

Mass customization in operations management: oxymoron or reality?

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Abstract

Mass customization in production and operations management, a process of integrating mass production/standardization principles with customization, seems to be gaining momentum in the United States as well as all over the world. Major companies like Dell, Motorola, Hewlett-Packard, General Motors, Ford, Chrysler, Toyota, Proctor and Gamble, and others are experimenting and also effectively implementing this process in their production and operations facilities. Mass production and customization have traditionally been at the two opposite extremes of the production continuum. However, integrating these together as mass customization seems to be the practice of the present with the strong likelihood that it would be a continued trend of the future. This paper explores the concept of mass customization, focuses on methods to achieve mass customization, explains why it is not an oxymoron but a reality, looks at the advantages and disadvantages, and discusses how it may be effectively used in production and operations management.

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1. Introduction

Mass Customization refers to a process of production of goods and services tailored to suit the needs of customers in a mass market. Pine [1] and Gilmour and Pine [2] contended that mass customization was the process that displaced mass production as the primary method used in production facilities. Most of these studies on mass customization appear to be developed from a strategic management perspective, and very limited research in the operations management perspective of mass customization exists in the production operations management literature [3].

However, this concept of mass customization is certainly a production operations management issue, especially as it pertains to the new, nontraditional process of integrating mass production and customization into mass customization. Also, major manufacturers such as Dell, Motorola,

Hewlett-Packard, General Motors, Ford, Chrysler and others are specifically using mass customization processes in their production facilities. Moreover, some studies have showed the positive consequences of integrating mass customization into the traditional mass production systems [4]. Therefore, mass customization is undoubtedly a production operations management issue and must be looked at from an operations management perspective, and this paper does so by taking this novel approach.

2. Mass customization: its evolution and uniqueness

The traditional methods of production used by manufacturing companies focused on mass production which used standardization principles. The traditional mass production company is bureaucratic, hierarchical, and highly standardized. Workers operate under close supervision and perform highly routine, standardized, and repetitive tasks. This type of a traditional production process leads to the manufacture of low-cost, standard goods and services. The time period

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most typical of mass production was from the early 1900s when Henry Ford introduced the modern assembly line in production of automobiles through the 1970s when mass production was the most dominant production method for all companies.

Mass production processes led to the continuous improvement methods of production [5]. The continuous improvement company is more participative, empowered, crossfunctional team-based and focusing on total quality management (TQM) principles. Workers are given more participative and decision-making responsibilities and managers perform the facilitative and coaching function of motivating their employees toward continuous improvement efforts in the production facility. This type of a production system results in the manufacture of low-cost, high quality, standard goods and services. The time period most typical of continuous improvement was in the 1980s when companies like Motorola began implementing TQM and other continuous improvement programs in their production operations management.

The continuous improvement production methods led to the unique concept of mass customization, a process in which all aspects within the organization from people, processes, organizational structures, and technology are geared to provide customers specifically what they need and want [1]. An efficient, well-integrated organizational system of production facilitates this process of mass customization. The result is low cost, high quality, customized goods and services produced on a large scale to a mass market. The time period most typical of mass customization was in the mid-1990s through the present time when companies like Dell began effectively implementing mass customization in their production operations facilities.

The best example of effective mass customization in action is the production facility at Dell Computers. When a customer wants to buy a computer system, he/she can use a computer and the internet to go online and place the order for a computer system. The personal computer system is defined in terms specifications such as memory size, processor speed, hard disk size, software, and other peripherals. Dell provides a variety of these specifications for the customer to choose from. The customer selects from the various options for the different aspects of the computer system according to his/her choice. Then, Dell produces a computer system as per the customer's needs and delivers it to the customer within three to 5 days in most cases. Dell can manufacture a built-to-order system of high quality and low cost and does this on a mass production scale to customers all over the world. According to Dignan [6], Dell has developed a reputation as a lean and mean PC manufacturer with high efficiency in its production processes. By producing a mass customized product at low cost (expense ratio of 9.9 percent well below its competitors Compaq's 19 percent and Gateway's 27 percent), Dell continues to gain market share and profits [6].

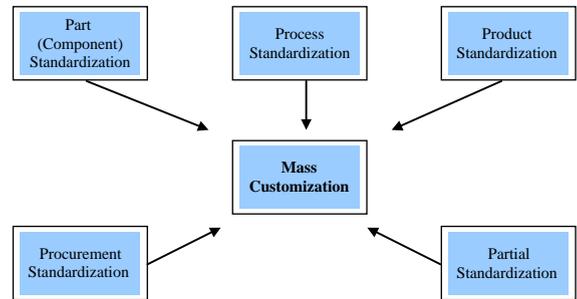


Fig. 1. Methods to Achieve Mass Customization.

3. Methods to achieve mass customization

Fig. 1 illustrates the dominant operational methods that facilitate the mass customization concept in practice. These include four standardization approaches—part standardization, process standardization, product standardization, and procurement standardization [7]. When a company uses common parts or components for various product items in a product line, it derives several benefits—it lowers its costs due to the economies of scale, reduces inventories, and improves the forecasting of the component needs. Robertson and Ulrich [8] distinguished between internal and external commonality of parts. They contended that if the commonality is built into the internal components (for example, wires hidden under the hood in an automobile) rather than the external components (such as the dashboard), this would be less obvious to customers. So, the potential risks of low product differentiation leading to a cannibalization effect as a result of using standardization parts are considerably reduced, if such standardization and commonality are internally based.

Also, mass customization is facilitated through the use of process standardization. When companies can delay the customization to as late in the process as possible, they can make use of the many benefits of process standardization. Hewlett-Packard, for example, adds some of its customized components such as manuals and power supplies in their printers being shipped to the European markets at the distribution centers in Europe, thus delaying its customization to the last stages of the production and distribution chain [9]. When using product standardization, companies may advertise a wide variety of products but stock only a few of them (standardized items), may be using the 80/20 rule. If customers demand certain un-stocked items, the firm may produce them after receiving this order or use a process called downward substitution to meet this demand. It may substitute a higher functionality/speed item for a lower functionality/speed item when the lower end item is not available. Similarly, rental car companies substitute the upgrade or higher-end car when the requested car is unavailable.

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