Structures of Textile apparel Supply Chain: Concepts and Cases *

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In recent years supply chain management (SCM) has been in popularity as a new management philosophy for all industries, including textile and apparel industries. The textile apparel supply chain is relatively complex because it encompasses many participants such as yarn manufacturers, fabric manufacturers, garment manufacturers and retailers. Although many scholars are engaged in researching SCM in textile and apparel industries, a systematic classification of textile apparel chain does not exist. The paper proposes three types of textile apparel chain, nominated vertical integration chain, traditional sourcing chain and 3P hub (third party as the hub) chain. Different coordinators exist in different types of chain. Three Hong Kong headquartered companies, Esquel Group, TAL Apparel Ltd., and Li & Fung (Trading) Ltd. are used as cases responding to each type of the structures respectively.

Keywords: *supply chain, textile apparel chain, coordinator, structure*

Introduction

In recent years, there have been giant *changes* in businesses due to profound advances in the political, economic, social and technological environments of the world. At the same time, *consumers* become fickle more demanding, and more customized in requirement. Thus the *competition* among companies becomes more intense. These have been referred to as 3C (change, consumer, competition), which lead to an innovation of management. The development of supply chain management (SCM) in both practice and theory has thus emerged in the last decade and is gaining emphasis and popularities.

In today's world, the textile and apparel industries make a significant contribution to many national economies especially in the developing world [1-3]. The textile apparel chain is relatively complex because it encompasses several processes such as yarn manufacturing, fabric manufacturing, garment manufacturing and retailing. There are also intermediate steps, and many auxiliary materials are involved [4]. Operational modes of companies differ, thus different companies play different roles in the textile apparel chain.

In academia, many scholars have been engaged in researching SCM in the textile and apparel industries in recent years [5-7]. Their focuses are different on various aspects of the textile apparel chain. For example, Forza and Vinelli's is on operations to reduce lead time [5]; Leung's focuses on world class apparel sourcing [6]; Mattila *et al.*'s is on retail performance measurement [7]. In the industry, different structures of textile apparel chain exist. Although the kernel of SCM applied to different structures of chains should be same, the same problem may have different optimized result among different structures. Till now, no systematic classification of textile apparel chain has been found in the literatures. This paper thus intended to fill in the gap. Three different structures of textile apparel chain, which are vertical integration chain, traditional sourcing chain and 3P hub (third party as the hub) chain are proposed in the paper. There are different coordinators in each type of chain. To further describe these chains, three Hong Kong headquartered companies are used as the illustrative cases corresponding to each structure. The objective of the paper is to depict the structures of textile apparel supply chain, so as to provide a foundation for further researches on SCM of the textile and apparel industries.

Textile Apparel Supply Chain

Textile apparel supply chain is a relatively complex one because there are many parties involved in the whole process. Forza and Vinelli described the main participants in the textile apparel supply chain, which is shown in Fig.1 [4].

In fact, the initial point of the textile apparel supply chain is the natural fibre (e.g., cotton) or man made fibre (e.g., polyester) processing. After the processes of yarn manufacturing and fabric manufacturing, the fabric for garment manufacturing is prepared. Then, garment factories make pieces of garment using fabrics and some other accessories such as buttons and zippers. After packing, the garments enter the distribution process until reach the hands of the final consumers. Not only is each

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one of the stages a process itself, there are also other intermediary stages which are not presented in Fig. 1, such as dyeing/finishing for manufacturing. At the same time, as the final product of the textile and apparel supply chain, fashion is characterized by a number of factors, such as short lifecycle, high volatility of market demand, low predictability, and high impulse purchase[8]. The long pipeline and characteristics of fashion make the lead time of textile apparel supply chain relatively long and the operations uncertain.

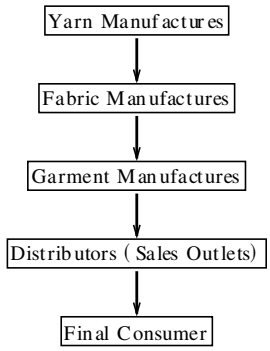

Fig. 1 Participants in the textile apparel supply chain

Organizational Sourcing Governance of Apparel Retail Firms

Generally, governance has been defined as "a mode of organizing transactions"[9], or more specifically, the institutional framework in which contracts are initiated, negotiated, monitored, adapted, and terminated[10, 11]. In this paper, the sourcing organizational governance will be defined as an institutional framework used in organizing sourcing arrangements between a buying firm and a supplier.

When investigating global sourcing of the US apparel industry, Jinsook proposed three types of organizational sourcing governance based on the extent to which domestic retailers integrate sourcing tasks internally, as opposed to delegating them to external agent. These are: (1) market oriented sourcing, (2) integrated sourcing, and (3) integrated production[12].

The first type of sourcing governance, market oriented sourcing, involves an external buying agent for global sourcing and is usually called "indirect sourcing". A buying firm can use domestic or foreign agents that are specialized in international procurement, such as international distributors, brokers, or trading companies. These external agents provide international assistance and perform a number of sourcing tasks for buying firms owing to their presence and knowledge of foreign markets and important sourcing procedures[13].

Unlike the market oriented sourcing, the rest two types involve the setting up of company owned business units in a foreign country that specialize in procurement, and are called "direct sourcing". Integrated sourcing and integrated production, however, represent two different degrees of integration. These two types of sourcing governance are distinguished by whether and to what extent the buying firm is involved in the manufacturing processes in a foreign country. In the case of integrated sourcing, the subsidiary simply replaces the external agents and assumes the function of global sourcing. For instance, a firm may have international purchasing units in domestic buying offices for global sourcing. Or, subsidiaries set up in foreign countries.

Integrated production represents a higher degree of integration than integrated sourcing. Under this type of governance, the buying firm not only owns buying offices in a foreign country, but also has foreign subsidiaries which manufacture products exclusively for the buying firm, or joint venture with manufacturing firms in foreign countries. This governance allows the buying firm to coordinate sourcing strategies and sourcing requirements, assign product designs, and provide technical requirements and information.

Jinsook's research focused on global sourcing of the US apparel retailers[12]. Explicit business modes of the global sourcing of the US apparel retailers are described. The three types of organizational sourcing governance, market oriented sourcing, integrated sourcing and integrated production determine their different ways of sourcing. Jinssok's research considered only one stage in the textile apparel supply chain, the retailers, and was not from the perspective of SCM. Expanded his research, three types of textile apparel supply chain, which are vertical integration chain, traditional sourcing chain and 3P hub (third party as the hub) chain are presented in this paper. Different coordinators exist in different types of chain. Except for the descriptions of these chains, three Hong Kong headquartered companies are used as examples corresponding to the three types of chain respectively in the next part.

Vertical Integration Chain

The major feature of vertical integration chain is that the apparel retailers are not only in charge of retailing, but also concerned with detailed manufacturing processes. The apparel retailers have their own garment factories, and may also have their own fabric factories, spinning factories, or even the origins of raw materials such as cotton farms.

Vertical integration refers to the process in which several steps in the production and/or distribution of a product are controlled by a single company or entity, in order to increase that company's or entity's power in the marketplace. Expansion of activities downstream is referred to as forward

integration, and expansion upstream is referred to as backward integration. Ellram observed that vertical integration could be viewed as an alternative to supply chain management, in that it attempts to manage control channel efficiency through ownership [14]. In fact, vertical integration can be viewed as internal supply chain management. In vertical integration chain, apparel retailers implement backward integration. They at least integrate garment production. Obviously, they are the coordinator of the supply chain. They must arrange all the related activities of supply chain, such as logistics and inventory, starting at least from fabrics to final selling. The structure of vertical integration chain is shown in Fig. 2.

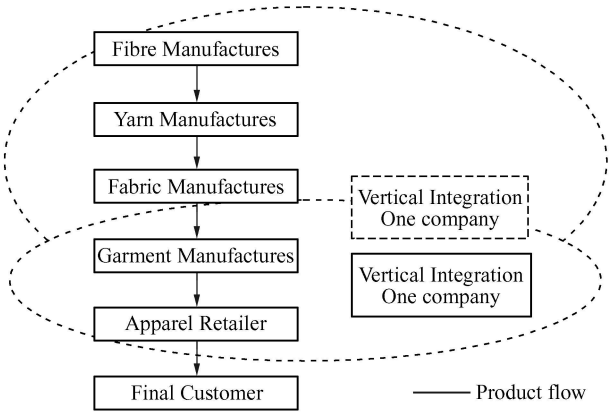

Fig. 2 Vertical integration chain

To further describe the vertical integration chain, let's see the case of Esquel Group [15]. Esquel Group is one of the world's largest producers of cotton shirts. The main facilities of Esquel are in China, Malaysia, Vietnam, Mauritius, and Sri Lanka. Esquel's network covers key markets in China, Japan, Europe and the US, and services customers across the globe. With a workforce of 47,000, Esquel manufactures 60 million pieces of garments annually.

As the major manufacturer, for her clients, like Tommy Hilfiger, Hugo Boss, Brooks Brothers, Nike and major retailers such as Marks & Spencer, Nordstrom and Jusco, Esquel establishes another type of chain with them. Besides this, Esquel also owns its vertical integration chain. The story of an Esquel shirt often begins in Xinjiang in western China. Esquel has sunk about $100 million into the region, with factories in the cities of Urumqi and Turpan. Its most interesting project, though, is the 12,000 acres on which cotton is farmed to the company's specifications. The cotton operations meet about 10% of the company's need. The spinning mills are also set in Urumqi and Turpan, Xinjiang. At the other end of the supply chain is Pye, a shop that opened in a Beijing shopping mall in 2000. Pye sells men's and women's shirts of Esquel's own design. Linking the two ends of growing cotton and selling shirts are the factories in Gaoming. These are their own knitting mills, weaving mills and the largest garment factories. Owning all the assets from cotton farm to retail outlet, Esquel is the absolute coordinator through the textile apparel chain.

Traditional Sourcing Chain

The traditional sourcing chain is one in which apparel retailers purchase their products from their suppliers — garment manufacturers. The retailers and manufacturers are legally independent. The retailers own the brands and outsource the production from the garment manufactures. Most likely, the retailers have their own design teams and specify their product design requirements. There are two types of traditional sourcing chains, depending on who is the coordinator of the chain. One is that the retailers are the coordinators of the chain. They coordinate at least two tiers of their suppliers. They place orders to garment factories, and at the same time, they may also involve in sourcing fabric. The other type is that the garment manufacturers are the coordinators. The retailers only place orders to the garment manufacturers and require the latter to deliver the right products to them at right time. The garment manufacturers either purchase materials from their suppliers or have backward vertical integration. The garment manufacturers drive the whole chain, even assuming some functions of apparel retailing. No matter whichever type is, the garment manufactures are the OEMs(Original Equipment Manufacture). The structures of traditional sourcing chain are shown in Fig. 3 and Fig. 4, representing either retailers as coordinators or garment manufactures as coordinators respectively.

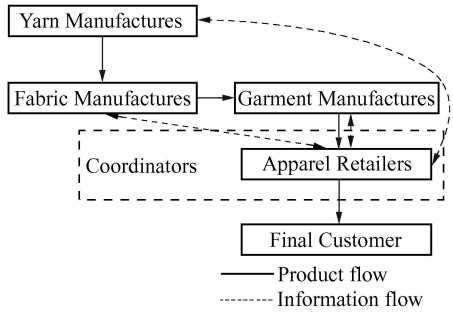

Fig. 3 Structure of traditional sourcing chain— Apparel retailers as coordinators

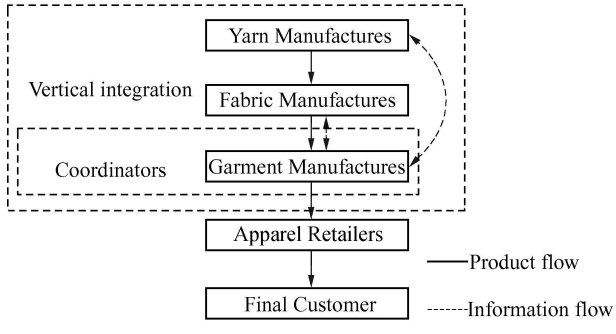

Fig. 4 Structure of traditional sourcing chain— Garment manufactures as coordinators

To further describe the traditional sourcing chain, TAL Apparel Ltd. can be an example [16]. TAL is the coordinator of the chain as the garment manufacture. Founded in 1947, TAL Apparel Ltd. is the world's largest producer of dress shirts, making every one in eight dress shirts sold in the US. The major customers of TAL include large retailers such as J. C. Penny and J. Crew, and leading brands such as Levis and Boss.

TAL is the pioneer in apparel industry to use SCM enabling technologies to cut the distribution expenses of its manufacturing bases in Hong Kong, Malaysia, Thailand, Taiwan and China. Upon receipt of EDI orders from US customers, TAL Apparel's Hong Kong office transmits the EDI production order to the relevant factory, which in turn transmits an EDI dispatch advice to the US customer once shipment is ready. Article numbers are assigned, pallets and cartons are labeled with SSCCs (Serial Shipping Container Code), and bar codes are used for accurate and easy scanning of product records. The use of this technology allows an effective cross docking practice, which reduces inventory, saves storage space and increases speed of delivery to stores.

Except for coordinating their suppliers, now, TAL continuously expands its functions in supply chain. For example, TAL took over some of retail's key areas such as forecasting and inventory management. TAL collects point of sales data for J. C. Penney's own brand dress shirts directly from the 1, 040 stores, and runs the numbers through a computer model it designed. TAL then decides how many shirts to make, and in what color and size. TAL sends the shirts from its factories directly to each store, bypassing Penney's warehouses and even its corporate decision makers. Instead of asking Penney what it would like to purchase, TAL just tell them how many shirts they just bought. For J. C. Penny, before it started working with TAL a decade ago, Penney would routinely hold up to six months of inventory in its warehouses and three months at its stores. Now, for the shirt lines that TAL handles, it is cut down nearly to zero.

J. C. Penney was reluctant to relinquish that power at first, and it took the step only after building up trust over years with TAL. But the system proved so effective that Penney has now let TAL take the arrangement one step further—designing and handling the market testing of new styles for its in store brands, such as Stafford and Crazy Horse. TAL's design teams in New York and Dallas come up with a new style, and within a month its factories can churn out 100, 000 new shirts, which are offered for sale at 50 selected Penney stores. After analyzing sales data for a month, TAL decides how many of the new shirts to make and in what color.

3P hub (Third party as the hub) Chain

The focal firm of the 3P hub chain is the garment trade companies whose main activity is coordinating the whole supply chain and provide the finished goods to their customers—apparel retailers. It is like a hub. The trade companies do not have their own manufacturing factories. They help the apparel retailers to choose suppliers and organize the production, including quality control and even the design. Generally, they control all the processes of the production until the goods are sent to their customers. Their core competence is their procurement network and good capability of coordination. Indeed, they are service providers. They can be even called textile apparel supply chain managers. The structure of the 3P hub chain is shown in Fig. 5.

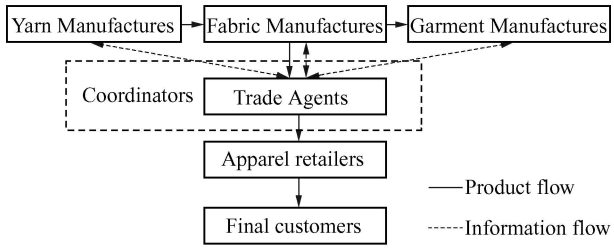

Fig. 5 Structure of coordinative chain

To further describe the 3P hub chain, let's cite Li & Fung (Trading) Ltd. as an illustrative case[17]. Li & Fung (Trading) Limited is a premier in global trading, managing the supply chain for high volume, time sensitive consumer goods. Garments make up a large protion of the Li & Fung business which also covers the sourcing of hard goods such as fashion accessories, furnishings, gifts, handicrafts, home products, and many others.

Founded in Guangzhou in 1906, Li & Fung is today headquartered in Hong Kong from where it coordinates the manufacture of goods through a network of offices in close to 40 countries. As a Supply Chain Manager across many producers and countries, Li & Fung provides the convenience of a one stop shop for customers through a total value added Package: from product design and development, through raw material and supplier sourcing, production planning and management, quality assurance and export documentation to shipping consolidation.

An example is that Li & Fung receives an order from a European retailer to produce 100, 000 garments. For this customer, Li & Fung decides to buy yarn from a Korean producer but have it woven and dyed in Taiwan. Because the Japanese have the best zippers and buttons, they order the right zippers in a big Japanese zipper manufacturer, YKK's factory in China. Considering the quotas and labor conditions, they ship all the materials to Thailand and

divide the orders to five Thailand garment factories for quick delivery. In the whole process, all the information from yarn manufacturing to final delivery is communicated between Li & Fung and the other parties. Li & Fung coordinates all the activities to guarantee the on time delivery. Li & Fung is the coordinator as the information center.

As the coordinator of the supply chain, Li & Fung establishes partnership with both consumers and suppliers. Although Li & Fung receives the order from the European buyer, the style and the colors have not been determined by the buyer yet. Only five weeks before delivery, Li & Fung can get the exact information. The trust between Li & Fung and the supply network makes it possible that Li & Fung can reserve undyed yarn from the yarn supplier. Li & Fung can also lock up capacity at the mills for the weaving and dying with the promise that they'll get an order of a specified size. Five weeks before delivery, Li & Fung will let them know what colors they want. The same thing also happens to the garment factories. In this mode, the textile apparel supply chain is coordinated efficiently.

Conclusions

The three types of textile apparel supply chain described in the paper are distinguished by the way of apparel retailers' sourcing and who are the coordinators of the chain. The first type is vertical integration chain. The apparel retailers are not only in charge of retailing, but also concerned with detailed manufacturing processes. The retailers are the obvious coordinators of the whole chain. The second type is traditional sourcing chain. The apparel retailers purchase garments from independent garment manufacturers. Either they or the garment manufacturers are the coordinators of the whole chain. The third type is the 3P hub chain. The retailers purchase their garment from apparel trade agents. The trade agents coordinate the whole chain and deliver the right products to the retailers at the right time.

Although different in structure, there are some similarities among the three types of chains. First, the material flow of the chains is approximately the same. It is shown in Fig. 1. The differences are information flow and fund flow. Coordinators of different textile apparel chains are information centers. Second, information sharing among supply chain partners is the most important problem for all structures. Third, an individual company may be categorized to different types of textile apparel chain. For example, Esquel may belong to vertical integration chain for its own brand Pye and to traditional sourcing chain for its customers such as Nike. And then, no matter what type, coordinators should actively integrate the whole chain for the maximum total profitability. That is to say, whether the whole supply chain is success or not is determined by the activities of the coordinators in a sense.

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