CUSTOMER CO-CREATION IN PRODUCT DESIGN AND PRODUCT CONFIGURATORS

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Abstract: The paper will discuss about the mass customization and personalization (MCP) trend in global economy with special emphasis on Serbian industry and companies who have adopted MCP strategy to produce goods and provide services designed and personalized by customers. This growing trend implies efficient production organization and sufficient information system for product management to be able to satisfy customer demands in acceptable delivery time and prize near the regular prize of standard products. The paper will also give an overview of Serbian companies and economy branches where you can be co-designer of products through product configurators.

1. INTRODUCTION

The idea of mass customization is based on the observation that there is a customer interest in products that are adapted to his/her individual needs and preferences, since the adaptation will increase perceived performance. As the standard of living has increased in the last 50 years, individualization has received increased focus, since customization has come within reach of the average consumer. At the same time there has been a massive development of technologies (Svenson/Jensen 2001:1).

The concept of mass customization was first identified in "Future shock" by Toffler (1971) and was later described in "Future perfect" by Davis (1987). Stan Davis, who coined the term in 1987, refers to mass customization when "the same large number of customers can be reached as in mass markets of the industrial economy, and simultaneously they can be treated individually as in the customized markets of pre-industrial economies" (Davis 1987:169). In order to address the implementation issues of mass customization, Tseng and Jiao (2001) provide a working definition of mass customization that is very useful. The objective of mass customization is "to deliver goods and services that meet individual customers´ needs with near mass production efficiency" (Piller 2003).

Doing so, mass customization is performed on four levels. While the differentiation level of mass customization is based on the additional utility (value) customers gain from a product or service that corresponds better to their needs, the cost level demands that this can be done at total costs that will not lead to such a price increase that the customization process implies a switch of market segments. The information collected in the course of individualization serves to build up a lasting individual relationship with each customer and, thus, to increase customer loyalty (relationship level). While the first three levels have a customer centric perspective, a fourth level takes an internal view and relates to the fulfillment system of a mass customizing firm: Mass customization operations are performed in a fixed solution space that represents (Piller 2003) "the pre-existing capability and degrees of freedom built into a given manufacturer's production system" (von Hippel 2001).

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Personalization should therefore be clearly distinguished from customization. Both *customization* and *personalization* are based on the assumption that a homogeneous offering is not sufficient in meeting the customers' needs. As defined by the Webster dictionary (2003), personalize means "to make something personal or individual; specifically: to mark as the property of a particular person" (Fung et. al. 2001:2). The definitions of *mass customization* and of *personalization* implies that the goal is to detect customers needs and then to fulfill these needs with an efficiency that almost equals that of mass production.

For more than two decades, *mass customization and personalization* has been the future of manufacturing – and for some manufacturers it will probably always be. On the face of it, mass customization is remarkably attractive proposition for customers and producers alike. Consumers get reasonably priced tailor-made product reflecting their personal selection of colours, features, functions and styles. Producers for their part get to reduce their inventories and manufacturing overhead costs, to eliminate waste in their supply chains, and to obtain more accurate information about demand. In short, a win-win position. Today's manufacturing systems have the potential to build a large variety of end products at costs comparable to mass-produced items. However, this potential is just the beginning to be realized based on the complexity of the product, manufacturing, and supply chain. Therefore, different manufacturing sectors have different business drivers and are at varying degrees of readiness to adopt MCP methodologies.

Two relatively recent developments have given the prospects for mass customization a boost: first success enjoyed by Dell Computers and other high-tech companies that build products to order, and second the emergence of the Internet, giving the manufactures a platform for taking orders from mass audience for customized products, such as bicycles, clothes, cosmetics, shoes and vitamins, at almost no cost. In the past, customization of this kind was handled by skilled but expensive salespeople closely interacting with customers. With these trends, many issues arise in the product development and production cycle.

These issues are being addressed by capabilities in computational, communicational, and informational areas creating innovations in flexible automation, networks, and electronic product design. An increasing number of companies are adopting mass customization strategies at different levels in their product development cycles (Fig.1).
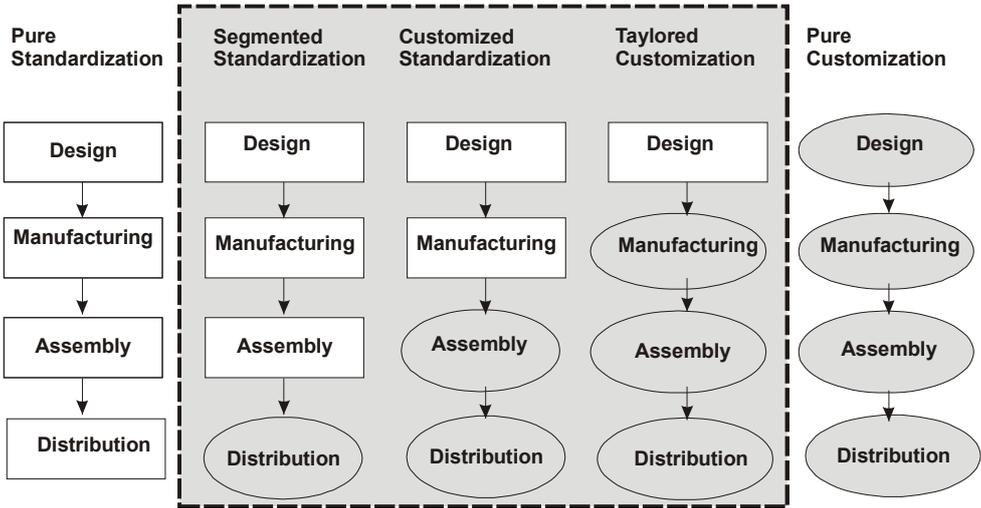

Fig. 1 Level and depth of involving customers

2. MCP STRATEGY POWERD BY NEW GENERATION OF CONFIGURATORS

We focus on discussing Web – based product configurators, because they are very important means for the practical implementation of MCP. Online product configuration tools allow web users to personalize their products over the internet. Depending on the type of product, the configuration

services can simplify the selection of product options, help enterprises in capturing customers' needs and bridge the gap between customers' desire and firms' competencies.

On Fig.2 are given some examples of configurators for different products:

a) 3D cars demonstrators to display cars of different models and colors (example get from http://www.mercedes-benz.de);
b) Displaying of 3D virtual mobile phones of different models and colors (http://www.nokia.co.uk);
c) Configurator focused on furniture products (http://www.fwc3d.com);
d) A software tool for customization of computers, software, mobile accessories, etc. (http://demo.x-cart.com);
e) Configurator for clothes, gifts and etc. (http://www.earlyimpact.com);
f) Experimental 3D Web configurator [3] - it supports and maintains the development and marketing of modular positioning and handling systems called "DriveSets".

Fig. 2 Web – based product configurators

It can be given many examples of products configurators but here our goal is to analyze their repeatable elements and represent their possibilities and functions in common. The features of the products configurators are very well summarized on the site http://www.technicon.com. These features include:

- Providing appropriate queries and generating of order-ready quotes, including by accessing the latest product and pricing information.
- Flagging incompatible options and highlighting prior options that are incompatible with the current option.
- Supporting the import of external and legacy configuration data and rules into Custom Commerce configuration models.
- Supporting complex pricing models that allow multiple price lists to be associated with any product option.
- Providing context-appropriate help messages and selling suggestions.
- Providing graphics and animations to aid in the configuration process, including 2D drawings and 3D models.
- Supporting the use of spatial relationships and rules for configurations, allowing layout and assembly of multiple products to arrive at integrated solutions.

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We pay attention to the functionality, because the quality of the reconciling customers' interests and features of products depends on technical functionality of the configurators. So it is very important to implement new ideas and technologies for their development. For example for the assurance of the appropriate to the design by the customer process functionality, the experimental 3D Web configurator given on Fig.3 f) was developed by the use of the relatively new X3D (eXtensible 3D) language for the description of product (we have used virtual product model of the DriveSets-family brought to the market by Systec E+S GmbH, Germany - http://www.drivesets.de). The 3D Web configurator provides as feedback in the web-browser of the customer not only the appropriate graphical representation of the newly developed system, but the model of the systems installation and operational area, animation of the systems action and dynamical change of the model parameters such as dimensions of form, dimensions of dispositions and etc.

By using of Web configurators it become possible users to customize (even in some cases to design) their products over the internet. The direct customer participation in the personalization of product or in the design of it saves time and money, reduces the engineering efforts in respect to the solving of the design problem, improves the quality, changes the attitude of the customers towards the product and on this way facilitates the product market realization.

3. THE ROLE OF CUSTOMER IN MASS CUSTOMIZATION

Mass customization and personalization alters the traditional product development and moves towards a two-stage model, the first, the realm of company/designer establishing the solution space and the second, that of customer as co-designer. This second stage fundamentally changes the role of the customer from consumer of a product, to a partner in a process of adding value.

The literature describes a spectrum of research in the area of designing for co-design and has identified a number of design considerations, which include:

- Minimizing the potential complexity experienced by the customer, keeping their expenditure in the buying process as low as possible, whilst providing clearly perceptible benefits;
- Reducing cognitive overhead, which lies not only in extent of choice, but also in areas such as lack of understanding about which solution meets their needs, uncertainty about the behavior of the supplier, and uncertainty regarding the purchasing process, ordering and paying in advance for something that's only been seen virtually.

These findings often fall into one of two areas for investigation:
- Issues surrounding the contents of the solution space;
- Communication and application of the contents through an appropriate product configurator.

Based on previous analysis, two questions have to be answered:
- What is the co-design experience for the customer?
- How can one design for the co-design experience?

If the co-design experience is an intrinsic element of a mass customized product, there is a need to develop a conceptual model for mass customized product offerings that encompasses this wider context within which the solution space resides, the entire co-design and product purchasing experience.

It is easy to assume that increased product performance heightens levels of customer satisfaction, but trends indicate that users are expecting increasing levels of 'connection' with everyday products. As markets have segmented, product development has begun to move beyond traditional considerations of usability and functionality. Consumers now look for more from the products that they buy; they are looking for pleasure and the fulfillment of their emotional needs". There is a growing acceptance of the need to design for consumer experience.

To further understand this phenomenon, it is necessary to look not only at consumer behavior, but to delve deeper and understand the meaning that consumers attach to possessions, which drives the act of purchase.

Mass customization is an approach that is fundamentally driven by an individual customers' emotional connection with the product, exemplified by their participation and engagement in the co-

design experience. To design for a co-design experience an understanding of the customers, their behavior, expectations and the interface between the customers and the configurator is needed.

One of the works that explicitly address the creation of positive feelings in product use is particularly useful as a hypothesis generating tool since it provides not a theory of pleasure, but rather a tool to help those involved in the design process take a structured approach to understanding the entire spectrum of pleasures a product can bring. It identifies four types of pleasure associated with products:

- **Physio-pleasure** – relates to the body and is concerned with positive feedback from the sensory organs; touch, taste, smell, hearing and sensual pleasure;
- **Socio-pleasure** – refers to relationships with others – individuals, groups and society as a whole. Socio-pleasure is drawn from the aspects of products that confer social, material or cultural status, help to construct personal identity and/or stimulate desirable social interaction. These product qualities give positive feedback to the owners about their personal view of themselves in society;
- **Psycho-pleasure** – refers to a user's cognitive interaction with a product and their subsequent emotional reaction. Psycho-pleasure is drawn from products that give emotionally satisfying results from the cognitive demands of interaction;
- **Ideo-pleasure** – relates to peoples' values. In the context of products this ranges from aesthetics to ethics. It includes taste, moral values and personal aspirations. It defines how people do, and would like to, see themselves.

The previously discussed framework resulted in the development of the product envelope model that appears to be the first complete expression of a coherent, user-centric mass customized product offering. It helps constructing the outer layers of co-design experience which surround its core element, the solution space.

The product envelope is generated by the producer of the mass customized product. As a co-designer, customer penetrates the envelope and engages with a number of experiential layers before reaching the solution space where the mass customized product resides; those layers are interconnected and the co-design experience will not necessarily provide a linear route through the envelope.

The design of the product envelope is characterized by regular traversal of the design line to ensure all regions of the envelope are integrated; this is important in ensuring coherence in the customer's perception of the entire mass customized product offering.

Brand is important in differentiating between product envelopes, in circumscribing the envelope and in permeating through the core of the envelope. This is an essential consideration, as brands generate choice, simplify purchase decisions, offer quality assurance, and reduce risks involved in purchase. Brand has an ability to trigger emotional responses that will often provide it with a winning edge over less familiar products and services. Every brand consists of an essence consisting not only of the product or service, but the mental constructs associated with it.

The product envelope must communicate a coherent brand to the customer co-designer throughout every element of the co-design experience. A key aspect to designing the experience is to understand and design the product 'touch points'; the tangible aspects which make up the experience of using a product or service, "instances of direct contact either with the product or service itself, or with representations of it by the company or third party".

4. SITUATION IN SERBIA

In spite the hard economic situation there are some Serbian companies that use product configurators in their business. After the research was carried out, it was found that configurators are using for the following groups of products (Fig.3):
- Computers and PC equipment
- Cars and automotive parts
- Furniture, mostly office furniture, or other panel board furniture
- Design of interior
- Services in banking sector or tourism

In most cases companies just taking over translated configurators, developed in parent companies from abroad, but there are also pioneers that are trying to take advantages from new business concepts and information technologies.

Fig 3. Some examples of product configurators in Serbian companies

Beside the mentioned market situation, product configurator development is very important regardless on the applied level MC concept. Product configurator enables easily processing large number of inquiries and forwards them to production system for further designing of nonstandard parts and process plans for manufacturing. Visualization of the product through showing possible modification on computers impressing customers and they are more readily for buying even the possibility for customization is minimal.

The fact is, that in this moment, only large international leading companies have power for implementation of the MC concept but small and medium enterprises could have benefits even now, though the application of the certain segments', concerning configuration and visualization of products. Introduction of the approach and refreshment of the marketing promotion - offering personalized products will strengthen their competitive position on the market for surely.

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