

Supply Chain Management: Fragmented Adoption in Practice

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Every day the construction industry develops new ideas and theories toward innovation in increased efficiency and quality for its projects. One method is supply chain management, which focuses on the relationships between partnerships along the supply chain. The theory was first developed in the manufacturing industry and this paper will highlight the reasons behind its fragmented adoption in the construction industry. The overall supply chain typically contains short supply chains that are dismissed upon project completion. Some companies have partially adopted the theory into their work practices but has been unable to fully adopt the theory as a whole. There have been many theories as to why supply chain management has not been able to be fully adopted and the research is aimed to understand the complications associated with it. The complications presented from the research include market conditions, competition and fairness, and workforce limitations. Insights from research gain perspective in how full adoption has been limited, the partial adoption enables partnerships to benefit multiple companies and increase productivity, prevent delays, and reduce additional costs. The challenges that restrict adoption highlight the necessity of said restrictions and cause other issues to rise.

Keywords: construction industry, supply chain management, limitations in adoption, construction theory

Introduction

Construction projects require many components, companies, and people to work together in order to fulfill an owner's project requirements. They incorporate many different entities to collaborate from the planning and early design stages to the day to day laborers providing a service on the jobsite. In order to ensure a project's quality and company profitability, different companies are required to collaborate with one another through various means of communication. Due to the competitive system of winning a bid for a specific project in many design-bid-build contracts, some companies may have little to no prior relationship with the companies they will eventually work with. Many bids are often awarded to the lowest price, which can result in miscommunication, project delays, lower quality, and additional costs depending on the partnership.

Supply chain management is a method of "understanding the breakdown and traceability of products and services" from the top to the bottom of the chain (Designing Buildings Wiki, 2020). These include, but are not limited to, services, organizations, logistics, activities, information, and resources. These organizations

work together in order to provide a quality product for the owner by collaborating in all aspects of the project, such as design, preconstruction services, general contractor services, subcontractor services, and supplier services. Supply chain management focuses on the ideology that repetitive partnerships with a company over another strengthens the relationship between companies. As a result, the theory suggests that the entire supply chain will have a strengthened relationship that reduces the number of contingencies in a project that cause delays, additional costs, and errors. Ultimately, the theory fails to account for the necessity of competition, fairness, and workforce when attempting to manage an entire supply chain and thus leads to its fragmented adoption.

Supply Chain Management in The Manufacturing Industry

Supply chain management is a theory of utilizing the relationship between products and services in order to provide a higher quality product or service. The term is best defined as a “network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services delivered to the ultimate consumer” (Mentzer, DeWitt, Keebler, Min, Nix, Smith, 2001, pg. 3). It originated from the manufacturing industry and has been successful in full implementation across all aspects of the theory. Understanding and utilizing the different components of a supply chain reduces many miscommunication issues while also minimizing costs and increasing efficiency.

The first application of supply chain management was executed by Toyota Production System for the JIT delivery system. The system “aimed to regulate supplies to the Toyota motor factory” by “drastically [decreasing] inventories and to effectively regulate the suppliers’ interaction with the production line” (Koskela, Vrijhoef, 2000, pg. 170). The theory has existed since the early 1950’s and focused on “working with the supplier as a partner in a long-term relationship of loyalty and trust” to “improve the quality and decrease the costs of production” (Koskela, Vrijhoef, 2000, pg. 170). It is distinctly different from the construction industry’s current focus – viewing parts or sections of a supply chain rather than the entire chain. The shift from the traditional management practices transformed the focus from a “transformation view to a flow view of production” (Koskela, Vrijhoef, 2000, pg. 171). The changes reflect a change in the management style of manufacturing products; management shifted from “independent control of each stage of product” to “control of the total flow of production” (Koskela, Vrijhoef, 2000, pg. 171). One focus was to “increase transparency and alignment of the supply chain’s coordination and configuration, regardless of functional or corporate boundaries (Koskela, Vrijhoef, 2000, pg. 170). The strategies of supply chain management in the

manufacturing industry were implemented in order to establish “stable partnerships, design for suitability, flexible manufacturing technologies, evolution of the supply chain with the product life cycle, and information acquisition and sharing” (Koskela, Vrijhoef, 2000, pg. 170).

In order for supply chain management to be used effectively, it requires “mutually sharing information among supply chain members, mutually sharing risks and rewards that yield a competitive advantage, and cooperation” (Mentzer, DeWitt, Keebler, Min, Nix, Smith, 2001, pg. 8). All these aspects are used in accordance with each other in order to perform joint planning and to “control activities to evaluate performance of the supply chain members” (Mentzer, DeWitt, Keebler, Min, Nix, Smith, 2001, pg. 9). In order for supply chain management to be implemented for maximum efficiency, all members of the supply chain need to have the same aligned goals and focus on serving customers. To ensure the members of the supply chain have the same goals and focus on serving customers, partners are required to both build and maintain long-term relationships, in order to secure efficiency and benefits between both parties. This can result in a competitive advantage over other companies, which plays a critical role in the construction industry over the manufacturing industry.

Supply Chain Management in Construction

Supply chain management involves including all members of the supply chain in “product design, materials sourcing and selection, and manufacturing processes delivery of the final product after its useful life” (Ojo, Mbowwa, Akinlabi, 2014, pg. 1). In most applications, supply chain management has only been partially adopted into the construction industry. According to Ojo, Mbowwa, and Akinlabi, some possible barriers that interfere with its full adoption into the construction industry are “lack of resources, supplier resistance to change, and lack of awareness” (pg. 1). When comparing both industries, the construction industry lacks the manpower and materials needed to increase communication due to the increased scope of the project. The increased scope influences the complexity of the supply chain and complicates how the parties interact with each other.

Typically, construction projects utilize temporary supply chains that influence how the companies and participants interact with each other. This results in the companies and participants becoming dismissed upon project completion but can be traced to the project based on the nature of construction. Al-Werikat explains that due to the “short term partnership with different members,” it may “cause problems and fluctuations in performance and productivity” (pg. 107). These fluctuations in

performance and productivity are one of the most important reasons for the desire to adopt supply chain management.

Al-Werikat also explains that some of the reasons why supply chain management has failed to be fully adopted in the past can be described in four characteristics from the demand side:

“Inappropriate selection criteria

- Awarding a contract to the lowest price and disregarding the value of the offer.
- May provide lower quality and service.
 - This can lead to problems of less trust, resistance to design changes, and claims for additional fees.

Discontinuous and low demand problems

- The economic recession and difficult financial situation leads to decline in public investment.

Inappropriate allocation of risk

- This refers to the imbalanced risk distribution in the project between the main contractor and the client.

Frequent changes in specification

- This problem is due to the client and occurs while the project is underway. This causes serious implications regarding the plan, cost and other factors” (pg. 107).

All of these components are important factors that limit how much supply chain management can become adopted in the construction industry. Because the industry awards bids to the lowest price, some contracts can be awarded to a company and establish a partnership that has not yet been established before. The new partnership can unknowingly create problems that might have been averted if the bid was awarded to a partner with an existing business relationship and a positive working history. The financial factors that influence supply chain management adoption limit the number of projects in a time period and limit the number of potential bidders. Because of how the construction industry already divides the allocation of risk within the companies of a construction project, companies lower on the supply chain may have a lowered amount of risk divided upon the completion of a job. If supply chain management were fully implemented, the theory suggests that risk could be shared in a better proportion. Since some projects can be bid on before the final design is complete, contractors can increase their price depending on the changes the owner requests in the form of additional costs. If all entities on the supply chain collaborated together on a project more efficiently, it could reduce the many additional costs or delays overall. The reduction of delays influences on site

activities and impact “labour flows to the site,” (Koskela, Vrijhoef, 2000, pg. 171). As a result, the labor flows influence the workflow of a project and impact the schedule. Figure 1 below shows how the different parts of a supply chain interact in order to promote collaboration and communication.

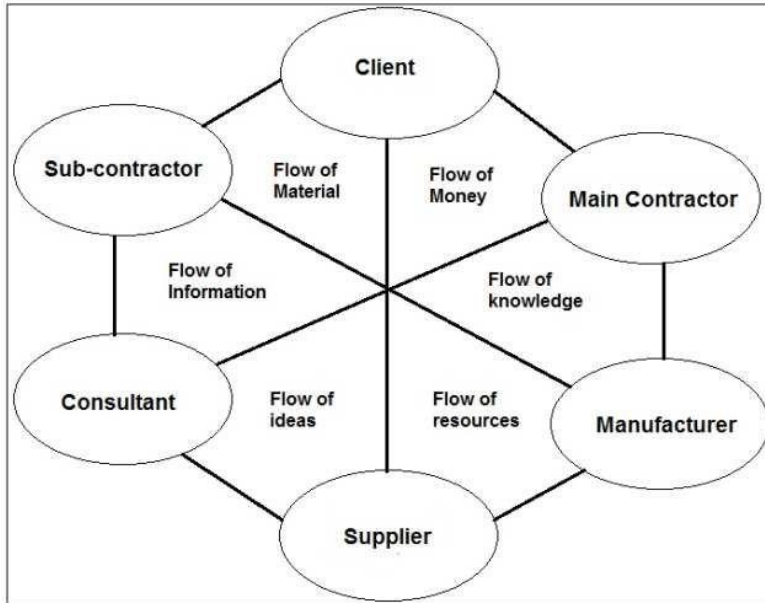


Figure 1

Source: Seng, L & Riazi, S & Nawi, M & Ismail, R pg. 157

Research Methodology

The objective of this research are as follows:

- To understand the reasons why supply chain management has not been fully adopted into the construction management industry.
- To highlight in what ways the construction industry utilizes parts of supply chain management.
- To highlight the challenges in implementing supply chain management as a theory into construction practices.
- To highlight the reasons why supply chain management succeeds in theory but fails in practice.

Surveys

For initial research on how much the construction industry utilizes parts of supply chain management, surveys were sent out to participants in different parts of the

supply chain. Most of the survey responses were from distributors and subcontractors. Their perspective highlights aspects of supply chain management that positively influence their company while also showcases the negative impacts it entails if fully adopted.

Interview

After survey responses were collected, further research was conducted as an interview with a current employee of a distributor. Upon first analysis of the participant responses, more research was required in order to understand the limitations and constraints of supply chain management in the construction field. A phone call interview was conducted with a participant with over thirty years of experience in the construction industry. The open-ended questions provided new information and perspective on the how the industry benefits from using supply chain management while also providing new understanding of how it fails. With new perspective on how supply chain management, the results confirmed partial adoption of the theory in the industry by clarifying how the barriers impact each company.

Data Analysis

The names of the participants and companies were erased to maintain confidentiality and the phone call was transcribed in order to maintain accuracy. Each survey was compared to discover new ways supply chain management is used in companies and understand why some do not use it. Many of the surveys provide understanding in how the barriers affect the adoption process and what changes are needed in order for it to be fully adopted.

Research Results

Survey Results

The survey results concluded that supply chain management is used dependent on the company the participant works for and the specific concentration they work in. At one distributor, the individual reported that the use of supply chain management is useful for “inventory information and forecasting” while at another company, the participant reported that the company did not.

One discovery of why the theory is not used in the industry is resistance to change. Many of the participants believed that the industry’s resistance to change and reliance on old practices impact a company may be resistant to change. Another individual expressed that in order for supply chain management to increase

efficiency, it is important to “bridge the gap between the old school and the new school,” which is a big challenge in their company. Due to the advancement of technology, digital communication is essential in order for all participants to work at maximum efficiency. Because of the progression of technology in a short period of time, the ability to adjust to change is vital in order for the company to stay efficient. Again, the “wide age gap in the workforce” limits the use of technology and ability to increase efficiency in communication in everyday activities. The lag in communication would vastly impact the ability to communicate effectively in supply chain management.

The companies that use partial adoptions of supply chain management emphasize the usefulness to provide “consistent customer service, quality of product, reliable delivery times, best pricing, and long and valuable personal relationships.” In order for supply chain management to be used across all parts of the supply chain, participants in the supply chain need to “understand the long-term benefits and values of it and be able to indoctrinate customers, associates, management, and manufacturing partners.” The immediate benefit of a faster project schedule is a driving force in the reason the company uses supply chain management and influence the company’s decision to utilize the theory for over fifty years.

Interview Results

The interview provided a new understanding of how the industry partially adopts the theory, but also requires the barriers of supply chain management in order for the market to be fair. The interview participant explained that the company partially uses the theory as a concept by partnering with specific manufacturers that are “based on the quality of products, value they bring, stocking location, marketing dollars, and rebate dollars.” All three aspects play a crucial role with having equal weight in a decision. Companies work together by using “rebates, marketing dollars, digital tools, and electric data interfaces.” For example, in order to improve communication efficiency, a digital tool will be utilized to be able to process requests, enter orders, and accessing invoices. The use of the digital tool allows both companies to access the same information without needing to change and learn a new program. Marketing dollars are also used between companies that allow networking. The marketing dollars use a “percentage” of the revenue, “set by the supplier,” in order to develop relationships with the hope of building a relationship in order to potentially win a contract in the future. The activities used by the marketing dollars include dinners, golfing, sporting events, and promotional events that teach the client about “the product and advertise about the company and the supplier.” Marketing dollars do not guarantee a contract; it instead focuses on the creation and maintenance of long-term relationships. In addition, the company may partner with specific manufacturers,

bidding, and providing materials on the basis of “relationship, price, and proven quality.” In these specific ways, supply chain management is a useful tool to maintain business relations with the hope to increase revenue for the future between short supply chains.

During the interview, the participant explained that not all aspects of supply chain management are feasible to be fully adopted due to market conditions. For products, not all manufacturers are available to suppliers and distributors, which limit which projects a company would be able to work with. Supplier availability of products and weekly price changes can influence a distributor’s decision to use specific products, but also does not take into consideration the specifications of the market or a project. Limiting a company with supply chain management would possibly increase price or create monopolies.

If companies chose to create specific partnerships despite the project type, the monopoly could influence fairness and create biases. The construction industry needs “checks and balances” in order to prevent biases; the biases could limit the quality of the overall project and increase price. Because a company may partner with a company based on the relationships rather than price, the company may lack experience and additional issues may arise. The company’s learning curve could set back the project and cause additional delays that would have been mitigated if the bid was awarded to a company based on experience.

Another issue with supply chain management is the ability to effectively communicate in all parts of the supply chain. The linkages can be “time consuming and challenging” and requires “consolidation in all functions” in order for a project to be successful. Managing many people from different companies could lead to miscommunication problems with prolonged delays.

Supply Chain Management Partial Applications

Through research, companies tend to “do business with people they already know.” The reliance on prior work experience and relationships from previous projects enable trust and reduce delays on projects. Supply chain management succeeds in partial application because of the benefits in between short segments of the chain. When trying to implement the theory as a whole, it fails to account for the current market conditions. There are many factors in a company’s decision for a partnership and there is not a way to “foresee a perfect supply chain.”

When comparing application of supply chain management in construction to manufacturing, the manufacturing industry is “purer.” Converting raw material to

product requires a shorter supply chain and consolidation of communication is more feasible; in contrast, the construction industry is more complex that influence the “buy and sell decisions” of the market. Also, the amount of people required to sustain the communication needed for supply chain management might outweigh the benefits. The theory requires an additional workforce in order for “employees and resources to make those relationships and connections.” The participant explained that the amount of people required for a workforce to fully adopt and utilize supply chain management would cost more than it would benefit the company.

Conclusion

Supply chain management as a theory succeeds in perfect market conditions but fails in real world applications as a whole. Currently, the theory exists only in short supply chains as overall supply chains are often temporary and are dismissed upon project completion. In short supply chains, supply chain management is often used between suppliers, distributors, and subcontractors. Often, the relationships, price, and quality are the driving forces behind partnerships and a contract cannot be established solely based on price.

The many issues that occur due to the full adoption of supply chain management can create more issues than benefits to a company. Monopolies and changing market conditions can cause sole partnerships, which can create delays and increase cost. Supply chain management can only benefit the construction industry in partial applications in order to provide checks and balances. The competitive industry ensures fairness and “keeps companies honest.” If supply chain management were to be fully adopted into the construction industry, many changes would need to be implemented in order to ensure the market continues to be competitive and fair. In order to understand more about how supply chain management affects other aspects of the supply chain, more research is required. Further research would include the perspective of subcontractors, general contractors, and owners in order to compare and contrast the two perspectives.

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Appendix A – Survey & Interview Questions

1. What is your name?
2. What company do you work for (if applicable)?
3. Is your company a supplier, general contractor, subcontractor, or other?
4. Does your company use supply chain management for projects?
 1. If yes, what are ways in which it is useful?
 2. If no, why do you think it is not used?
5. Why do you think is underutilized in the industry?
6. Do you think SCM can benefit your company?
7. What are some ways that need to be changed in order for SCM to be adopted and fully utilized?
8. What changes does the construction industry need to enact in order for SCM to be adopted and used?
9. What elements of SCM does your company already use?
10. What are some obstacles your company would face in adopting SCM?
11. Do you think SCM will benefit the construction industry?
12. Do you think SCM will benefit your company (if applicable)?