

Challenges faced by construction industry and proposed solutions

Title of the dissertation	Integrating construction project process with the supply chain: exploring disruptive and incremental solutions
Contents of the dissertation	<p>Construction industry suffers from supply chain (SC) management issues such as delays in material deliveries and ordering too many materials. There are material flow issues such as wasted time searching materials on-site, problems regarding the project process like improvisations and lack of communication. The industry faces productivity and coordination challenges due to poor integration of SC and project process.</p> <p>This work aims at identifying ways to improve construction performance by developing practices to integrate the construction project process and SC through both disruptive and incremental solutions. Novel operations management concept Direct Digital Construction (DDC) and 3D concrete printing (3DCP) in construction are identified and investigated as disruptive approaches. Material kitting and logistics maturity model are investigated as incremental approaches.</p> <p>Design-based control of construction operations is possible via DDC. Adopting DDC principles, design models are kept up to date. Reusing the design model is possible in the later phases of a building's lifecycle or in future projects. The dissertation raises awareness on potential of 3DCP in construction in terms of cost and schedule competitiveness and design flexibility against conventional practices. Also, this research offers deep insights on how to implement logistics solutions. Material kitting was found to stabilize production and align the SC with the project process while improving the labor productivity. Companies can assess their logistics maturity using logistics maturity model as a roadmap to improve their capabilities.</p> <p>The new information generated with this thesis is relevant to logistics and construction operations management research as well as to the construction industry professionals. This research relates to industrialized construction, production methods, material and information flow management and cost and schedule estimations. Increased control over operations and better connection between design and production are a few implications of this study.</p>
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