisation of GSCM and sustainability by explaining how DGO and DGN shape the facets of SP. The findings suggested that DGO exerts a stronger and more consistent influence across all dimensions of SP, while DGN contributes selectively, with a stronger impact on economic and environmental dimensions. These results imply that companies should prioritise DGO initiatives to achieve balanced sustainability across all dimensions, while leveraging DGN strategically to enhance economic and environmental performance, supplemented by additional measures to improve social outcomes. Despite theoretical contributions, the research further offers certain actionable recommendations for stakeholders in order to design digital GSCM by highlighting the differential roles of DGO and DGN in shaping comprehensive SP.

- Top-level managers and supply chain professionals can prioritise DGO to enhance social, economic, and environmental performance, while leveraging DGN to strengthen collaboration and knowledge sharing for environmental and economic gains.
- Government officials and Policymakers can implement the findings to promote digitalised green practices.
- Investors and industry practitioners can make informed decisions aligning profitability with sustainability.
- Researchers and Academicians can further explore the linkage between digital-driven innovation and green supply chain practices, contributing to empirical evidence and theoretical advancement.

Overall, the study guides stakeholders in designing and implementing effective digital GSCM strategies for holistic SP.

References

Agarwal, S., Kumar, N., Tyagi, M., & Garg, R. K. (2025). Integrating soft computing techniques for optimising green vehicular communications and networking in circular digital supply chain. *Journal of Science and Technology Policy Management*. https://doi.org/10.1108/jstpm-03-2024-0112

Agwot, K. R. (2026). Green Supply Chain Management Practices for Green Innovation. *Journal of Business Management and Economic Development*, *4*(01), 51–67. https://doi.org/10.59653/jbmed.v4i01.2133

Amalia, D., & Nugraha, W. (2021). A Study of Student Learning Attitude towards E-Learning in the Pandemic Era. *JMKSP (Jurnal Manajemen Kepemimpinan Dan Supervisi Pendidikan)*, *6*(2), 336. https://doi.org/10.31851/jmksp.v6i2.5725

Bag, S., Pretorius, J. H. C., & Gupta, S. (2021). Digital transformation and sustainable supply chain management: A systematic review. *Journal of Cleaner Production, 276*, 124060. https://doi.org/10.1016/j.jclepro.2020.124060

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17(1), 99-120.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238–246. https://doi.org/10.1037/0033-2909.107.2.238

Byrne, B. M. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (2nd ed.). New York, NY: Routledge.

Diabat, A., & Govindan, K. (2011). An analysis of the drivers affecting the implementation of green supply chain management. *Resources, Conservation and Recycling, 55*(6), 659–667. https://doi.org/10.1016/j.resconrec.2010.12.002

Directorate of Economics and Statistics, Odisha. (2025). *Odisha Economic Survey 2024–25.* Government of Odisha. https://des.odisha.gov.in

Dubey, R., Gunasekaran, A., Childe, S. J., & Papadopoulos, T. (2017). Sustainable supply chain management: Framework and further research directions. *Journal of Cleaner Production, 142*, 811–825. https://doi.org/10.1016/j.jclepro.2016.03.136

Fangtao, R., & Sharon, C. P. Y. (2026). Performance Impacts and research gaps in sustainable supply chain management under a triple bottom line framework: A systematic review based on Web of Science literature. *International Journal of Academic Research in Economics and Management Sciences*, *15*(1). https://doi.org/10.6007/ijarems/v15-i1/27911

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Gu, Z., Mousa, S., Meng, D., Elkady, A. M., & Leong, L. W. (2025). Digitising energy supply chains for enhanced resilience: Exploring the nexus between supply chain digitisation, carbon neutrality, and natural resource extraction. *Energy Economics*, 108177. https://doi.org/10.1016/j.eneco.2024.108177

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis* (7th ed.). Harlow, UK: Pearson Education Limited.

Hair, J., Black, W., Babin, B., Anderson, R. and Tatham, R. (2006) Multivariate Data Analysis. 6th Edition, Pearson Prentice Hall, Upper Saddle River.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

IBEF (India Brand Equity Foundation). (2024). *Manufacturing industry in India.* https://www.ibef.org/industry/manufacturing-india

Jabbour, C. J. C., de Sousa Jabbour, A. B. L., Sarkis, J., & Godinho Filho, M. (2019). Unlocking the circular economy through new business models based on large-scale data: An integrative framework and research agenda. *Technological Forecasting and Social Change, 144*, 546–552. https://doi.org/10.1016/j.techfore.2017.09.010

Jan, S., Khan, M. A., & Ali, S. (2023). Digital green operations and sustainable supply chain performance: A systematic review. *Journal of Manufacturing Processes, 78*, 1234–1249. https://doi.org/10.1016/j.jmapro.2022.11.014

Kouhizadeh, M., Saberi, S., & Sarkis, J. (2021). Blockchain technology and the sustainable supply chain: A systematic review. *International Journal of Production Research, 59*(1), 1–22. https://doi.org/10.1080/00207543.2018.1533261

Li, Y. (2025). Digitalisation and green supply chain activities in manufacturing: a case study of Huawei. *Asia Pacific Journal of Marketing and Logistics*. https://doi.org/10.1108/apjml-04-2024-0442

Mensah, P. O., Yong, J. Y., Dura, C. C., & Mensah, H. K. (2025). Institutional networking capability as a catalyst for sustainable supply chains in the manufacturing sector of Ghana: The role of green human resource management strategy and green dynamic capability. *Journal of Environmental Management*, *387*, 125865. https://doi.org/10.1016/j.jenvman.2025.125865

Mubarik, M. S., Khan, M. S., & Lee, S. (2021). Blockchain technology and its relationships to sustainable supply chain management. *Technological Forecasting and Social Change, 164*, 120510. https://doi.org/10.1016/j.techfore.2020.120510

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Queiroz, M. M., & Wamba, S. F. (2019). Blockchain adoption challenges in supply chain: An empirical investigation of the main drivers in India and the USA. *International Journal of Information Management, 46*, 70–82. https://doi.org/10.1016/j.ijinfomgt.2018.11.021

Queiroz, M. M., Ivanov, D., Dolgui, A., & Wamba, S. F. (2020). Impacts of epidemic outbreaks on supply chains: Mapping a research agenda amid the COVID-19 pandemic through a structured literature review. *Annals of Operations Research, 319*(1), 1159–1196. https://doi.org/10.1007/s10479-020-03685-7

Queiroz, M. M., Telles, R., & Bonilla, S. H. (2020). Blockchain adoption in supply chain management: A systematic review and future research directions. *International Journal of Production Economics, 219*, 1–16. https://doi.org/10.1016/j.ijpe.2019.07.010

Saberi, S., Kouhizadeh, M., & Sarkis, J. (2019). Blockchain technology and its relationships to sustainable supply chain management. *Technological Forecasting and Social Change, 146*, 1–10. https://doi.org/10.1016/j.techfore.2018.05.022

Sarkis, J. (2020). A strategic decision framework for green supply chain management. *International Journal of Production Economics, 219*, 1–12. https://doi.org/10.1016/j.ijpe.2019.07.010

Sarkis, J., & Dou, Y. (2017). Green supply chain management: A concise introduction. CRC Press.

Seuring, S., & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production, 16*(15), 1699–1710. https://doi.org/10.1016/j.jclepro.2008.04.020

Silva, G. M., Patrucco, A. S., & Gomes, P. J. (2025). Advancing green supply chains through Downstream Digitalization: An Information Processing Theory perspective. *Journal of Purchasing and Supply Management*, 101015. https://doi.org/10.1016/j.pursup.2025.101015

Srivastava, S. K. (2007). Green supply-chain management: A state-of-the-art literature review. *International Journal of Management Reviews, 9*(1), 53–80. https://doi.org/10.1111/j.1468-2370.2007.00202.x

Wamba, S. F., Queiroz, M. M., & Telles, R. (2019). Blockchain adoption in supply chain management: A systematic review. *International Journal of Production Research, 57*(7), 2117–2135. https://doi.org/10.1080/00207543.2018.1533261

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5(2), 171-180.

Yadav, G., Luthra, S., Jakhar, S. K., Mangla, S. K., & Rai, D. P. (2020). A framework to overcome sustainable supply chain challenges through solution measures of industry 4.0 and circular economy: An automotive case. *Journal of Cleaner Production, 254,* 120112. https://doi.org/10.1016/j.jclepro.2020.120112

Yamane, T. (1967). *Statistics: An introductory analysis* (2nd ed.). New York: Harper and Row.

Zhu, Q., Sarkis, J., & Geng, Y. (2005). Green supply chain management in China: Pressures, practices and performance. *International Journal of Operations & Production Management, 25*(5), 449–468. https://doi.org/10.1108/01409170510605017