Mass customization and mass production

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Research and concepts
Mass customization and mass production

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Keywords

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Abstract

Total quality management resulting from total customer satisfaction today can mean giving every customer a product tailored specifically to his or her needs. In the past, manufacturing was usually characterized by keeping costs down with economies of scale. Mass customization can result in a challenging manufacturing environment typified by both high volume and an excellent product mix, where customers expect individualized products at the same price as they paid for mass-produced items. Meeting this challenge requires profound changes in the manufacturing process and in organizational dynamics. Despite the potential offered by mass customization it is necessary that organizations ensure that such a strategy is the optimal route for their business before embarking on full scale mass customization.

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Introduction

The issue of change is the concern of much research, debate and discussion. The importance of transformational change to organizations is increasing along with rates of technological obsolescence, mergers, acquisitions and globalization (Dyck, 1997, p. 793). Organizations are going through tremendous changes to create environments where everyone can contribute their best, where customer requirements are not only met but exceeded and where efficiency, effectiveness, productivity, quality, customer satisfaction and competitiveness are taken seriously as critical success factors (Edosomwan, 1996, p. xii). Long-term competitive advantages are said to be no longer sustainable and suggestions are made of continuous market disturbance in order to create "temporary" competitive advantages (d'Aveni quoted in Logman, 1997, p. 39).

The reasons cited for the transformation and the accompanying emergence of new strategic alternatives in pursuit of continuous performance improvement and competitive advantage, are manifold. New manufacturing technologies such as computer aided design and manufacture (CAD/CAM) have fundamentally altered the economies of manufacturing and removed the factory as a barrier to product variety and flexibility (Meredith, 1987). An increased pace of technological change and the concomitant shortening of product life cycles have led to an increased proliferation of product varieties (Sanchez, 1995). The nature of customer demand at the same time shifted to requirements of increased product variety, more features, and higher quality (Kotler, 1989). Firms competing in industries characterized by turbulent environments and intense competition find that they can no longer compete on the basis of standardized products and services alone (Kotha, 1995, p. 21) and that being world-class in manufacturing cannot sustain a competitive advantage either.

Transformation is also taking place in other fields of the organization. Top-down marketing has become bottom-up. Organizations are realising the increasing importance of

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individually oriented marketing strategies and of the information flow between the customer and the organization (Logman, 1997, p. 39). The new role of marketers is to be the voice of the customer in the company (Oliva, 1997, p. 8).

In view of the foregoing, it seems that strategic flexibility together with quick responsiveness is essential. To a growing number of researchers, such as Pine (1993) and Feitzinger and Lee (1997), the emerging paradigm of mass customization is seen as providing the means for attaining strategic flexibility and responsiveness.

What is mass customization?

The notion of mass customization dates back to 1970 when it was anticipated by Alvin Toffler in *Future Shock* and delineated in 1987 by Stan Davis (1987) in *Future Perfect*. Mass customization is essentially an oxymoron, putting together seemingly contradictory notions – the production and distribution of customized goods and services on a mass basis. The ultimate in mass customization is manifested in a Nissan Corporation's pronouncement: "Any volume, any time, anybody, anywhere, and anything" (Pine and Maskell, 1998, p. 1).

The ideal as put forward by Nissan, essentially consists of two interrelated parts. The first is a visionary approach, viz. the ability to profitably provide customers with anything they want, any time they want it, any way they want it and anywhere they want it. This goal may, however, be hard to realize, even by the most dedicated mass customer. The second aspect implied in this vision is the reality of using flexible processes and organizational structures geared to producing varied and individually customized products and services at the low cost of a standardized, mass-production system. This implies that customization is provided within a predetermined variety, where the goal is to ascertain, from the customer's perspective, the range within which a given product or service can be meaningfully customized or differentiated for that customer, and then to facilitate the customer's choice of options from within that range. The ultimate is, however, the ability to provide uniquely individualized products and services satisfying any requirement, but in a cost-effective way.

Allowing firms to operate at maximum efficiency, while quickly meeting customers' orders at minimum cost, requires at least three basic organizational design principles as put forward by Feitzinger and Lee (1997, p. 117), viz.:

(1) a product design that consists of independent modules that can be assembled into different forms of the product easily and inexpensively.
(2) manufacturing processes that consist of independent modules that can be moved or rearranged easily to support different distribution networks.
(3) supply networks (including positioning of inventory and locations, number and structure of manufacturing and distribution facilities) designed to provide two capabilities: the ability to supply the basic product to the facilities performing the customization in a cost-effective manner, and the flexibility and the responsiveness to take individual customers' orders and quickly deliver the customized goods.

A fourth principle, however, has to be added. An organization-wide commitment to mass customization together with a mindset of continuous improvement, innovation and co-ordination, organizational and individual learning as well as the development of capabilities, is required. All the stakeholders of the organization also need to be reassured of the viability and desirability of mass customization.

From mass production to mass customization

The forerunner of mass customization was mass production. In following Pine (1993) who states that the system of mass production has become outmoded and is no longer effective, researchers of customization such as Jelinek and Goldhar (1983) and Kotler (1989) focus on the contrast between mass production and mass customization. Unlike the foregoing, we argue that mass production and mass customization should not necessarily be viewed as incompatible opposites, but rather be seen as two positions on a continuum of continuous improvement, where either of the approaches may be more appropriate under certain conditions. It may also be viable, even preferable, for an organization to

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practise both approaches, albeit in two different factories aimed at different target markets.

The conventional mass-production firm is often typified as bureaucratic and hierarchical, where workers under close supervision fulfil narrowly defined, repetitive tasks, resulting in low-cost, standardized products and services (Pine *et al.*, 1993, pp. 116-17). Mass customization on the other hand calls for flexibility and quick responsiveness together with a reconfiguration of environment, people, processes, units, and technology to give customers exactly what they want at relatively low cost. Managers co-ordinate independent, capable individuals, within an efficient linkage system.

Under a system of mass production consumers generally accept standard products. This acceptance facilitates the extension of the market and the reduction of prices through increasing economies of scale. The price difference between mass-produced and customized goods as well as the focus on low prices and low costs, further encourage the clustering of demand around homogeneous products. In the interplay between producers and consumers the paradigm of mass production thus becomes a feedback loop that creates and reinforces standardized products, mass production techniques and large, homogeneous markets.

In situations of unstable environments and markets that are fragmented into many niches consisting of customer needs which are not only harder to generalize but also more and more prone to changes and shifts, a strategy of mass customization is said to make more sense (Hart, 1995, p. 38). The organization that better knows and better satisfies its customers' individual needs will therefore have comparatively better sales. A positive feedback loop is created where higher profits and a more intimate knowledge and understanding of customer needs will assist the organization in providing even more variety and customization, which will in turn further fragment the market. As mass customization is associated with greater quality, flexibility and lower prices, a continued focus on faster and faster processes and procedures to turn customer requests into products and services, is required. To do this effectively, personal and electronic integration of the value chain through instant communication linkages, common databases, and multi-functional and cross-organizational teams, is required. An agile software system is thus a necessity. Pine and Maskell (1998) identify five characteristics of agile software, viz.:

(1) *Integration*. Systems must be fully integrated, so information is entered only once, and is up-to-date and accurate.
(2) *Simplicity*. Programs, screens and reports must be designed to be simple and easy to use.
(3) *Flexibility*. Users must be able to introduce new techniques in one area while retaining an old approach in others.
(4) *Openness*. Software must lend itself to easy interfacing with other systems and networking.
(5) *Accessibility*. Information must be readily accessible to users of everything from creating performance measures to *ad hoc* analysis reports.

To facilitate a better understanding of the move along the continuum from mass production to mass customization, the focus and implications of these two approaches in respect of different aspects of the organization are summarized in the Appendix.

The next matter for consideration is whether the organization is in the position to make either a partial or a complete shift on the continuum towards mass customization. It also has to decide whether it is not more desirable to simultaneously accommodate both approaches.

Mass production, mass customization or both?

The controlling focus of mass customization is to create variety and customization through flexibility and quick responsiveness. The question is, however, whether all organizations could, and indeed need, to make the shift to an approach which requires extreme agility along the total value chain.

Before embarking on a programme of mass customization, the organization has to at least carefully evaluate its potential for success against the conditions set out below. These conditions should be viewed on a continuum between the extremes of complete mass customization on the one hand and complete mass production on the other.

Industry and competitive environments

- Are there competitive forces that would enhance the advantages the organization would derive from mass customization?

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- Is the industry environment turbulent, unstable and unpredictable?
- Is the industry characterized by increased product proliferation and new product introductions?
- Is there a viable group of customers who can be persuaded to value customization?
- Is/are there a well-entrenched competitor(s) in the industry who is/are already pursuing mass customization?
- Will the organization enjoy considerable first-mover advantage?
- Is there a high potential for new competitive rivalry?
- Are the loyalty levels of existing competitors fairly low?

Resources and capabilities

- Does the organization's process technology allow it to tailor its products/services to individual customer needs, or could such technology be easily incorporated?
- Can the organization make long-term investments in advanced technology, such as information technology?
- Would the impact on the cost structure of incorporating and maintaining such technology be reasonable?
- Would the increased cost still allow a competitive price for the customized product/service?
- Are substantial in-house engineering expertise and manufacturing capabilities available?
- Are there access to a group of highly trained, disciplined and skilled workers?
- Is the organization's design conducive to and flexible enough to translate consumers' needs into specific specifications?
- Does the marketing department have access to the level of detail regarding consumer needs as required for mass customization and is it capable of analysing such information?
- Are the intermediaries that the organization has to depend on part of and supportive of mass customization?
- If there is no direct contact with the final consumer, are there sound collaborative relationships with customers involving highly interactive communication?
- Are the organization's suppliers located strategically and can requirements be supplied frequently and reliably, so that minimum inventory can be carried?

Organizational readiness, leadership and culture

- Does the organization's culture focus on knowledge creation and the development of manufacturing capabilities?
- Does top management institute organizational mechanisms that foster interactions among focused plants?
- Is there integration across functions while maintaining excellence within each function?
- Is there a high degree of fit between the opportunity inherent in mass customization and the organization's ability to capitalize on these?
- Are the leaders committed to mass customization?
- Is there a shared vision throughout the organization?
- Is the organization ready for change?
- Is change consistent with the organizational culture?

Customer orientation

- Do the customers really have unique needs?
- Do the customers really care about more customization of their products/services?
- Do they really want more choices or will they be overwhelmed by a larger variety?
- Are the customers prepared to accept certain sacrifices in order to buy from the specific organization?
- Will they be prepared to pay more/wait longer for a customized product/service?
- Is there a positive growth potential in the customized market?

Although the guidelines above do not indicate the exact timing of implementing a strategy of mass customization, they indicate the degree of readiness of the organization for coping with the demands of mass customization. As a simplistic rule of thumb it could be stated that the more the organization can confidently agree with the questions posed in the list above, the higher the potential for successful implementation of a strategy of mass customization.

Simultaneously implementing mass customization and mass production

It was pointed out earlier that mass customization and mass production could be viewed as different placings on a continuum of continuous improvement and not

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necessarily as opposites. With this argument in mind, together with the guidelines set out in the list of conditions shown earlier, the question arises whether the particular challenges of mass customization, the organizational dynamics and capabilities and the particular characteristics of the target markets would also allow an organization to simultaneously practise both mass customization and mass production, albeit in two separate factories. Such a strategy could allow for a progressive move along the continuum until the market requirements and/or the organization's capabilities call for a strategy of mass customization only.

In a study by Kotha (1996) of the NBG's strategy in the Japanese bicycle industry, it was found that the interaction between mass production and mass customization can be a source of knowledge creation and in the process create a strong competitive advantage to reap superior performance benefits.

Mass customization is not for everyone

Mass customization offers numerous opportunities and advantages to both producers and consumers. A strategy of mass customization cannot, however, be followed blindly. A number of companies have already run into problems while trying to make the leap to mass customization (Pine *et al.*, 1993). An example is that of Nissan, which reportedly had 87 different varieties of steering wheels, most of which were great engineering feats. But customers did not want many of them and disliked having to choose from so many options. Toyota experienced problems when they invested heavily in robots and instituted measures which deprived employees of opportunities to learn and think about processes and thus reduced their ability to improve them. Amdahl did not achieve its goal of delivering a custom-built mainframe within a week. It stocked inventory for every possible combination that customers could order and was saddled with hundreds of millions of dollars in excess inventory.

It is thus important that the organization ensures that its customers really desire customized products or services and that it has access to the required processes, procedures and capabilities before embarking on the shift to mass customization. Mass production may be outmoded, but it is still the most viable strategy in some instances.

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Appendix

Table AI Continuum of mass production and mass customization

Mass production		Mass customization
Product and production orientation		
Consistent quality standardized products and services via production/operational efficiency	Focus	High quality customized products and services via integrated process efficiency
Low variable costs; affordable prices because of high volumes	Beneficial implications	High production flexibility; low inventory carrying costs – even zero inventories; continual process improvement; optimum utilization of production assets
Reliance on suppliers; production inflexibility; high cost of variety; relatively lower productivity of production assets	Detrimental implications	Reliance on interaction with all stakeholders; possible demanding and stressful environments
Research and technological development		
Breakthrough innovations	Focus	Continual incremental innovations
Great technological advances	Beneficial implications	Continual improvements, eventual technological superiority; shorter cycle times; better fulfilment of customer needs
Longer cycle times; less customer focus	Detrimental implications	Lack of breakthrough innovations?
Marketing orientation		
Selling low-cost, standardized products to large, homogeneous markets	Focus	Gaining market share by fulfilling customer needs in fragmented, niche markets
Stable, predictable demand	Beneficial implications	Quick response to changing customer needs; meeting exact needs
Disregard of some consumer needs; segment retreat and avoidance	Detrimental implications	Too much reliance on technological advances
Structural and managerial orientation		
Efficiency and economies of scale through stability and control	Focus	Variety, customization and economies of scope through flexibility and quick response
Lower cost through increased efficiency based on specialization	Beneficial implications	Management attention focused on core competencies; organic, flexible and relatively less hierarchical structures; cross-functional teams; positive feedback loops
Managerial attention often diverted towards diversification and conglomeration; mechanistic, bureaucratic and hierarchical structures; division of labour; negative feedback loops	Detrimental implications	Possible loss of focus; competitive mediocrity

Source: Adapted from Pine (1993, pp. 126-8)

Commentary

A sensible study which balances customer orientation with commercial necessity.

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