

Analysis of the Building Material Supply Chain Process

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Abstract— The scientific literature has addressed supply chain management (SCM) in great detail, particularly with regard to enhancing business performance. The use of SCM techniques is seen to be beneficial in obtaining improved competitiveness of construction enterprises and the construction sector as a whole, as the construction industry is a major social and economic activity in every nation. Construction is a global industry with many unique features that involves a wide range of projects with radically varying scopes, scales, and levels of complexity. The reality in the construction industry is very different from what the literature suggests, despite the fact that generic supply chains should be straightforward and linear. Any construction firm that provides a solution to a client or end user must integrate a variety of construction supply chains and markets. Therefore, the purpose of this study is to evaluate previous research and summarize key methodologies and findings in order to guide future supply chain research in the construction industry. Using the ProQuest database, this review specifically aims to screen published studies for the following aspects: a) level of analysis; b) research focus; c) type of study/paper; d) sample used; e) analyzed relationships; and f) the various construction subjects covered and linked into supply chains.

Keywords: Construction company performance, Construction industry, Supply Chain Management Track

I. INTRODUCTION

The global construction industry has a significant influence on every nation's overall economy and possesses unique features that set it apart from other economic sectors. Recent research has shown how critical it is for construction organizations to use efficient supply chain management (SCM) in order to boost performance and efficiency in the industry. The industrial sector is where the idea of SCM originally emerged. It is regarded as a challenging innovation that builds upon earlier modifications like just-in-time and total quality management (TQM).

The definition of the supply chain is "the network of organizations involved in the various processes and activities that generate value in the form of goods and services that are in the hands of the ultimate customer, through upstream and downstream linkages." "A system that's components include materials supplies, production facilities, distribution services, and customers linked via the feed forward movement of materials and the feedback flow of information" is how a supply chain is defined. However, the concept of the construction supply chain is a little more complicated because the construction business involves projects of drastically various sorts, sizes, and complexity. Additionally, there is a significant degree of subcontractors within the sector. The connections between clients, consultants, contractors, and subcontractors must first be defined and understood. Examined various forms of these connections in terms of the level of cooperation and integration between the 1960s–2000s

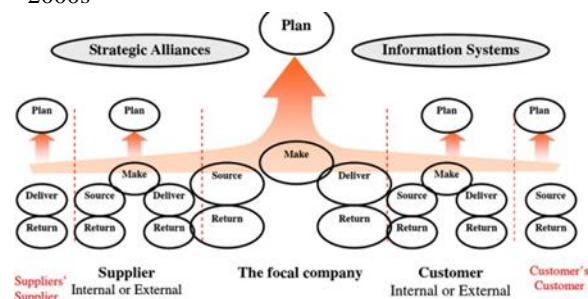


Figure 1. Applying the SCOR model for supply chain linkage

Sources: Adapted from Supply Chain Operations Reference Model Version 7, Supply Chain Council, 2005

Construction clients' methods were still controlled by the conventional one-stage procurement process. Different techniques to procurement, such as "two-stage competitive tendering," "design and built," "management contracting," and "construction management," illustrate the variations in the responsibilities and interactions between partners. The partnerships that were the foundation for the creation of supply chain management (SCM) are really

the connections that were previously addressed.

"Partnering is when multiple companies come to an agreement on shared goals, figure out how to settle disagreements and commit to ongoing improvement, track their progress, and split the benefits in order to enhance performance." SCM is a more advanced type of partnership in the construction industry, and acceptance of its tenets is clearly progressing in this direction today. A rising consciousness of the need for changes within the construction industry, particularly with regard to its present business procedures, has led to a small but growing number of construction firms implementing SCM tactics in an effort to enhance their performance.

This study reviews previous studies and summarizes key methodologies and conclusions in order to guide future research on supply chains in the construction industry. Specifically, this study aims to filter previous research are a) level of analysis, b) research focus, c) type of study/paper, d) the sample used, e) analyzed relationships, and f) the different types of construction subjects which are covered and linked into supply chains.

A brief overview of the construction supply chain environment is given, along with an analysis of various descriptions of supply chain management in the sector. Identifies the various bodies of literature from which research on building supply chains have so far come, evaluates the material using the aforementioned standards, and provides some conclusions based on the findings.

II. THE CONSTRUCTION SUPPLY CHAIN LANDSCAPE.

The construction business has numerous unique qualities, as we have already discussed. A definition of the construction supply chain is different from its roots since it is sometimes maintained that the construction sector is unique in the way it develops projects to provide one-off goods. Three different kinds of building supply chains exist:

- 1) The main supply chain, which provides the materials used to make the finished building product,
- 2) The supply chain, which offers tools, knowledge, and supplies that make building easier, and
- 3) The human resource supply chain – which involves the supply of labor.

The idea of the supply chain and the industrial production process are sometimes tightly linked. is a schematic representation of the production process that is composed of the operational operations in the construction industry.

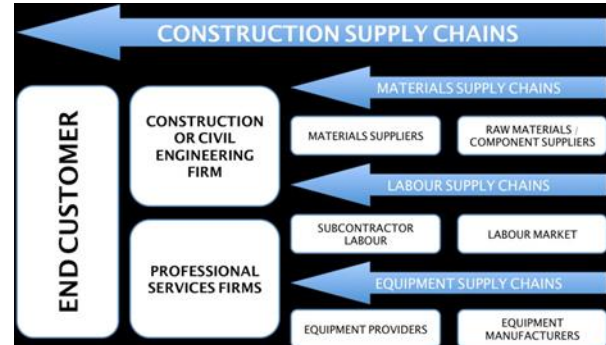


Figure 2: The myriad of construction supply chains

The procedure depicted in the figure is sometimes described as a supply chain. It might be cyclical, including several iterations as facilities are updated or replaced, or it can end abruptly, as is the case with many one-off corporate initiatives.

Since the customer initiates most construction projects in the business, the supply chain for building is frequently seen as a process that expressly begins and ends with the end user, as Figure illustrates. All clients involved in building projects are considered stage end consumers. In order to ensure that the construction project has the necessary functionality to sustain their company, these clients usually acquire their building requirements from very competitive construction supplier marketplaces. Furthermore, any civil engineering and construction company that completes projects for a client is considered a construction or civil engineering firm. In an extremely competitive marketplace, these companies function as the "integrators" for all the individual building supply chains. Any professional services company that offers engineering, design, planning, etc. is considered a professional services firm. Unquestionably, the main feature of the building supply chain is that every client is a distinct consumer with distinct needs. And in order for the building supply chain to become more efficient and effective, it must adapt to that.

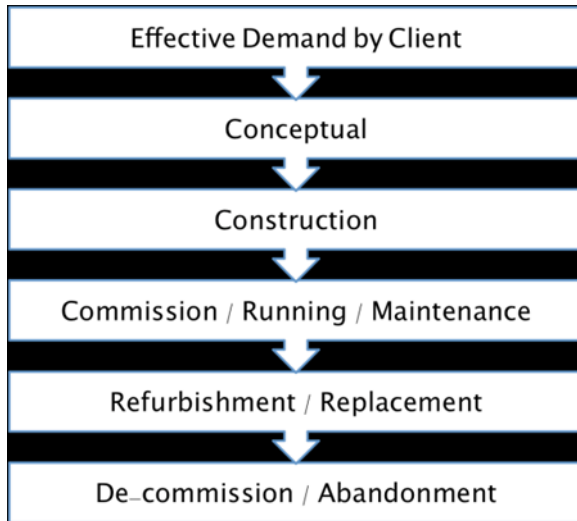


Figure 3: process chain of operational activity in construction (Edum-Fotwe et - 1999)

The way the notion of supply chain has been formed has contributed to the lack of a common definition for construction supply chain management. As a result, as the next section will explain, the idea of the building supply chain has been examined from a variety of angles within several pertinent bodies of literature. We provide a comprehensive overview of the body of research that has already been done on building supply chains, with the goal of shedding light on methodology and helping to set the stage for future studies. In the literature now in circulation, we have identified six topics related to the field of building supply chain. Within each of these categories, we have outlined an indicative definition of research issues.

III. SCOR-BASED CONSTRUCTION MATERIAL SUPPLY CHAIN MODEL

A supply chain model for building projects was constructed using SIMPROCESS, a computer simulation program, using the SCOR structure as the foundation. A hierarchy simulation tool with integrated functionalities, SIMPROCESS (CACI Products Company, 2004) helps increase productivity through process analysis. Moreover, activity-based costing, hierarchical event-driven simulation, and process mapping may all be integrated with SIMPROCESS. It offers tailored features that may be added to the software as needed to achieve different objectives. Compared to other statistical analysis techniques, SIMPROCESS often yields more accurate

results since it can reliably track resource utilization. SIMPROCESS is built on top of XML and Java. These foundational technologies offer dynamic and hierarchical formulations for modeling large-scale applications, as well as event-driven simulation capabilities. In contrast to associated diagrams or files that describe processes hierarchically, SIMPROCESS provides full object-oriented hierarchy. When modeling using SIMPROCESS, all component symbols are built into a palette. A modeling element in SIMPROCESS is then dragged to a blank place, and the components are joined together using a connecting line based on their input/output connection.

IV. SCOR - PROJECT APPLICATION

Following the case study, the research discovered that SCOR could effectively assist managers in creating supply chain models for building projects so they could gauge the success of SCM and comprehend the behavior of the chain's participants. There were many conclusions drawn from the study on the use of SCOR in building projects. Although SCOR offers a common supply chain model that may be used in a variety of sectors, applying the five SCOR viewpoints and sub-items to the construction industry results in compatibility. Customized items are frequently used in the definition of "make" to ascertain the precise order requirements and sizes prior to beginning production. This feature cannot be completely implemented since it is uncertain how some construction materials age.

Sub items in the five SCOR concepts look easier than for other industries because several procedures utilized in the delivery process—such as inspections and the process of returning bought material or getting returned product—are carried out in Deliver Make-to-Order mode. With SCOR, the construction sector can assess each supply chain's performance and evaluate how it stacks up against rivals. In order to identify strategic causes for change, the corresponding performance indicator, and establish a new supply chain structure, the supply chain process was constructed based on SCOR.

The current state of affairs was evaluated, and it was discovered that supply chain performance metrics are trustworthy. The business can use the SCORCard performance measurements as benchmarks for

assessing and enhancing supply chain management if its performance metrics are much lower than those of its competitors. Not every one of the SCOR reference models apply to the construction sector because manufacturers transmit information less effectively and construction business sources are unreliable. For SCOR to be implemented correctly, the entire information idea must be invested.

Based on a summary of the topics covered by current construction supply chain studies, it can be shown that the majority of the examined articles concentrate their study on material wholesalers and contractors' businesses. We may observe from building projects that the number of studies investigating housing projects, tunneling/bridge projects, or public projects is equal.

V. CONCLUSION

This review paper aims to provide a summary of the context and focus of previous supply chain studies that are set within a construction context, in light of the fragmented and incomplete implementation of SCM in the industry thus far. Additionally, it serves as a reference guide for future research.

Since the authors want to expand and update this analysis of the literature, any information about supply chains in the construction industry is very appreciated and welcomed. When compared to empirically based research, one of the most important conclusions from our literature study has been the relative paucity of theoretical work in this area. A comparison of supply chain management tactics with current construction management strategies might be the goal of future study. Future research may, in particular, concentrate more on the role supply chain management strategies play in attaining construction environmental sustainability at the project level and also broaden the focus to include supply chain management strategies utilized in construction systems, given the fragility of many construction systems.

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