IT Enabled Global Operations in the Textile Industry

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Abstract

This study, based on a case of an international textile group, demonstrates the change process and change content of an IT enabled global operations model in the textile industry. This textile group has restructured its operation network via a Global Operations System (GOS) to obtain maximum resource utilization at the network level. The findings indicate: (1) in the absence of the required trust and commitment among transaction parties, global operations require a governance mode that is more vertically integrated than virtually integrated. NWTextile Taiwan adopted a cross-holding strategy to obtain control power and increased ownership of their global operations, ensuring there was sufficient information exchange and good quality information for operation decisions; (2) a centralized decision center should be created to organize global resources from a global viewpoint; (3) clarifying the benefits of a GOS and providing related support as well as financial incentives are the keys to successful implementation.

Keywords: Global operations, textile, global sourcing, global operations systems, operation network

1. Introduction

To date, textiles remain an important industry for many developed and developing countries, and have served as a key source of employment and export growth (US Department of State 2008). Since the 1990s, textile companies have been aware of the trend of globalization. As fashion is merchandised and sourced from across the world, textile businesses face a widely fragmented supply chain. A single item of clothing may be made by numerous raw material suppliers and garment manufacturers, resulting in complicated operation processes. Because of quota limitations and complicated global material management, it is more difficult for textile companies to leverage among various manufacturing factors and achieve optimal solutions for all the parties in their supply and production network. The ability to virtually integrate operation activities has become more of an issue in the textile industry. As Cudahy et al. (2008) observed, a 'multi-polar' world has been created due to the increase in economic interdependence across multiple centers of economic power. This is true for textiles, especially when substantial shifts in the worldwide textile trade happened because of the uncertainty induced by the changes to quota policy of the US and the European Union (EU).[1]

There is now a need for textile companies to upgrade their operation activities and move up along the value chain. In contrast to other industries, for which the

[1] Although textile quotas were abolished from the beginning of 2005, in May 2005 the US government decided to re-impose a special quota restriction on China's exports of several types of textile products. Meanwhile, the EU resumed the setting of quotas on China's textile exports to the EU (US Department of State, 2008, Chowdhury, 2005).

most obvious reason for globalization is to reduce production costs, globalization in the textile industry has different considerations. Different from other globally-operated industries, such as the high-tech machinery and paper industries, the textile industry utilizes a great variety of non-standardized materials which are produced worldwide. Therefore, companies from more than a hundred countries have to co-operate with each other along the whole supply chain. Textile companies need to balance various complicated factors, such as structural restrictions (e.g., quotas and tariffs), labor costs, transportation costs, quality, delivery times, and so on, so as to optimize efficiency and establish an effective worldwide operation.

Although textile companies have traded worldwide for decades, many companies have dealt with their operating activities (e.g. procurement, production, marketing, and manufacturing) separately and have not yet adopted a comprehensive approach to operate globally (Monczka et al. 2008). Recently, more and more leading textile companies have realized that effective operations in the global market requires an integrated operation network in which all operation activities and parties are taken into consideration. Traditional supply chains in the textile industry need to be restructured to form an integrated perspective so as to eliminate any inefficiency in global resource management and to leverage the capabilities of all divisions.

Nevertheless, global operations pose several challenges, including such issues as restructuring the decision-making process, redesigning operation procedures, sharing information among network parties, and the management of conflicts of interest between local sites and central offices. This paper is an attempt to provide a case study for a better understanding of these issues. We examined a Taiwanese textile group that had developed an integrated global operations model through a global operations system (GOS) to deal with imbalances of capacity and resource management among the group members

2. Global Operations

2.1 Evolution of Global Operational Modes

As the textile market is greatly fragmented with thousands of material suppliers from all over the world, global operations play an important role in the operation process. To take on and manage such complex operations globally, there should be a key issue that can determine exactly what the most efficient form of a global operation is. There are several feasible alternatives for global operational modes.

First, firms can be tied to upstream suppliers and downstream customers with regards to the aspects of materials, information, finances and services to form a supply chain (Larson and Halldorsson 2002, Menzer 2001). Recently, such simple one-way exchanges in a traditional supplier-buyer relationship have evolved into a more flexible ‘supply network’. A supply network encompasses the complexity of exchanges and coordination from a broad, strategic view for the purposes of resource acquisition and network management (Harlan et al. 2001).

For a more efficient supply network design, both the physical and information aspects of the supply chains are treated separately in a governance structure of virtual integration. Virtual integration substitutes direct ownership with partnership and emphasizes information sharing among vertical parties that leads to increases in manufacturing flexibility and adaptability (Wang et al. 2006). By outsourcing organizational functions and concentrating on the core area of competence, virtual integration allows firms to make decisions and coordinate actions quickly (Guisinger and Ghorashi 2004). Virtual integration, therefore, is considered to be the most flexible governance structure of a supply chain. Nevertheless, without a high degree of trust and commitment among the parties, high transaction costs could offset

production costs, leading the supply structure to become unstable and collapse (Maropoulos et al. 2008).

A production network is another type of network. A common challenge suffered in production planning is deciding on the inventory level, production venues and workforce size required so as to meet with fluctuating demands (Hax and Candea 1984). Companies that share the same market and that have targeted customers and suppliers may find there are redundancy, incapability and insufficient resources among themselves. An exchange of information and resources can provide these companies with the opportunity for better production planning (Wiendahl and Lutz 2002). Therefore, companies cooperate with other companies in a production network and reinforce horizontal partnerships in a long-term and stable relationship (Maropoulos et al. 2008).

In textile markets, numerous factors might have an impact on operation decisions, such as costs, quotas, quality, capacity, lead times, industrial infrastructure, and delivery times. It is essential to leverage these factors in an integrated manner in order to improve product quality and manufacturing flexibility to ensure an economic portfolio (Ettlie and Sethuraman 2002, Monczka et al. 2008). Both production networks and virtual integration are run with a market system rather than a central planning system. In a competitive market system, key information, such as resource availability, consumer preferences or technological opportunities, are not necessarily transmitted (Milgrom and Roberts 1992). However, determining an efficient allocation of global resources requires detailed information about the entire network, and the optimized solutions of operation should take all this information into consideration. As Min and Eom (1994) state, operational decisions in different working units should be consistent and based on the strategic operation plans of a central office. Unlike virtual integration, global operations emphasize both horizontal and vertical integrations in a network. In global operations, the structure of the network is built through the effective integration of operational activities including R&D, sourcing, manufacturing, sales, marketing, logistics, delivery, and supporting services (Cudahy et al. 2008). Resource allocation is planned as a centralized process for both local and global demands. In their study, Cudahy et al. (2008) observed firms with highly effective global operations, typically favoring globalization of the entire value chain of product lines or business units, rather than the globalization of specific functions. By so doing, firms can manage a balanced portfolio of local, regional, and global resources and leverage their abilities for all network parties to realize maximum profits for the whole network rather than individual companies within the network.

2.2 Global Operations Design

A big challenge of a global operations model is how to effectively coordinate and leverage worldwide requirements while remaining responsive to the needs of regional business units and operation sites (Monczka et al. 2008). Dealing with various problems separately within an individual unit or from a local viewpoint usually results in the sub-optimization of global operations, and this can lead to poor customer service, distribution inefficiencies, cost wastage and low employee morale (La Londe et al. 1993, Bendiner 1993). Such sub-optimization is caused by the interrelated nature of logistical activities, and these, in turn, damage global logistics (Capacino and Britt 1991). Accordingly, constructing a fully integrated model, rather than building smaller sub-models separately, is required to effectively manage capacity and resources in global operations (Min and Eom 1994).

Cudahy et al. (2008) proposed setting up a central office or a staff head to account for global operations and deal with the inevitable conflict among local, regional and global divisions. A center-led and coordinated decision-making function is called ‘Centers of Excellence’ (CoE),

which is a small, center-led group of experts within an organization who focus on standardizing processes, leveraging eSourcing technology, adopting the best practices, sharing information, and streamlining procurement activities (Hochman and Dorf 2008). Decisions that involve broader and more centralized strategies require resource alignment and information sharing between the locals and a central office to balance local requirements with overall network goals (Colotla et al. 2003). There must be a 'positive tension' and a balance must be made between corporate, regional, and local sites, with the process and principal decisions made on the central level, as well as daily operating decisions. Therefore, operational practices are best performed at the local sites (Cudahy et al. 2008, Monczka et al. 2008). Consequently, once grounded in resource integration and information visibility, global operations demand a strong and controlling power for decision-making and information acquisition. By so doing, a global operational model can reduce the total costs of ownership and leverage abilities and the resources of the entire operational network, thereby increasing manufacturing flexibility.

2.3 Global Operations System

Global operations emphasize the functions of identifying and evaluating alternative options for operation activities and the ability to structure complex managerial goals, constraints and variables. Information technology (IT) thus plays a critical role in global operations as it provides timely connection, collection, access to and analysis of information produced in interrelated operation activities from numerous operation sites. An early study by Eom and Lee (1990a) indicates that marketing and logistics are the predominant fields when adopting decision support systems (DSS). The application of DSS to solve a variety of operating problems in operations areas includes tactical and operational planning, strategic planning, manufacturing logistics management, monitoring and controlling manufacturing flow, transport management, planning/scheduling, and so on (Eom and Lee 1990b). Considering the complexity of global decision-making, Min and Eom (1994) thus proposed an integrated DSS framework for multinational corporates to enhance the effectiveness and efficiency of worldwide communications based on an information-network that could overcome geographical, cultural and legal barriers extant in the foreign market. They argued that the implementation of specific DSSs to aid specific logistical decisions should be designed for both cross-functional and cross-border operations and must build a network-based system that directly delivers information from foreign countries to the corporate headquarters (Min and Eom 1994). An integrated DSS which coordinates operation activities, shares a central communication network and evaluates trade-offs throughout the entire operation process is called a Global Operations System (GOS). More specifically, parameters, such as price, transportation fees, labor costs, lead time, quality and the available capacity of candidate factories, will be taken into consideration at the same time, using a mathematical algorithm model to obtain an optimal solution. A GOS should be designed with an effective flow of information across the entire operation network to eliminate duplicated effort and to successfully link activities from sourcing, production and marketing to logistics. As Min and Eom (1994, p.37) described, "The assimilation of up-to-date information and knowledge from different countries and fields can provide a "macroscopic" or "bird's eye" view to the operation planner to make better plans and decisions". Integrated operations enabled by such IT allow manufacturers to substitute 'information for inventories' so as to improve resource utilization and production flexibility for the whole network (Dudley and Lasserre 1989).

IT can not only provide greater information processing and communication ca-

pabilities, but also better controlled feedback mechanisms. However, it could be a challenge for trading partners using IT to achieve greater inter-firm collaboration and information exchange. Without the autonomy of administration, the quality and precision of shared information may be a problem. Therefore, the adoption of a GOS requires a restructuring of the operation network in which both the controllability and adaptability of manufacturing are high.

3. A Case of Global Operations in the Textile industry

3.1 Research Method

The purpose of this study is to suggest a qualitative case-based method to provide an insight into a particular area rather than to validate the existing theory. Both qualitative and quantitative data were collected.

Table 1: Interview Questions

Interview Questions
1. The purpose of GOS adoption.
2. Difficulties and problems encountered in the old business model.
3. The interviewee's role in business model change and GOS implementation.
4. The process of GOS implementation (project members and their roles, implementation method, steps etc.)
5. The role of MIS in GOS implementation.
6. GOS usage in NWTextile.
7. Difficulties and challenges for GOS implementation and business model change
8. Reasons for approving a GOS and global operations model.
9. The evaluation of GOS performance.
10. Functions of GOS.
11. Solutions for business model change and SBUs' resistance

One of the authors of this study was the consultant for this company's GOS implementation from the beginning of the project. Semi-structured interviews with key personnel, including the CIO and CEO involved in the GOS project, were conducted and a sample of the interview questions is illustrated in Table 1. During the interviews, extensive notes were taken and these notes were then written up as soon after the interviews as possible, often on the same day of the interviews. In addition to interviews, related information (such as GOS project documents including system analysis and design, budgets, project members, and a Gantt chart), and secondary data (annual NWTextile reports, newsletters, local newspapers and historical reports on the textile industry) were available for the authors as references. A system demonstration of the GOS was also provided by NWTextile and this allowed the authors a better understanding of the proposed functions of the system. However, for confidentiality, NWTextile requested that some information was not revealed. Participant observation and informal conversations with key personnel were also used by the author, who was the consultant of the company. These personnel included several senior managers of foreign SBUs (Strategic Business Units). Conversations with these key personnel helped the authors to understand the feelings of the different groups and attitudes toward the GOS implementation. On the basis of the collected data and literature, a rich organizational context has been developed in which the story of the adoption of GOS takes place.

3.2 NWTextile Group

NWTextile was established in the late 1970s by five good friends who had been awarded BA degrees from the same textile engineering department. They became the main stockholders of NWTextile. NWTextile started as a trading converter and fabric supplier, coordinating between textile traders and manufacturers. Despite a successful history, the textile industry in Taiwan has been put under pressure by the rise of China's textile industry and higher labor costs that came with economic development. It was inevitable that garment manufacturers would spread their manufacturing and marketing operations offshore. NWTextile also found it was getting more difficult and more competitive as a trading converter in Taiwan's textile industry. With changing markets and the trend of globalization in Taiwan's textile

industry, NWTextile started to expand its business from material manufacturing to apparel trading and manufacturing. From the 1990s to early 2000, NWTextile expanded its territory through reinvestment and developing joint ventures with Chinese and Mexican dyeing, weaving, and apparel trading companies, becoming an apparel OEM. NWTextile also invested in three apparel trading companies in the US (New York, Los Angeles, and Dallas) to evaluate US markets. The NWTextile group's businesses now include yarn spinning, dyeing and finishing, fabric sales, garment production, and other sales departments. In 2007, NWTextile group's global turnover was about USD 1.3 billion (over 70% from garments, approximately 15% from yarn-dyeing, and 10% from weaving). All of NWTextile's important apparel customers are in North America, including K-Mart, Wal-Mart, and Alfred Dunner. NWTextile group has a few factories in Africa and Central America. It also has joint-ventures and subcontracting material suppliers in Southeast Asia. During the expansion process, each stockholder was in charge of one or two companies and was responsible for a broad set of decisions relevant to his/her own units. NWTextile Taiwan undertook very few management roles within other units, and found it difficult to coordinate activities within the growing firm operated over broad geographical areas.

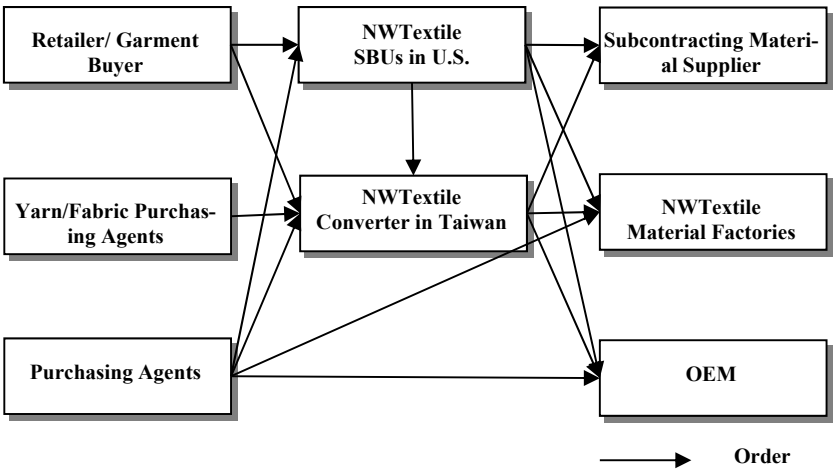

Figure 1: Operation Model of NWTextile before 2003

3.3 Unbalanced Resource Arrangement in the Decentralized Operation Model

The original operation model used by NWTextile is illustrated in Figure 1. Every local division within NWTextile served as a SBU, operated as a self-contained planning unit and was financially self-sufficient. SBUs in North America were in charge of marketing, sales, channel management, and apparel customer service, SBUs in the Asian Pacific region were in charge of dyeing, fabric and weaving, sourcing, marketing, and trading tasks, with an SBU in Mexico in charge of both material and garment manufacturing and trading.

The managers of each SBU had a large degree of autonomy. Each SBU developed its own business strategy, goals and operational plans that could be different to other SBUs. Most SBUs had purchase and sales staff who were responsible for their own SBU's purchasing and orders. Given that NWTextile was run as a decentralized collection of entirely separate units, it was not necessary for the sales and marketing SBUs to pass garments or material

orders with reference to the production, dyeing, or weaving SBUs within the NWTextile group. However, purchasing agents and sales personnel in the U.S. SBUs might choose suppliers from markets to enhance the profitability of their own units. NWTextile Taiwan, as a trading converter, had a set of external customers. Additionally, the material factories in Southeast Asia were not just run as internal material suppliers within the NWTextile group. NWTextile Taiwan, thus viewed itself as a customer of NWTextile New York and NWTextile Los Angeles, and the contrary was true for weaving SBUs and dyeing SBUs in Taiwan. All SBUs make their own decisions from a more local perspective, and some elements of the practical programs and facilities are shared among them. As the CIO and CEO of NWTextile Taiwan said:

"The purchase function was not independent in the old business model and every SBU could make its own purchase decisions. A manager could make decisions on fabric orders from tens to thousands of yards that could amount to millions of US dollars. He could also make decisions on outsourcing because he had to be responsible for the delivery date" (Quoted by the CIO).

"We used to view NWTextile US as our customers. We needed to compete with other (companies) to obtain orders from the US (SBU)" (Quoted by the CEO).

As Figure 1 describes, both NWTextile Taiwan and NWTextile U.S. would take garment orders from the customer first, and would then pick a manufacturing facility for their own consideration. The facilities were not necessarily NWTextile members. Manufacturing factories were independent from each other, meaning that they had separate manufacturing arrangements, sourcing, equipment and inventories. Once the orders were forwarded, the manufacturing process became an independent task of that SBU. Such arrangements virtually divided the whole NWTextile group into many smaller independent companies and the entire NWTextile group was unable to generate economies of scale and overall utility.

Given that commercial information is handled separately, the independent operations of each SBU decentralized the process of operational information flow and this created difficulties with the integration of information and resources among these SBUs. This model seriously impaired the decision makers' ability to quickly harmonize business units for global operations since they could not receive quick and integrated information from the other members. Functional activities spread over many SBUs resulted in inconsistent information and redundant efforts made by different unit managers. Strategies focusing on one site optimization also prohibited the NWTextile group from achieving overall optimization of the whole group. Consequently, this caused low efficiency and business conflict, and even competition among the SBUs. This decentralized operation model introduced an imbalance among the NWTextile manufacturers and meant that "some units had overcapacity and some had few orders" (Quoted by the CIO).

Table 2: Analysis of NWTextile Global Operations Layout

Regions	Regional Strength	Function	Affiliates	Quotas	Labor Costs	Delivery Speed	Industry Integration
Taiwan	1. Good at R&D 2. Complete integration of supply chain	Operations center, finance, strategy planning, R&D	Yarn dyeing, Weaving, Plain, Garment Factories	End by 2005	High	Medium	High
China	1. Mature textile industry 2. Good at producing complex products 3. Massive domestic market	Global sourcing, manufacture of garments, sweaters	Shanghai Sourcing Agent, Shenzhen Purchasing Agent	Uncertain	Medium	Medium	High
Southeast Asia	1. Good at producing complex products 2. Incomplete integration of supply chain	Manufacturing	Vietnam Garment Factories	End by 2005	Low	Slow	Medium
North America	1. The biggest apparel market 2. Fast response to customer requirements 3. Communication with customer is easy.	Sales and marketing	New York, Los Angeles, and Dallas companies	No	High	Fast	Low
Mexico	1. Duty free and no quota limitations 2. Quick response 3. Near to North America	Manufacturing	Dyeing, knitting, and garment factories	No	High	Fast	Low
Africa	1. Duty free and no quota limitations 2. Low labor wages 3. Reciprocal benefits from local government	Manufacturing	Garments, Dyeing, Weaving, Yarn spinning, Spinning factories	No	Low	Medium	Low

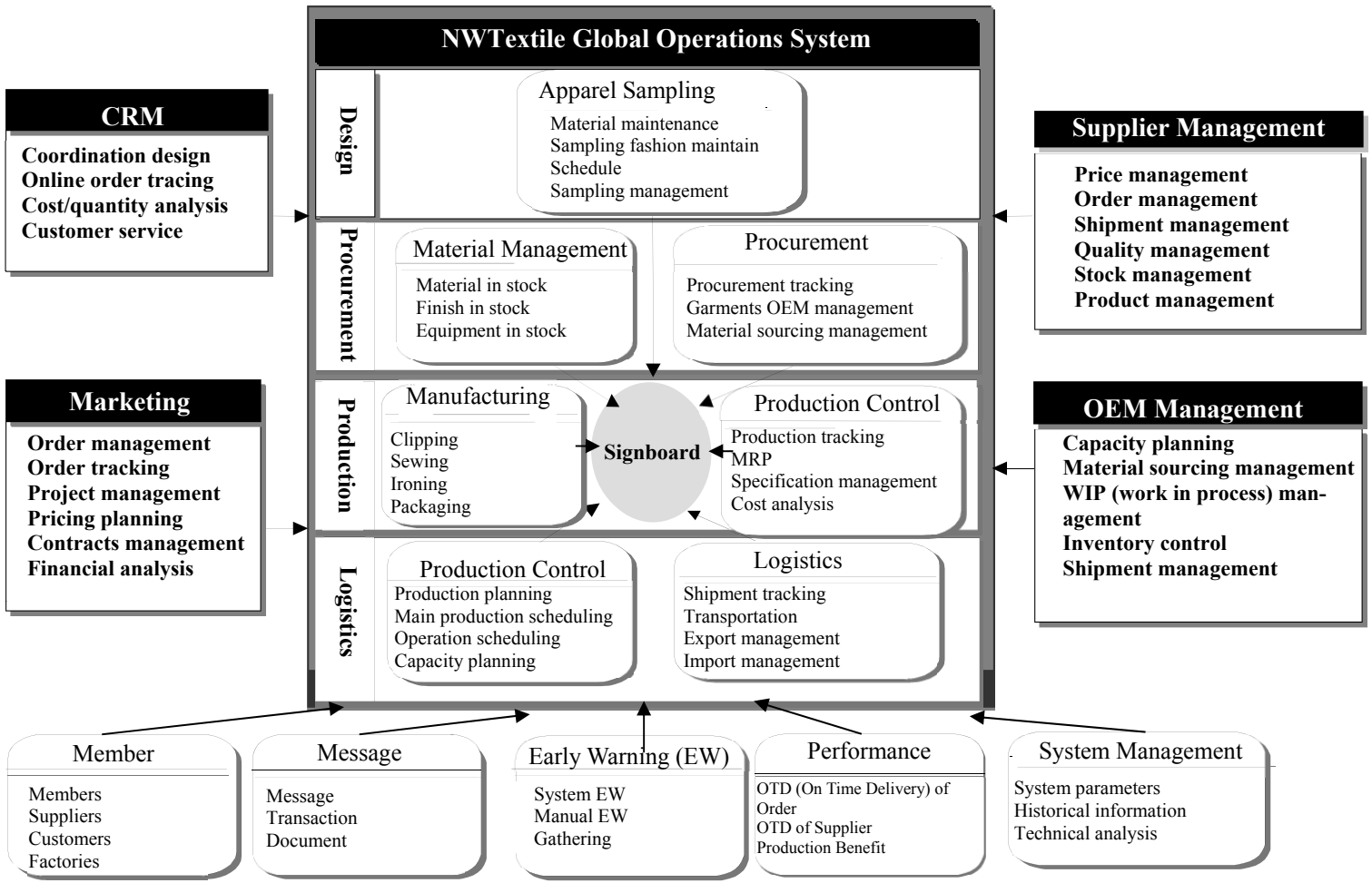

Figure 2: Functions of Global Operations System

4. Discussion

4.1 Changes to the Global Operations Model

With the increase in competition, NWTextile was forced to find its own competitive edge and niche market to respond to the economic challenges of costs, lead time, and trade restrictions. The CEO of NWTextile Taiwan recognized that the limitations and insufficiencies of its current operation structure where dragging down the performance of the entire group. NWTextile Taiwan thus began to transform its business model in 2002 to build a more integrative and globally-operated framework.

A global operations model requires appropriate operations and planning, according to the characteristics of each geographic region, which can quickly respond to the market and develop an optimal operational plan at the network level. To reach this goal, real-time information is vital in synchronizing and coordinating the different facilities. NWTextile Taiwan decided to build a comprehensive global operations network through a GOS that integrates information from all SBUs, OEM, joint-ventures and subcontractors that is relevant to the whole operational process. The analysis of NWTextile for global operations design is shown in Table 2 and the functions of its GOS are illustrated in Figure 2.

The goals of the GOS initiative are to (1) centralize decision-making and planning by managing operational information through a single nerve center, so as to better organize resources and the competence of all network members; (2) integrate resources and the abilities of all operation sites to provide operation strategies with a global perspective.

4.2 Organization Restructuring

The first step in the organization restructuring process was to redefine the roles and functions of each working site according to each SBUs' regional characteristics and competitive edge.

Southeast Asia and South Pacific: Although the largest clothing market is in North America, higher wage costs preclude manufacturers from establishing a labor-intensive plant there. Countries in Southeast Asia and the South Pacific, such as Vietnam, Cambodia, and Indonesia are more suited to fabric production and garment assembly because of lower wage costs. However, the application of certain complicated textile techniques requires not only low wages but also technical support and external resources from the whole textile industry. NWTextile, therefore, looked for OEMs and subcontractors in China, taking into consideration the increased development of China's textile industry as well as the massive domestic market. China is a member of the WTO, and there have been no quota limits on China since 2005. As a result, material suppliers in China, the South Pacific and Southeast Asia became the best choice for material sourcing and manufacturing.

Africa: Considering labor costs and quota limits, NWTextile chose Africa as their base for garment production . Because of the African Growth and Opportunity Act (AGOA), garments made in Africa were free from tariffs and quota limitations when exported to the U.S. before 2005. Additionally, since many countries in Africa were economicaly under-developed, as defined by the AGOA, NWTextile were also able to import materials from other regions to its African factories to maintain its duty-free status. Therefore, NWTextile built two new garment factories in Africa in 2001 and 2002.

Central America: For a garment manufacturer, on-time delivery is more important than quality control of the products. NWTextile found that the production systems in China and Southeast Asia were unable to service quickly the orders from North-American customers.

To solve this problem, NWTextile used Central America as a manufacturing

base. This region is a party to the North American Free Trade Agreement (NAFTA), which makes textile goods exported from this region duty free. Also, this region is close to the U.S. and the short communication distance makes lower labor costs feasible. NWTextile finally established garment factories, fabric factories, and dyeing factories in Mexico.

North America: North America is the biggest fashion market and has been the largest importing market of garments (The U.S. imported large quantities of clothing to the value of almost $90 billion in 2005, 80% of which was controlled by the big four retailers: J.C. Penney, K-Mart, Wal-Mart and GAP). Because of the short life cycle of apparel and the changing nature of fashion, marketing and manufacturers located in regions close to the U.S. are important in order to quickly respond to customers' changing demands. Taiwan is geographically far away from the Western world, thus it is difficult for Taiwanese manufacturers to have a good grasp on fashion trends in the U.S..

To obtain orders from the major U.S. retailers and to remain profitable, it is essential to provide a better service and be more active in maintaining a good working relationship. Since most of NWTextile's customers are located in North America, it was necessary for NWTextile to set up several branches in the U.S. to gain better access to their customers. For example, NWTextile can create value for customers by providing the newest information and innovative materials or samples, or by suggesting new production technology. Nonetheless, garment manufacturers still have to suffer cut-throat competition to survive in the market. A late delivery can be sufficient to destroy a thirty-year relationship. Therefore, the regions close to the U.S. are definitely important, considering speed-to-market for marketing and sales functions.

Taiwan: First, the textile industry in Taiwan is mature with a highly flexible supply chain. Second, related industries, such as yarn-spinning, weaving, and dyeing, are more prominent compared to other countries. Third, advanced production technologies for, textiles such as a computer assisted color match system has been pioneered in Taiwan and NWTextile Taiwan has developed strong R&D capabilities over a long period. Engineers in the R&D team have rich experience in yarn-dyeing, finishing, weaving, and garment production. NWTextile finally chose Taiwan as its operating center to manage information and determine sourcing, producing and manufacturing plans for the entire network. Based on the information passed from all units, suppliers, and OEM, the Taiwanese operation center can produce production plans and manufacturing schedules for its global operations in a more integrated way. The tasks and decisions of each unit can be found in Figures 2 and 3.

Table 3: Effectiveness of Global Operations

Performance	Before, 1st quarter, 2001	After, 1st quarter, 2003	Growth rate
On time delivery of orders	76.92%	89.21%	12.29%
On time delivery of suppliers	63.42%	79.12%	15.70%
Average lead time (days)	71 day	62 day	12.68%
Sales growth of NWTextile group (USD)	157 millions	242 millions	53.41%

As shown in Figures 3 and 4, sales, sourcing and production processes are integrated to leverage resources to reach a better arrangement for all network members. In the global operations model, resource management and planning functions are now regrouped by the global operation center in Taiwan. NWTextile Taiwan essentially acts as a full-service center to engage, integrate and coordinate global operation activities across the worldwide locations. In many respects, this center ena-

bles global operations planners to have a worldwide footprint. The optimization of global operations considers variables including quality, production costs, inventory costs, transportation costs, lead time, duty, and tariffs in a more holistic view enabled by the decision support function of the GOS (Figure 2 and Figure 3). Hence, global demand can be satisfied more efficiently, resources can be reallocated to different facilities more quickly, and large scale production can be planned and estimated more precisely.

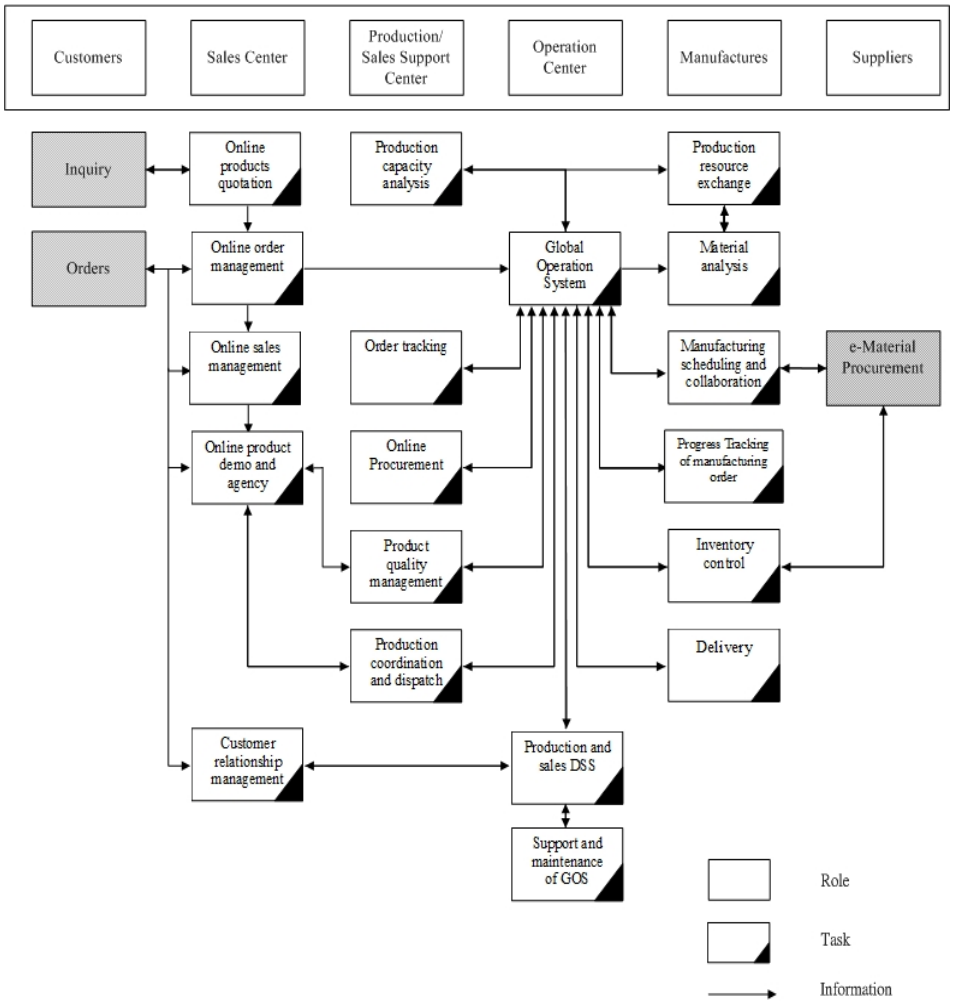

Figure 3: Global Operations Processes

Table 4: Financial Effectiveness of Global Operations

Year	Profit Ratio	Inventory Turnover	Average Days in Sales	Ratio or return on share-holder's equity
1998	4.01	5.57	65.53	7.61
1999	unavailable			
2000	0.04	11.94	30.56	0.11
2001	0.94	9.9	36.86	1.5
2002	2.37	11.27	32.38	4.92
2003	5.13	11.14	32.76	10.92
2004	5.44	9.8	37.24	8.43

The financial data is cited from the annual report of NWTextile Taiwan
Inventory turnover=cost of goods sold/average inventory
Average days in sales=365/inventory turnover
Profit ratio=net income/net sales

4.3 Transformation Process and the Difficulties Encountered

Before running global operations, NWTextile's global strategy was similar to a 'multinational strategy' (c.f. Bartlett and Ghoshal 1989). To quickly respond to diverse local needs and national opportunities, the Taiwanese headquarters managed its foreign subsidiaries as a loose federation, and each SBU operated its own business autonomously. The need for efficient communication with customers and for local responsiveness was the main driving force behind the old business model. Following the multinational strategy, manufacturing facilities within NWTextile were independent from each other and they were even financially independent. In such circumstances, the advantage of this kind of arrangement is that each facility can be flexible in determining its marketing and manufacturing-related matters. Conversely, the physical distance hindered information flow and high coordination costs all served to preclude optimal production and marketing arrangements. Consequently, the multinational strategy was unable to deal with orders of small quantities and great variety in an economically viable way as the entire NWTextile group was expanding.

The global operations model is closer to a 'transnational strategy' as the Taiwanese headquarters conducts most operational activities from a global perspective. Bartlett and Ghoshal (1989) argue that the goal of a transnational strategy is to retain local flexibility while simultaneously achieving global integration and efficiency as well as the worldwide diffusion of innovations. In this sense, the design of global operations aims to optimize supply and demand by utilizing the most competitive resources from each region. As Bartlett and Ghoshal (1989, p. 69) state, "dynamic interdependence is the basis of a transnational company - one that can think globally and act locally".

However, changing from a multinational strategy to a transnational strategy connotes the change in decision-making structures and thus requires the redesign of organizational structures to facilitate the implementation of new strategies. Therefore, the first problem faced by NWTextile is to rearrange its power and decision-making structure. Further, in the transformation process, NWTextile changed the location of its headquarters three times and finally chose Taiwan as its 'Center of Excellence (CoE)'. NWTextile also increased the stock holdings of its African SBUs (one factory from 60% to 100% and another from 30% to 80%) and continued to invest in U.S. SBUs (nearly 6 million USD in 2003 and 2004). Some SBUs had little willingness to join the new business model and NWTextile finally decided to sell a U.S. SBU and reduce the stockholding from 47% (in 1999) to 13% (2003) to 0% (in 2004).

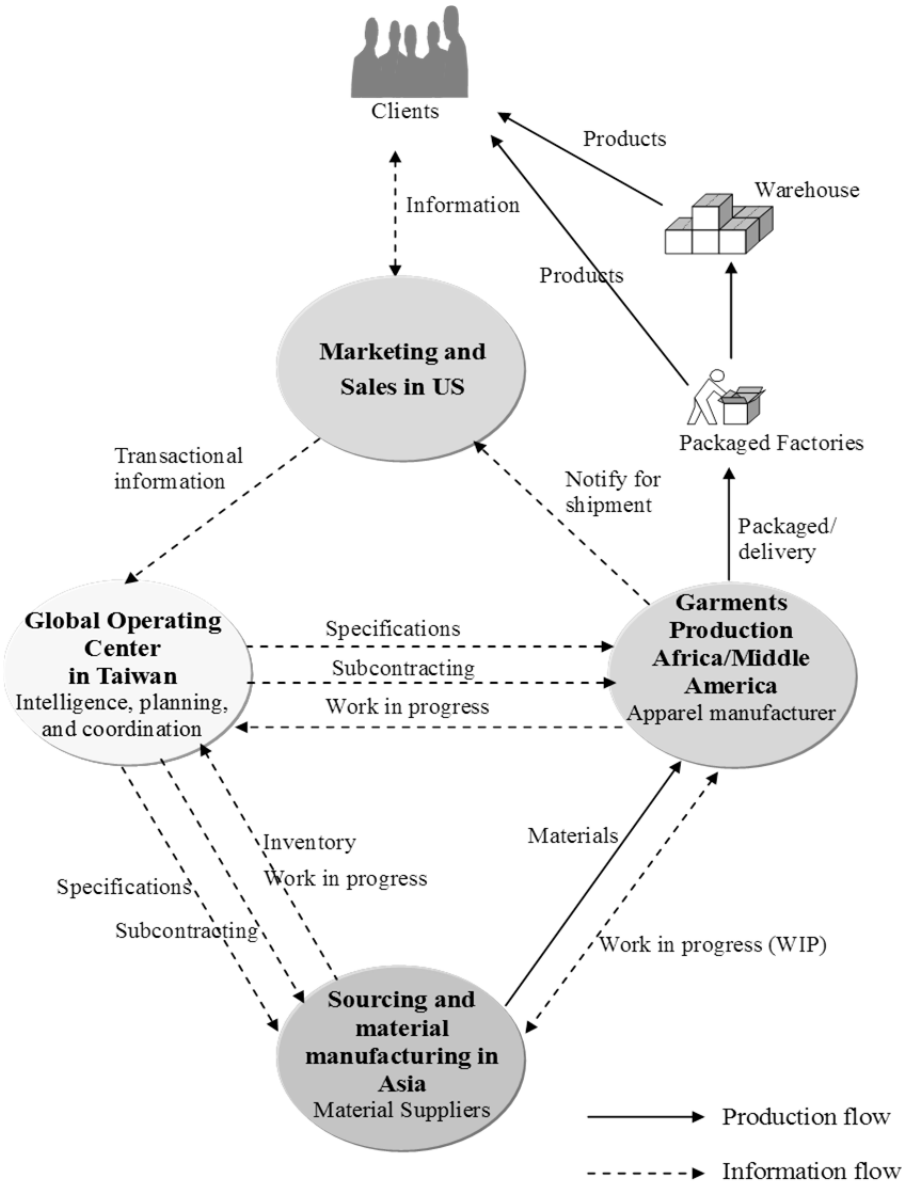

Figure 4: Global Operations Model of NWTextile

The changes to this global operation model took NWTextile a full five years to complete. The most important factors when introducing a business change are the top leader's determination and the clarity of their strategic goals (Ives and Jarvenpaa, 1991).

"Because of the GOS project, I was promoted to Vice General Manager. In this position, I could discuss business procedures with the directors of other SBUs in a fairer way" (Quoted by the CIO).

"Communication is an on-going process, even now. Collaboration with some factories has actually stopped and we no longer give them orders, while with some units it stopped in the middle of the collaboration. However, we are constantly re-

structuring and making changes all the time, since restructuring is an on-going process" (Quoted by the CIO).

By recognizing the importance of a leader's determination during a business change, the NWTextile's CEO himself handled the fear and anxiety emanating from structural change.

"As long as you can help factories with their business and reduce their costs, they are willing to discuss this with you. It might not be obvious that sometimes we had to rush people to two places during one day in order for the communication to go smoothly. It takes more than ten hours by airplane from the northern-most part of Guangdong to Shenzhen (in China)" (Quoted by the CIO).

"Sometimes when factories were not willing to provide production information, we had to talk directly to their managers. However, it had to be direct contact between the President and their managers; still I am not able to do that. Matters like this can be extremely complicated" (Quoted by the CIO).

"We had to go everywhere to communicate with them (SBUs) and explain the benefits of this model to them. I had even flown to ten places within seven days to do this" (Quoted by the CEO).

To reduce resistance from employees in the transition process, NWTextile first clarified the benefits of GOS to the top managers of every SBU, and arranged positions, career paths, training and education for employees at the same time. As a willingness to cooperate from all network parties is essential for the successful initiation of global operations, the NWTextile headquarters provided financial incentives to all SBUs to work towards the common goal of global operations. To align the incentives between local sites and the entire network, NWTextile Taiwan increased the commission ratio for SBUs on the total revenue of the headquarters and also increased employee stock bonuses.

NWTextile Taiwan was responsible for the fees, design, and development of GOS to encourage the SBUs, clients, suppliers and manufacturers to cooperate. Since the GOS could have had a great impact on all parties, the change was undertaken in phases.

5. Conclusions

In this study we demonstrate how the international textile group, NWTextile, responded to the challenges faced in the new post-quota era with organizational transformation. Over the past decades, NWTextile had grown by encompassing increasingly diverse business activities in textile trading and the manufacture of fabric, cotton yarn, and apparel. NWTextile used to adopt a multinational model to run its expanding businesses across broad geographical areas. Each SBU had full control of its own functional activities, including resource allocation, supplier selection, production line scheduling, new product development, and strategic direction making. With the multinational model, each regional unit was autonomous, and unit managers would seek to maximize their own unit interests, which could damage the interests of the entire NWTextile company. As the CIO of NWTextile Taiwan said:

"In the old model, we found that some units faced serious drought, and others were flooded."

Competing instead of cooperating and the difficulties of undertaking planning on a global scale motivated NWTextile Taiwan to frame its transnational strategy. In the IT-enabled global operations model, the functional activities that traditionally belonged to each unit were regrouped as an integrated system. Decisions regarding a global operations model considered the interplay and interdependence of manufacturing factories and the whole network at the same time in order to align local resources and capabilities with the network goal (Colotla et al. 2003). A planning and R&D center is now centralized in Taiwan, a sales and marketing center is located in the U.S., manufacturing is decentralized in Africa, South-East Asia, Mexico, and Chi-

na, whilst China is also responsible for sourcing activities. This model helps NWTextile eliminate inefficiencies and decrease the imbalance of resources and capacity allocation among network parties. Global planning in this transnational model made global economies of scale easier for NWTextile.

The GOS model helps NWTextile to centralize its coordination and control powers and achieve global integration and national responsiveness. With the support of the GOS, the corporate headquarters serves as a nerve center and manages all planning tasks. Thus, it can make day-to-day management decisions efficiently. Production and sourcing planning are separated from the manufacturing facilities. The nerve center can plan and arrange the production process according to the order price, delivery time, quality requirements, factory capacity, costs, distance, and so on. With respect to material sourcing, the nerve center makes decisions on 'where to buy' and 'from which suppliers' with the exception of some cheap local materials. Theoretically, the visibility is enhanced as the nerve center controls the orders, manufacturing capacity, inventory, and production progress via the GOS.

To implement the global operations model successfully and reduce the resistance from SBU stakeholders, NWTextile not only redesigned its operational process and integrated information flow across different SBUs, but the CEO of NWTextile also provided good incentives for the SBU owners, which included an increase in the commission ratio and employee stock bonuses for the stakeholders and top management. NWTextile Taiwan adopted a cross-holding strategy to gain support and control from the SBUs. In so doing, the relationship between NWTextile Taiwan and the SBUs changed from virtual integration to vertical integration. NWTextile Taiwan absorbed all tasks and fees for the GOS development, and provided training and education to the SBU staff. The chairman of NWTextile clarified the advantages of global operation by directly communicating to every stakeholder of each SBU continuously.

The findings of this study are provided to assist with the development of global operations in the future. First, when the general circumstances are uncertain and there is a lack of trust and commitment among the transaction parties, global operations may be performed through a governance mode that is more vertically integrated than virtually integrated.

As mentioned earlier, some firms struggle to build an operation network that will achieve higher manufacturing flexibility and cost advantages that enable them to survive in a globally competitive environment. To achieve the above objectives, some researchers argue that the structure of traditional vertical integration should be replaced with a virtual integration. Vertical integration is criticized for its low manufacturing flexibility, low adaptability, and high administrative inefficiency, even though it provides higher continuity and controllability over the whole production process (Dwyer and Oh 1988, Mahoney 1992). Conversely, in the governance structure of virtual integration, firms can outsource production activities and members if a virtually integrated production network can cooperate tightly and share manufacturing information through inter-organizational systems. In such electronic hierarchies, both collaboration and information sharing are enhanced, and both manufacturing flexibility and controllability are increased because of higher information visibility. However, virtual integration has its own challenges when sharing information among inter-organizations. Building on a transactional inter-organizational relationship, the extent and quality of information shared among firms may be inadequate and problematic. Given that this governance structure substitutes ownership with partnership, virtual integration requires very high levels of trust, commitment and a mutually-dependent relationship for sharing key

information (Ramsay, 2001). In an uncertain environment and a transactional relationship, information that is harmful toward self-interest may not be exposed sufficiently to other parties.

Both virtual integration and global operations are enabled by integrated information systems which synchronize material flow and allow firms to have greater upstream and downstream visibility. When implementing such integrated information systems, business models should be restructured for leveraging the benefits of the system (Ives and Jarvenpaa 1991). On the one hand, enhanced IT capability increases the scope that a firm can control and make decisions about. That is, with proper IT support, a firm can lower both its transaction costs and agency costs. On the other hand, a GOS is developed as a central system whereby the activities of all parties within an entire operation network are fully integrated. It requires a centralized governance structure to ensure the gathering of information and the follow-up on decisions is made by the headquarters. By increasing the level of the cross holdings of its SBUs, NWTextile Taiwan participated more fully in upstream manufacturing and downstream marketing. The cross holding strategy enabled the NWTextile headquarters to obtain information concerning demand, inventory buffers, work in process, and production capacity from its network members. With the increased ownership, the NWTextile headquarters gained greater control of the SBUs and was able to ensure sufficient information exchange and information quality.

Second, central to the new business model is the integration of all operational activities from a global perspective so as to consider the comparative advantages of the different regions, allocate resources and spread risks accordingly. As Taylor (2009) states, the operating practices of a firm are that it is usually retained or modified piecemeal when a firm extends its business and there is a need to develop a systematic and strategic view of the global supply chain management. In the GOS model, a centralized decision center should be created to arrange global resources from a global viewpoint. However, the execution of production, sales, and marketing practices are given to offshore parties and subcontractors. Such a design is meant to overcome the inherent differences that exist across different regions and to prevent individual sites from preceding their self-interests over the entire group's interests. Centralized planning with decentralized practices allows NWTextile to coordinate all its operational activities on a borderless basis in order to meet speed-to-market, production quality, and manufacturing flexibility.

Finally, when implementing a GOS, clarifying the benefits of the new business model, providing related training and education to all related persons, and providing financial incentives are key to reducing resistance and increasing individual parties' willingness to cooperate. Corporate restructuring, information integration, incentive alignment, centralized decision-making, and decentralized operations are all essential factors in the success of the global operations of NWTextile. Since the GOS might affect and restructure the costs and profits of an operation network, these changes should be undertaken gradually and should obtain stakeholders' buy-in to avoid employee resistance.

This paper contributes to the body of work on supply chains by demonstrating a paradigm shift in the operational model of the textile industry. We show that a centralized decision structure is the key to leveraging decentralized resources distributed globally. Global operations need greater centralized decision-making power for allocating all the network resources and administrative power in order to control the entire production process. Since IT reduces the administrative costs within firms, and also transaction costs between firms, researchers should rethink the issue of inter-organizational governance concerning the flexibility, adaptability, controllability

and the risks of vertical integration and of virtual integration for global operations.

Like the old Chinese saying: *'Strategies are devised in a military camp, battles are won thousands of miles away.'*

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