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CUSTOMER INVOLVEMENT INTO PRODUCT CREATION PROCESS IN MACEDONIAN COMPANIES

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Abstract: *The communication between the customers and companies is necessary and offers customers greater satisfaction. Customers express their individual needs and enable the companies to produce customized products. Incorporating customer preferences into product specification means successful customized product. This paper discusses how manufacturers try to involve customers in product creation process. Analyzing some companies in Macedonia we identify different forms which are used as a solution for customer involvement in the product creation process. The results of the study show which are the current trends for cooperation with customers and meeting their needs.*

Key Words: ***Mass Customization, Customized product, Customer needs, Customer***

1. INTRODUCTION

Mass customization is an attractive strategy for both manufacturers and customers. Companies are able to reduce their inventories and manufacturing overhead costs, eliminate waste in their supply chains, and obtain more accurate information about demand [2]. Customers, on the other hand, get reasonably priced, products according to their personal needs.

The benefit of mass customization is the cooperation with customers and meeting their needs. The increasing use of information technology in the manufacturing companies enable costumers directly interact with the manufacturers to specify their needs and requirements and make their own decisions [1]. Combination of advanced engineering and high-speed information and communication technology allows companies to be much more flexible and responsive in providing product variety and customization [3,4].

The main distinctive principle of mass customization is a mechanism for interacting with the customer and obtaining specific information in order to define and translate the customer's needs and requirements and create a concrete product or service specification [5,6]. In this way, the customer is integrated into the product creation process.

Today's customers do not make their decisions after comparing different product alternatives with limited selections to those offerings placed in front of them [1]. This type of buying process is no more attractive for customers because they are forced to make many compromises. On the other hand, in mass customization, customers can choose different attributes and combine them together to form a product.

Customers in new economy have got a lot of choices and they are looking for a company, which can prepare the most value for them [7]. Today's customers are sophisticated and their high expectations are very difficult to be satisfied completely.

Introducing customer participation into the company's value creation process, increases customers' sense of involvement in the end product [11]. Customers are involve in product creation process step by step and they have a great impact on the product that is produced for them. In addition this paper shows which are the current trends used as a solution for customer involvement in the product creation process.

2. CUSTOMER - COMPANY INTERACTION

Mass customization requires increased customer interaction. Compared to conventional ways, the customers have to participate in one or many product creation processes (design, manufacture, assemble, distribute) in order to get their customized product [8]. There are customers who are not willing to pay these opportunity costs. They are content with a satisficing solution, not the superior one mass customization offers, but researches and observations show that customers are often willing to pay a price premium for a customized solution that better fits their needs than the standard product [9, 11].

Customer integration plays a key importance in a mass customization strategy [10, 12]. Integration means getting the customer involved in designing or configuring a product. Because the main part of the interaction with the customer takes place during the configuration and the design of a customer specific product, so it seems appropriate to call the customer a

co-designer [14]. Customer co-design describes a process that allows customers to express their product requirements and carry out product realization processes by mapping the requirements into the physical domain of the product [6,14].

By integrating the customer into the design or configuration process, a possible adversarial relationship between a customer and provider may be transformed into a synergy [12]. Including the customer in the product design also establishes an individual contact between the manufacturer and customer. If the customers are satisfied with an individual purchased item, they award the manufacturer with an increased chance for customer loyalty [13].

Meeting customer needs is one of the basic requirements for successful customized product. Companies use different methods to get information about their potential customers in order to follow the current trends. Usually getting information is by asking customers about their basic needs and preferences via market research like surveys, by analyzing sales data, internet research or surveying sales personnel [15]. Some customers provide important information about future trends and possible solution technologies.

Companies use existing customer information from diverse input channels like feedback from sales people, analyzing the sales data from the last season, internet log files, or research reports by third parties in order to identify customer needs [15,16]. Customer preferences also are identified via surveys, qualitative interviews, or focus groups [15]. In today's competitive marketplace companies actively involve customers in the design or development of future offerings, often with the help of tools that are provided by them.

2.1 Customizing a product

Today the decision makers are the customers and the task that must be fulfilled by the customers is the selection of the optimal product variant from the solution space of the mass customizer. Two main categories of information emerge: the objective information about individual needs that the customers would require to select the optimal product variant and the subjective information about individual needs that the customers actually use to select a product variant.

We call the first category of information the objective customers needs and the second category the subjective customers needs. The information supply relates to the information that the customers receive from the mass customizer in order to carry out product selection. This information refers to the achievement potential and is called offered variety.

From the costumer's point of view, customizing a product means configuring a product, either by selection, or design of the attributes, in order to satisfy individual needs, with respect to manufacturer's capabilities. The product configuration process has been recognized as a key enabler of mass customization [17]. Also the Web has been recognized as a very effective interface to facilitate the configuration process. This process is supported by a software program, which can define and manage a unique variant of a product for each customer [1].

In the configuration process, costumers are faced with choices of attributes (e.g. color, shapes, etc) and their levels (e.g. red, white or black color and round or rectangular shapes). Costumers need to select an attribute level from each attribute, and combine them into a product [1]. The product adapts to the needs of the customer, and the customization is an outcome of customer-product interaction. A customized product is a special product designed for individual customers to meet their needs.

The interaction between the user and the configuration system can bring us one step closer to real-world face-to-face communication. Users are enabled to express their requirements in a natural way and their confidence in the system's results increases when they have the feeling that their requirements are taken adequately into account [18]. Webbased product configuration systems are nowadays well-established in commercial environments and enable users to specify desired product variants typically on a technical level.

2.2 Product Configurators

Enabling IT is one of the main enablers for mass customization [19]. For this, a broad range of software tools are required to offer customisable products at the market. These tools are able to reduce the increasing complexity of data, produced during the product life cycle of mass customised products.

Known as product configurators, choice boards, design systems, toolkits, or co-design platforms, these systems are responsible for guiding the user through the configuration process. Configuration system can be defined as a socio-technical system, whose optimization requires the combined optimization of the human and computing sub-system [24].

Product Configurators, have become significant in addressing many of the design issues related to mass customization. They are systems that create, maintain, and use electronic product models that allow complete definition of all possible product option and variation combinations, with a minimum of data entries. This capability is essential for companies offering unique configurations to satisfy specific customer needs [20].

The core configuration software presents the possible variations, and guides the user through the configuration process, asking questions or providing design options. Analyzing tools finally translate a customer specific order into lists of material, construction plans, and work schedules. They further transmit the configuration to manufacturing or other departments [6].

In offering mass-customized products, manufacturers will determine which attributes consumers can customize, and let consumers make the selection of an attribute values in each attribute, and combine all the attribute values of their own selection [1]. An intelligent product configurator can use selection rules to determine which product or components are required to satisfy customer needs [25].

3. CASE STUDY

3.1 Methodology

This research includes data and information collected for thirty Macedonian companies from different business sectors and with different number of persons employed. Data were collect through surveys, face-to-face communication with managers and internet based research related to customer co-creation and meeting customer needs. Analyzing collected data we identify different forms used by Macedonian companies as a solution for customer involvement in the product creation process.

3.2 Active business entities in Macedonia

According to the data of the State Statistical Office the number of active business entities in the Republic of Macedonia in 2013 was 71 290. The sectors with the highest share in the structure of business entities were: wholesale and retail trade; repair of motor vehicles and motorcycles with 25 429 entities or 35.7% and manufacturing with 7 918 entities or 11.1%, where as the least represented were the sectors mining and quarrying with 164 entities or 0.2% and Electricity, gas, steam and air conditioning supply with 132 entities or 0.2%, Figure 1 [21].

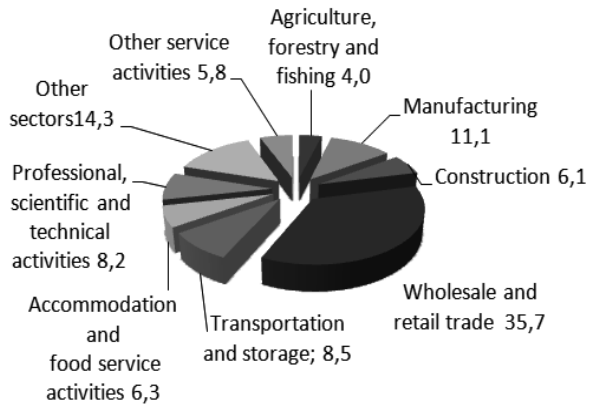

Fig. 1. *Percentage Structure of business entities in Macedonia*

The data on the structure of active business entities according to the number of persons employed show that the highest share of 85% belongs to business entities with 1-9 persons employed, followed by business entities with no persons employed or entities with unascertained number of persons employed (no data on persons employed) with 6.2%, and entities with 10-19 persons employed with 4.2%. The share of entities with 20-49 persons employed was 2.5%, those with 50-249 persons employed participated with 1.8%, while entities with 250 or more persons employed had a share of only 0.3% [21].

3.3 Results

In today's competitive business environment, customization is almost a mandatory option that companies have to offer to keep their customers happy. The number of companies which are adopting strategies like mass customization continuously is increasing. As a new production trend, mass customization is an attractive challenge for Macedonian companies. Some of them are already implementing some aspects of mass customization concept, especially companies in the furniture industry and those which offer information technology products and services.

Defining customer needs is essential for implementing some aspects of mass customization strategy. To accomplish this, companies have to involve the customers and make them their partners and co-designers of the final product solution. In this research were analyze thirty Macedonian companies with different business profiles, most of them from the sectors with highest share in the structure of business entities according to the data of the State Statistical Office, Table1. The number of persons employed in most of the involved companies is between 10 and 250, Figure 2.

Table 1. Structure of *involved business sectors*

Business sector	business entities	%
Manufacturing	9	30%
Wholesale and retail trade	16	53%
Agriculture, forestry and fishing	2	7%
Construction	2	7%
Other business sectors	1	3%

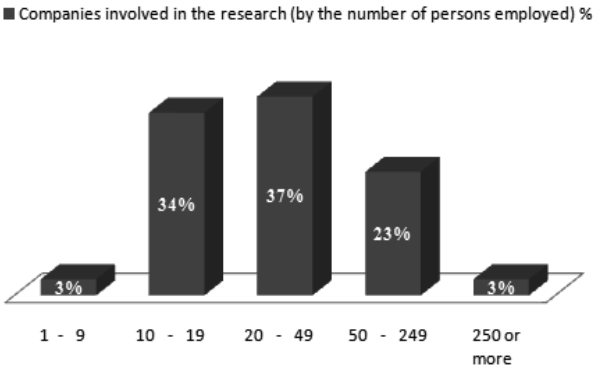

Fig. 2. *Involved companies (by the number of persons employed) %*

According to the collected data we recognized three mostly used solutions for customer involvement in product creation process. Figure 3 presents the result of the research.

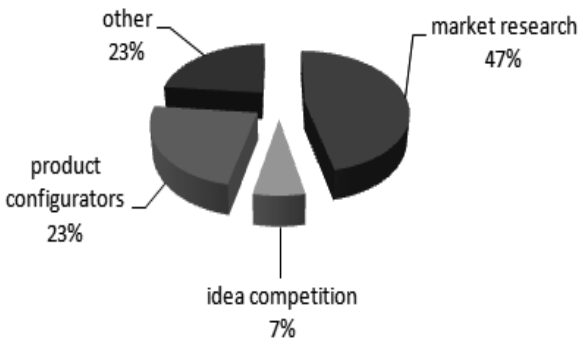

Fig. 3. *Research result*

1) Market needs research.

Market needs research helps companies to be aware of current product requirements and, by producing products that customers want and need, they can reduce their inventories and increase their sales and profit. 47% of the companies, included in the research, use market needs research to get information about their potential customers.

2) Idea competitions.

Idea competitions are usually supported by social networks, companies' own platforms or co-creation communities. Anyone could participate by submitting their own designs, their creative proposals and be the one from the crowd of people who would be the creator of new product [22]. These are usually creative contests organized to collect large number of ideas from people who are motivated almost only by promised reward and fun. According to the result of the research, Figure 3, this type of customer involvement is used by 7% of the companies.

3) Product Configurators.

Product configurators are information systems that support the specification of product individuals and the creation and management of configuration knowledge. The configurators have been used in different companies to help the customers to create the product they need. Web-based product configuration systems are important enablers of the mass customization paradigm and nowadays are well-established in commercial environments. They enable users to specify desired product variants - typically on a technical level, because in practice the technological perspective dominates the user perspective [23].

Through product configurators customers are directly involved in the product creation process. According to the result of the research, 23% of the companies use product configurators in order to collaborate with their customers. Implamenting configuration platform means implementing some aspect of mass customization concept.

4. FUTURE TRENDS

In this time of intense competition companies need to invent new competences and business practices in order to engage their customers in value co-creation processes [26]. Companies have to communicate with customers and make them their partners and co-designers of the final product solution As a new tools, , mobile applications for customization are very attractive for customer - company interaction.

Mobile application for customizing a product, designed for tablets and smart phones, can be used for 3D virtual view and product presentation supported by "Augmented Reality". This kind of product presentation has many advantages. In addition are some of them:

- Visualization of the real product .
- Online product customization (product variants: different material, color, shape..)
- Virtual 3D presentation of all product characteristics.

This mobile application is excellent tool for product marketing and promotion and also can increase the interaction customer - company. The mobile application usually is free for the last users which means quickly increasing the number of last users.

5. CONCLUSION

In today's competitive market where the customer is most important, and business products and services are more likely to be customized to fit customer needs, it is important for the companies to adopt and include customization in their offerings. According to the result we can conclude that the problem of identifying customer needs, can be solved by applying some form of customer - company interaction.

This paper presents that some business entities in Macedonia are already adopting variations of the mass customization concept. Using different methods and tools they try to involve customers in product creation process. Higher degree of them (47%) are getting information by asking customers about their basic needs and preferences via market research like surveys, by analyzing sales data or internet research. Small percentage of the companies (7%) are using idea competition in order to involve customers in product creation process. Based on the result of the research, 23% of the companies use some form of product configurator. They develop them to be more attractive for customers and offer different product variants. Macedonia is a developing country and does not have high level of sales, but the result of the research leads to conclusion that Macedonian companies are trying to achieve close customer interaction and adaptability to the current world trends .

6. REFERENCES

[1] S. H. Kurniawan, M. M. Tseng and H. Y. S. Richard. "Modeling Consumer Behavior in the Customization Process", *The Customer Centric Enterprises - Advances in Mass Customization and Personalization* , Springer, 2003, pp.267-282.

[2] T. Stojanova, V. Gecevska, and Z. Anisic. " Mass Customization - Tool for growing product variety", in *4th International Scientific Conference Management of Technology Step to Sustainable Production - MOTSP 2012*, Zadar, Croatia, 2012, pp.99-106.

[3] S. Kotha. "Mass Customization: Implementing the Emerging Paradigm for Competitive Advantage", *Strategic Management Journal,* Vol. 16, no. 7, pp. 21-42, 1995.

[4] J. B. Pine, B. Victor, A. C. Boyton. "Making Mass Customization Work", *Harvard Business Review*, Vol. 71, no. 5, pp. 108-122, 1993.

[5] P. Zipkin. "The Limits of Mass Customization", *Sloan Management Review*, Vol. 42, pp. 81-89, 2001.

[6] N. Franke, F. Piller. "Configuration toolkits for Mass Customization: Setting a research agenda" *Working paper no.33 Dept. of General and Industrial Management*, Technische Universitaet Muenchen, 2002.

[7] S. Reza, S. Javadin, M. K. Zarandi. "Superior Customer Value through Mass Customization",

Mass Customization in Central Europe - Theory and Practice" *University of Information Technology and Management,* Rzeszów, Poland. 2006.
[8] J. Lampel, H. Mintzberg. "Customizing customization" , *Sloan Management Review*, Vol 38, no. 1, pp. 21-3, 1996.
[9] J. Jiao., and M.M. Tseng. "A pragmatic approach to product costing based on standard time estimation". *International Journal of Operations & Production Management,* 19(7), 1999, pp. 738-755.
[10] F. T. Piller. "Mass Customization: Reflection on the State of the Concept", *The International Journal of Flexible Manufacturing Systems,* 16(4), 313-334, 2004.
[11] S. Wikstrom. Value Creation by Company-Consumer Interaction*, Journal of Marketing Management,* 12(5*)*,1996, pp. 359-374.
[12] A. Kumar, and K. E Stecke. "Measuring the Effectiveness of a Mass Customization and Personalization Strategy: a Market –and Organizational-capability based Index"*, The International Journal of Flexible Manufacturing Systems,* 19(4), 548-570, 2007.
[13] B. J. Pine, D. Peppers, and M. Rogers. "Do You Want to Keep Your Customer Forever?"*, Harvard Business Review,* 73(2), 103-114, 1995.
[14] M. M. Tseng. and X. Du. "Design by Customers of Mass Customization Products", *CIRP Annals*, Vol. 47, pp. 103-106, 1998.
[15] F. Piller, C. Ihl and A. Vossen. " Customer Co-Creation: Open Innovation with Customers", *New Forms of Collaborative Innovation and Production on the Internet*, Universitatsverlag Gottingen, 2011.
[16] E. Dahan, and J. R. Hauser. "The virtual customer." *Journal of Product Innovation Management, 19*(5), pp. 332-353, 2002.
[17] R. Bourke. "Product configurators: key enablers for Mass Customization", Mid-*Range ERP*, 2001.
[18] G. Kreutler and D. Jannach. "Personalized needs elicitation in web-based configuration systems", *Mass Customization Challenges and Solutions,* chapter 2, Springer, 2006.
[19] F. Piller. "Mass Customization and SAP R/3TM – Business Solutions like SAP R/3 as an Enabler of Mass Customization", University of Wuerzburg, Germany, 1997.
[20] Z. Anisic. " Some results of the implementation of the mc concept in small companies", *2nd International Conference on Mass Customization and Personalizationin Central Europe -MCP-CE 2006,* Poland, 2006.
[21] Business entities "Active Business Entities"*, State statistical office,* Republic of Macedonia, 2014.
[22] A. Orcik, T. Stojanova, R. Freund. "Co-Creation: Examples and Lessons Learned from South-East Europe" in *6th International Conference for Entrepreneurship, Innovation and Regional Development- ICEIRD 2013*, Turkey, 2013, pp. 36-44.
[23] T. Blecker, G. Friedrich, B. Kaluza, N. Abdelkafi, and G. Kreutler.: *Information and Management Systems for Product Customization*, Springer, 2005.
[24] C. Forza, and F.Salvador. "Product Information Management for Mass Customization" , Palgrave MacMillan, UK, 2007.
[25] M. Kratochvil, and C. Carlson. "Growing Modular: Mass Customization of complex products, services and software", Springer, 2005.
[26] V. Ramaswam. Co-creating value through customers' experiences: the Nike case. Strategy & Leadership 2008; 36 (5), pp. 9 – 14.

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