

## **Manufacturing Enterprises Value Chain Model Analysis within the Context of the Network Economy**

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### **ABSTRACT**

Manufacturing enterprises in the future will have to survive and develop in the network economy with the development of information and network communication technology, the globalization of economy, and the interaction of these two factors. Nowadays the business environments which manufacturing enterprises are facing are very complicated and volatile. The traditional coordinating relationships between operation models of manufacturing enterprises and their business environment have already been changed as a result of globalization, informatization and personalization of customers' needs. New coordinating relationships are in the process of forming.

Concerning operations management in manufacturing enterprise, traditional management theories and methods only confined to the solving of problems within the boundaries of individual enterprise. The introduction of supply chain management makes people considering enterprise problems in a larger context, but most researchers in this field pay more attention to tactic issues. Typical solutions are methods such as postponed manufacturing, information sharing and interests sharing. The systematic and strategic analysis of the supply chain is ignored.

Systematic analysis approach is adopted in this paper. We start our work from the analysis of environment, objective, and structure of supply chain system. Porter's value chain model is then studied and its limitations under new circumstances are pointed out. On the basis of the work described above, we analyze the features of network economy and explore the new value chain model for manufacturing enterprise in the network economy. Finally an empirical case study is conducted.

**Keywords:** Manufacturing Enterprises, Value Chain, Systematic Analysis, Net Economy, Case Study

### **1. GENERIC MODEL OF MANUFACTURING ENTERPRISE SUPPLY CHAIN SYSTEM**

In this part, we analyze the environment, boundary, function, objective and the structural element of supply chain system.

The environment of system includes behavior of competitors, change of customers' demand, change of policy, trend of technological change, supply condition, etc. Enterprise environment is the part that is usually beyond the control of enterprise.

The boundary of system consists of supply boundaries, distribution boundaries and other boundaries between manufacturing enterprise and its partners. In essence, system boundaries are the boundaries of resources and technologies. The resources and technologies within boundaries are those that can be allocated and managed by manufacturing enterprises.

The function of system refers to the abilities to provide satisfactory products and services to the customers through cooperation and coordination among supply chain partners in response to the requirements of market competitions as well as customers' needs with regard to quality, price, delivery and innovation. The functions of system mainly embody the rapidly responsive ability to

meet the needs of customers with low cost.

The structure of system refers to the relatively stable relationships among subsystems or elements within system boundaries. The relationships here are those that form among manufacturing enterprises and their suppliers, distributors and other partners around the activities to provide products and services to meet the needs of customers. These relationships include not only the relationships with regard to the material flow, information flow and cash flow, but also the relationships concerning personnel and organization, technology cooperation, interests allocation, and performance management among different entities.

A system can survive and develop only by adapting its functions and objectives to the changes of environment. The environment of system determines the objectives of system. The objectives of system raise the requirements of system configuration, while the realization of system objectives depends on the structure of system.

### **2. VALUE CHAIN MODEL OF MANUFACTURING ENTERPRISE**

Michael E. Porter's value chain model reflects the relationships among the environment, objective and structure of the supply chain system of manufacturing

enterprise within the context of traditional industrial economy.

Porter introduced the concept of value chain in his book entitled *competitive advantage*. As a system model, value chain model mainly has the following connotations:

- The competitive environment of enterprise consists of five competitive forces including the entry of competitors, the threat of substitutes, the bargaining power of buyers, the bargaining power of suppliers, and the rivalry among the existing players. The five forces determine the achievement of enterprise objectives.
- The objectives of enterprise reflect its abilities to gain profit. Enterprise achieves its objectives through value chain configuration and wide variety of value creating activities. Value chain refers to a collection of different activities including product development, production, marketing and sale, delivery and other supporting activities. Value chain and value creation of the chain reflect the relationship between structure and objectives of the system.
- Activities along value chain are closely interconnected. Value creating activities of an enterprise can be categorized into two types - primary activities and supporting activities. Primary activities refer to all kinds of activities that associate with material creation of product, marketing and sale, and after-sale service. Primary activities include inbound logistics, operations, outbound logistics, marketing and sales, and service. Supporting activities support primary activities and provide procurement, technology, human resource and other functions within enterprise to ensure mutual support. Supporting activities include procurement, technology development, human resource management, and infrastructure. The former three supporting activities connect to every primary activities and support entire value chain. Enterprise infrastructure also supports the entire value chain though it does not connect to specific primary activity.

Porter's value chain model has the following features:

- Partners such as suppliers, customers and distributors are viewed as rivals.
- It is considered that the activities along the value chain should be controlled to prevent the invasion of competitors upon market profits. Vertical integration is adopted as primary approach to realize control.
- Production activities are managed as basic value generating part, as a result of the enlargement of production scale and the reduction of production

cost are considered as primary management approach.

### 3. VALUE CHAIN MODEL ANALYSIS WITHIN THE CONTEXT OF NETWORK ECONOMY

The limitations of value chain model of Porter include the following three aspects:

- The analysis of environment is simplified. The competition is emphasized while cooperation is ignored.
- The recognition about objective is limited. Only the profitability of individual enterprise is taken into account while the identification of customer's needs is ignored, due to the ignorance of the fact that the basis for an enterprise to survive and develop is meeting customers' needs.
- The analysis of system structure is limited within enterprise. Dynamic change and interaction, roles of information, innovation and people are ignored.

Therefore, it is necessary to analyze the environment, objective, and structure of the supply chain system of manufacturing enterprises under the new circumstances.

The new environment has the following features:

- Globalization. The scopes of competition and resource collocation change from region to the whole world. Division of work and cooperation around the world accelerate the trend of specialization.
- Personalization of customers' needs. Mass markets are taken place gradually by segment markets.
- The development of information and communication technology infrastructure. Information and communication technology infrastructure provide a platform for inter-enterprise cooperation, making it possible to cut down substantially the management cost within organization and the transactional cost between organizations.

The objective of the existence and the development of supply chain system remains value creating. The value of product is finally determined by customers. It is the measurement of customer satisfaction.

Supply chain is a collection of many enterprises. The factors that can coordinate behavior of different enterprises come from external environment. The most important factor that determines the objective is the needs of final customers. Objective can be denoted as specific output that can meet customers' needs at specific time with specific price and should be comprehensively measured from several aspects including price, time, quality and service.

In order to adapt to the change of environment, manufacturing enterprises should establish new supply chain system structure.

Wide application of information technology is changing the way of communication within and between enterprises, making it possible for enterprises to extend their scope of control and management. At the same time, the trend of specialization around the world has brought about new opportunity for manufacturing enterprises to reconfigure their different kinds of operations activities. For example, procurement, product development and technical service that are previously considered as supporting activities had now become the primary activities that create value for enterprises. Infrastructure that needs lots of investment can be cheaply obtained outside the enterprises.

Under the new circumstances, enterprises can gain profits by establishing tight and diverse relationship with suppliers, customers and other partners. In order to do so, the following two factors are very important. First, enterprises should have their own core competencies, yet it is not necessary to allocate resources on each part of the value chain. Second, enterprises should establish good information infrastructure and international operations platform so as to integrate and make use of resources from all over the world.

The model of relationships between new environment, objective and structure of the supply chain of manufacturing enterprises is shown below.

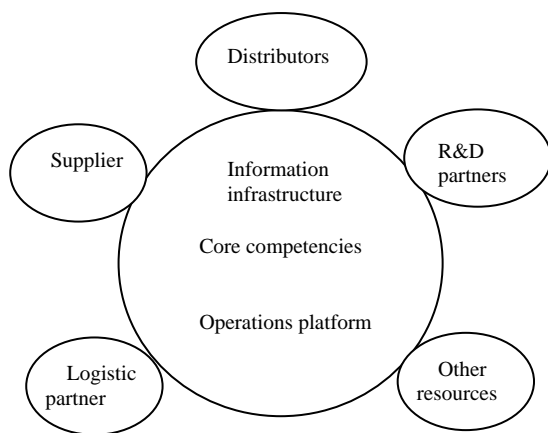


Figure1: Supply Chain System of Manufacturing Enterprises in the Network Economy

#### 4 A CASE STUDY OF BANKING EQUIPMENT MANUFACTURER

##### 4.1 Background of BEM

BEM (a virtual name) specializes in the development, production, sales and after-sale services of ATM (Automatic Teller Machine) equipment whilst engaging in other monetary electronic equipments. With the initial capital of RMB 50 millions and 12,000 square-metered manufacturing center, BEM can roll out

more than 6,000 sets and generate RMB 100 millions as annual sales revenue. BEM is pinning its long-term hope to become a world ATM manufacturer and it already gains its sound position in China.

BEM owns its state-level enterprise technology center where a handful of veterans work together. Blended with its sophisticated management and trustful alliances with well-renowned suppliers at the home and abroad in ATM field, in addition to its combined strengths in modular design and famous brand components, BEM provides tailor-made products and services of superior quality for different kinds of customers.

Currently, BEM is tapping into the fast-growing economic region Guangzhou and strongly penetrates in Southern China. Besides, BEM further moves into seven Chinese regions by launching 19 contact points for its after-sales services. Due to the intensified domestic competition, BEM relentlessly expands its presence in new-fangled international markets, mainly in Asian developing countries such as Philippines, Sudan and India.

##### (1) Tremendous Market Potentials

Automatic Teller Machine (ATM) was a novelty to cash-taking China when first introduced in late 1980s. By some statistics, the United States leads the ranking of ATM installations and its deployment exceeds 1,250 terminals per million. Meanwhile, the deployment rates in HK and worldwide are 410 and 204 per million respectively. With a current base of 50,000 ATMs (or 42 sets per million), the Chinese ATM market has just begun to take shape and its all-out explosive growth will possibly make itself the world largest and juiciest by 2007, as suggested by some experts.

##### (2) Intensive Competition

The hope-fueling China with its untapped potentials has drawn feverish competition amongst a handful of international ATM vendors encompassing NCR Corp., Diebold, Siemens, Fujitsu and Hitachi as well as numerous domestic ones (such as Lide, Guangli and Eastcom) – all vying for a largest piece of pie in Chinese ATM market. Amongst them, the “foreign brands” dominate the market and have grabbed a 90% share, only having slipped the remaining 10% away from their big hands onto their domestic counterparts. BEM controls 70% of domestic brand’s share, making up a 7% of market share in China. Based on the above figures, we still discover that BEM has its dominant position over the domestic brands though its share is obviously small compared with those of international vendors.

##### (3) Critical Success Factors for Industry

With regard to the unique business environment in China, brand image has become one of the principle factors to ensure the ATM success. In fact, those international super-brands including NCR and Diebold,

as opposed to domestic brands, have been identified as superiority in Chinese state-owned banks and are deployed by most of them based on their brand preferences. Besides, product and service quality are considered to be high performance gaps. Furthermore, Guanxi (i.e. interpersonal relationships) connections underpinned by Chinese cultural practices should be singled out as an important instrument in accounting for the business success in China.

Compared with heavyweights, BEM can provide flexible products at reasonable prices. However, it is still a long coming for BEM to develop strong brand equity and highly reliable products for those banking institutions.

#### (4) Operating Performance of BEM

After considerable improvement efforts, BEM has achieved significant performance outcomes in 2003, which are illustrated as below:

- (i) **Gross Output Value of Industry:** RMB 200 millions (+63.3%);
- (ii) **Sales Revenue:** RMB 180 millions (+51.6%);
- (iii) **Profit Growth:** Exceed the Directors' annual target.

#### 4.2 Supply Chain/ Value Chain Model in BEM

World-class supply chain configuration has become a crucial issue in the competitive strategies of ATM manufacturers faced with big propositions of cutting their costs and improving operations efficiency in the ATM field. The paradigm shift toward supply chain excellence has promoted the urgent needs of the BEM to relentlessly improve its supply chains for securing its competitive advantages. In order to understand the current situation of the BEM's supply chain management, we will identify how BEM manages its *purchasing, inventory, sales and information*, following the discussion on its supply chain structure.

##### (1) The Supply Chain Structure

Before a closer investigation on its supply chain in the four perspectives, we will unveil the *supply chain structure* of BEM by demonstrating a simplified web-centric model, which is illustrated as follow Figure 2.

##### (2) Make-or-Buy

The contemporary economic landscape in the ATM field requires BEM to adopt flexible sourcing strategies in terms of the combinations of in-house production (make) and sub-contracting (buy) in the production and assembly levels. BEM has taken considerable steps towards outsourcing for traditional electronic components (such as display and power) in order to maintain flexibility and avoid over-investment.

On the other hand, BEM assembles the components for the modules, card readers, dispensers, receipt printers, journal printers and diagnostic panels by

itself or sometimes by the sub-contractors located in the Pearl Delta Regions.

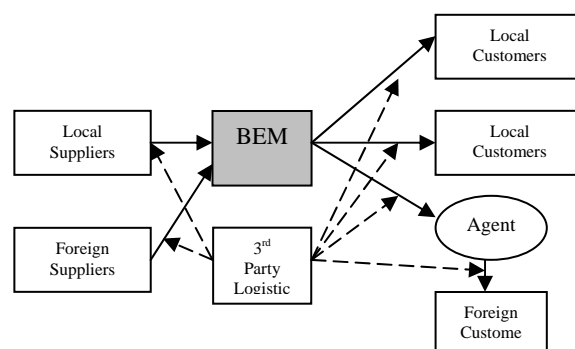


Figure 2: Supply Chain Structure

##### (3) Supplier Integration

The turbulent Chinese ATM market and ever-demanding banking customers have echoed the needs for *supplier integration*, a managerial approach to tighten the supply chain in order to cut costs and lead times, as well as to build flexibility. Despite the importance of supplier integration, BEM only assigns the suppliers with the responsibility of assembling the generic components while conducting the QC tests by itself.

##### (4) Inventory

Inventory management is key to optimizing the inbound logistics of BEM, and it is pivotal in the supply chain management. In our section, we put an emphasis on the “inventory structure” and “inventory turnover” of BEM.

First, the *inventory structure* of BEM conforms to the industry standard that requires more raw materials than semi- and final- products. Actually, the raw materials contribute to 40% of total inventory in BEM whereas the semi- and final-products take the account of 30% and 30% of total inventory in BEM respectively. Besides, its lead times are 15 to 30 days, much less than the industry level (i.e. 30- 45 days). Second, the *inventory turnover* of BEM indicates much room of improvement in BEM because it is 72 days, much greater than the industry level (i.e. 40 days).

Having established good relations with its suppliers, BEM has similar VMI arrangements with some of its suppliers. However, BEM faces a vexed issue of how to improve its inventory levels and financial profile given much cash are buried in the inventory in an attempt to shorten the lead time. Figure 3 illustrates the true VMI:

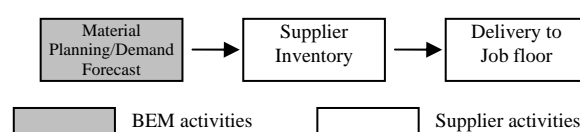


Figure 3: Revised Replenishment Cycle of Raw Materials

### (5) Sales

Supply chain begins with the sources of supply and ends with the customer consumption; therefore, fulfilling the customer requirements becomes an integral part of supply chain process to achieve operational efficiency and to produce sales.

BEM has broken into the untapped ATM market in China and aggressively dived into scalable domestic banking institutions encompassing four state-owned commercial banks. Because of good relationship with the Agricultural Bank of China, BEM has obtained the bank's aggregate order that accounted for 22% of its total sales in 2003. In order to support its international strategies and achieve its marketing excellence, BEM has developed the domestic and overseas marketing divisions to manage the corresponding customers respectively.

There has little doubt that what ATM customers really want is excellent after-sales service because technical problems would seriously affect the patronage of bank customers (customers' customers). In order to secure a high level of brand loyalty, BEM has developed 27 maintenance centers based on the product distributions. Besides, BEM provides service guarantees to the bank institutions. According to the service guarantee, BEM will deliver the maintenance service within 4 hours and solve the technical problems within 12 hours.

### (6) Information

In facing today's extremely challenging business environment, creating real-time supply chain visibility is becoming very critical for BEM's success in the marketplace. Supply chain visibility refers to the sharing of information to a member within the supply chain, for monitoring, controlling and changing supply chain strategy and operations, from production to delivery (Schoenthaler, 2003). Meanwhile, the challenge of getting the right information to the right person at the right time can be simplified by deploying the appropriate IT applications (Schoenthaler, 2003). Indeed, BEM is only concerned with *the sharing of purchasing and production information with the suppliers* by means of email, telephone and fax. Internet is seldom adopted.

Furthermore, despite the increased expenditure on supply chain integration with the goal of improving customer interaction and reducing inventory costs, BEM

appears lagging behind at the moment given its relatively *low level of information sharing with customers*, resulting in limited collaborative activities such as new product development with customers. Presently, the company relies on fax, phones and emails as major correspondence. It can be understood partly because its customers may perceive impersonal communications a better way to explain their individual needs, and partly because BEM hasn't discovered the tremendous opportunities derived from internet and information technology. BEM should get out of the way of relationships between customers and suppliers while providing a technology-enabled framework for a greater level of integration.

Note: A team from South China University of technology joined the project. We have analyzed the 'AS-IS' of BEM and proposed a 'TO-BE' proposal. The primary solution of the proposal is to reconfigure the previous ERP system and integrate it with customers and suppliers to facilitate process integration and improve information visibility of the supply chain.

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