



Application of Supply Chain Management in Highway Construction Projects: A Review

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ABSTRACT

This study explores the application of supply chain management in highway construction projects in India, focusing on material and equipment usage across different stages. Using data from 62 highway projects in Maharashtra, a probability distribution function was developed for materials and equipment, with outliers filtered using SPSS and best-fit distributions determined via RiskPal software. An integrated discrete event simulation model was created using Arena software, considering key factors like truck numbers, travel times, and working hours. The Taguchi method was applied to optimize resource allocation and improve construction performance. The findings offer valuable insights for better resource planning and scheduling, helping reduce delays and improve supply chain management in Indian highway construction.

1. INTRODUCTION:

Due to its linear and dynamic nature, highway construction projects are essential for the development of the country and necessitate careful planning, scheduling, and resource management. Since the needs for materials and equipment change as a project progresses, it is essential to analyze these resources effectively in order to reduce delays. Perishable mixes from plants must be delivered on time in order to avoid wasting resources on location. Project success depends on the timely and appropriate distribution of supplies and machinery. In the international construction sector, delay management is still a significant problem. According to the Ministry of Road Transport and Highways (2020–2021), India is making significant investments in road infrastructure and has the second-largest road network in the world. Road construction rates increased from 12 km/day in 2014–15 to 30 km/day in 2018–19, with the infrastructure industry accounting for almost 4% of India's GDP between 2016 and 2021. With a goal of 40 km/day by the end of 2022, these advancements highlight how important resource management and planning are. In highway construction projects, using real-time data from job sites can greatly improve scheduling and planning procedures, assisting in resolving issues and boosting productivity.

1.1 Supply Chain Management:

In the road construction industry, supply chain management (SCM) refers to the strategic coordination of personnel, equipment, materials, and logistics to guarantee that projects are finished on schedule, within budget, and to the necessary quality standards. Road construction projects are large and complicated, thus managing changing demands at various project stages requires efficient supply chain management. Delays in the acquisition and delivery of necessary materials, including aggregates and asphalt, can cause project delays and higher expenses, hence material management is a crucial component. In a similar vein, controlling the availability and upkeep of construction equipment—from vehicles to large machinery—guarantees that activities go without hiccups. Another crucial element is logistics coordination, particularly when it comes to moving supplies to and from the building site. This is especially true for perishable goods like asphalt that must be put on right away after arrival. In order to minimize bottlenecks and guarantee the effective use of worker resources, labor management is also essential to ensuring that the relevant skills are accessible when needed. Furthermore, risk management is essential because preventive steps can be taken to lessen the impact on the project timeline by anticipating possible disruptions like supply shortages, delays in transportation, or changes in regulations. Real-time data and project management tools are boosting SCM by facilitating better forecasting, resource allocation, and decision-making as a result of the growing use of technology in the construction industry. In the context of road construction, effective SCM contributes to smoother project execution, reducing costs and delays, and supporting the timely delivery of critical infrastructure. As road construction efforts expand globally, particularly in fast-developing economies like India, advanced SCM practices will be key to overcoming challenges such as resource shortages and rising operational costs.

2.LITERATURE SURVEY:

1. **SM AbouRizk, DW Halpin, JD Lutz** : Examining current advancements in construction simulation, this study highlights noteworthy contributions to the area. It summarizes recent research on simulating construction processes and provides a brief history of simulation in the field. The special simulation needs for simulating and evaluating these processes are also included in the article. Finally, it draws attention to new developments and possible avenues for further study and use in building simulation.

2. **MA Abdelmegid, VA González, M Poshdar, M O'Sullivan, CG Walker, F Ying**: Although studies have shown that computer simulation has been a useful tool for decision-making in building projects for more than 40 years, the industry has not yet widely used it. This study examines the challenges that prevent simulation from being widely used in the construction industry and assesses how well scholars have solved these issues. Academic databases were searched, and the profiles of top scholars in the field were examined, in order to perform a systematic literature review. Journal papers, conference articles, and theses published between 2000 and 2019 were the focus of the review, which produced 78 documents that highlighted 14 significant obstacles. After that, these barriers were critically examined. The results point to four crucial areas for development that might aid in overcoming these obstacles. By removing these obstacles, the advantages of simulation may be better realized, which would eventually promote a wider use of simulation technologies in the building sector.

3. **VR Battula, SK Namburu, V Kone**: In the industrial industry, supply chain management, or SCM, has been used with notable success. Both residential and traditional businesses compete with Indian construction companies in the present market, therefore implementing SCM is essential to increasing productivity and obtaining a competitive advantage. The purpose of this study is to determine the barriers to SCM adoption in the construction sector. To include findings from earlier research and speak with professionals in the field, a survey was carried out. Participants in this study were people engaged in building projects and working with prime contractors. Professionals from more than ten construction-related businesses participated in in-person interviews to gather data. The data was examined using the Relative Importance Index (RII) approach, and the factors were sorted according to the average RII values.

3. CONCLUSION :

Supply chain management (SCM) and construction simulation have the ability to increase project efficiency, according to the analyzed studies. AbouRizk et al. highlight the development of simulation technologies and the necessity of more study to improve these instruments. Key obstacles to the broad use of simulation in construction are identified by Abdelmegid et al., who also suggest ways to get beyond them. The adoption of SCM in the construction industry is the main topic of Battula et al.'s study, which highlights implementation issues and suggests solutions. In order to optimize the advantages of simulation and SCM and promote more competitive and efficient construction methods, it is imperative that these obstacles be removed.

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