Role of Logistics in Mass Customization

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Abstracts: The Mass customization paradigm is based on flexibility and quick responsiveness in developing, producing, marketing and delivery products that can satisfy as wide a range of customers as possible without substantially increasing costs. Precise management of transportation and delivery of inbound materials is essential in mass customization. This is quite difficult especially when many parties are involved, including parts manufacturers, sub-assemblers and master assemblers. The sub-assembler may have the entire right stuff ready, but if the logistics piece isn’t properly lined up, it won’t work and the manufacturer will not be able to meet the commitments to the customers. This paper discusses an insight of mass customization and the role played by logistics in mass customization to meet with the customer demands of producing components as when, how and where required by the customer. A case study is discussed in order to get a better understanding of this concept.

Keywords: Mass customization, Inbound & outbound Logistics, Multiparty collaboration, Cost effectiveness

1. Introduction

In the present world, virtually all companies recognize the importance to be customer driven by providing superior service to satisfy customers’ needs. Mass customization is the key factor for the growth of any industry in the future. Mass customization also helps the company realize what is actually required by the customer and eliminate the processes and components that are not required by the customer. Hence the Logistics department of the company has to closely observe the requirements of the customers and take suitable actions to meet with customer requirements. The companies that reacted
quickly and efficiently to the changes are now ruling a new frontier in business competition. These realized that not only can higher quality yield lower costs and increased sales, but also can increase the variety of product offerings to their customers and hence have a stronger hold on the market. In the following sections, we have discussed about the challenges of mass customization and roles of logistics to meet those challenges with couple of case studies.

2. Mass Customization Overview

Companies are competing each other to deliver customized products to their customers. Many companies today are, in fact, able to provide customized products in short order. They do so by practicing a manufacturing strategy known as Mass Customization (Duffie, et al., 1996). Mass customization is an outgrowth of the customer-service revolution; it involves careful coordination of order management, manufacturing, and distribution to provide customers with mass-manufactured products that are made to their exact specifications (Kim, I., and Tang, 1997). A mass customized company must have the following five attributes.

(i) Customer Responsiveness—A mass customization company will work with customers, in anticipation of customer needs. From Organizational point of view it is the time taken to respond to its customers.

(ii) Physical Plant and Equipment—A mass customization company will employ an ever-growing knowledge base of manufacturing science to implement reconfigurable in terms of flexibility and adaptability which are scalable, cost-effective, maneuverable manufacturing processes and plants that adapt rapidly to specific production needs.
(iii) Human Resource Responsiveness—A mass customization company Comprise of highly capable and motivated, knowledgeable workers with independent decision-making capabilities.

(iv) Global Market Responsiveness—A mass customization company will develop its manufacturing strategy to anticipate and respond to a continuously changing global market. The focus here will be on the third party logistics and international logistics.

(v) Teaming as a Core Competency—A mass customization company will team within and outside the company to acquire and focus needed knowledge and capabilities to develop, deliver, and support its products and services.

There are five different approaches to fulfill customer needs (Lampel, et al., 1996). These five variations are based on the degree of customization and standardization that is available when producing a product to the customer.

**Pure Standardization:** This method involves the stereotypical assembly-line production of identical items using the standard parts and uniform manufacturing procedures available. The products are designed to meet the requirements of the greatest number of buyers, but those buyers have no influence on the design, production or distribution. The examples are pencils, paper clips, Henry Ford’s Model T cars etc.

**Segmented Standardization:** This method produces a few variations on a basic product to meet the requirements of a particular group of consumers. Though the number of choices increases and manufacturers might customize distribution, customers do not have any direct influence on product design or production. Some examples are shoes (high heel, flat and mid heel), bread (rye, whole wheat, white).
**Customized Standardization:** Here we make products to order from standard, mass-produced components. Generally, the choices are limited to adding components to a single, basic unit. So the buyers have influence over the assembly and distribution but have no impact on the design and production of these products. Here the customers may select the paint and upholstery and choose the optional equipment to add a uniform chassis and body design.

**Tailored Customization:** In this method the fabrication, assembly and distribution are customized. But the manufacturer still has control over the design, offering the customer various options. The manufacturer may modify the design to meet the customer’s needs based on the product. A suitable example would be having a suit custom made.

**Pure Customization:** In this method every aspect of design, fabrication, assembly and distribution are customized. This method requires the customer and the manufacturer to collaborate as partners in developing the product. The best example is the relationship between a homeowner and an architect to design and construct a house.

### 3. New Challenges Facing Mass Customization

Customers want design to fit solutions for their exact application in the least possible time. Hence the world-class manufacturers are gearing up to meet the challenges presented by these opportunities. Customers have raised the expectations of their suppliers in following ways:
Customers want their products in lesser time. So this reduces the preference of use of the old way of using manual operations and paper-intensive proposals.

Inaccuracy in quoting will not be tolerated by customers. Once a supplier submits a quote, there are little chances to change or add to the scope. This implies that the customers should be able to trust the supplier’s submitted information.

Due to proliferation of world class, worldwide competitors with a range of offerings, customers want a broad range of products to be customized to meet their requirements.

Simpler products and systems like computers need to be configured quickly and as part of the order taking process.

Customers want to deploy Configuration/Supply chain planning technology to both their sales force and as customer direct interfaces.

Depending on the complexity of the customer’s operation, customers want to be able to pick and place and choose from a variety of configuration models to find the solution that best fits their unique environment.

Customers want an accurate delivery date often on a rush basis. So they expect the supplier to have a knowledge of the inventory before making a commitment, and when a commitment is made they want the supplier to stick to it.

Customers also expect the ability to perform cost/benefit analysis as part of the quotation process. They expect the supplier to provide information about prospective performance data and financial justifications for buying the product from that supplier.
Supplier companies, which are planning to incorporate Configuration/supply chain planning technology, have also posed certain demands from software suppliers. Some of these are as follows:

- They would like to evaluate a number of supply strategies to make the most profitable method of meeting the demand.
- Using up of excess inventories or excess capacity of expensive equipment will also be considered.
- They would like to know the different capacity loading options and using of subcontractors.
- The different modes of transportation and their costs to make the delivery also have to be considered.
- They want to be able to actively involve their key suppliers in a teamwork fashion, and even the suppliers of those suppliers if necessary.
- The most important factor is to evaluate the suggested delivery dates before they submit to the customer. This information has to be accurate because the company’s performance depends on the information provided by the supplier to the customer and keeping up with the commitments.

4. Role Of Logistics In Mass Customization

Mass Customization program cannot succeed if a company does not have efficient logistics operations and information systems. Logistics is the glue that holds the entire system together to work efficiently (Pine, Joseph, 1993).
Precise management of transportation and delivery of inbound as well as outbound materials is essential in mass customization. The best way to implement mass customization of a product is to put together what exactly the customer wants out of a large number of permutations in the least possible time with minimum inventory. Hence in mass customization producing the right product at the right committed time is made possible by the logistics department of the industry (Guixiu Qiao, et al., 2004). This is quite difficult especially when many parties are involved, including parts manufacturers, sub-assemblers and master assemblers. The sub-assembler may have all the right stuff ready, but if the logistics piece isn’t properly lined up, it won’t work and the manufacturer will not be able to the commitments to the customers.

Companies that practice manufacturing postponement often use outside resources for logistics to customize packaging and distribute products to the final customer. Warehouses and distribution centers run by third parties offer flexibility and proximity to the final customer without all the costs of fixed assets. For outsourcing to meet customizations standard, it is essential to integrate the third party’s information system with those of the manufacturer. The complexity and accuracy involved in mass customization demands total coordination across the entire supply chain, and logistics is the right choice to play that role (Pine, Joseph, 1993). Only logistics has the scope and skills to take on that task. In a mass customization environment, logistics is like an air-traffic controller, making sure everything is synchronized up and down the supply chain.
Many authors refer to logistics as instrumental and central to providing competitive advantage (Porter, 1985). Unlike a product change or enhancement, achieving logistics superiority (because it involves changes in the people, technology, facilities and/or strategic corporate relationships infrastructures of the company) is a capability difficult to imitate. Logistics leverage can help firms achieve and maintain a positional advantage through both types of competitive advantage conceptualized by Porter (1985): cost and differentiation. In the following sections we have described two cases to explain the role of logistics on mass customization and on cost and differentiation of products.

Case 1: New way of Exceeding Customer Delivery Time Expectations

Company ABC is a mass customized machine tool industry, which produces customized machine tools for its international customers (John T. et al., 2001). It sales both the products and the services including replacement parts to its customers. It needs to pay a hefty amount of money to ship the replacement parts overseas for expedite service. The regular shipment takes longer time and dissatisfies its customers. Company ABC launched a market research to resolve this problem. As a result of this market research insight (and in an effort to turn a customer dissatisfaction problem into a customer satisfaction advantage), Company ABC embarked upon a four year plan to implement a dramatic new logistics leverage strategy that was embodied in the phrase: "We guarantee we will deliver replacement parts to any customer worldwide before they order it."

Notice that this zero-delivery-time strategy embodies two key elements of logistics leverage: (1) excellent logistics performance (in this case, the ability to meet this guarantee), and (2) the ability to market this performance to customers (in this case, the
dramatic promotional statement that easily conveys the superiority of their performance over the competition).

To accomplish this strategy, Company ABC began installing cellular phones in every machine they sold (a minor cost compared to the overall purchase price). No matter where the machine is in the world, every day each machine conducts a diagnostic analysis of its performance, calls the Company ABC’s home office, and transmits the results of these diagnostics. Company ABC computers analyze these diagnostics every night, determine whether any parts are beginning to fail and, if they are, issues a shipment order to its distribution center. This kind of innovation greatly affects the logistics system of the company and helps to compete with other competitors comfortably.

Case 2. Dell Computers- Virtually Integrating the Value Chain

Dell is an excellent example of successful mass customization and efficient logistics infrastructure. Many of Dell's large competitors built personal computers starting from estimates of demand and contracts with distributors that sold the computers to individuals or businesses. They decided how many computers to assemble based on these demand estimates, shipped them to distributors, and hoped they would be sold before they became outdated. This was Dell Customized approach. It eliminated markups charged by dealers and vastly reduces the risk of carrying large inventories by taking orders directly from the customers and building computers with the specific options individual customers wanted. Dell implemented this strategy through a combination of outsourcing and mass customization. Dell does not manufacture the semiconductor chips used in its computers and does not attach the chips to the computer motherboards. Instead, it buys computer
motherboards from suppliers. Dell asks Airborne Express or UPS to pick up computers at the Dell plant in Austin, match the computers with monitors from the Sony plant in Texas, and ship both to the customer at the same time. In a similar fashion, technicians who service Dell computers in this field are actually employees of other firms operating under contract with Dell. Major customers such as MCI can access information directly through the web.
Analyzing Dell's business model, we found that the ideas behind Dell’s business are not new. Dell effectively integrating these ideas into a work system that is highly innovative, efficient and effective is the key for its success. The idea of "Virtual Integration" is realized by aggressively extending the value chain to its customers and suppliers, to a level that virtually blurring the boundaries of organizations and forming a virtual value chain, or what we called virtual integration (vs. vertical integration). We considered this is one of the Critical Success Factors for Dell Computer. The value chain of Dell computer is shown in the following figure 1.
Figure 1: The Value Chain of Dell Computer
5. Conclusion

Mass customization in terms of product and its delivery is vital for companies to stay competitive in the market place. In this "Age of Customer Service," buyers are demanding customized products and pricing once again. Customers can no longer be lumped together in a huge homogeneous market. Customization in the 21st century differs in two important respects from the way our ancestors conducted business: Today's buyers want customized products in enormous quantities, and they want them as quickly as they receive standardized products. Without efficient and effective logistics systems in place, mass customization alone cannot retain the customer base.
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