Implementation and Challenges of Supply Chain Management in the Construction Sector: A Review

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***Abstract*— The construction industry is one of the most dynamic yet fragmented sectors, often facing challenges in coordination, resource management, and timely project delivery. Effective Supply Chain Management (SCM) plays a crucial role in addressing these inefficiencies by integrating various stakeholders, processes, and technologies. This study aims to understand the concept, significance, and current status of SCM practices within the construction industry. A comprehensive questionnaire-based survey was conducted among industry professionals to identify the major challenges and barriers affecting SCM implementation. The study further analyzes existing supply chain practices, focusing on the level of technological adoption and collaboration among contractors, suppliers, and clients. Microsoft Project (MSP) is utilized to demonstrate its application in planning, scheduling, and managing supply chain operations, emphasizing its potential to enhance coordination, streamline resource allocation, and improve overall project performance. The findings highlight that digital tools like MSP can significantly strengthen construction supply chains by promoting transparency and real-time monitoring. Finally, the research proposes strategic recommendations for the effective adoption of digital supply chain management systems, contributing to improved productivity, reduced project delays, and better decision-making across the construction sector.**

Keyword: Supply Chain Management, Construction Industry, Microsoft Project (MSP), Digitalization, Project Efficiency

I. INTRODUCTION

The construction industry plays a pivotal role in the economic development of any nation, contributing significantly to infrastructure growth, employment generation, and urbanization. However, despite its importance, the sector is often characterized by fragmented operations, poor coordination among stakeholders, cost overruns, time delays, and inefficiencies in resource utilization. In recent years, the concept of Supply Chain Management (SCM) has emerged as a strategic approach to address these challenges and enhance overall project performance.

Supply Chain Management in construction refers to the systematic coordination of materials, information, finances, and resources across the various stages of a project—from design and procurement to construction and delivery. Unlike manufacturing industries where supply chains are often stable and repetitive, the construction sector deals with unique, project-based supply chains that involve multiple independent entities such as clients, contractors, subcontractors, suppliers, and consultants. This complexity makes the implementation of SCM principles more challenging but also more critical for achieving project success.

The adoption of SCM in construction aims to improve collaboration, reduce waste, optimize logistics, and ensure timely delivery of materials and information. By integrating supply chain processes, stakeholders can achieve better transparency, reduced costs, and improved quality outcomes. Moreover, with the increasing emphasis on sustainable and lean construction practices, SCM offers a framework for minimizing environmental impact while enhancing productivity and value creation.

A. What is Supply Chain Management (SCM)

The term “supply chain” refers to a series of interdependent steps of activities or processes (sometimes sequential and sometimes overlapping) as

well as flows between them, supported by infrastructure (people, equipment, buildings, software, etc.). These flows express real or forecast customer demand going in one direction, and supply going in the other direction in order to fulfil that demand. Figure outlines the general directions of these flows. Demand and supply flow in opposite directions but may follow different routes (they are not necessarily one- on-one opposites of each other). Information flows both ways. Products and services also may flow both ways (e.g., a fabricator may ship products to a galvanizer and then incorporate returned products into larger assemblies). Accordingly, the term supply "network" might be a better characterization of this system than supply "chain" is, but the latter term is used more commonly and will thus be used throughout this chapter. Supply chain management (SCM) refers to managing the flows of physical products and services, information, and money between the activities or process steps that companies perform, while aiming for customer service as the goal (i.e., get the right product to the right place at the right time for the right cost). Defined in this way, SCM applies to the delivery of capital projects (so-called "project supply chains") as it does to the delivery of products or services in other industries (supply chains that deliver products are sometimes referred to as "product supply chains").

II. STATE OF DEVELOPMENT

In the construction industry, the management of materials, information and resources through the supply chain is increasingly recognized as a critical determinant of project success. Unlike repetitive manufacturing supply chains, construction supply chains are project-based, temporary, highly fragmented and involve multi-stakeholder networks. To explore how Microsoft Project (MSP)-based tools and digital approaches might assist in overcoming implementation barriers of supply chain management (SCM), it is necessary first to review the existing scholarly literature on SCM in construction: its core concepts, implementation practices, challenges, technology adoption, and evaluation of performance. This chapter systematically examines selected studies to synthesize the current state of knowledge, identify recurring themes, highlight limitations, and frame the research gaps that this thesis will address through a combination of questionnaire survey and MSP-based modelling.

Nkolika J. Peter et. al. (2020) Construction projects are becoming increasingly complex and the conventional methods of managing them have plateaued over the years. The complexity could be traced to the complexity of designs, which requires inputs from different suppliers/contractors. This has led to fragmentation where suppliers/contractors specialize in a given project and are contracted to deliver only on their area of expertise. The aim of this paper is to produce evidence of the areas of application of supply chain management (SCM) in the construction industry. The aim was achieved by a thorough literature review of works done in the area. The results showed that all the selected research on the SCM falls within eight major areas. They are procurement, logistics, models application, information, performance evaluation, customer relationship, environmental management and sustainability.

Findings: The study categorised SCM in construction into eight major application areas: procurement, logistics, models/application, information, performance evaluation, customer relationship, environmental management and sustainability.

Gap: While application areas are identified, the study does not link these to how scheduling/project-control software (such as MSP) could integrate SCM activities, nor does it gather practitioner/industry-survey data on the actual usage of such tools.

Walter Puppo Studer et. al. (2021) The relevance of supply chain management (SCM) is being increasingly recognized in the construction industry. However, its implementation has been limited and is still challenging for researchers and practitioners. An adequate and systematic understanding of context-specific core concepts and practices are considered fundamental to foster its implementation. This paper aims to provide a holistic look into the existing research on elements underlying SCM in the construction industry. It adopts a systematic literature review method to examine almost two decades of publications and uses a comprehensive SCM framework to synthesise the findings. The results revealed a set of 19 core elements clustered in five subject areas (i.e., 'strategic management', 'logistics', 'relationships', 'best practices' and 'organizational behaviour') that have a prominent role in construction

SCM. Every core element was analysed in detail and the results were discussed in the context of other evidence. This study produced the first comprehensive picture of the current state of knowledge, providing relevant contributions to enhance the understanding and implementation of SCM within the construction industry.
Findings: Identifies 19 core elements of construction SCM across five categories. Implementation remains limited and challenging.
Gap: It stops short of providing empirical survey data or demonstrating specific software tool usage (like MSP) for those core elements.

Loh Yong Seng et. al. (2017) Construction materials play a significant role in the construction industry which therefore requires full attention when creating project plan. Materials form a large part of the total cost of construction project. The absence of materials when needed is one of the main causes of loss of productivity on a worksite. Current materials management practices in the construction industry are performed on a fragmented basis with many problems faced when managing material supply chain, especially during pre-construction phases. These problems are the main root that because performance-related problems such as delay in material ordering and receiving, low productivity, cost and time overrun, conflict and disputes. Thus, this paper reviews and discusses the activities and problems faced in material supply chain management during pre-construction phases. It also reasons out the potential of SCM to be the way forward for improving problems of construction industry (i.e., material supply chain management). A series of in-depth literature review was conducted to dig the relevant points towards achieving the aims of this paper. In the end, it was clear that material supply chain practices at pre-construction phases are still at below optimum level and that SCM literature strongly supports it being the potential saviour.
Findings: Materials supply chain in pre-construction is fragmented; key problems include delays in ordering/receiving, low productivity, cost/time overruns.
Gap: This study focuses solely on materials in pre-construction and reviews literature only. It does not explore technology adoption (software) or gather new empirical data via surveys.

Matteo Donato et. al. (2015) The construction industry supply chain is seen as a highly volatile and inefficient mechanism that falls well short of expectations due to its project focus rather than its supply chain management prowess. Relationships are short term and project-based so the development of enduring relationships become difficult. The purpose of this study is to present a conceptual model that looks at how construction supply chain actors develop relationships from partner selection through to project completion. The conceptual model suggests that the relationship is dynamic and changes through the life-cycle of a project and is linked to future working relationships.
Findings: The study shows that short-term relationships and resource dependency hinder collaboration in construction supply chains; relationship development is dynamic across project life-cycle.
Gap: While collaboration and relationship issues are well-covered, the use of scheduling software tools and empirical survey data are lacking.

K.B. Jaisree et. al. (2024) Supply chain management (SCM) plays a crucial role in the success of construction projects, influencing factors such as project timelines, costs, and overall efficiency. This literature review paper provides an in-depth analysis of SCM in construction, with a primary focus on the unique dynamics of the Indian construction industry. Drawing from a wide array of scholarly articles, research papers, and industry reports, this comprehensive review synthesises existing knowledge in the field. It examines the evolution of SCM practices in the construction sector, emphasizing the shift from traditional methods to contemporary, technology-driven solutions. Furthermore, this literature review explores key SCM elements such as procurement, logistics, risk management, sustainability, and the integration of advanced technologies within the construction supply chain. Sustainability emerges as a significant theme in this review, as it discusses the growing emphasis on environmentally responsible SCM practices in construction projects. In conclusion, this literature review offers a comprehensive overview of supply chain management in construction projects, with a specific focus on India. It serves as a valuable resource for researchers, industry professionals, and

policymakers seeking to understand the intricacies of SCM in the Indian construction sector. In addition, the review highlights areas for further research and development, paving the way for continued advancements in construction SCM practices.
Findings: Presents a regional (India) perspective; notes shift toward technology-driven SCM and sustainability focus.
Gap: While technology and sustainability are acknowledged, the precise role of project scheduling software (MSP) is not detailed; no practitioner survey or MSP-based implementation is discussed.

N. N. Phani Babu et. al. (2024) Supply Chain Management (SCM) plays a pivotal role in the construction industry, influencing project efficiency, cost-effectiveness, and overall quality. This review article examines the key components and strategies of SCM in construction, including procurement, logistics, and collaboration among stakeholders. It highlights the unique challenges faced by the construction sector, such as project complexity, diverse stakeholder involvement, and fluctuating material costs. The study also explores advancements in technology that enhance SCM practices, such as Building Information Modelling (BIM), Artificial Intelligence (AI), and the Internet of Things (IoT). By analyzing existing literature and case studies, this article identifies the benefits of effective SCM, including improved project delivery, reduced waste, and enhanced communication. Additionally, it discusses the limitations and risks associated with SCM in construction, emphasizing the need for a strategic approach to mitigate these challenges. The article concludes with recommendations for future research and practice, underscoring the importance of integrating innovative technologies to streamline supply chain processes and improve construction project outcomes.
Findings: Technology (BIM, IoT, AI) is increasingly recognised as critical to SCM; challenges persist in construction environment.
Gap: While technology is explored, there is little specific focus on how MSP or similar project management tools are used for supply chain coordination in construction. Also, empirical survey data of practitioners' technology adoption is missing.
Gangesh Kumar Joshi et. al. (2023) The supply chain plays a vital role in the successful completion of a construction project. Lack of proper supply chain management in any construction project results in cost overrun, time overrun, claims, disputes, and low productivity, which may ultimately lead to failure of the project.
Findings: In a region-specific study (Kathmandu valley, Nepal), SCM deficiencies (such as delays, poor coordination) are linked to cost/time overruns and low productivity.
Gap: The study is comparative and empirical within a region but does not incorporate software tool usage (e.g., MSP) for modelling supply chain processes. Also, it lacks a detailed survey instrument and linkage to project scheduling software (your objective #4) and doesn't propose MSP-based strategy.

O. Adigun et. al. The construction industry (CI) faces a lot of challenges ranging from behavioural attitudes among partners to lack of trust between clients and industry practitioners. A review of construction activities has revealed that these challenges are informed by the lack of collaboration and performance within the supply chain (SC). The various literature reviewed showed that the construction supply chain (CSC) needs to be adaptive by applying the principles of supply chain management (SCM) to utilise system-wide costs to attain system-wide services no matter how broad the value chain.
Findings: Highlights behavioural, trust and collaboration issues as key barriers.
Gap: While behavioral barriers are identified, the literature does not couple those with digital tools (e.g., MSP) or practitioner survey data about tool adoption, or specific scheduling/coordination modelling.

Kamarul Al-Hafiz et. al. (2019) Supply chain Management (SCM) has assumed a significant role in firm's performance and has attracted serious research attention over the last few years. A literature review reveals a considerable spurt in research in theory and practice of SCM. Combining and informing on features of Supply Management and distribution Management. This integration has resulted in the concept of extended enterprise and the supply chain is now manifest as the collaborative supply chain across inter-company borders to maximise the value across the entire supply chain. A large number of research papers have been published in various journals in the last two decades. In this paper an attempt is made to

review the status of literature on Supply Chain Management. A literature classification scheme is proposed. A total of 588 articles from 13 refereed academic journals are classified into articles in five methodologies i.e., Exploratory, Normative, Methodology, Literature Review and Hypothesis testing. This literature review finds that exploratory type of research is mostly preferred; it is expected that with the maturity of SCM the hypothesis testing method will pick up.
Findings: Presents broad SCM theory; identifies research methodology trends (mostly exploratory).
Gap: The study is broad and generic, not specific to construction industry, nor does it incorporate software tools such as MSP, nor include empirical survey in construction SCM context.

Ieva Cataldo et. al. (2022) Although the importance of supply chain management in the construction sector has been recognized in recent years, its implementation still faces significant challenges. For the long-term evaluation of this creative sector, numerous intricate sustainability components, such as environmental, social, and financial, are necessary. The study focuses on long-term sustainability considerations in the supply chain in the construction sector. More than 95 publications were studied from the beginning of 2017 to the end of 2021 using both in-depth content analysis and bibliometric methodologies. Several issues of SSCM in construction have been found including environmental, economic and social patterns which are most commonly known as the triple bottom line, typically enhanced by artificial intelligence. Many challenges were discovered including inefficiencies in the logistics system and a shortage of funding, environmental issues in demolition procedures and difficulties in applying sustainability measures due to high skill, data, and time requirements. The article offers a broad list of potentials for improving the current situation in the construction sector by using various types of supply chains such as increasing investment in energy conservation and emission reduction technologies to drive sustainable development, establishing strong green supply chain relationships, and forming a Covid-19 financial support group for small construction companies among other things. The study's findings suggested that due to the significance of long-term relationships between construction companies, suppliers and customers, smart technology could make it simpler to reach every supply chain link. After an exhaustive literature review 59 research questions were formulated for the future research.
Findings: Sustainability in construction supply chains is increasingly recognised; many sustainability-related issues (triple bottom line) exist; logistics inefficiencies and resource/funding constraints are major barriers; smart and digital technologies flagged as enablers.
Gap: This study provides broad sustainability review but does not specifically address the use of project-scheduling software (e.g., Microsoft Project) in SCM for construction, nor includes empirical practitioner survey data on digital tool adoption.

III. CONCLUSION

From the table above, the following key research gaps emerge which your thesis can address:
Gap in software tool application: Very few studies explicitly address the use of project-scheduling or project-control software (e.g., Microsoft Project) to integrate SCM activities in construction projects.

- Gap in practitioner survey data: Many studies are literature reviews; only a few present empirical survey data of industry professionals on SCM adoption, challenges, tool usage etc.
- Gap in linking scheduling/planning with supply chain management: While many papers identify SCM elements and barriers, fewer link them to project scheduling/planning systems and supply chain coordination in construction projects.
- Gap in covering digital tools in construction-SCM context: Although some address BIM/IoT/AI, the specific integration of MSP in SCM for construction is underexplored
- Gap in strategy recommendations and tool-driven implementation: Although barriers and elements are identified, actionable strategies (especially leveraging MSP) and empirical validation are scant.

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