

An AHP Based Study on Critical Success Factors for the Supply Chain Management in Hong Kong Manufacturing Industry

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Abstract

Supply Chain Management (SCM) has drawn high attention and been discussed and under investigation for over two decades. However, how Hong Kong manufacturing firms carry out SCM is still unclear. In order to open the myth on what essentials are critical for SCM implementation, a large-scale questionnaire survey was conducted together with Expert Interviews in 2003. A SCM framework was then developed in which all the critical factors were summarized, categorized and prioritized to come up with a foundation for a self-assessment system for improving SCM performance.

Key Words: Analytic Hierarchy Process (AHP); Supply Chain Management (SCM)

1. Introduction

Due to the explosion of information technologies and globalization of industry, Supply Chain Management (SCM) has gained enormous attention from academics and industries. The more important is that competition is no longer between organizations to organizations, but supply chains to supply chains [1]. As mentioned by Spekman et. al., the supply chain will only be as strong as the weakest link or supply chain partner, organizations have to employ various kinds of strategies in order to enhance the competitive edge of the whole supply chain for survival [2].

Hong Kong, due to its overwhelming position, the Mainland China was Hong Kong's largest trading partner, accounting for 43 percent of Hong Kong overall trade value in the first half of 2003 [3]. Meanwhile, the Mainland was the largest supplier of Hong Kong, as well as the largest market for Hong Kong's re-exports and the second largest market for domestic exports, accounting for 43 percent of total imports, 44 percent of re-exports and 32 percent of domestic exports in the first half of 2003 (see Figure 1).

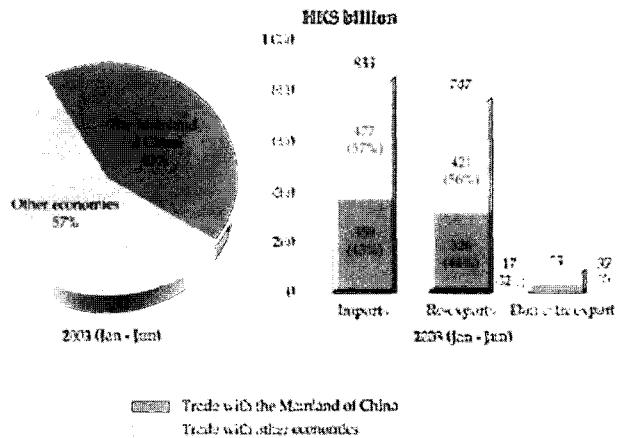


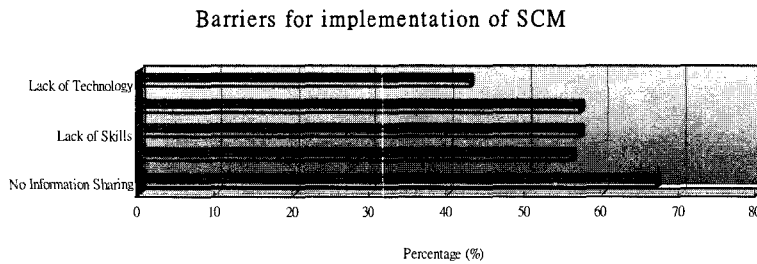
Figure 1. Hong Kong's major trading partner

China's World Trade Organization (WTO) accession and the signing of the CEPA (Closer Economic Partnership Arrangement) between the Hong Kong Special Administrative Region and the Central People's Government of China, Hong Kong manufacturers will probably enjoy more business opportunities than organizations from other countries.

The management of the supply chain in Hong Kong manufacturing industry has undergone little improvements over the last two decades. In mid-1990s, the application of supply chain management in Hong Kong was still relatively immature [4]. Both manufacturers and retailers had maturity lower than the world average and comparatively, retailers were ahead of manufacturers in supply chain practices. It was because Hong Kong manufacturing firms came across hindrance on carrying out SCM, namely, lack of technology, insufficient training and skills, lack of vision and no information sharing [4] (see Figure 2).

In contrast, the retailers in Hong Kong, for example, Park n' Shop, one of the biggest Hong Kong supermarket chains, has successfully implemented supply chain management since 1996 [5]. Its product range and volume has increased by 500 percent and 200 percent respectively and at the same time there are no increase of warehouse space, decrease in inventory, and the halved out-of-stock. Just-in-time (JIT) delivery, cross-docking, continuous replenishment, electronic trading, supplier partnerships, computer forecasting and pallet pooling are the supply chain practices that

Park n' Shop is now engaging. Certainly Hong Kong manufacturers seemed in lack of those experiences. This indicates that Hong Kong manufacturing organizations implemented a rather low level of SCM and did not aware the importance of SCM implementation.



Source: SCM survey, 1996

Figure 2. Barriers of SCM implementation in Hong Kong.

Since 1996, the implementation of SCM in Hong Kong manufacturing firms is still not popular. The apparel industry has been one of the last to adopt SCM and related technologies even though SCM enabling technologies, such as Electronic Data Interchange (EDI), Enterprise Resource Planning (ERP), have been around for several years [6]. The main barriers were lack of internal systems to support SCM, and the mindsets of the vendors were not up-to-date.

Until 2003, the manufacturing industry, especially the apparel industry in Hong Kong, was still lagging behind other sectors in adopting modern SCM practices, as pointed out by Managing Director of Luen Thai International Group Limited, a Hong Kong-based apparel manufacturer and a key supplier of several famous global brands [7]. Moreover, Hong Kong Article Numbering Association (HKANA) studied that not all Hong Kong companies were ready to implement the SCM practices, particularly in data sharing. That is why Vendor Managed Inventory (VMI) and Collaborative Planning, Forecasting & Replenishment (CPFR) are not popular in use. This indicates that Hong Kong manufacturers really lack relevant SCM knowledge and philosophy to adopt the SCM practices.

With Hong Kong having such a strong emphasis on global trade, the competitiveness of its manufacturing sector depends on the ability of local companies to adapt to a changing global business environment. Adopting SCM principles will help these companies to secure their status in the future. Thus manufacturers in Hong Kong have to increase its data transparency for data sharing with its supply chain partners in order to reap more benefits

through SCM implementation, for instance, improvement of order fulfillment time, increased product availability, reduce inventory, cost reduction and increased market shares.

2. Survey on SCM Critical Success Factors

An extensive review on literatures on the field of Supply Chain Management (SCM) was carried out to dig out critical factors for SCM implementation. Afterwards, these factors were validated and revised through a large-scale questionnaire survey in 2003. The questionnaires were mailed, faxed and emailed to Hong Kong manufactures in accordance with Members' directory of Federation of Hong Kong Industries. In total, 1,000 questionnaires were sent out and received 114 responses (11.4 percent response rate), of which 107 were found to be valid. Companies were associated with five different types of product classification, including electrical and optical products, electronics products, mould and die manufacturing, plastics products, and toys and games.

The result proved that all the factors found from literature were accepted as the critical factors to put successful SCM into effect. And the finalized critical factors were categorized into four main criteria; these are Internal Organization (IO), Supply Chain Relationship Management (SCRM), Competitive Supply Chain Strategies (CSCS), and Performance Measurement System (PMS), which altogether form a SCM conceptual model (see Figure 3).

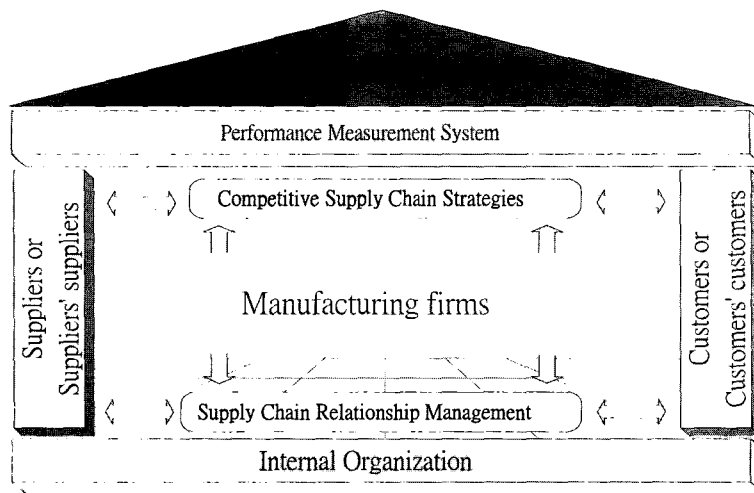


Figure 3. Conceptual Model for SCM Implementation.

“Internal Organization” is the basic building block of the SCM model, which is the critical success factor for cohesion, harmony, and integration across organization entities, say, the way they solve the problems and lead the whole organization, how they leverage the capability of employees and most importantly, how the top management plan strategically and commit the resources. Apart from internal integration, the next level, Supply Chain Relationship Management (i.e. external integration) is needed for successful SCM implementation. A closer and long-term relationship between supply chain parties (i.e. from suppliers to customers) is essential in sustaining competitive edge in the vigorous changing market. After the integration of internal organization and external integration with key supply chain partners, a higher level of supply chain strategies has to be developed in order to survive in the marketplace. Last step, the most important one, is the measurement of the whole supply chain performance on SCM implementation for continuous improvement. That is why each criterion is stacked on each other layer by layer, just like a small house.

For each criterion, they are further broken down into a series of sub-criteria, namely, top management commitment and support, training and education, application of information technology and system, supply chain wide performance metrics. All these factors thus altogether form the basic elements for the two-level SCM hierarchy. Detailed descriptions can be found in Figure 4.

3. Analytic Hierarchy Process (AHP) Interview

In the same year, face-to-face expert interviews were conducted with a view to prioritizing the SCM critical factors and finding out their rankings or weights by use of Analytic Hierarchy Process (AHP) approach.

The Analytic Hierarchy Process (AHP) was developed by Thomas L. Saaty and the earlier survey provided over 200 known applications of the AHP [8]. AHP models unstructured problems by decomposing a problem into a hierarchy of element (usually attributes and alternatives) influencing a system by incorporating levels; objectives, attributes, sub-attributes and alternative. A pairwise comparison of elements in each hierarchy is made to determine the importance of each element, and, ultimately, the relative score for each alternative is determined.

As a result, prioritization of the critical factors can be acquired through expert interview by rating the factors on a 1 to 9 scale with 1 indicating “Equal importance” while 9 indicating “Extreme importance”. By use of commercial software called “Expert Choice”, the

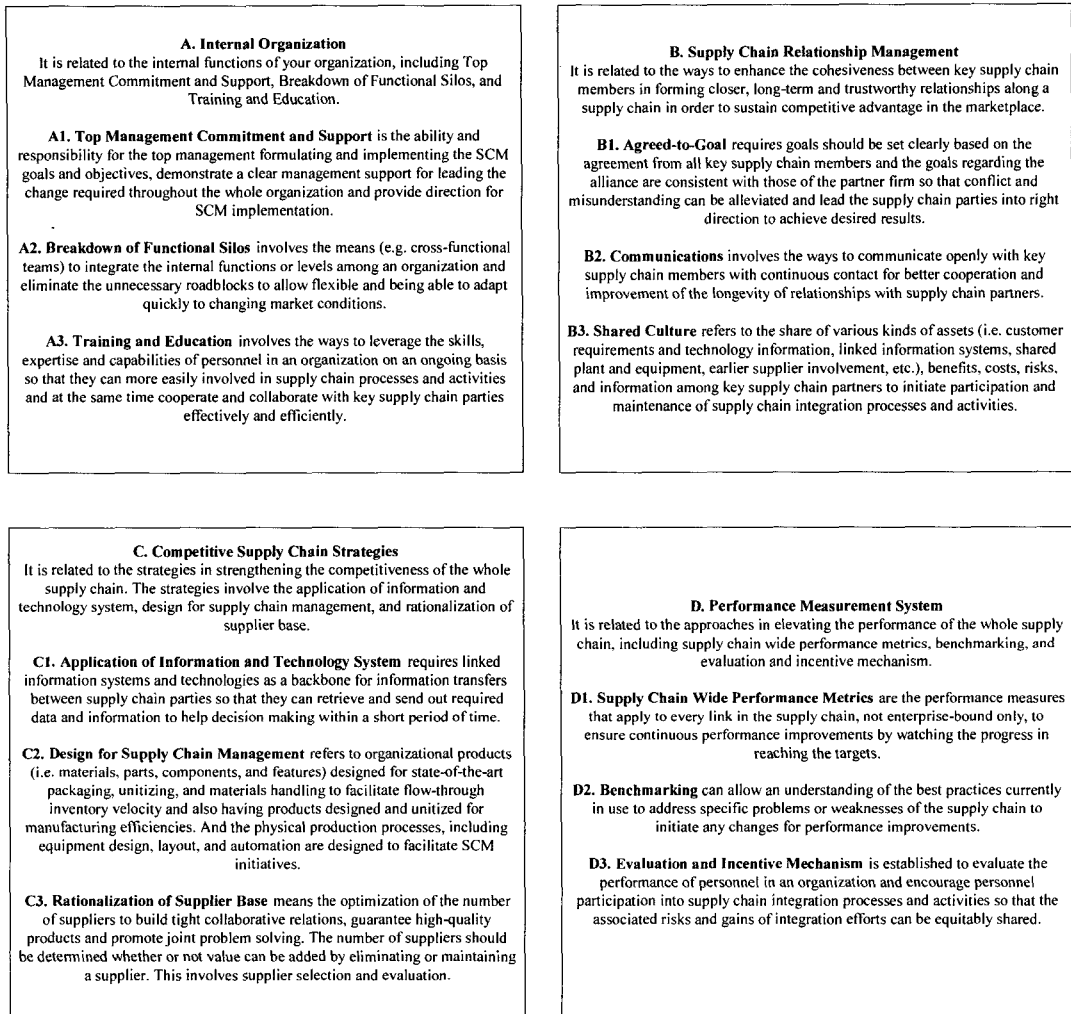


Figure 4. Descriptions for each critical success factor for SCM model.

relative priorities and weights for each factor can be generated. The results were checked against a consistency ratio (CR) which can be calculated to determine whether the responses in comparative judgments are consistent. The results will be normally considered as acceptable once the consistency ratio is smaller than 0.1. If the ratio is equal to or exceeds 0.1, re-judgment should be done to get the desired result.

Totally there were seven experts involved in this investigation and they are of average seven years upon SCM implementation in Hong Kong manufacturing industry, their manufacturing products include batteries, lighting switch, electronic products, toys, optical

discs. Their positions varied from supply chain manager, logistics material manager, to assistant managing director and managing director. The interviews lasted for 45 to 90 minutes. Apart from the pairwise comparison, the practices or best practices they were employing were also under investigated.

4. Priorities and Weights of the Critical Success Factors on SCM Implementation

With the Expert Choice software, the relative weightings with respect to each critical success factor were generated and formed as a self-assessment tool to monitor the progress of the organizations towards SCM implementation (refer to Table 1). Top Management Commitment and Support, Agreed-to-Goal and Design for Supply Chain Management were found as the top three most important factors in our study. This is because implementation of SCM is a long-term programme that requires participation from all levels and functions of an organization. It is thus essential to have top management as a catalyst to launch and improve organization's SCM

Table 1. Scoring System of the SCM framework in Hong Kong manufacturing industries.

Criteria / Sub-Criteria	Point Values	
A. Internal Organization		260
A1. Top Management Commitment and Support	155	
A2. Breakdown of Functional Silos	50	
A3. Training and Education	55	
B. Supply Chain Relationship Management		240
B1. Agreed-to-Goal	115	
B2. Communications	70	
B3. Shared Culture	55	
C. Competitive Supply Chain Strategies		270
C1. Application of Information and Technology Systems	90	
C2. Design for Supply Chain Management	100	
C3. Rationalization of Supplier Base	80	
D. Performance Measurement System		230
D1. Supply Chain Wide Performance Metrics	95	
D2. Benchmarking	60	
D3. Evaluation and Incentive Mechanism	75	
Total Points		1,000

performance. Without top management support, the other functions within the organization are not likely to buy-in the supply chain concept and the changes in the organization needed to interface with other supply chain members will not occur [9].

For SCM implementation, developing a long-term relationship with the partners is the prerequisite for success. In order to alleviate conflict or any misunderstanding between the partners, it is essential to set agreed-to-goals for all members of the supply chain at the very beginning [10]. Once the goal is set, it is much easier to accomplish. With reference to Whipple and Frankel, he further supported that establishing and executing clearly defined goals are beneficial to alliance success as the well-defined goals can lead the supply chain members into the right direction and achieve desired results [11]. This goal must also be thoroughly disseminated throughout the organization to enhance employee participation.

According to Fisher [12], supply chain design needs to be matched to the product. Functional products, such as toothpastes, have to accompany with physically efficient process while market-responsive process for innovative products, namely, sportswear and footwear. In Hewlett-Packard (HP), its success is contributed from its integrated design of its products, processes and supply network and so HP can deliver customized products quickly and at a low cost through mass customization, modular product design. Another example is IKEA, the world's largest Swedish furniture retailer, has implemented 'Design for economic packaging and transportation' for convenient use of the customers and manufacturers [13]. These approaches are similar to that of the SCM seven principles 'customize the logistics network' and 'differentiate product closer to the customer' [14]. Similar terms such as modularization, customization, postponement, all belongs to design for SCM. That is why organizations have to employ this approach to pursue their success.

5. Conclusion

This paper proposes a concrete SCM model to help Hong Kong manufacturing firms improve their SCM performance through Self-assessment approach. Organization can use the self-assessment model for continuous improvement and to identify areas for improvements. Implementation of Supply Chain Management (SCM) involves various parties, integration of the necessary processes and flows of the whole supply chain can speed up the flows of materials, information and finance. Companies have to adopt state-of-the-art information technology to act as a backbone for carrying out SCM. Top management commitment, Agreed-to-goal, and also Design for Supply Chain Management cannot be neglected.

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