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Review of the Model-Based Supply Chain Management Research in the Construction Industry

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Abstract : This paper reviews the model-based qualitative and quantitative Operations Management research in the context of Construction Supply Chain Management (CSCM). Construction industry has been traditionally blamed for low productivity, cost and time overruns, waste, high fragmentation and adversarial relationships. The construction industry has been slower than other industries to employ the Supply Chain Management (SCM) concept and develop models that support the decision-making and planning. However the last decade there is a distinct shift from a project-based to a supply-based approach of construction management. CSCM comes up as a new promising management tool of construction operations and improves the performance of construction projects in terms of cost, time and quality. Modeling the Construction Supply Chain (CSC) offers the means to reap the benefits of SCM, make informed decisions and gain competitive advantage. Different modeling approaches and methodologies have been applied in the multi-disciplinary and heterogeneous research field of CSCM. The literature review reveals that a considerable percentage of CSC modeling accommodates conceptual or process models which discuss general management frameworks and do not relate to acknowledged soft OR methods. We particularly focus on the model-based quantitative research and categorize the CSCM models depending on their scope, mathematical formulation, structure, objectives, solution approach, software used and decision level. Although over the last few years there has been clearly an increase of research papers on quantitative CSC models, we identify that the relevant literature is very fragmented with limited applications of simulation, mathematical programming and simulation-based optimization. Most applications are project-specific or study only parts of the supply system. Thus, some complex interdependencies within construction are neglected and the implementation of the integrated supply chain management is hindered. We conclude this paper by giving future research directions and emphasizing the need to develop robust mathematical optimization models for the CSC. We stress that CSC modeling needs a multi-dimensional, system-wide and long-term perspective. Finally, prior applications of SCM to other industries have to be taken into account in order to model CSCs, but not without the consequential reform of generic concepts to match the unique characteristics of the construction industry.

Keywords : construction supply chain management, modeling, operations research, optimization, simulation
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