

Role Of Supply Chain Management in Construction Industry

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Abstract—The construction industry faces difficulties with sustainability, risk, cost, and efficiency. This study investigates how improved planning, procurement, logistics, and stakeholder collaboration are some of the ways Supply Chain Management (SCM) tackles these problems. A 5-point Likert scale was used to evaluate SCM across six areas in a survey of 50 academics and construction professionals. Results show that real-time logistics, vendor selection, and early procurement planning improve project outcomes. Although fluctuations in material prices continue to be a worry, risk management techniques proved beneficial. Efficiency gains and environmental impact reduction are increasingly being facilitated by sustainability practises and innovations like as BIM and IoT. Additionally, SCM tools enhance risk mitigation and communication. SCM greatly improves construction project performance overall, but addressing environmental and economic issues need for concentrated work.

I. INTRODUCTION

SCM, or supply chain management, is essential to the construction industry because it manages resources, procedures, and stakeholder collaboration from beginning to end. Construction takes place in dynamic on-site conditions, unlike manufacturing, necessitating flexible, robust supply chains. Delays and cost overruns are among the inefficiencies the business faces, frequently brought on by disjointed supply chains. SCM concepts, which are aided by digital twins and BIM, assist solve these problems by enhancing resource allocation and coordination. Strategies like prefabrication, real-time tracking, and just-in-time delivery are becoming increasingly popular as projects get more complicated. Vulnerabilities are revealed by fragmentation and disturbances, as those that occurred during COVID-

19. Additionally, sustainability is becoming more and more important, which is driving a change to waste reduction and green procurement. In addition to promoting environmental objectives, integrating sustainable SCM increases stakeholder value and cost effectiveness.

II. OBJECTIVES

Examining the function and efficacy of supply chain management (SCM) in building projects is the main goal of this study. It seeks to assess the ways in which supply chain management (SCM) affects important project elements like planning, procurement, logistics, communication, risk management, sustainability, and overall performance. Through organised data gathering and analysis, the study aims to determine the advantages and disadvantages of present SCM techniques. Additionally, it aims to evaluate the industry's awareness and degree of adoption of SCM tools and technologies, such as BIM and IoT. The study intends to provide strategic insights into enhancing SCM integration for increased productivity, decreased delays and cost overruns, and improved resource usage by examining the perspectives of construction professionals. The study's ultimate goal is to make suggestions that encourage resilient and sustainable supply chain methods in the building industry.

III. LITRATURE REVIEW

The research objectives are supported by the literature, which outlines a dynamic SCM model that optimises procedures to save costs and delays. [1] Divergent stakeholder perspectives on supply chain management

(SCM) in Kathmandu's construction industry are highlighted in the literature, underscoring the necessity of improved integration with site management and communication to guarantee project success.[2] The study goal of increasing SCM efficiency in building projects is supported by the literature, which demonstrates that integrating BIM with SCM improves supply chain visibility, coordination, and decision-making.[3] The study's emphasis on effective and integrated supply chain management methods is supported by the literature, which shows that enhancing supply chain control, data interchange, and collaboration can save costs, improve project outcomes, and reduce delays. [4] The research supports the study's focus on improving stakeholder coordination by demonstrating that both traditional and integrated project delivery methods can foster collaboration. This suggests that strategic partnership is more important for effective SCM than the delivery model.[5] In line with the study goal of enhancing SCM through improved information flow and decision-making, the literature emphasises the necessity of precise definitions of Supply Chain Visibility (SCV) in the construction industry and defines essential information requirements.[6] The literature supports the study's goal of evaluating and modifying SCM approaches for improved industry results by emphasising that while SCM, including JIT concepts, can address inefficiencies in construction, its implementation must be customised to project-specific conditions. [7] In line with the goal of the study, which is to improve construction performance through improved supply chain integration, the literature points out inefficiencies in Nigeria's public procurement system and advocates implementing strategic supply chain management techniques to improve project delivery. [8] The study's goal of assessing and enhancing SCM practises for increased effectiveness and environmental responsibility is supported by the literature, which examines the development of SCM in Indian construction and emphasises its increasing emphasis on technology and sustainability.[9] The literature supports the study's goal of improving coordination and stakeholder integration in SCM practises by highlighting the significance of supply chain collaboration in the construction industry and finding critical success factors and trends across projects.[10] In line with the study's objective of fostering technology-driven

efficiency in construction supply chains, the literature emphasises how digital tools and logistical integration in CSCM increase coordination, lower mistakes, and enhance resource utilisation. [11] The literature supports the study's goal of improving supply chain management (SCM) performance through a better understanding of interconnected supply networks by highlighting supply chain mapping as an essential tool for managing complexity and accomplishing sustainability goals. [12] The goal of the study, which is to promote resilient and environmentally friendly supply chain practises, is supported by the literature, which emphasises the necessity of sustainable SCM methods in the construction industry to manage disruptions and minimise environmental effect. [13] The study's goal of increasing efficiency through improved supplier integration and SCM practises is supported by the literature, which identifies performance gaps in multi-tier construction supply chains and recommends the use of tools like SCOR, OMAX, and Traffic Light models to facilitate evaluation.[14] The literature supports the study's goal of improving SCM efficiency and project performance by examining lean supply chain management as a remedy for ongoing inefficiencies in the construction industry, with a focus on value stream optimization.[15]

IV. METHODOLOGY

This study uses a methodical technique to evaluate how Supply Chain Management (SCM) affects building projects. Five major SCM categories—planning and procurement, logistics and material management, collaboration and communication, risk management, and sustainability and innovation—were the focus of a descriptive research design. Using a purposive sample technique, a structured survey was given to 50 construction industry professionals in order to gather data. In order to collect comprehensive information, the questionnaire—which was created using a 5-point Likert scale—was split into sections that corresponded with the five SCM categories. Utilizing statistical tools, the replies were examined to determine mean scores, exposing trends and highlighting the advantages and disadvantages of SCM procedures. In order to ensure appropriate analysis of Likert-type data, the interpretation was predicated on the analytical framework put forward by

Sullivan and Artino (2013). This approach made it possible to draw trustworthy conclusions about how well SCM performed in terms of project efficiency, sustainability, risk mitigation, and cost savings. As a result, the study offers evidence-based suggestions for enhancing SCM tactics in the building industry, emphasising both innovative and successful approaches. The results are statistically sound and practically applicable to the construction sector thanks to the methodical approach.

V. SURVEY RESULTS AND DISCUSSION

The survey responses from 50 construction professionals about the function and efficacy of supply chain management (SCM) in building projects are thoroughly examined in this chapter. Planning and Procurement, Logistics and Material Management, Collaboration and Communication, Risk Management, Sustainability and Innovation, and Overall Impact were the six main topic areas that formed the framework of the survey. A five-point Likert scale was used to collect the data, and it was then analysed to find patterns and insights.

5.1 Planning and Procurement

The results show that project performance is significantly improved when SCM is involved early in the planning stage. By reducing delays and promoting cost-effective decision-making, SCM improves planning outcomes, according to about 80% of respondents who agreed or strongly agreed. Furthermore, 86 percent of interviewees emphasised the need of early purchase planning in avoiding delays in material supply. Eighty-four percent of respondents thought it was vital to choose vendors based on their quality and dependability. Despite the fact that 74% of respondents favoured bulk purchasing as a way to cut costs, 26% were undecided or neutral, maybe as a result of worries about logistics or storage issues.

Table 5. 1 Summary of responses- planning and procurement

Statement	Agree/Strongly Agree (%)
SCM involvement improves planning and performance	80%
Early procurement avoids material supply delays	86%

Vendor selection impacts project outcomes	84%
Bulk procurement reduces total project costs	74%

5.2 Logistics and Material Management

Survey respondents overwhelmingly favoured effective material handling and logistics procedures. Ninety percent of respondents said that real-time material tracking was especially preferred, demonstrating how important on-time delivery is to project efficiency. Eighty-four percent of respondents agreed that effective logistics planning is essential to lowering transportation expenses and delays. But just 72% of respondents favoured Just-in-Time (JIT) delivery, while 28% were ambivalent or disagreed, suggesting reluctance because of the possibility of supply delays.

Table 5. 2 Summary of Responses – Logistics and Material Management

Statement	Agree/Strongly Agree (%)
Real-time delivery tracking improves efficiency	90%
JIT minimizes on-site material wastage	72%
Logistics planning reduces costs and delays	84%

5.3 Collaboration and Communication

The necessity of collaboration in supply chain management is highly supported by survey data. Approximately 88% of those surveyed concurred that supplier-contractor cooperation improves supply chain reliability. Furthermore, 78% of respondents said that SCM software is useful for enhancing collaboration and communication. Eighty-eight percent of respondents agreed that prompt communication with suppliers is an essential tactic to avoid material shortages and project delays.

Table 5. 3 Summary of Responses – Collaboration and Communication

Statement	Agree/Strongly Agree (%)
Contractor-supplier collaboration improves reliability	88%
SCM software facilitates stakeholder coordination	78%
Timely communication reduces material shortages	88%

5.4 Risk Management

SCM was recognised as a useful instrument for reducing a variety of hazards associated with construction. Although 30% of respondents were neutral or disagreed, indicating a lack of confidence in SCM's capacity to control economic volatility, over 70% of respondents agreed that SCM techniques may handle concerns associated with material price variations. However, 80 percent of respondents felt that contingency planning works well to keep projects on track even in the face of unforeseen circumstances, and 82 percent favoured supplier diversification as a tactic to lessen disruptions.

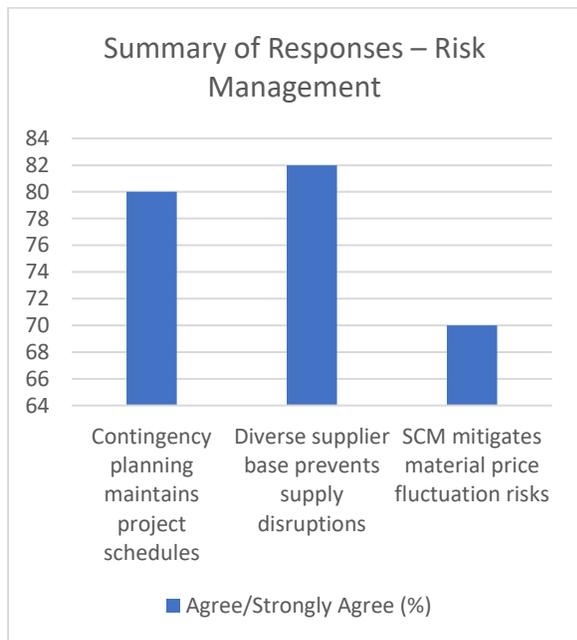


Figure 1 Summary of Responses – Risk Management

5.5 Sustainability and Innovation

Compared to other issues, the role of technology and sustainability in SCM was largely supported, albeit with somewhat less agreement. Of those surveyed, 78 percent agreed that sustainable procurement procedures have a beneficial impact on project outcomes, and 82 percent acknowledged the advantages of using technologies like the Internet of Things and Building Information Modeling (BIM) (IoT). 30 percent of respondents, however, gave neutral or unfavourable answers, especially when it came to the environmental impact, suggesting that adoption and application of sustainable SCM methods are still developing.

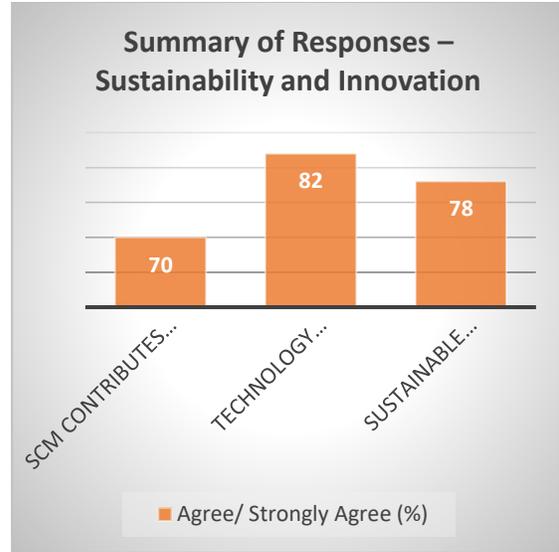


Figure 2 Summary of Responses – Sustainability and Innovation

3.6 Overall Impact

Overall, SCM was seen in a very favourable light. Significantly, 84% of respondents concurred that SCM guarantees projects are completed on schedule. Similarly, 82% of respondents highlighted SCM's significance in preserving construction quality through on-time material delivery, and 78% acknowledged its contribution to cost savings. Notably, 80% of participants thought that incorporating SCM techniques into projects increased stakeholder satisfaction.

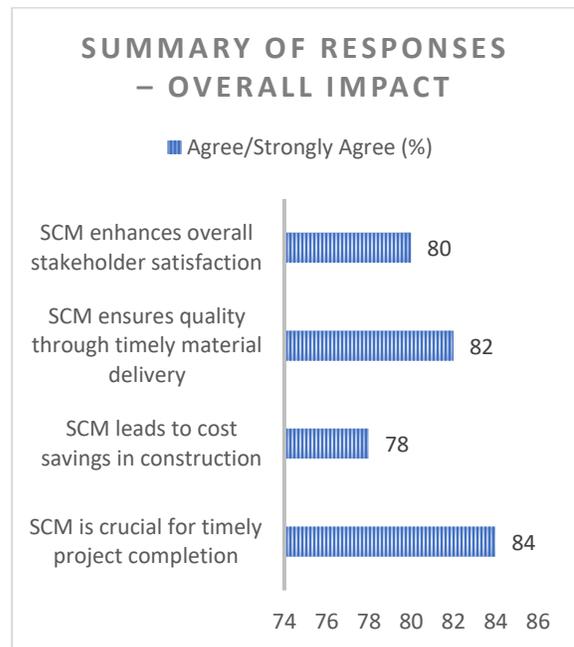


Figure 3 Summary of Responses – Overall Impact

The results of the survey show that SCM plays a significant influence in many aspects of building project management. SCM is a major facilitator of project efficiency, cost management, and quality assurance, as evidenced by the high levels of agreement in areas like planning, logistics, collaboration, and overall impact. Moderate neutrality in areas like sustainability and price volatility, however, points to possible directions for future research. Therefore, incorporating strong SCM tactics is essential to guaranteeing project success and satisfying contemporary construction expectations.

VI. CONCLUSION

By improving planning, procurement, logistics, risk management, sustainability, and stakeholder coordination, supply chain management, or SCM, is essential to the success of building projects. The results of the survey show broad consensus regarding SCM's ability to boost productivity, cut expenses, and improve performance. While timely procurement and seamless operations are guaranteed by early SCM engagement, project objectives are further supported by real-time logistics and vendor dependability. Responses to just-in-time delivery were conflicted because of practical issues. Although material price volatility is still an issue, risk management techniques including supplier diversity and contingency planning were commended. Although they encounter obstacles to implementation, sustainable practises and technology like BIM and IoT were seen favourably. SCM software and tools have enhanced collaboration and communication. Overall, SCM was recognised for promoting stakeholder satisfaction, quality improvement, and on-time delivery—all of which are critical for attaining sustainability and efficiency in contemporary building projects.

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