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**REVISITING GREEN SUPPLY CHAIN MANAGEMENT
THROUGH MEDIATION OF SOCIAL CAPITAL:
A RESEARCH DIRECTION**

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Abstract:

Green supply chain management (GSCM) has emerged as a crucial strategic approach for manufacturing companies to achieve sustainable performance as environmental regulations become more stringent and stakeholder expectations rise. Despite its growing adoption, the relational mechanisms that enable GSCM practices to effectively translate into measurable sustainability outcomes remain insufficiently

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explored. By proposing social capital with structural, relational, and cognitive components as a mediating mechanism, this paper re-examines the relationship between GSCM and sustainable performance. This study creates a thorough conceptual framework that demonstrates how embedded social relationships within supply chain networks strengthen green supply chain practices through underpinning theories of Natural Resource-Based View (NRBV) and Social Capital Theory (SCT). These social interactions facilitate knowledge sharing, trust, and collective commitment, which in turn enhance economic, environmental, and social performance outcomes. To empirically validate the proposed model, this study adopts a quantitative research design targeting firms in the Electrical and Electronics (E&E) manufacturing sector. The paper contributes to the literature by extending the understanding of GSCM from a predominantly techno-operational perspective to a socio-operational perspective, highlighting the importance of social capital in strengthening the effectiveness of green supply chain initiatives. The findings are expected to provide valuable managerial insights for fostering trust, shared vision, and collaborative networks to support sustainable supply chain transformation.

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Keyword:

Green Supply Chain Management, Social Capital, Sustainable Performance



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Introduction

Increased environmental scrutiny and the growing need to implement sustainable operational practices are shaping the modern manufacturing landscape. Green supply chain management (GSCM) has changed from being a reactive compliance-based activity to a proactive strategic priority for organizations due to regulatory pressures, stakeholder expectations, and global sustainability agendas (Albhirat et al., 2023). According to Zhu et al. (2005) and Yildiz Çankaya & Sezen (2019), GSCM broadly refers to the integration of environmental considerations throughout the entire supply chain, including activities like eco-design, green manufacturing, end-of-life product management, and environmentally responsible sourcing. Businesses can simultaneously pursue environmental protection, operational efficiency, and long-term competitiveness by integrating environmental concerns into supply chain processes. Although a substantial body of empirical research confirms that GSCM practices contribute positively to sustainable performance, many studies tend to conceptualize supply chains as largely technical or operational systems (Geng et al., 2017). Such perspectives often overlook the complex social and relational dynamics that influence the successful implementation of sustainability initiatives across organizational boundaries (Lee, 2015; Che Sobry et al., 2022).

Recent scholarship suggests that sustainability-oriented supply chain initiatives are fundamentally socio-technical in nature, requiring not only technological capabilities but also strong collaborative relationships and trust among supply chain partners (Dubey et al., 2019). Consequently, understanding the social mechanisms that facilitate the effectiveness of GSCM practices has become an important area of inquiry in supply chain and sustainability research.

Green purchasing, eco-design, green manufacturing, and reverse logistics are important GSCM components that have been shown to have a positive impact on sustainable performance (Yildiz Çankaya & Sezen, 2019), though literature often treats these components as primarily technical or procedural functions. However, the effective implementation of many GSCM practices, particularly those involving external stakeholders such as green purchasing and reverse logistics, requires extensive collaboration, information sharing, and joint problem-solving among supply chain partners. The importance of social factors in supply chain sustainability initiatives is highlighted by scholars who increasingly contend that relational resources embedded within networks of firms facilitate such collaboration (Dubey et al., 2019). This observation reveals a critical gap in the literature, which is the need to examine the sociotechnical mechanisms that enable organizations to translate GSCM practices into improved sustainable performance outcomes.

In addition, the successful implementation of GSCM practices such as eco-design and reverse logistics often demands high levels of inter-firm coordination, knowledge exchange, and collective risk management (Shaharudin et al., 2019). These requirements cannot be achieved through formal contracts or governance structures alone; rather, they depend heavily on the development of strong relational ties among supply chain actors. In this context, social capital is defined as the network-based resources derived from relationships characterized by trust, shared norms, and mutual understanding plays a crucial role in facilitating collaboration and information exchange (Nahapiet & Ghoshal, 1998; Dubey et al., 2019). Therefore, this paper posits that Social Capital functions as an important mediating mechanism linking GSCM initiatives to sustainable performance outcomes.

Specifically, this study proposes on the Electrical and Electronics (E&E) manufacturing sector, an industry characterized by rapid technological change, short product life cycles, complex global supplier networks, and strict environmental regulations related to electronic waste management (Ho et al., 2016). The E&E sector faces significant sustainability challenges due to the environmental impacts associated with electronic production and disposal, making the adoption of GSCM practices particularly critical (Isernia et al., 2019; Mohamad et al., 2022). By examining how the structural, relational, and cognitive dimensions of social capital influence the relationship between GSCM practices and sustainable performance, this conceptual study seeks to provide a more comprehensive understanding of how sustainable supply chain initiatives can be effectively implemented within complex industrial ecosystems.

Literature Review

The shift towards a more sustainable manufacturing process has forced organizations to integrate environmental factors into their traditional supply chain processes. GSCM is a paradigm shift from the traditional profit-oriented supply chain to a more holistic approach where organizations need to balance profit with environmental and social responsibilities (Albhirat et al., 2023). Existing empirical research indicates GSCM is a crucial antecedent to

sustainable performance, measured through the Triple Bottom Line (TBL) framework encompassing economic, environmental, and social dimensions (Habib et al., 2020).

GSCM and Sustainable Performance

Recent empirical investigations underscore the positive correlation between the comprehensive adoption of GSCM and overall sustainable performance. A recent empirical research study conducted in the manufacturing industry indicates a direct relationship between the implementation of GSCM and a decrease in the overall carbon footprint, thereby increasing overall industry competitiveness and reducing long-term operational costs (El Mokadem & Khalaf, 2024). Furthermore, modern frameworks emphasize that organizations that proactively implement GSCM are better positioned to navigate strict environmental regulations, thereby avoiding compliance penalties and fostering robust corporate reputations (Norddin et al., 2021).

However, existing literature indicates the relationship between GSCM, and sustainable performance is not transactional. The relationship requires the integration of GSCM elements to deliver a balanced triple bottom line. The following subsections detail how individual elements of GSCM; green purchasing, eco-design, green manufacturing, and reverse logistics drive specific dimensions of sustainable performance.

Green Purchasing

Green purchasing involves the selection and acquisition of products and services that minimize environmental impact. It is the foundational upstream activity in GSCM. According to Balin and Sari (2023), adopting green purchasing criteria such as requiring suppliers to possess ISO 14001 certification or conducting lifecycle assessments of raw materials directly enhances environmental performance by preventing hazardous materials from entering the production cycle.

From a financial point of view, although the cost of green materials is higher in the initial stages, the company is able to reduce waste disposal costs and risks associated with supply chain failure due to environmental non-compliance, as supported by empirical research (Alkandi et al., 2024; Linda et al., 2025). On the social front, working with green suppliers has been linked to higher occupational health and safety standards, thus positively influencing social performance.

Eco-Design

Eco-design, or Design for Environment (DfE), integrates environmental criteria during the product conceptualization phase, which dictates up to 80% of a product's eventual environmental impact (European Commission, 2020). Literature indicates that eco-design is perhaps the most proactive GSCM practice. By designing products that require less energy, utilize recyclable materials, and toxic substances, manufacturers significantly improve their environmental performance metrics (Abdullah et al., 2020).

From an economic point of view, eco-design has been linked to enhanced performance in terms of material and energy efficiency in the manufacturing stage. For example, in the electrical and electronic industry, recent studies have confirmed eco-designed products to be in high demand

among the growing demographic of "green" consumers, thus enhancing sales performance (Khor & Udin, 2012). Moreover, eco-designed products for easier disassembly are also linked to reverse logistics and the creation of secondary revenue streams (Awan & Sroufe, 2022).

Reverse Logistics

Reverse logistics encompasses the processes of retrieving, recycling, refurbishing, or properly disposing of end-of-life products (Govindan et al., 2015). In the context of the Triple Bottom Line, reverse logistics acts as a critical loop closer. Environmentally, it diverts substantial volumes of waste from landfills and reduces the need for new raw material extraction.

Economically, effective reverse logistics allows firms to recapture value from used products and components. The refurbishment and resale of products can open new market segments and reduce production costs for new units. Socially, reverse logistics programs often necessitate community engagement and customer cooperation, which enhances corporate image and consumer trust (Albhirat et al., 2023).

Customer Cooperation

Customer cooperation refers to the active involvement of customers in organizational processes such as product development, environmental initiatives, information sharing, and demand forecasting (Sudusinghe & Seuring, 2022). Through collaboration with customers, firms can align their environmental and operational strategies with market expectations, ultimately enhancing sustainability performance.

Numerous studies demonstrate how supply chain cooperation can help achieve sustainability goals. In a systematic review, Sudusinghe and Seuring (2022) discovered that by encouraging resource sharing, product recovery systems, and cooperative environmental planning, external collaboration with stakeholders, including customers, improves environmental and economic sustainability outcomes. Businesses can better understand sustainability requirements and incorporate eco-friendly practices throughout the supply chain by working with customers (Burki et al., 2019).

The positive correlation between customer collaboration and sustainability performance is further supported by empirical research. For example, customer collaboration greatly enhances sustainability performance by promoting innovation and knowledge sharing among supply chain partners, according to recent research on manufacturing companies (Ocicka et al., 2022). Customer engagement provides firms with valuable feedback on environmentally friendly products and encourages firms to adopt greener operational practices.

Customer cooperation also supports sustainable innovation and knowledge sharing. Through direct communication with customers, firms can identify market needs related to sustainability and develop environmentally responsible products and services (Charalampidis et al., 2023). Collaborative relationships promote transparency and information exchange, enabling organizations to improve forecasting accuracy, reduce waste, and enhance operational efficiency (Kotzab et al., 2019). Such interactions help firms implement eco-friendly processes and reduce environmental impacts while improving economic performance.

Green Information Systems (GIS)

Green Information Systems (GIS) and big data analytics capabilities refer to information systems that support environmentally sustainable practices by enabling organizations to monitor, manage, and reduce environmental impacts through digital technologies (AL-Khatib & Shuhaiber, 2022). GIS integrates environmental considerations into information systems design, implementation, and usage, thereby promoting sustainability across organizational operations. In recent years, GIS has gained significant attention in sustainability and supply chain management research. Organizations increasingly rely on information systems to manage environmental data, optimize resource utilization, and support green decision-making processes.

According to Al Karim et al. (2024), GIS is essential for improving sustainability performance since it enables businesses to monitor environmental indicators, cut waste, and promote ecologically friendly supply chain practices. They also showed that by promoting green supply chain management techniques, green information systems have a positive impact on businesses' environmental performance. Referring to their findings, GIS helps businesses incorporate environmental data into strategic decision-making procedures, which improves the results of environmental sustainability.

The capacity of digital integration to facilitate data-driven sustainability management is one of its main advantages. Businesses can gather and examine environmental data about resource usage, emissions, and energy consumption thanks to digital technologies (AL-Khatib & Shuhaiber, 2022). This information enables managers to identify inefficiencies, implement corrective actions, and monitor sustainability performance. As a result, GIS enhances environmental transparency and facilitates sustainable decision-making.

The role of digital transformation in sustainability has also been emphasized in recent studies. Digital technologies, including information systems, big data analytics, and cloud computing, support sustainable business practices by improving resource efficiency and enabling environmental monitoring (Lin & Fan, 2024). Through digital transformation, firms can integrate sustainability considerations into operational and strategic decision-making processes.

Social Capital

The integration of sociological theories into supply chain management is a rapidly developing direction of research. Researchers acknowledge the importance of considering the role of supply chain management in business, as efficiency in this area is not enough for a company to stay competitive for a long time. Grounded in Social Capital Theory (SCT), social capital in supply chains is a set of actual and potential resources found within, available through, and derived from the network of relationships possessed by the organization (Acquah et al., 2024). The existing literature increasingly considers social capital not only as a result of business processes but as a driving force for sustainability in various aspects, namely, economic, environmental, and social sustainability (Widyawati et al., 2023).

Social Capital and Sustainable Performance

Recent studies consistently demonstrate that firms with high levels of accumulated social capital exhibit superior sustainable performance. For instance, Lee (2015) discovered that structural and relational social capital have significant effects on environmental performance in supplying firms, where the research has made significant connotation about the positive correlation between social capital and environmental performance. Social capital minimizes the transaction costs associated with finding reliable partners, negotiating contracts, and monitoring compliance with environmental standards. By fostering a collaborative ecosystem, firms can pool resources to invest in expensive green technologies and share the risks associated with sustainable innovations (Asamoah et al., 2024). To fully understand this dynamic, scholars deconstruct social capital into three distinct but highly interrelated dimensions: structural, relational, and cognitive capital.

Structural Capital

Structural capital refers to the architectural configuration of a supply chain network, essentially defining who is connected to whom and the frequency of those interactions. It encompasses information sharing, network ties, and cross-functional communication channels (Nahapiet & Ghoshal, 1998). Empirical research by Che Sobry et al. (2022) highlights that robust structural capital enhances supply chain visibility. When communication channels are highly developed, firms can rapidly trace the origin of raw materials, monitor suppliers' carbon footprints, and respond swiftly to environmental disruptions. Economically, this structural connectivity reduces lead times and inventory holding costs.

Relational Capital

While structural capital focuses on the presence of ties, relational capital focuses on the quality and affective nature of those ties—most notably trust, respect, reciprocity, and mutual obligation (Nahapiet & Ghoshal, 1998). Trust is frequently cited as the most critical element of relational capital. When supply chain partners trust one another, they are more willing to share proprietary eco-designs and sensitive environmental data without fear of opportunistic behavior (Acquah et al., 2024). Albhirat et al. (2023) found that strong relational capital significantly improves social performance, as partners working in high-trust environments are more likely to collaboratively improve workplace safety, labor conditions, and community engagement initiatives.

Cognitive Capital

Cognitive capital embodies the shared representations, interpretations, and systems of meaning among supply chain partners. This translates into a shared vision, common goals, and a shared operational language (Nahapiet & Ghoshal, 1998). In the context of sustainability, cognitive capital is vital because "green performance" can be interpreted differently by different actors. Studies indicate that when a manufacturer and its suppliers possess high cognitive capital, they align their strategic environmental goals seamlessly (Che Sobry et al., 2022). This shared mindset reduces friction during the implementation of complex green practices, such as circular economy initiatives or reverse logistics, leading to highly cohesive environmental and economic outcomes.

Social Capital as a Mediator

While the direct link between social capital and performance is well-documented, a growing body of literature conceptualizes social capital as a crucial mediating mechanism. Green Supply Chain Management (GSCM) practices such as green purchasing and customer cooperation are essentially structural frameworks. However, these technical frameworks cannot function effectively in a relational vacuum.

Studies examining complex supply chains posit that GSCM practices stimulate the development of social capital, which in turn drives sustainable performance (AL-Khatib & Shuhaiber, 2022; Che Sobry, 2022). For example, the act of engaging in collaborative eco-design (a GSCM practice) naturally forces engineers and managers from different firms to interact frequently (building structural capital), develop mutual trust through joint problem-solving (building relational capital), and align their design philosophies (building cognitive capital). It is this newly generated social capital that facilitates the smooth transfer of knowledge, reduces the cost of implementation, and ultimately results in superior economic and environmental performance. Therefore, social capital serves as the indispensable element that translates the technical intent of green supply chain initiatives into sustainable realities.

Dependent Variable: Sustainable Performance

Sustainable performance is evaluated holistically through the Triple Bottom Line (TBL) approach (Gelmez et al., 2024).

Economic Performance. Contrary to the archaic belief that environmentalism harms profitability, effective GSCM improves economic outcomes. Metrics include cost savings from reduced energy consumption, decreased waste treatment costs, avoidance of regulatory fines, and improved market share through green product differentiation (Albhirat et al., 2023).

Environmental Performance. This is measured by the tangible reduction of the firm's ecological footprint, including reductions in air emissions, solid waste, effluent wastewater, and the consumption of hazardous, toxic, or scarce materials (Abdullah et al., 2020).

Social Performance. Often the most neglected dimension, social performance evaluates the impact of the firm's supply chain operations on human systems (Geng et al., 2017). Metrics include improvements in employee health and safety, community welfare, and the enhancement of corporate reputation and stakeholder trust.

Hypothesis Development

Based on the integration of the literature, this paper proposes that while GSCM practices provide the technical foundation for sustainability, social capital provides the relational lubrication required for these practices to succeed across firm boundaries. GSCM initiatives like green purchasing and customer cooperation inherently build structural ties and relational trust. In turn, this accumulated social capital facilitates the seamless knowledge transfer and risk-sharing necessary to achieve high economic, environmental, and social performance.

- **H1:** Green Supply Chain Management is positively associated with Sustainable Performance.
- **H2:** Green Supply Chain Management is positively associated with Social Capital (Structural, Relational, and Cognitive).
- **H3:** Social Capital is positively associated with Sustainable Performance.
- **H4:** Social Capital mediates the relationship between Green Supply Chain Management and Sustainable Performance.

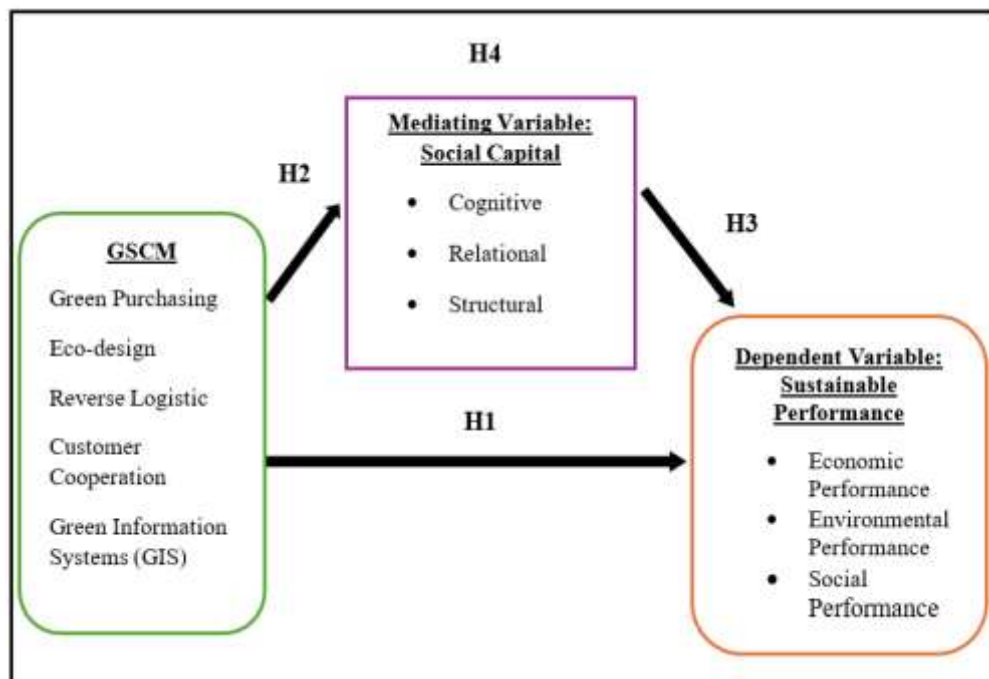


Figure 1: Proposed Framework

Underpinning Theories

This conceptual framework is anchored in the integration of the Natural-Resource-Based View (NRBV) and Social Capital Theory (SCT).

Natural-Resource-Based View (NRBV). NRBV posits that a firm's competitive advantage is fundamentally tied to its relationship with the natural environment (Hart, 1995; Hart & Dowell, 2010). It suggests that organizational capabilities facilitating environmentally sustainable economic activities such as pollution prevention, product stewardship, and sustainable development are rare, valuable, and difficult to imitate. In the context of this study, GSCM represents a strategic capability under the NRBV framework that drives sustainable performance (Acquah et al., 2024).

Social Capital Theory (SCT). While NRBV identifies what capabilities are needed, SCT explains how these capabilities are operationalized across firm boundaries. Nahapiet and Ghoshal (1998) initially defined social capital as the sum of actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an actor. SCT argues that competitive advantage is derived from structural ties, relational

trust (Lee, 2015) and cognitive shared visions among supply chain partners. Integrating these theories provides a robust lens: GSCM (the NRBV capability) requires Social Capital (the SCT mechanism) to effectively yield Sustainable Performance.

Research Methodology

To empirically validate the proposed conceptual framework, this study adopts a quantitative cross-sectional research design, which is widely utilized in supply chain and sustainability research to examine relationships among latent constructs. Quantitative approaches allow for the systematic testing of theoretical relationships and provide robust empirical evidence regarding the causal links between Green Supply Chain Management (GSCM), Social Capital, and Sustainable Performance (Hair et al., 2019).

Population and Sampling

The target population for this study consists of middle-to-senior level managers, including Supply Chain Managers, Procurement Directors, Sustainability Officers, and Operations Managers within the Electrical and Electronics (E&E) manufacturing sector. These individuals are considered appropriate respondents because they are directly involved in supply chain decision-making and sustainability initiatives within their organizations.

The E&E sector is selected due to its high exposure to global environmental regulations, rapid technological innovation, and complex multi-tier supply chain structures, which necessitate the adoption of sustainable supply chain practices (Lee et al., 2012; Shaharudin et al., 2023). To ensure adequate representation across industry segments, a stratified random sampling technique is recommended. This approach allows for the inclusion of firms from various E&E sub-sectors, such as consumer electronics, semiconductor manufacturing, and industrial electronic components, thereby enhancing the representativeness and reliability of the collected data.

Data Collection and Instrumentation

Primary data will be collected using a self-administered structured questionnaire, which is commonly employed in supply chain management studies due to its efficiency in capturing perceptions and organizational practices across a large sample (Hair et al., 2019). All measurement items will be adapted from previously validated scales in the existing literature to ensure content validity and reliability.

The constructs examined in this study; GSCM practices, Social Capital, and Sustainable Performance will be measured using a seven-point Likert scale, ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Utilizing established measurement scales helps ensure comparability with prior studies and strengthens the reliability and validity of the research instrument (Dubey et al., 2019).

Data Analysis

To test the proposed relationships in the conceptual model, Partial Least Squares Structural Equation Modeling (PLS-SEM) will be employed using statistical software such as SmartPLS.

PLS-SEM is particularly appropriate for studies involving complex models with multiple constructs, mediation effects, and relatively predictive research objectives (Hair et al., 2022).

The analysis will proceed in two stages: first, the measurement model will be assessed to evaluate reliability and validity, including indicator reliability, composite reliability, convergent validity, and discriminant validity. Second, the structural model will be examined to test the hypothesized relationships among the constructs. In particular, the mediating role of Social Capital in the relationship between GSCM and Sustainable Performance will be tested through bootstrapping procedures, allowing for the evaluation of both direct and indirect effects (Hair et al., 2022). This approach enables a comprehensive understanding of how relational resources within supply chain networks influence sustainability outcomes.

Implications of the Study

Theoretical Implications

This conceptual paper contributes to the growing body of supply chain sustainability literature by bridging the operational and behavioral perspectives of supply chain management. While prior studies have largely emphasized the operational aspects of GSCM practices, this study highlights the importance of relational and social mechanisms in facilitating successful sustainability initiatives.

Specifically, the study responds to scholarly calls for greater theoretical integration between sociological and strategic management perspectives in supply chain research (Dubey et al., 2019). By combining Social Capital Theory (SCT) with the Natural Resource-Based View (NRBV), this research proposes a more comprehensive explanation of how sustainability-oriented supply chain practices translate into improved organizational outcomes.

Furthermore, the framework positions social capital not merely as a by-product of collaboration but as an active mediating mechanism that enables knowledge exchange, trust development, and coordinated action among supply chain partners. This perspective extends existing GSCM research by emphasizing the critical role of relational resources in achieving sustainable performance.

Practical Implications

From a managerial perspective, the proposed framework highlights an important strategic blind spot within many sustainability initiatives. Organizations often invest heavily in green technologies and operational improvements such as eco-design systems, environmental management tools, or green information systems, yet overlook the relational capabilities required to support these initiatives.

For practitioners in the Electrical and Electronics manufacturing sector, this study suggests that technological investments alone may produce suboptimal sustainability outcomes if the relational infrastructure within the supply chain is weak. Managers should therefore focus on actively cultivating inter-organizational trust, collaborative partnerships, and transparent communication channels with suppliers and customers.

Strengthening the structural, relational, and cognitive dimensions of social capital can facilitate more effective information sharing, joint problem-solving, and alignment of sustainability objectives across supply chain partners. Ultimately, such relational investments can help firms fully realize the economic, environmental, and social benefits associated with GSCM implementation (Dubey et al., 2019).

Conclusion and Limitations

Achieving sustainable performance within the contemporary manufacturing ecosystem requires more than the mere adoption of environmentally friendly operational practices. Instead, it requires the development of collaborative supply chain networks characterized by trust, shared values, and effective communication mechanisms. By conceptualizing Social Capital as a mediating mechanism, this study proposes a comprehensive framework that captures both the operational and relational dimensions of sustainable supply chain management. The model highlights how the successful implementation of GSCM practices depends not only on technological capabilities but also on the quality of relationships among supply chain partners.

Despite its contributions, this study has several limitations. As a conceptual paper, the framework has not yet been empirically validated. Future empirical research is therefore necessary to test the proposed relationships and verify the mediating role of social capital. Additionally, the study focuses specifically on the Electrical and Electronics manufacturing sector, which may limit the generalizability of the findings to industries with different supply chain configurations, such as agriculture, extractive industries, or primary manufacturing sectors.

Future research is encouraged to empirically test the proposed model using diverse industry contexts and to consider longitudinal research designs that can capture how social capital evolves over time within green supply chain partnerships. Such studies could provide deeper insights into the dynamic role of relational resources in achieving long-term sustainable performance.

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