

A Method for Mass Customization Implementation in Manufacturing Smes

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Abstract : A mass customization framework fits well together with agile production. Even though the mass customization principle is relatively simple, implementation is not easy. The target of this research was to develop and test a method for implementing comprehensive mass customization framework in a manufacturing company. Radical changes in a company's operations are done at high risk. Especially small companies need to carefully think whether to change their way of operating. This paper describes a method that helps the company to understand what mass customization is and to give directions to implement a framework for it with relatively low resources.

I. INTRODUCTION

Mass customization has been for a long time an important factor in developing the competitiveness of small and medium sized industry in Europe. It has also been clear that manufacturing in the high expense countries cannot compete by performing mass production. It has three real choices: to develop the first product in market, to develop the best product in market, or to be agile [1]. Agile production is usually best served with a mass customization framework because of the flexibility of the processes [2],[3]. Even though the principle itself is relatively simple, implementing a comprehensive mass customization framework is not easy [4]. This is most likely because of the nature of strategic choice. Also many old fashion habits, tacit knowledge and traditions prevent the implementation and efficient use of mass customization.

The fact that the whole company needs to adapt mass customization framework collaboratively and simultaneously makes the situation even more difficult [5]. There are several manufacturing companies in Finland that produce tailored products for customer needs [6]. Because of the project based business, they cannot utilize the economies of scale. However they can substantially improve their performance with mass customization framework. The target of this research was to develop and test a method for implementing comprehensive mass customization framework in a Finnish manufacturing company. A working method including employee participation for developing mass customization capabilities in a Finnish SME was developed. The research question is: How can an SME that manufactures tailored products implement a mass customization strategy?

II. THE RESEARCH PROCESS

In order to understand how the manufacturing company can develop the mass customization framework, an exploratory case study approach was adopted [7]. Data collection has been taking place by developing the concept as an action type of research. The researchers conducted a project at the case companies, finding a model, guiding the directions of implementation, teaching mass customization and preparing learning material for the employees. The research process on finding the way of working has been based on continuous iteration and comparison between observations during participation and systematic collection of data from the company case, as well as literature study. The process of this study, which intertwines empirical research and literature review, can be seen as a systematic combining process as suggested by Dubois and Gadde [8]. Mass customization is more than a product or production design approach; it is a strategic decision and way of doing business [5],[3]. It has been acknowledged that participatory strategic planning reduces the bias [9]. We chose to incorporate the employees to the development as much as possible.

The research set as a starting point the not academically proven framework of "mass customization mountain" that was presented by a Finnish research project in 2007[6]. By applying and redefining this concept a strategy, roadmap and training material for mass customization was created. The approach was developed with two pilot companies. The process included development of a tool for clarifying the needed changes and giving the training for mass customization.

III. PILOT PROJECTS

Both pilot companies- are acting in the field of moving vehicles and have earlier been making tailored products. One of them was medium sized and the other one a larger company. When production volumes have been increasing, companies have started to find effective ways to increase capacity without huge investing. They both have noticed the possibilities for this by moving from tailored products to mass customization, but they also have noticed that the change is not easy and wanted to find effective way to implement the new strategy and to minimize the risk of failing.

When developing mass customization strategy, the whole company needs to participate. It needs to be done together and simultaneously. By including company employees to the development work, people are more committed to it. This way, researchers will also have more accurate information faster. Company employees will be more committed also in the future, when plans are turned in to actions. In this project we chose a model developed by Ahoniemi et al [6]. The model suggests the before mentioned “mass customization mountain” that describes the developing functions as hills and at the top of the mountain. What it is possible to provide comprehensive mass customization framework (Fig. 1). The hills are product development, production, supply chain, IT management, customer interface and organization.

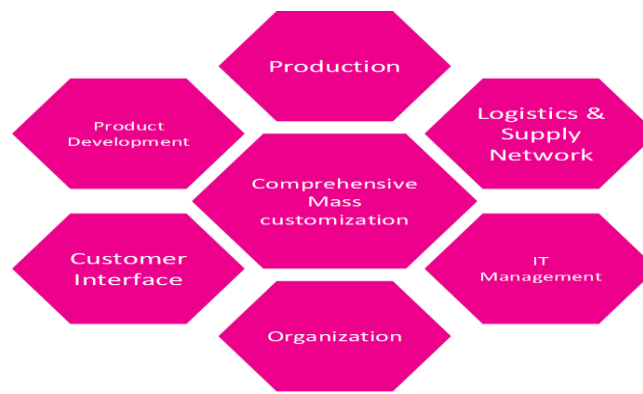


Figure 1. The mountain of mass customization [Modified from Ahoniemi et al. [6]]

It is also essential to understand the differences between mass customized and tailored products, which are discussed in Table 1.

Table 1: A comparison of tailored product and mass customized product

Function/feature	Tailored product	Mass customized product
Product Structure	Integral	Modular, standard
Number of items	Large	Small
Change management	Slow, the change affects the whole product	Fast because of the product structure
Production	Push	Pull
Sourcing	Order controlled	VMI
Average throughput time	Long	Short
Capacity usage in production	Low	Good
Variation rate	Low	High
Change and spare capacity	Weak	Flexible
WIP rotation	Slow	Fast
Value added / costs	Low	Good
Capacity usage in total	Low	Flexible

To be able to introduce a strategic vision and training material of mass customization to the personnel of pilot companies a process model was developed. It was used to implement the principles of mass customization in all functions of pilot companies (Fig 2). The target was to build a training material based on the special needs of different companies. The development work included for example examination of the knowledge level of mass customization of companies personnel. The training material focused especially on challenging problems that were recognized during the examination phase. In order to get these problems out, every point in the analysis was also clarified with practical examples to make the discussion and personal insights easier.

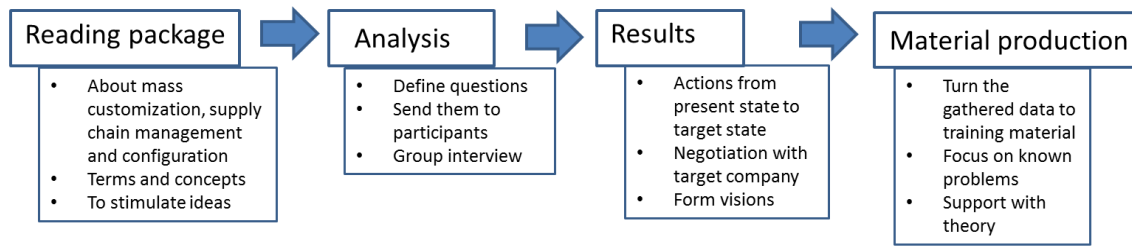


Figure 2. The process model of developing the training material.

The process for developing the framework first starts with an analysis of the mass customization as-is-status in the company. The project at the case companies started with five key functions of mass customization; Production, product development, supply chain, sourcing and logistics, information systems, organization and customer interface. These areas were chosen on the basis of a practical study conducted in Finland with 37 companies [6]. The model was discussed with the company representatives and based on these interviews a need for augmenting the model with services was obvious. Services here refer to product life cycle related services as maintenance, spare parts, etc. In the case companies, the organization area was included in all the other areas because the development of organization from upper level was found difficult and unnecessary. The area in question was responsible of taking care of their organizational development and it was not noticed as an individual part in the analysis and material. Based on the examinations of the knowledge level of mass customization of company personnel the most challenging problems were recognized and taken to be discussed in the training material. After discussing with the company about the to-be-status, actions how to mass customize were derived from the gap between the present state and the target state. This data was then used as a base for the training material content. The mass customization mountain model was decided to use as a main level structure in the material.

In the case companies the standardization and modularization have already been done but not followed enough and it might not have always reached every operation where it should have been taken into notice. Because of this the future decisions made in design might not have the right information about the effects of the previous changes. Design and production can't be sure how standardization and modularization have effected on e.g. quality, rotation of inventories, production and sales. The change management does not cover the evaluation of the effects made in the engineering of the product structures.

Manufacturability and production development are not enough taken into account in the early phase of new product development, which may lead to bad quality and problems in manufacturability, which increases the costs and the lead time to the customer. These were few of the challenges that were recognized during the analysis phase and they were used in the training material as an example how not to do in mass customization. The developed training material included, among others, a video animation that explains how mass customization influences for example product development, material management, sales- and product configuration, production planning, quality management and – the most importantly – to the manufacturing costs and speed to market. Also to support the video animation, a digital learning material was developed for product development, production and supply chain management, product data management and customer relations. Animation was used because people have different ways of learning and when the message is delivered by sound, image and text, everyone will get it more accurately. With this video animation and digital learning material, employees can have good understanding from the whole process and how mass customization affects in it, when it is compared to tailored products. Via produced material, they can also understand how other operations in the process work and what input they expect from others and what output do they give.

IV. CONCLUSION

The research is answering to the need of implementing the framework behind the buzzword of mass customization. Piller answers the question Why is mass customization not there yet? in his paper [3] by referring to lack of understanding. Our paper describes a method that helps the company both to understand what mass customization is and to give directions to implementing a mass customization framework. This paper also describes the creating of training and learning material with involving the companies in the process. Mass customization mountain model was found to work well in visualizing the framework during the development; it helped company employees to have clear vision and road map. Model was found to be general and work well in

manufacturing companies as problems in these different tailored products producing companies in the pilot projects were quite similar.

Agility has been stated to be a business-wide capability that embraces key functions of a company as well as mindsets [10]. Mass customization framework in companies has to be developed in the same way, by taking every key operation of the company as a part of the process so that mindsets will be changed to support mass customization in every action. Radical changes in a company's operations are always done at high risk. Especially small companies need to carefully think whether to change their way of operating. This paper presents a method to clarify the change with relatively low resources. As a part of efficient supply network, the production works with the Lean principles. By eliminating waste, the production becomes more efficient and faster providing customer more value. And by aligning agile principles as well, the production system can get benefits out of mass customization by producing more with the same capacity as being used in producing tailored products, being ready for changes and aligning production quickly with volume changes.

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