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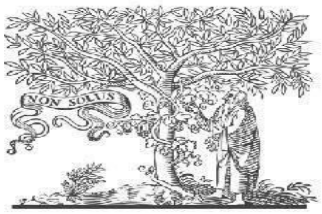

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FRAMEWORK FOR MODELING SUPPLY CHAIN DYNAMICS CONTROL AND MANAGEMENT

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Abstract

In this paper a very competitive and complex industry like the construction industry with demands for the delivery of top quality projects at very competitive prices, a significant need for an effective management of the construction supply chain has arose. Construction Supply Chain Management (CSCM) is a very promising approach to successfully achieve integration between the several disciplines of the chain (i.e. internal and external suppliers, designers, vendors, contractors, subcontractors and internal and external clients). Big international construction companies have carried out extensive research and developed computer based platforms to experiment the recent Supply Chain Management (SCM) concepts. Even though SCM in the manufacturing industry has been widely researched and developed, the application of the same concepts to the construction industry shows problems in construction supply chains are extensively present and persistent. Analysis of these problems has shown that a major part of them originate at the interfaces between the various disciplines or functions and the complex nature of the construction environment. The aim of this research study report is to provide a set of propositions for improving construction supply chain management such as benchmarking, improvement of suppliers/subcontractors performance, elimination of waste, training and information sharing between parts of the supply chain. The study includes the literature review regarding the trends of the supply chain management in construction industry, the specific characteristics and problems in coordinating construction supply chain and finally it suggests improvements in supply and demand management based on integration, collaboration, information sharing and trust.

1.Introduction

Supply Chain Management (SCM) has been widely analyzed in the academic literature related to operations management. Most of research is focused on quantitative and qualitative approaches. Quantitative modeling is applied to inventory management, demand forecasting and routing optimization. These studies are highly related to data analysis from case studies in manufacturing processes. Qualitative, managerial or soft aspects of SCM are usually related to the definition of frameworks, which are applied within industry and after that are validated through empirical research. Such frameworks are usually applied in performance measurement, strategic planning and governance in SCM. Construction management has unique characteristics related to its nature such as an intermittent flow and non-repeated projects. Quantitative and modelling

studies are not easily applied within construction environment due to its complexity for two main reasons:

•**non**-repeated projects take along difficulties toproduction standardization and modularization, notcontributing to obtain gains of scale in productionsystems.

•**construction management presents a lack** ofintegration between designers, vendors, maincontractors, subcontractors, suppliers, site team andfinally the client. Integrated efforts are key aspects toimprove performance, not only to deliver betterprojects on/or before completion time to the clients,but also to reduce waste and to promote costreduction throughout the supply chain (SC).

Advanced and newly developed practices of supply chain management in industrial engineering can be directed implemented or adapted to the construction industry.

The purpose of this paper is to propose some methods for improving construction supply chain management. Such proposition is based on a literature review of SCM considering mainstream journals of construction/industrial engineering and the proceedings of the last conferences of the International Croup of Lean Construction. This paper has four further sections. The second section provides a definition of supply chain and analyzes the benefits of the application of supply chain management. The third section focuses on supply chain in construction/industrial sector analyzing the special characteristics, the problems and the areas of focus of the supply chain in the construction sector compared to the ones in the manufacturing sector. The fourth section presents a discussion of improvement in the construction supply chain management. Finally, a concluding section includes research limitations and suggests topics for further research.

Existing method

The existing method describes Quantitative modeling is applied to inventory management, demand forecasting and routing optimization. These studies are highly related to data analysis from case studies in manufacturing processes. Qualitative, managerial or soft aspects of SCM are usually related to the definition of frameworks, which are applied within industry and after that are validated through empirical research. Such frameworks are usually applied in performance measurement, strategic planning and governance in SCM.

Proposed method

The proposed method describes The major benefits that construction organizations can achieve by applying SCM principles are: reduced real costs, with margins maintenance, incentive to remove waste from the process, competitive advantages, greater certainty of out-turn costs, delivery of better underlying value to the client, on time delivery, productivity improvement, value creation, more repeat business with key clients, greater confidence in longer-term planning and better relationships between parties. The benefits for end-users and project clients include a more responsive industry delivering facilities that better meet user needs, delivered to time and cost with minimum defect

Methodology

Taking into consideration the lack of academic studies and the increased show of interest of big construction companies

to improve the construction supply chain and to succeed an effective management of the construction chain, the development of a set of propositions for improving construction supply chain management would be helpful to develop structured approaches between the construction companies and their contractors, resulting in better results for the entire supply chain.

The proposition of these managerial practices also promotes a different discussion in terms of supply chain improvement in construction. First, these practices are focused on the strategic level, in which there is a lack of research. Second, the shift from an operational to a strategic view places supply chain improvement as a corporate matter that should be taken in consideration for strategic planning purposes.

The subsections below are an attempt to propose a se t of managerial practices in order to improve construction supply chain management.

Suppliers' and Subcontractors' Development

The interfaces between construction companies and their contractors is continuous through the whole duration of a project. In this sense, the performance delivered by the contractors influences the overall performance of the project.

Major companies related to manufacturing have developed initiatives concerned about suppliers' development.

Such initiatives comprise structured programs based on training, consulting, and feedback provided to the suppliers. In general, these programs are led by the focal (major) company within the supply chain, which invest capital to support these programs in order to obtain better results in terms of cost, quality, dependability, among others, from its suppliers. After this period, the suppliers are ranked and some of them are conducted to a higher level of development in a new cycle.

Performance Measurement

Measure the performance of the processes is an ongoing challenge for companies from all sectors. Research regarding performance measurement is recent and provided frameworks that provide guidelines for managers in implementing performance measurement. Usually, the difficulties are first concentrated in defining the metrics and second in using the information provided by them for improvement.

Nevertheless, the use of performance measurement systems proves to be crucial in order to face the current market competition. The use of standardized metrics to assess the performance of suppliers and provide feedback for them is a powerful approach for supply chain management improvement. Such approach refers to the traditional view of PDCA cycle (Plan, Do, Check, Action), in which **"**Check**"** is totally related to performance measurement and give directions to correct the course of action.

Conclusions

Construction is a productive process that has various and complex interfaces between participants and many problems originated by the lack of coordination of these participants. SCM provides several principles to address this fragmentation and reduce it. Even though SCM in the manufacturing industry has been widely researched and developed, the application of these same principles to the construction industry shows waste and

problems in construction supply chains are extensively present and persistent. Some of the major benefits that construction organizations can achieve by applying SCM principles are: reduced real costs, with margins maintenance, incentive to remove waste from the process, competitive advantages, greater certainty of out-turn costs, delivery of better underlying value to the client, on time delivery, productivity improvement, value creation, more repeat business with key clients, greater confidence in longer-term planning and better relationships between parties. The benefits for end-users and project clients include a more responsive industry delivering facilities that better meet user needs, delivered to time and cost with minimum defects.

The aim of this research study report is to provide a set of propositions for improving construction supply chain management. The study is based on literature review regarding the definition of the supply chain, the benefits of supply chain management, the characteristics and problems of the supply chain in construction and finally it focuses on the improvement in construction supply

chain management by suggesting practices to be studied and implemented. Such practices are well developed in industrial engineering and they are recommended to be implemented in the construction management.

As a conclusion a deep and detailed academic and practical (by companies) research of the improvement process in construction supply chain management proves to be necessary in order to orient research developments on this topic.

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