

# Mass Customization Practices for Manufacturing Industries

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**Abstract - The paper intends to present clear pictures of research evolution in two research domains based on a thorough literature review: The service system design and mass customization areas. It identifies a necessity for integrating these two areas, which adopted the concepts of mass customization to guide the service delivery system design to cope with the traditional operation dilemma. Mass customization allows firms to produce only things their customers want (or produce after they have orders in hand). This paper illustrates that mass customization strategies depend on an understanding of the conditions in each industry. Applying methods of mass customization to the empirical process can improve product development process efficiency and reduce time and cost. Empirical methods are used to develop predictions of product behavior in conjunction with analytical methods or instead of analytical methods. These empirical methods represent a complete sub-product development process within the overall product development process. Application of process decomposition and planning used in mass customization can improve the efficiency, lower the time and cost of these empirical processes. This paper presents a method for applying principles of mass customization to the empirical sub-processes within a product development process. The ability of enterprises to react quickly to changes in the business environment is becoming imperative. Mass Customization (MC) is introduced as a competitive strategy for diversified markets by combining principles of mass production and individualization.**

## I. INTRODUCTION

Mass customization is a futuristic concept for the fashion industry, there are already some initiators companies, which have started customized fashion but have not combined all the existing components. This is due to very high price implementations of this new technological equipment (Vignali C., Vrontis D., Vronti P.D., 2004).

Mass customization is a broadly based term encompassing vast changes in manufacturing, distribution and delivery of products. First identified in Future Perfect, Davis (1987) based the oxymoron on the mass production of customized goods. The term has evolved along with significant enabling technologies to be viewed as a strategy that uses information technology to efficiently produce customized goods and services with maximum differentiation through low-cost production. Pine (1993) viewed mass customization, not as an extension or evolution in the history of mass production, but rather as a catastrophic shift or movement toward a totally new business paradigm (Anderson L.J., Brannon E.L., and Ulrich P.V., 2001).

Mass Customization is the large-scale production of personalized goods and services. To succeed at it, companies must harness technologies that revamp their speed, flexibility and efficiency at minimum expense. Combined with organizational changes to focus firms on the unique needs of very small customer segments, these technologies help companies affordably deliver custom versions of their offerings to profitable niche markets.

### *1.1 The Definitions of Mass Customization*

Mass Customization is the customization and personalization of products and services for individual customers at a mass production price (Dean P.R., Tu Y.L., and Xue D., 2007).

Mass customization, the involvement of the customer in the design, production, or delivery process before the actual sales transactions, using technology to limit the cost, is another strategy with which businesses are experimenting (Kotha S., 1995).

According to “**Cracking the Code of Mass Customization**,” mass customization is a great way to better align your business with customers’ needs and is probably easier to pull off than you think.

### *1.2 Advantages of Mass Customization*

- Maximized market share by maximizing customer's satisfaction and number of customers.
- Cut cost of inventory and material waste: materials and inputs are pushed into production just in time. Also, very low inventory of finished products because of production to orders, not produce to stock.
- Increase cash flow: Lower inventories, prepayment (thus lower receivables) increase cash flow.
- Shorten time of responsiveness (accumulative time from receiving orders to delivering): organization structure and flexible manufacturing in mass customization allows the company to adapt to different demands rapidly.
- Ability to supply a full line of products or service with lower costs: the purpose of mass customization is to differentiate products to particular demands, resulting in broader product lines of the company and a much lower risk of obsolete inventory (Pollard D., Chuo S. and Lee B., 2008)

### 1.3 Limits of Mass Customization

- It requires a highly flexible production technology. Developing such technologies can be expensive and time-consuming. Some processes, moreover, are more flexible and easier to digitize than others. Examples include information processing, printing, and cutting metal rods and tubes.
- It requires an elaborate system for eliciting customers' wants and needs. To make something unique for someone requires unique information. Eliciting such information entails, for instance, asking the right questions and taking the right physical measurements — and that's more difficult than it appears.
- It requires a strong direct-to-customer logistics system. Fulfillment is the weak link in much of e-commerce, and the same is true of mass customization.

## II. LITERATURE REVIEW

The history of mass customization started over forty years ago (Toffler 1970, Davis 1987 and Pine 1993). In the mass customization management system, the goal is to develop, produce, market, and deliver affordable goods and services with enough variety and customization that nearly everyone finds exactly what they want (Pine, 1993). In practice, mass customization means that customers can select, order, and receive a specially configured product - often choosing from among hundreds of product options - to meet their specific needs (Bourke and Kempfer, 1999). Other similar definitions and descriptions have been presented (e.g., Hart 1995, Anderson 1998). The reason why customized products are superior compared to standard products is the following (Pine, 1993). The company that better satisfies its customers' individual wants and needs will have greater sales. With higher profits as well as a better understanding of the customers' requirements, the company can provide even more variety and customization, which further fragments the market. Because it is outdistancing its competitors in variety and customization, market fragmentation allows it's once again to better satisfy its customers' individual wants and needs, and so on.

In 1980, Toffler<sup>1</sup> made the first reference to "de-massified production." At that time, few of the technologies required for mass customization had developed to the extent required. By 1992, Davidow and Malone<sup>2</sup> described the structure of an enterprise capable of supporting the new business model. In 1993, Pine<sup>3</sup> coined the name "Mass Customization" (Kamalini R., 2002; Gwinner P.K., Gremler D.D. and Bitner J.M., 1998).

### 2.1 Conclusions from Literature Review

Mass customization aims to fulfill each customer wish ("customization") at conditions and costs comparable to mass production ("mass"). It requires all sectors of the organization to work fast and efficiently: marketing and sales must build up a clear picture of customers' needs and desires; production must become very flexible and all business processes, such as logistics, must be very smooth. Companies can take different approaches to mass customization. A basic range of products can be changed to meet individual needs, as is the case for made to measure garments, where mass customization is treated as change in development. The other extreme is to offer a modular product range, which is configured to meet customer needs.

## III. PROBLEM FORMULATION

### 3.1 Problem Statement

Mass customization is new to the apparel industry, and in its processes, following problems need to be resolved for the full implementation of mass customization toward consumers:

(1) Body Scanning: Body scanning brings the output of the XYZ coordinates of a physical body, so it must be modified to make its use more practical in aspects of the application of apparel design and pattern.

(2) Single-Ply Cutting: In mass customization, manufacturers cut one garment exactly according to consumer preferences. The problem is that this single-ply cutting is more expensive than general cutting systems, and it must be improved in order to accommodate automatic continuous cutting for mass customization.

(3) CAD System: Despite the AAMA's (American Apparel Manufacturers Association) new CAD standards, compatibility problems between hardware and software systems from vendor to vendor mar the spread of mass customization through the industry.

(4) Pattern Design: Because commodity patterns must be modified for individual customers, the means by which the pattern is altered is an issue of concern, table-1 shows patterns and design options.

Table-1 Apparel Mass Customization Model

Point of customer involvement	Apparel mass customization options	Enabling technologies
Patterns	Custom fit or design	Body scanner, digitizer and CAD
Design	Component choice: size, style, fabric	CAD and web based product configurations
Production planning	Data forecast	EDI and production planning software
Assembly	Small-lot repeats	Electronically controlled eqpt robotics and UPS
Distribution	Point-of-sale data	EDI and supply chain management software
Post purchase	Customer adjustments	Electronic settings for smart clothing, gel gloves that mold to hands

### 3.2 Market Turbulence

Market turbulence has been the major cause of the shift from mass production to mass customization in many industries. But what has caused market turbulence?

There are two primary reasons why industry after industry has gone from stable to turbulence environments over the past thirty or forty years. First the number of sweeping changes in modern society, changes that have completely altered the landscape of both American and global markets. Second feeding of the changes in society, new forms of competition have discovered the power of mass customization and created turbulence in the market environments of every firm with which they compete.

In short, turbulence in society as a whole created the climate in which mass customization could be most effective. Mass customization, in turn, increased the levels of market turbulence and set in motion the self-reinforcing feedback loop of more variety, higher levels of customization, and greater turbulence. To understand this feedback loop more fully, let's examine the societal changes that first set it in motion.

## IV. RESEARCH METHODOLOGY

### 4.1 Construction of Demand Turbulence Measures

Pine's original market turbulence map instrument included as much as seventeen individual items, which were divided into demand (9 items) and structural (8 items) categories. In the literature section we introduced all the demand turbulence items and argued that only some of the items were directly related to demand, while other has a more or less indirect affect. As a result of this argument, we constructed the following four generic demand turbulence items: 1) The DALL item included all Pine's nine demand turbulence items, 2) DFOUR included only those items that were part of "first seven" group, 3) DDIRECT included four items, which in our opinion were directly related to demand uncertainty, and finally 4) DINDIRECT included all five items, which in our opinion were indirectly related to demand turbulence. All nine items were measured on 7-point Likert-scales, which asked for the respondents' opinion about the current and future (end of 2004) status of their business with respect to these items.

#### 4.2 Questionnaire

I make a research questionnaire for capturing readiness of companies for adopting mass customization. In this direction this questionnaire is a tool that will enable us to accessing the status of readiness of Indian industries for mass customization. These questionnaires have two sections one only for the demographic information and other related to services and facilities.

Questionnaire has twenty questions; all has same options Strongly Agree (1), Agree (2), neither Agree nor Disagree (3), Disagree (4), Strongly Disagree (5); based on Likert scale. With the help of questionnaire we can also find customer buying behavior, needs and wants, market turbulence, company's production capability, company infrastructure, production technology, product demand predictability etc.

1.	The demand of your product is highly unpredictable	1	2	3	4	5
2.	Fashion and style influence your customers in their decisions to buy	1	2	3	4	5
3.	Your business units sales is affected by economic cycles	1	2	3	4	5
4.	You and your competitors battle for market share in the market	1	2	3	4	5
5.	Product technology is changing rapidly in your business units	1	2	3	4	5
6.	Your product development cycle is short	1	2	3	4	5
7.	Customers want customized products and services anyway	1	2	3	4	5
8.	Customer are willing to pay a premium for customized products	1	2	3	4	5
9.	Your products fill complete luxuries in mind of your customers	1	2	3	4	5
10.	Your products fill very basic needs of your customers	1	2	3	4	5
11.	Your customers needs and wants are easily understood	1	2	3	4	5
12.	Your customers needs and wants are changing very quickly	1	2	3	4	5
13.	Customer's buying capacity has increased in recent time	1	2	3	4	5
14.	Your customers desire always same product	1	2	3	4	5
15.	Your customers desire unique product	1	2	3	4	5
16.	Your company production capabilities are automated	1	2	3	4	5
17.	In future company can go with Mass Customization	1	2	3	4	5
18.	Your industry is based on new and flexible technologies	1	2	3	4	5
19.	You have ability to communicate directly with customers	1	2	3	4	5
20.	Your customers are able to know about your products	1	2	3	4	5

#### V. CONCLUSIONS

The mass customization is one of the critical success factor in order to satisfy the customer or consumer preferences keeping low waiting time overcoming the mass produced goods, as real advertiser to the product or services is the real satisfied customer to increase the business in monetary terms, many organization's are changing their philosophy now, from mass production to mass customization, recognizing the individual customer preferences.

In the paper some cautions while implementing the Mass Customization through modularity, guidelines for mass customization in manufacturing sector given, are to be highly focused while doing the mass customization in this globalized dynamic business environment in order to keep or stand high an organization in the market.

#### REFERENCES

- [1] Anderson L.J., Brannon E.L., and Ulrich P.V., (2001), "Discovering the Process of Mass Customization: A Paradigm Shift for Competitive Manufacturing", Journal of Mass Customization.
- [2] Chen J. and Hao Y., (2010), "Mass Customization in Design of Service Delivery System: a Review and Prospects", African journal of business management, Vol. 4(6), PP. 842-848.
- [3] Cristopher P.H. and Light B., (1999), "Global Enterprise Resource Planning Implementation", Hawaii International Conference on System Science.
- [4] Dean P.R., Tu Y.L., and Xue D., (2007), "A Framework for generating product production information for mass customization", International Journal of Advanced Manufacturing Technology, Vol. 38, PP. 1244-1259.
- [5] Giovani J. and Flavio S.F., (2002), "Mass Customization Definition, Levels and Success Factor", Journal of Mass Customization vs. Mass Production.
- [6] Kamalini R., (2002), "Managing Product Variety: An Integrative Review and Research Directions", Research Paper on Product Variety.

- [7] Kotha S., (1995), “*Mass Customization: Implementing the Emerging Paradigm for Competitive Advantage*”, Strategic Management Journal, Vol. 16, PP. 21-42, Special Issue: Technological Transformation and the New Competitive Landscape.
- [8] Kratochvil M. and Carson C., (2005), “*Growing Modular, Mass Customization of Complex Products, Services and Software*”, 3<sup>rd</sup> Ed., Publisher- Berlin Heidelberg New York.
- [9] Labarthe O. and Espinasse B., (2006), “*Towards a Methodological Framework for Agent Based Modeling and Simulation of Supply Chains in a Mass Customization Context*”, Research Paper on Mass Customization Context.
- [10] Pine B.J. II, (1999), “*Mass Customization the New Frontier in Business Competition*”, 5<sup>th</sup> Ed., Harvard Business School Press, Boston, Massachusetts.
- [11] Pollard D., Chuo S. and Lee B., (2008), “*Strategies for Mass Customization*”, Journal of Business and Economics Research, vol. 6, No. 7, PP. 77-86.
- [12] Vignali C., Vrontis D., Vronti P.D., (2004), “*Mass customization and clothing industry*”, Journal of clothing industry, Vol. 55, No. 5-6, pp 502-512.