

REVIEW OF SUPPLY CHAIN MANAGEMENT IN CONSTRUCTION

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Abstract: supply chain management (SCM) is a concept that has originated in the manufacturing industry to control logistics. It represents a management process by which enterprises administer and control the worldwide network of suppliers, factories, warehouses, distribution centers and retailers through which raw materials are acquired, transformed and delivered to customers. In construction, procurement and procurement related activities occur during all phases of a construction project. Because of inevitable complexity and fragmentation of the construction process, supplies of resources like equipment, labor, material and other services may not be always available on time, in right amounts and in the desired quality and price. An overall management process like supply chain management is essential to monitor and control all such logistic activities.

This paper represents fundamentals and objectives of supply chain. The concept of supply chain management in construction outlining its origins in manufacturing are introduced in this paper. The effectiveness of the supply chain management has been evaluated with its potential benefits to the construction industry. A list of possible barriers, which may affect the application of supply chain management concept in the construction industry, has also been presented. Finally, a simplified model for supply chain management In the construction industry is presented

Keywords: supply chain management, construction industry ,SCM model, advantages, disadvantage

I. INTRODUCTION

The construction industry is viewed as unique by the majority of commentators due to its complexity and sheer magnitude. It is an industry that is of significant importance to economies not only from an employment perspective but also because of the financial contribution it provides to an economy as a whole. However, construction is also an industry which has, and continues to be, severely criticized for poor performance at almost every level of its operation. Indeed, its failure to keep up with technological and systems advancements which have been adopted by other industries has become a key focus of many governments during the past decade. This continued negative perception

has more recently prompted a call for dramatic change in how the industry operates and functions, Egan, J. (1998).

Today in many parts of the world, the industry is embarking on a period of adjustment in how it operates and functions and is making gradual changes prompted by the need to adhere to new legislations and regulations and the extended use of technology and management techniques and concepts. The results of such changes indicate that traditional industry structure and practices are gradually changing course in an endeavor to reduce waste and to improve performance, delivery and overall client satisfaction on projects. Indeed the construction industry today has been described as;

“facing a paradigm shift to, increase productivity, efficiency, infrastructure value, quality and sustainability, reduced lifecycle costs, lead times and duplications via effective collaboration and communication of stakeholders in construction projects”

The construction industry is one that is recognized as fragmented and distinguished by a collection of large and small firms, bulk material suppliers, and many other support professionals, Benton. W. C & McHenry. L. F. (2010). The key characteristic of any construction project is the complex series of sequential and separate operations and task's

undertaken by individual parties, Egan. J. (1998), resulting in a construction project being reliant on hundreds of organizations, especially when delivering major construction projects, Stewart et al, (2004). This complex series of participants or providers is also referred to as the “supply chain”. The term “supply chain” is used to describe the linkage of companies which turns a series of basic materials, products or services into a finished product for the client, Constructing Excellence, (2004). As such when looked at in the context of construction projects, the supply chain could be described as the owner, planner, designer, architect, authorities, contractor, specialist contractor/s, sub-contractors, suppliers, distributors and even accountants, human resources, plant – equipment fleet operations to name but a few. Indeed, the supply chain is a collection of all participants involved in production of downstream information required for the upstream flow of activities and products needed to produce the end product, McCaffer .R. & Root .D. (2000).

1.1 Concept of supply chain management

SCM is a concept that has originated and flourished in the manufacturing industry, according to (Vrijhoef et al., 1999). The first signs of SCM were perceptible in the JIT delivery system as part of the Toyota Production System, see (Shingo, 1988). This system aimed to regulate supplies to the Toyota motor factory just in the right - small - amount, just on the right time. The main goal was to decrease inventory drastically, and to regulate the suppliers' interaction with the production line more effectively.

After its emergence in the Japanese automotive industry as part of a production system, the conceptual evolution of SCM has resulted in an autonomous status of the concept in industrial management theory, and a distinct subject of scientific research, as discussed in literature on SCM, see (Bechtel et al., 1997), (Cooper et al. 1997). Along with original SCM

approaches, other management concepts (e.g., value chain, extended enterprise) have been influencing the conceptual evolution towards the present understanding of SCM.

The concept of SCM represents a logical continuation of previous management developments (Van der Veen et al., 1997). Although largely dominated by logistics, the contemporary concept of SCM encompasses more than just logistics, for (Cooper et al. 1997).

Actually, SCM is combining particular features from concepts including Total Quality Management (TQM)

1.2 Need of SCM

In traditional procurement the companies may only be linked by contracts that have been procured on lowest price against fixed specifications. The supplier is asked to deliver the specified product or service as cheaply as possible. There is no motivation to work in the client's interest. In some cases the supply chain is not even linked by contract.

The benefits for individual companies in the supply chain include:

- Reduced real costs, with margins maintenance .
- Incentive to remove waste from the process .
- Greater certainty of out-turn costs .
- Delivery of better underlying value to the client .
- More repeat business With key clients.

1.3. Supply chain fundamentals and objectives

In this section, some fundamental definitions and features about the concepts of “*supply chain*” and “*supply chain management*” are proposed, but also the objectives of supply chain management.

This paper being a review of existing approaches to supply chain communications, both for manufacturing and construction, the analysis is made here for the two sectors. Supply chain in manufacture is first presented, since this concept originated in the manufacturing industry. Some methodologies for managing supply chains are also presented, based on developments made for, and applied to industry.

1.4 Supply chain management in construction

Although engineers, construction managers and contractors do not typically consider the supply chain or SCM, they deal with the supply chain and make SCM decisions on a daily basis. In construction, supply chain refers to the end-to-end “chain” of stakeholders and partners that come together both on individual projects and during a firm's business life.

In a project, a supply chain includes the owner, planner, designer, architect, engineer, construction manager, general contractor, subcontractors, suppliers, distributors, and manufacturers. Throughout a firm's business life, components of a supply chain may also include accounting, human resources, equipment fleet operations, etc.

Within the construction project, the supply chain can be simply conceived with the owner at the top followed by designer, contractor, specialist contractors/subcontractors/suppliers etc., forming various levels of supply chain.

Demand can be seen as flowing down the chain in terms of information, e.g. project briefs, drawings, schedules, works orders etc, with a flow of goods and materials flowing in the opposite direction (McCaffer and Root 2000).

1.5 Barriers in the Implementation of Supply Chain Management in Construction

The authors have concluded the following reasons for the slow growth of supply chain management in construction.

- Lack of guidance for creating alliances with supply chain partners
- Failure to develop measures for monitoring alliances
- Inability to broaden the supply chain vision beyond the procurement or product distribution to encompass
- larger business processes
- Inability to integrate the company's internal procedures
- Lack of trust inside and outside a company
- Organizational resistance to the concept
- Lack of integrated information systems and electronic commerce linking firms
- Lack of suitable organizational setup

1.6 Advantage of SCM

- Incentive to manage out waste
 - Reduced real cost
 - Greater certainty of out-turn cost
- Better value to clients
- Greater confidence in budgeting future turnover
- Supply chain management looks at the enterprise as a whole. It includes not only relationships with other functions within the firm but also with all trading partner relationships outside the firm.
- For this reason Supply Chain Management is said to have 'Visibility' and allows development of a consistent supply and demand plan from the customer to the supplier.

1.7 Disadvantage of SCM

Some of the general problems are as follows:

- Lack of coordination, collaboration and commitment between suppliers and clients within the supply chain.
- Design problems (many changes and inconsistent information).
- Poor quality of materials and components.
- Deficient communication and information transfer.
- Inadequate management within the supply chain, mainly poor planning and control.
- Poor training of contractor's suppliers, subcontractors and workers.
- Lack of effective methods for measuring the performance of the different parties within the supply chain.

2. SCM MODEL FOR THE CONSTRUCTION INDUSTRY

A simplified model for the application of supply chain management concept in construction, (i) the procurement process and (ii) the construction services process. The procurement process deals with the supply of materials, equipment and labor to the construction site. The stakeholders in this process are the material producers, equipment manufacturers, the wholesalers, suppliers or vendors, labor unions, the contractors and the subcontractors. The chain in this process can be termed as 'procurement chain'. The construction services process essentially consists of clients, architects, designers, construction manager, contractors and the sub-contractors and the so formed chain can be named as construction chain. The project requirements move across the construction chain in the form of project briefs, schedule and

budget as explained earlier. The model proposes that all the supply chain activities are managed through a separate SCM database, which should be linked with the central project database. Only with this level of support, one can plan and control the complexity of construction processes and projects.

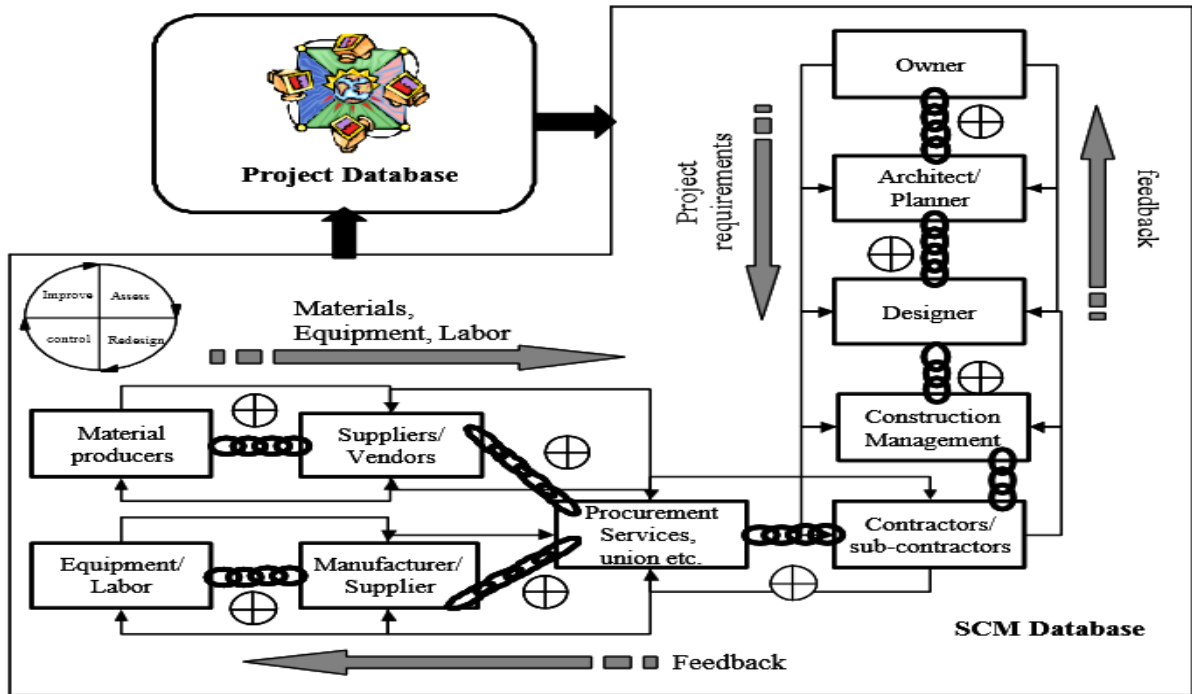


Figure.1 A Simplified Supply Chain Management Model for the Construction Industry

3. METHODOLOGY

The methodology of SCM consists of four main elements:

- (1) supply chain assessment
- (2) supply chain redesign
- (3) supply chain control
- (4) continuous supply chain improvement

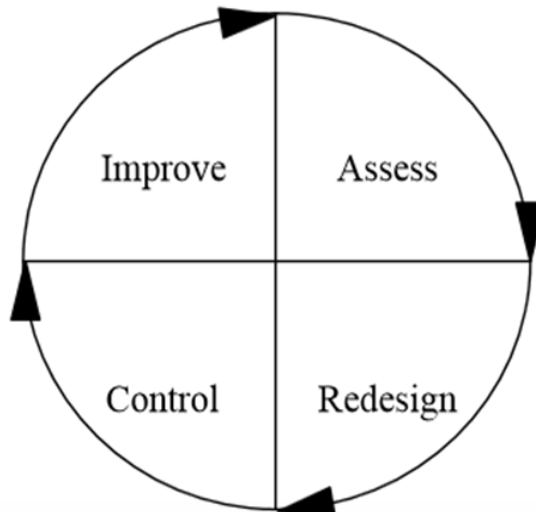


Figure.2 Generic Supply Chain Management Methodology

Source: *Vrijhoes and Koskela, 1999.*

- (1) **Assess** the current process across the supply chain in order to detect the problems and find their root causes. Once the root causes are detected, the next step,
- (2) **redesign** the supply chain in order to introduce structural resolution of the problems. This includes redistribution of roles, tasks and responsibilities among the actors in the supply chain, and a review of procedures.
- (3) **control** the supply chain according to its new configuration. An important part of the control function is the installation of a monitoring mechanism to continuously assess how the supply chain operates.
- (4) **improvement** implies the ongoing evaluation of the supply chain process, and the recurring deployment of the previous three steps: assessment, redesign and control.

CONCLUSION

Supply chain management (SCM) is a great opportunity for the construction industry primarily to reduce cost and time, and thus improve profitability. SCM principles seem to have much strength to smoothen and integrate the construction processes. The supply chains in construction could be divided into two major groups as materials chain and the construction chain, which would help to separate the procurement and management operations. However, both chains are linked through a SCM database, which is further linked with the central project database. This would ensure the smooth flow of information within the different chains and results in increased collaboration within the supply chain partners. Obstacles for supply chain management are found to be poor level of logistical competence, lack of guidance for creating strategic alliances, inability to integrate the company's internal procedures, strong project focus as well as the attitudes and traditions in the construction industry.

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