

Critical Factors affecting Construction Supply Chain Management

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Abstract

The construction industry operates through highly fragmented and complex supply chain networks that often suffer from inefficiencies such as material delays, poor coordination, excess inventory, sustainability gaps, and cost overruns. These inefficiencies significantly affect project performance, profitability, and client satisfaction. This study aims to enhance construction supply chain efficiency through the systematic application of the Six Sigma methodology. A structured questionnaire comprising 40 critical supply chain variables was developed based on extensive literature review and expert consultation. A total of 111 valid responses were collected from construction professionals including contractors, engineers, procurement managers, and supply chain coordinators. Reliability testing using Cronbach's Alpha yielded a value of 0.96, confirming excellent internal consistency. Six Sigma analysis was conducted using Defects Per Million Opportunities (DPMO) to quantify performance gaps and determine sigma levels. The sigma performance ranged between 3.9 and 4.4, indicating moderate capability with substantial improvement potential. The top 10 defect areas were identified and further analyzed using a Cause and Effect Matrix to determine the most influential contributing factors. Five critical causes were identified, namely cost-based procurement practices, poor inventory planning, limited sustainable suppliers, lack of sustainability criteria in procurement, and poor coordination among stakeholders. The study proposes targeted improvement strategies and develops Key Performance Indicators (KPIs) to ensure continuous monitoring and control. The findings provide a structured, data-driven framework that construction firms can adopt to improve supply chain performance, sustainability integration, and overall project outcomes.

Index Terms

Digital Supply Chain, Lean Six Sigma, Process Optimization, Supply Chain Management