Supply Chain Management in the Cement Industry

By Isabel Agudelo
Thesis Advisor: Dr. Edgar Blanco

Summary: Supply chain management (SCM) has traditionally played an operational role within cement companies missing opportunities for cost reduction and value creation. These missed opportunities can be realized by introducing the strategic use of SCM as explained in this article.

KEY INSIGHTS

1. The cement industry; mature companies focusing on economies of scale, operating in an oligopolistic market, selling a product with high density and low value-to-weight ratio, has neglected supply chain management to realize cost reductions.
2. Because the cement industry relies on asset utilization, supply chain management provides opportunity for market differentiation, cost reduction and value generation.
3. Cement companies must transform their supply chains to be responsive in emerging markets.

Isabel Agudelo is currently the Executive Director of CLI (Center for Latin-American Logistics Innovation) LOGyCA's partnership with the MIT Center for Transportation & Logistics (MIT CTL) in Bogota (Colombia). Prior to MLOG, Isabel was the Consulting Director of LOGyCA.

Introduction

Cement is produced in more than 150 countries all over the world. Cement, as the most important ingredient of concrete, is essential in the development of infrastructure and construction in general. The level of advancement in cement and concrete Supply Chain Management (SCM) can facilitate or constrain world economic development.

The purpose of this research was to understand the unique characteristics of SCM in the cement industry, to clarify the evolution of supply chain management in the cement industry, to propose the right supply chain for cement, and to demonstrate that supply chain management can generate value for cement companies.

To research the global cement industry, I interviewed SCM employees from the three largest cement companies and one medium-size cement company. Figure 1 below shows the three levels of analysis and the frameworks I used. These are discussed section by section in this article.

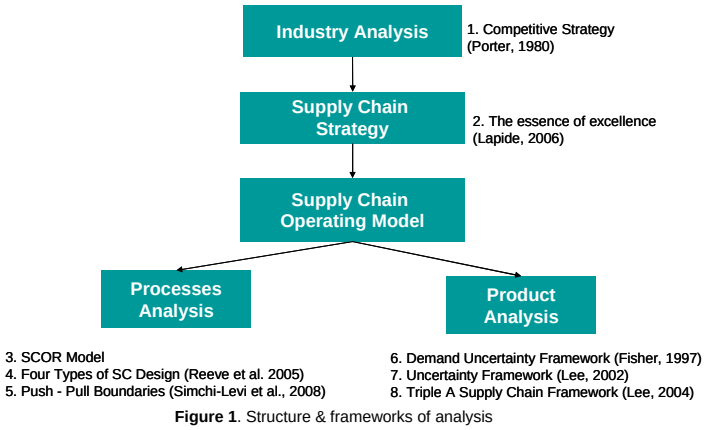

Figure 1. Structure & frameworks of analysis

Cement Industry Analysis

Figure 2 presents the graphical summary of Porter's five forces driving cement industrial competition. Porter (1979) suggests that when the forces are weak collectively, there is a major opportunity for superior performance. Therefore, we can conclude that the cement industry is unattractive in mature markets, but attractive in emerging markets.

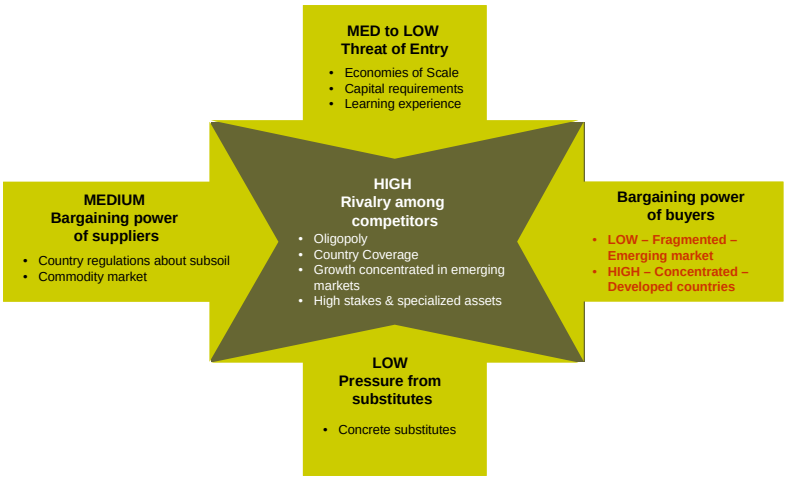

Figure 2. Porter's Five Forces Analysis for the Cement Industry

Largest Cement Companies Supply Chain Strategy

In his article, Lapide (2006), Supply Chain (SC) operational objectives can be classified in three groups: asset utilization, customer response and efficiency. We believe that the cement industry is concentrated on asset utilization with some level of efficiency. The main reason for this location is that cement companies are focused in minimizing cost based on the economies of scale generated by their investment in large manufacturing plants. This is a given condition for all large cement companies in the industry.

Some cement companies are moving towards the other two operational objectives to gain differentiation in the market. One key success factor is the required SC transformation to support this decision.

Cement Supply Chain Operating Model (Processes Analysis)

Figure 3 presents the diagram with the summary of the cement SC characteristics according to the Supply Chain Council's SCOR model processes; plan, source, make, deliver and return. In summary, the cement industry planning process is centralized and optimization oriented. There is no constraint in the availability of cement main raw materials with the exception of some countries where subsoil ownership regulations applied. Cement manufacturing is capital and energy intensive where cement truck delivery is restricted due to its low value-to-weight ratio.

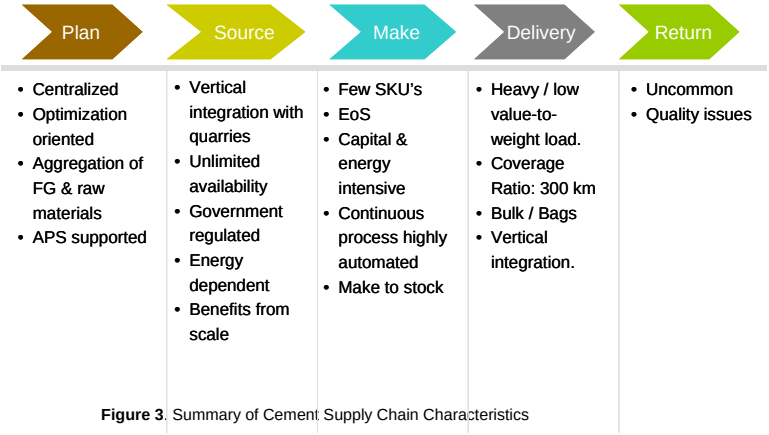

Figure 3. Summary of Cement Supply Chain Characteristics

Cement Supply Chain Operating Model (Product Analysis)

Cement can be characterized as bulk and bagged as shown in Figure 4. Bulk cement is dominant in developed countries and its demand is generated by large construction companies and government. Bagged cement is dominant in emerging markets and is generated by Do-It-Yourself customers and small contractors. Relatively speaking, bulk cement is functional while bagged cement is innovative. Functional products should have an efficient supply chain while innovative products should have a responsive supply chain.

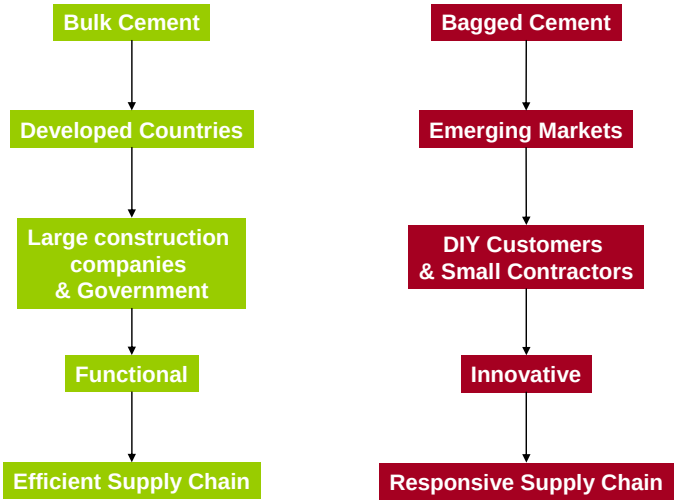

Figure 4. Functional vs Innovative Products

Configure-To-Order (CTO) SC design is more appropriate for an innovative product like bagged cement. At present, the cement industry supply chain has a BTS (Build-to-Stock) SC design where purchase orders are delivered from storage, the lead time to consumer is just the transportation time and the degrees of customer choice are limited. Cement current supply chain is shown in Figure 5.

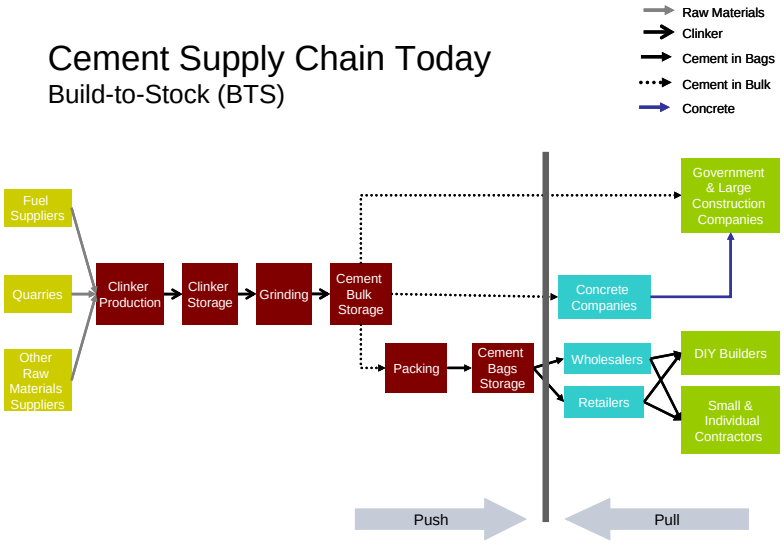

Figure 5. Cement Supply Chain

Two alternatives were proposed to migrate from BTS to CTO, moving the push-pull boundary back in the cement supply chain. First, Grind-to-Order where cement is kept in clicker (intermediate product of the cement manufacturing process) and then grinded as orders appear. Second, Pack-to-Order, where cement is kept in bulk and then packed as orders appear. Further research should be made to confirm the feasibility of these alternatives.

SC Innovations in the Commodity Industry

Finally, three case studies were presented to support the idea that SCM can add value to the corporate strategy of cement and mineral extraction commodity companies. The first case is the implementation of a single 3PL (Third Party Logistics Provider) by three of the largest oil companies in Colombia obtaining a 20% cost reduction in freight forwarding services, transportation and customs clearance services. The second case is a collaboration project between concrete and cement supply chain in Cemex Colombia resulting in an increase in concrete mixers availability to 93% and a reduction in maintenance cost by 25%. The third case is collaborative port operation contract in the steel industry where loading efficiency increased by 40% reducer maritime freights and waiting time.

Conclusion

The conclusions of this research are the following:

- From an economic perspective, the oligopoly or monopoly that characterized cement industry might explain the lack of importance of SCM. Compared to a free market, oligopolies and monopolies have low pressure to reduce costs, low pressure from customers and limited number of competitors. The focus of companies in oligopolies or monopolies is concentrated on pricing and competition monitoring. Traditionally, SCM is not a priority for these companies.
- Cement is a mature industry. On average, the four largest cement companies are 130 years old. Change management processes for these companies require time and resistance may be the found. SCM importance within the companies might take time to be incorporated in the strategy but it could be an excellent opportunity for innovative managers to create value. The case studies presented were from companies in emerging markets; maybe this is a coincidence, but one can conclude that innovation in SCM is possible when the pressure from headquarters was relaxed because of local market situations.
- Traditionally, cement supply chain is driven by asset utilization. Assets are represented by production plants, infrastructure and transportation equipment. Asset utilization is a given for the largest companies in the cement industry. This is why they are moving to Efficiency and / or Customer Response objectives to differentiate and to gain competitive advantage in the market. This change in strategy requires cement companies to build supply chain management capabilities that traditionally asset utilization companies don't have, in order to succeed in the new competitive environment.
- Given the asset utilization focus of cement companies, there were significant investments to improve cement manufacturing processes. As a result, a highly automated and continuous production process was developed. Today, large investments are required to improve

manufacturing capabilities, so SCM may be seen as the new frontier of cost reduction in the cement industry.

- The low price-to-weight ratio, which is a characteristic of cement, limits the geographical coverage of a production center. This situation reduces supply chain management to an operational role because it is solely responsible for moving the product by truck in a ratio of 300 kilometers. The use of maritime, rail and river transportation expanded the coverage of a production center allowing SCM to increase its scope facilitating the access to new markets and reducing costs significantly. Additionally, SCM costs are normally hidden in the company financial statements. Detailed cost analysis is required to uncover the potential of savings of SCM.
- Cement companies face a major challenge in emerging markets where bulk and bags coexist. To gain competitive advantage, these cement companies have to build two different supply chain strategies, one for each type of product. The bulk cement supply chain has to be focused on efficiency to obtain benefits from optimization processes and maximize utilization. The bagged cement supply chain has to be responsive and focused in availability. Bagged cement is more similar to a consumer good product than to bulk cement. To cope with the bulk and bagged challenge, supply chain leaders in the cement companies in emerging markets need a team which is able to work in these supply chain environments.
- Practices such as collaboration and information sharing with upstream and downstream supply chain partners are a significant opportunity to gain alignment for cement companies. Other elements such as the use of equitable contracts and the elimination of forward buying practices might generate value and increase the agility of these supply chains. One additional opportunity is supply chain collaboration with local or regional competitors in the purchasing of common components, equipment and services. Collaboration with competitors requires a significant change in the mind-set of the cement companies.

Cited Sources

Fisher, M. (1997, March). What is the Right Supply Chain for your Product? Harvard Business Review, 75(2), 105-116.

Lapide, L. (2008, November). The Operational Performance Triangles. Supply Chain Management Review, 6-7.

Lapide, L. (2006, March). The Essence of Excellence. Supply Chain Management Review, 10(3), 18-24.

Lee, H. (2004, October). The Triple-A Supply Chain. Harvard Business Review, 82(10), 102-112.

Lee, H. (2002, Spring). Aligning Supply Chain Strategies with Product Uncertainties. California Management Review, 44(3), 105-119.

Porter, M. (1980). Competitive Strategy. New York, United States: The Free Press.

Reeve, J., Srinivasan, M. (2005, May / June). Which Supply Chain Design is Right for You? Supply Chain Management Review, 9(4), 50-57.

Simchi-Levi, D., Kaminsky, P, Simchi-Levi, E. (2008). Designing and Managing the Supply Chain.Third Edition. New York, United States: McGraw-Hill / Irwin.