

Supply Chain Integration in Construction Industry

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INTRODUCTION

Although logistics activities have been carried out by individuals for many centuries, only a few decades ago, logistics has been seen as a new area of integrated management, that is, to think about products and services flowing seamlessly from the sources of raw materials to the final consumers (Ballou, 1999). The supply chain management (SCM) consists of the integration of the business logistics management processes involving not only units within an enterprise but also across units belonging to both upstream and downstream partners, such as suppliers, customers, and logistics service providers.

According to the council of logistics management (CLM, 1999), the set of activities to be managed includes customer service, demand forecast, distribution communications, inventory control, material handling, order processing, plant and site selection—location analysis, purchasing, packaging, return goods handling, salvage and scrap disposal, traffic and transportation, and warehousing and storage. Business logistics is focused on planning, organizing, and controlling these activities in order to make products (and services) available to customers at the right time, in the right place, and in the right form and condition to ensure customer satisfaction in the most effective way. In fact, new approaches to logistics management describe logistics as the strategic process that aims to promote competitive advantage by reducing costs and improving service level (Carvalho, 2004).

The SCM in the construction industry can be seen as the network of installations, resources, and activities that provides added value to the final customer, in

the functions of project design, contract management, acquisition and provision of materials and services, production and delivery of raw material, and management of the installations and resources (Love, Irani, & Edwards, 2004). The logistics network usually involves a large number of entities such as suppliers of raw materials, equipment, and other resources, and is characterized by the widespread use of the outsourcing of activities extending the logistics network to a large set of subcontractors. In addition, because end products are generally large and costly, customers usually need to recur to credit financing. Therefore, financial organizations (namely, banks) and other related organizations like insurance companies often also get involved in the supply chain, typically acting as consultants of clients in dealing with construction enterprises.

Nowadays, enterprises are facing an environment changing at an increasing rate which forces them to adapt to changes by introducing new approaches to business management. In the logistics area, a significant degree of innovation has been observed as a consequence of the increasing complexity and dynamics of markets. However, the construction industry has been slower than other industries in adopting new management strategies, and there is relatively little evidence of the application of good logistics practices in this area. And, since the construction industry is the largest industrial sector in the world, accounting for approximately 10% of the global gross productive effort (O'Brien & Al-Biqami, 1998), it seems that there is a great potential for improving.

This article discusses the main issues of the SCM in construction, the different forms of cooperation among firms, and the role played by the new informa-

tion technologies and systems for an effective integration of all units of the supply chain. The article also intends to clarify some logistic and SCM concepts in an attempt to systematize the knowledge and experience in this area.

LOGISTICS IN CONSTRUCTION

End products of the construction industry are built up on sites where they will be used and require a wide diversity of components and functions. The supply chain is therefore characterized by requiring a great diversity (and number) of specialists and materials in different places in a given time period. Companies use a high level of outsourcing, in contrast to traditional manufacturing sectors (Kornelius & Wamelink, 1998), and constructions are carried out by many, often hundreds, of parties. Typically, the contract of a project is taken by a big company that subcontracts smaller (local) companies; in turn, smaller companies prefer to delegate much of their tasks to self-employed contractors. This happens because demand runs cyclically between recession and grow periods, involving large investments, and so companies prefer to organize their businesses in order to face variable costs rather than fixed costs by outsourcing rather than maintaining permanent employees. This means that the economic structure of the construction industry is not favorable to adopt a vertical integration approach for its supply chain structure (O'Brien & Al-Biqami, 1998).

The extensive use of outsourcing requires a considerable effort on management and coordination functions. In addition, this difficulty is generally accompanied with the inexistence of reliable communication channels between construction sites and central coordinators. Therefore, managers are faced with an even more difficult task of planning, implementing, and controlling an efficient and transparent supply chain. Typically, in practice, this means that each supply chain partner is unable to gain an overall insight about the progress of the project leading them to improvise procedures and to feel strictly responsible for its own tasks. The result is that some requirements and responsibilities are not clearly defined across the supply chain, and, on the other hand, companies tend to focus their business on price and time. In these circumstances, construction quality is badly guaranteed, often sacrificed to balance the budget.

Overall, there seems to be an intrinsic inability of the construction industry to accelerate its rate of performance improvement. In this respect, the Strategic Forum (2005) points out another series of obstacles that inhibits this industry to effectively address logistical problems. This series includes:

- Difficulty in identifying who benefits with the potential improvements.
- Highly fragmented nature of projects and the frequent appeal from bigger companies to subcontracting smaller ones.
- Construction job is seen as an on-off project of short duration.
- Lack of transparency in costs, and decisions are often based on the analysis of cash-flows.
- Information is not accurately transmitted as it should be.
- Lack of trust and confidence of managers on the performance of the supply chain.

The implementation of information systems (IS) and information technologies (IT) allows higher levels of integration that can result in improved productivity, higher levels of cooperation and coordination, and competitive advantages for business. However, construction enterprises are still facing great difficulties in implementing such innovations both internally and among partners as the result of the use of dispersed software packages with non-integration, lack of availability of real-time information for decisions makers and partners, non-utilization of bar coding for tracing products, and little or non-existing formal training either in logistics and ITs. Additionally, the lack of appropriate communication and information systems prevents a deep change in the construction industry culture, a prerequisite to achieve successful supply chain integration.

Many reports describe the success of other industries in adopting extensive and effective supply chain integration, cooperation, and organizational culture, introducing new business processes and achieving significant cost reductions, generating gains in both productivity and quality. Despite the difficulties, there is an emergence of the adoption of such managerial approaches in construction industry. Most can be done, despite that on-off projects, wide geographical and functional dispersion, and cyclical demand for products, among many other obstacles, may inhibit

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