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تحسين إدارة سلسلة التوريد في صناعة البناء في المملكة العربية السعودية

Optimizing Supply Chain Management in Saudi Arabia's Construction Industry

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1. Introduction

Overview of the Construction Industry in Saudi Arabia

The Saudi construction industry is a significant growth vehicle, especially with regard to the position held by the Kingdom in diversifying its economy in light of Vision 2030. The development of the country is changing with major infrastructures including NEOM, a futuristic city, and the Red Sea Project, as well as investments in roads, housing, airports, and other common facilities to satisfy the increasing needs (Alwafi, 2025). The industry is making major contributions to the GDP, with investors in the real estate and commercial infrastructure as the main contributors. Effective organization, especially in supply chain procedures, is valuable in terms of project delivery within the said deadline, quality construction, and affordability.

Importance of Supply Chain Management in the Construction Sector

In construction, supply chain management (SCM) plays an important role by providing the smooth movement of materials, labor, equipment, and information. The efficiency of SCM is linked directly to project timelines, cost, and success. A strong and firm chain of supply is required in an industry characterized by an array of stakeholders, which includes, among others, the suppliers, contractors, subcontractors, and logistics suppliers. Through the inefficiency of SCM, the delay, material scarcity, and the costs may all imperil the success of projects. To eliminate such threats, the projects should be implemented on time and within budget; hence, good SCM is required.

Research Problem

Despite the significance of SCM, the Saudi construction market is not effectively described in relation to the supply chain. The most common problems associated with the spatial

projects are delays in receipt of materials, communication among the stakeholders is very low in many projects, and finally, project overruns are widespread, especially because of poor planning, the inability to coordinate, and the inability to use modern technology (Mejia et al., 2023). Such losses are quite costly and consequently, shortages in profits and reputations are recorded. The challenges help to increase the competitiveness and effectiveness of the Saudi construction industry.

Research Objectives

The research will also have dwelt on the issues related to supply chain management within Saudi construction industry and come up with some suggestions on improving supply chain management efficiency within this sector. The objectives are:

- To assess the level of SCM use of the Saudi construction industry.
- To identify key challenges and inefficiencies in managing supply chains.
- To investigate the effect of inefficiencies on project schedules, expenses, and outcome.
- To recommend strategies and best practices for improving SCM.
- To assess the role of technology in enhancing SCM practices.

Research Design

Such a study will be conducted in a mixed-methods approach that entails the usage of both qualitative and quantitative methodologies. Qualitative evidence will be conducted using intensive interviews with the industry players, including project managers and contractors, in order to acquire insights on challenges and tactics. The quantitative data regarding performance and challenges of the supply chain are going to be obtained using surveys. A comparison of both sets of data would give a clear picture of the SCM problems, which in

turn would guide to actionable measures to enhance the efficiency of the supply chain in the construction industry of Saudi Arabia.

2. The Study Issue

Supply Chain Challenges in Saudi Arabia's Construction Industry

The Saudi Arabian construction sector suffers a major challenge to the construction supply chain in the shape of delayed projects, costs, and efficiency. These issues have taken on significance as the demand for infrastructure rises because of Vision 2030.

- **Logistical Delays:** The large terrain and climate of Saudi Arabia offer transport challenges. The infrastructure is growing, but road reliability is questionable, particularly in remote locations and in cities such as Riyadh and Jeddah (Alshehri et al., 2025). International suppliers, customs, and shipping also add to the delays.
- **Resource Allocation:** The industry has a problem with forecasting and controlling resources in terms of materials and labor. The effect of changing demand is that it causes surplus or shortages of resources, which will delay schedules and increase costs. These are worsened by poor coordination between contractors, suppliers, and subcontractors.
- **Inventory Management:** Proper inventory should be properly managed, yet this is not so, and hence, inventory falls short or overstocks (Madzivhandila, 2022). It causes inefficiency and wastage of materials, increased costs, and time-wasting.
- **Lack of Integration:** Inadequate communications and coordination of the supplier, subcontractors, and the project managers lead to delays in the procurement process, quality problems, and errors in the construction process. These problems are aggravated by the misfit of goals and responsibilities.

Current Gaps in the Literature

Literature on the supply chain management in construction has made substantial studies; nevertheless, there are still various gaps in studying the Saudi Arabian supply chain management challenges.

- **Regional Factors:** The effect of the geographical location of Saudi Arabia, weather conditions, and reliance on foreign vendors on logistics and delivery is covered by a few studies.
- **Technology adoption:** The use of technology like BIM, IoT, and blockchain is underrepresented in the Saudi case, however, it may bring efficiency within the supply chain.
- **Collaboration Issues:** The stakeholder coordination role is cited, and very few studies exist on the exact impacts of poor collaboration on the supply chain performance in Saudi Arabia.
- **Cultural Factors:** Supply chain operations have not received much attention in their relation to the cultural dynamics of supply chain operations, which include decision making and informal networks.

3. Why the Study is Important

Significance to the Saudi Construction Industry

In Saudi Arabia, the success of construction projects demands a strong supply chain management (SCM) with the continued mega-projects under Vision 2030. The delivery of materials, good resource distribution, and cost are critical in making the project turn out successfully. Cost overrun, delays, and destruction of the reputation of construction companies are other issues that result from delays in materials, mismanagement of resources, and ineffectiveness in the supply chain (Shoar et al., 2023). The solution to these problems

will result in better efficiency of the project, lower costs, and a competitive construction industry in Saudi Arabia.

Contribution to Knowledge

The proposed research will yield important information that relates to certain issues in the Saudi construction industry supply chains that have not been addressed by other works, either in the literature, due to the regional and context-specific factors. The study will cover logistical, resource distribution, and inventory management problems that are peculiar to the Kingdom, broadening the view about such advances in the Saudi environment (Khan et al., 2025). Furthermore, the research is also going to explore the implementation of the following technologies into the field of supply chain practice in the building industry to use as the future source of research and enhancement of SCM as building information modeling (BIM), Internet of Things (IoT), and blockchain.

Practical Implications

The study has practical implications for different stakeholders within the construction industry in Saudi Arabia. One of the strategies contractors can adopt is to enhance their ability to predict the resources and reduce any disturbance, resulting in cost savings. The suppliers will find out how to better sync with the construction companies in order to make the delivery of goods on time, and the project managers will find recommendations on how to manage schedules and procurement in an optimal way (Khan et al., 2025). Comprehensively, the research will present a guide on how to effect a change in supply chain practices in a manner that enhances the performance of projects and renders the construction industry in Saudi Arabia more competitive on the local and international scene.

4. Study Goals

- To assess the present situation of Supply chain management in Saudi construction industry
- To Determine the Appropriate Opportunities and the Most Critical Best Practice Challenges in Effective Supply Chain Management
- To Suggest Strategies or Answers to the Optimal Management of the Supply Chain in Construction

5. Study Questions

Main Research Question:

- What are the major challenges affecting supply chain efficiency in the Saudi construction industry?

Sub-Questions:

- How do supply chain inefficiencies impact project timelines and costs in Saudi construction projects?
- What strategies can be implemented to improve supply chain management in the Saudi construction sector?
- How do technology and innovation play a role in improving the construction supply chain in Saudi Arabia?

6. The Study Hypotheses

H1: Inefficiencies in the supply chain significantly contribute to delays and increased costs in Saudi construction projects.

H2: The adoption of new technologies (e.g., BIM, IoT, blockchain) can reduce supply chain inefficiencies in construction.

H3: Team work and interaction between the parties of the construction supply chain enhance general project performance.

7. Previous Study

Review of Literature

Construction Supply chain management (SCM) is a concept that has received a lot of recognition all over the region and the world within the last few decades. In Saudi Arabia, the growing pace of infrastructure development as a part of the Vision 2030 emphasizes the role of the effective supply chain (Alanazi & Alenezi, 2024). Nevertheless, the construction industry is also accompanied by numerous challenges, including delayed projects, finishing over budget, and underperformance due to inefficiencies such as logistical difficulties, poor planning, and data management. These problems are aggravated by traditional paper-based communications as well as the slow uptake of technology.

The wider Gulf region of cooperation (GCC) follows the same plight in that there is inefficiency in procurement, inventory control, and supply chain fragmentation. Most projects depend on international suppliers, and this makes it difficult to coordinate the stakeholders. The prospective solutions can be provided by technological solutions such as Building Information Modeling (BIM) and the Internet of Things (IoT). BIM will allow the process of tracking materials and the project schedule to be optimized, and IoT will be used to simplify logistics and offer real-time information (Elmalah et al., 2024). The combination of the technologies is essential to improve SCM practices and solve current inefficiencies in the construction business.

Key Findings

According to the literature, some of the issues that prevail about supply chain management in Saudi Arabia and construction industry locally include:

1. **Logistical and Communication Issues:** In many cases, causes of delays can be found in logistical and communication problems due to a lack of proper communication and coordination of the activities of the contractor, suppliers, and subcontractors. The lack of centralized mechanisms for sharing information aggravates these problems.
2. **Inadequate Technological Integration:** BIM and IoT are documented to present a substantial number of benefits to an economy such as Saudi construction sector; they are yet to gain traction (Iqbal et al., 2025). The outcome of this gradual integration is lack of efficiency in terms of inventory management and scheduling and procurement activities.
3. **Supply Chain Fragmentation:** The Saudi construction projects usually have more than one contractor and supplier, and therefore, an integrated supply chain is difficult to achieve. The result of such fragmentation is inaccuracy of the decisions, poor efficiency in the procurement, and poor agreement in relation to the project objectives.
4. **Supplier Reliability and Material Delays:** Supplier reliability or vagaries in delivery schedules are a huge challenge, with delays to the projects and cost overruns (Kelvin & Chipandwe, 2025). As per the research, this can be resolved through improved supplier management and enhanced contracts.
5. **Project Costs and Time Delays:** The costs of projects and delays become high when there is inefficiency in the supply chain. Ineffective management of stock and a

sudden lack of required materials will force one to spend more money on supplies, hence exceeding the budget.

The above results indicate the significance of better communication, integration with technologies, and supplier management in enhancing the supply chain of Saudi construction projects.

Research Gaps

Despite significant research on supply chain management (SCM) in the construction sector, several key gaps remain:

1. **Region-Specific Challenges:** The literature captures the rosy side of logistics and procurements just the same, but not the specifics faced by location-specific problems, such as in the case of the huge size of Saudi Arabia and how this affects the time of delivery of materials and the efficiency of a project.
2. **Technological Adoption:** The principal gap in technological adoption is a lack of focus on the obstacles to embracing modern technologies such as BIM, IoT, and blockchain in Saudi SCM construction (Azmi et al., 2022). A research needs to be done on the combination of these technologies and integration obstacles, including the cost, lack of expertise, and resistance-to-change.
3. **Cultural and Organizational Factors:** Most of the studies emphasize the aspect of communication and collaboration, but very little research has been conducted on the role of the business culture of Saudi Arabia, the process of decision making, and personal connections in contributing to the efficiency of SCM.
4. **Long-Term Impact of SCM Improvements:** In the majority of cases, studies are concentrated on the short-term effects, and the gains include cost and time saving.

The long-term effects have not been much researched, such as better rapport between the contractor and the suppliers, better reputation, or better profitability.

5. **Integration Across Stakeholders:** Limited research exists on how to integrate the entire supply chain stakeholders, i.e., on a design-to-delivery basis, in order to enhance the effectiveness, especially in the capability of technology.

The identification of such gaps will help to improve the knowledge about SCM in Saudi construction and supply key insights on how to optimize the supply chain-related activities.

8. Theoretical Premises of the Study

Supply Chain Theories

1. **Theory of Constraints (TOC):** TOC is the method developed by a physician named Eliyahu M. Goldratt, who sees the job as the issue that the system is primarily affected by and needs attention. In supply chain management, one inefficiency that occurs, such as late material or poor performance of the subcontractors, can bring the whole flow of the project to a halt (Vrijhoef, 2020). These constraints are to be mitigated with the aim of optimizing the entire system.
2. **Lean Supply Chain:** According to the concept of Lean Manufacturing, the theory is supposed to eradicate waste and the optimization of processes due to the reduction of non-value-added processes like overstock and poor logistics. In the construction business, the use of lean principles can enhance the maximum efficiency of the project, save money, and guarantee prompt delivery of a given project by curtailing the storage of materials and delays.
3. **Just-in-Time (JIT):** JIT has made it possible to supply the materials and components as and when necessary, thus resulting in lower costs to hold the inventories. In construction, the JIT aspect hinders the stocking of materials prior to when they are

needed in the construction site (Tetik et al., 2021). The method assists in easing the processes and avoiding delays in mega projects.

Theoretical Framework

This study will be theoretically based on the TOC, the Lean supply chain, and the JIT theory. TOC will assist in pinpointing and solving bottlenecks, Lean Supply Chain will assist in optimization of resources, and JIT will assist in optimization of material flow without any hectic delays or cost overruns.

Conceptual Model

A conceptual model will be drawn to explain the relationship that exists between inefficiencies in the supply chain and the result of construction projects. The model is to
comprise the most important components as follows:

1. **Supply Chain Inefficiencies:** These include delays in logistics, poor distribution of resources, coordination, and inefficient inventory control.
2. **Project Outcomes:** Such will encompass project completion in time, cost-effectiveness, as well as the quality of the construction project.
3. **Intermediary Factors:** The intermediary factors that will be incorporated in the model are technological adoption (e.g., BIM, IoT) and the collaboration among stakeholders, which may affect both the inefficiencies of the supply chain and the project performance.

9. Methodology and Research Methods

Mixed Methodology

The proposed study will adopt a mixed-methodology research design because it will examine the Saudi Arabian construction industry supply chain challenges in depth. The use of both qualitative and quantitative methods of research will enable the study to obtain insights into the deep, contextual evidence as well as into the general trends. A mixed-method approach is used for the following reason: both qualitative and quantitative data can be used because they complement each other well (Matović & Ovesni, 2023). Interviews and case studies are the ways to use the qualitative method to gain deeper insight into the problems of industry professionals. These techniques are applicable in revealing intricate problems, like breakdown of communication and mismanagement of resources that cannot be easily measured. These challenges will be quantified using quantitative research, whereby surveys will enable a quantification of the frequency of occurrence and determine the effectiveness of the projects completed. This will provide a balanced analysis, which is deep and generalized.

Qualitative Approach

1. Interviews with Construction Industry Professionals

The qualitative method will include semi-structured interviews with major stakeholders in the Saudi construction industry, including contractors, project managers, supply chain managers, and subcontractors. These highly qualified individuals are directly engaged with the construction supply chain management and can offer useful insights into challenges they encounter and the approaches they use to address them. Interviews will be conducted face-to-face or virtually, depending on accessibility, and will explore topics such as:

- The major waste in the construction chain.
- Communication and collaboration in successful projects.
- The effect of the adoption of technology in the processes of supply chains.
- The most effective innovations and methods employed in management of typical supply chain risks.

Quality of the interviews used will make the interviews generate rich data, which will give deep insight into the problems of complexity of a supply chain involved in the Saudi construction industry.

2. Case Studies of Specific Construction Projects

The case studies on particular construction projects in Saudi Arabia will also be included, besides interviews, to investigate the supply chain practice in real-life conditions further. These case studies will give a close description of how the construction projects in the Kingdom manage the supply chain challenges in their projects, what approaches or plans they have undertaken to curb the challenges, and the effects of their strategy (Ika & Munro, 2022). These cases will assist the study to have a practical understanding of the success and failure criteria of effective supply chain management in the Saudi construction projects.

Quantitative Approach

1. Surveys/Questionnaires

The quantitative approach will involve the use of either surveys or questionnaires distributed to more industry stakeholders. This will entail contractors in construction, suppliers, project managers, and providers of logistics. The survey will gather numerical data on various aspects of supply chain performance, such as:

- The frequency of supply chain disruptions (e.g., delays, material shortages).
- The impact of inefficiencies on project costs and timelines.
- The level of technology adoption in supply chain management.
- The effectiveness of collaboration between stakeholders.

The data gathered would be analyzed to track trends and lines of correlation between the lack of supply chain efficiency and the performance of a project. Surveys will allow the research to measure the extent of supply chain issues and draw some trends that could be used to formulate successful improvement approaches.

Sampling Strategy

1. Participant Selection

In this study, both qualitative and quantitative results will involve the identification of participants through purposive sampling. The purposive sampling is especially appropriate in this study as it allows selecting individuals working in the construction supply chain of management, who could reliably access the issues under investigation.

- **Qualitative Sampling:** The sampling of the qualitative phase will involve industry experts (project managers, contractors, and supply chain managers), depending on their experience levels and cognizance with respect to the construction industry (Ulhaq et al., 2023). Such people will be found using industry networks, professional associations, and recommendations by key stakeholders.
- **Quantitative Sampling:** The sample size of the quantitative survey would comprise a wider range of stakeholders; they must represent various sections of the supply chain, such as suppliers, subcontractors, and logistics providers. The aim is to survey 100 or more stakeholders to have a statistically meaningful sample size for analysis.

2. Sampling Criteria

Participants will be identified through both major and minor construction projects and large-scale infrastructure development in order to provide better representation and diversity. It will allow the study to document the variation in supply chain management practice in different project sizes and complexities.

Data Collection Tools

1. **Interviews:** Semi-structured interviews that ask open-ended questions will be given, where participants can provide more information on their experiences. These interviews shall be recorded and then transcribed to be analyzed.
2. **Surveys/Questionnaires:** The survey questionnaire will also accommodate questions based on the Likert scale, or multiple-choice, or open-ended questions to obtain both qualitative and quantitative responses. The participants chosen will be provided with the survey in electronic format.
3. **Document Analysis:** Relevant project documents (e.g., procurement records, project reports, and supply chain performance metrics) will be reviewed to gather secondary data on timelines, costs, and supply chain practices. This will help validate and supplement the primary data collected through interviews and surveys.

10. Study Tools

Data Collection Instruments

1. **Survey Questionnaires:** The quantitative data will be collected among the stakeholders, i.e., contractors, project managers, suppliers and logistics suppliers through the standardization of a questionnaire. It will comprise of survey questions that will be Likert-scaled, multiple choice and unlimited questions regards to the areas

in supply chain, holdups, cost-blow opportunities, development in innovation in technology innovation and teamwork.

2. **Interview Guides:** The semi structured interviewing guide will also include open questions in partaking the challenges presented by the supply chain, the role played by technology, and the steps to be undertaken to enhance efficiency. These guides will enable flexibility where participants can provide detailed information as per their experience.
3. **Case Study Protocols:** Case study protocols will provide uniformity in data related to the analysis of a particular construction project. The protocol will concentrate on the project schedules, procurement plans, and supply chain operations, and how they affect project success or failure.

Software Tools

1. **SPSS:** Analysis of the survey data will be conducted using SPSS, which determines trends, correlations, and statistical significance of the supply chain performance.
2. **NVivo:** NVivo will support the analysis of qualitative data, will help to perform thematic coding, thus enabling the categorization of interview transcripts with the identification of recurring themes.

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