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# WILLINGNESS TO ACCEPT THE MARKET VALUE SYSTEM IN THE TRANSITION PERIOD AS CONDITION FOR ESTABLISHING NEW RELATIONSHIPS WITH CUSTOMERS

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**Abstract:** *In the transition period, all society goals are being reevaluated. That implies change of the value system.*

*In this research work, the value system which encapsulates our willingness to adopt market economy, where customers are put in the center of all activities, is being explored.*

*We suspect that there is an important deviation between our value system and the value system in countries with market economy.*

*We used a questionnaire on the population counting 500 people.*

*Results of this questionnaire are compared with the results of the same questionnaire taken in the USA.*

*Research shows the level of willingness of our employees to accept global trends in the area of customer relationships.*

Accepting the system of social values (accepting social responsibility) can be realized in multiple directions, but two are fundamental:

1. Purely economic – guided solely towards financial gain.
2. Socially economic – takes regard not only to profit, but also to social gain (local or global)

Value system that the management accepts motivates both the workers and the company to act according to it.

Learning the differences in adopting the value system is important because the influence of the specifics of our social development (wars, the breakup of Yugoslavia, transition) and the influence of the basic ambient on adopting certain value system can be detected. It is possible to anticipate, partially and conditionally, the way of value system development here, when a higher level of social and economic development is achieved.

## 1. INTRODUCTION

A group of standpoints about basic social values which the manager adopts and is motivated by to make decisions concerning the dealing of the company, is a social responsibility.

## 2. THEORETICAL FUNDAMENTALS OF THE RESEARCH

These fundamentals are actually the discussion and the observation of the way different social milieus influence the adoption of various value systems, and the

difference in interpretation of company social responsibility.

Adoption of various value systems can be studied from a historical perspective (understanding social responsibility has changed noticeably in comparison to the period after the WW2).

### 3. HYPOTHESIS

There is a significant difference in social value systems between our students and the employees in the USA.

### 4. RESEARCH

#### 4.1. Exposé

The poll (questionnaire) was used as a basic and sole instrument for learning about the social value system amongst our students. This is because the poll is very suitable inquiry technique for broad research (the 'general' is analyzed by using a specific number of individual occurrence).

#### 4.2. Instrument

The questionnaire answered by students in the survey process is showed on picture 1.

The task for the students was to arrange the offered social values in a pyramid using their own sense of importance, so that the top of the pyramid (field number 1) contains the most important, and the bottom (field number 18) the least important value.

ZAOKRUŽITI POL muški ženski ANKETA SMER: \_\_\_\_\_

TEMA: OSNOVNE VREDNOSTI

-Pažljivo pročitali osnovne vrednosti koje su nabrojane u anketi i numerisane brojevima od 1 do 18.

-Zatim ih poredali po sopstvenom osećaju važnosti u datu piramidu, tako da na vrhu piramide u polju numerisanim brojem 1 bude najvažnija, a u polju sa brojem 18 najmanje važna.

-Piramida se sastoji od 18 polja raspoređenih u 5 redova, polja su numerisana brojevima od 1 do 18 i predviđena za upis rednih brojeva osnovnih vrednosti, u svako polje može se upisati samo jedna osnovna vrednost.

1. Zadovoljstvo kupca 10. Očuvanje okoline  
2. Etika 11. Raznovrsnost  
3. Odgovornost 12. Stvaranje koristi društvu  
4. Poštovanje prema drugima 13. Poverenje  
5. Otvorene komunikacije 14. Društvena odgovornost  
6. Profitabilnost 15. Bezbednost  
7. Timski rad 16. Prenosjenje vlasti na radnike  
8. Inovacije 17. Zadovoljstvo poslom  
9. Neprekidno učenje 18. Zabaviti se na poslu

REZULTATI OVE ANKETE BIĆE ISKORIŠĆENI U IZARADI SEMINARSKOG RADA  
HVALA NA ULOŽENOM VREMENU !

Picture 1.

#### 4.3. The research results

The following tables with descriptive statistical and correlation values of the given variables, are formed using and comparing the results from a survey taken amongst students at Visoke tehničke škole u Novom Sadu.

The following symbols are being used in the tables:

**I\_god** - 1. year students

**III\_god** - 3. year students

**m\_svi** - all students (male)

**svi** – all polled students

**z\_svi** – all students (female)

**usa** – polled workers from the USA

/ data was taken from the researches taken in the USA source - "AMA Corporate Values Survey, ([www.amanet.org](http://www.amanet.org)), 30. October 2002. /

Table 1. Survey results

	usa	III_god	I_god	svi	m_svi	z_svi
	9,38	23,5	13,5	18,5	22,5	14,5
	9,26	6,5	8	7,25	9	5,5
	7,43	20,5	14	17,2	14	20,5
	7,19	3	8,5	5,25	4	6,5
	6,21	3	4,5	3,75	4	3,5
	5,97	8,5	5	6,25	7	5,5
	5,72	5,5	8,5	6,5	7,5	5,5
	5,72	2,5	0	0,75	1,5	0,5
	5,24	0,5	2	1,25	2,5	0,5
	5,12	0,5	3	4,5	0,5	8,5
	4,99	0,5	0	0,25	0,5	0,5
	4,63	1,5	0	0,25	0,5	0,5
	4,51	6,5	5	5,25	4	7,5
	4,02	1	0	0,75	0	2,5
	4,02	2	10,5	6,25	9,5	3
	3,90	0	0	0	0	0,5
	3,78	13	14,5	13,75	11,5	11
	2,92	1,5	3	2,25	1,5	3,5

#### 4.4. Results processing

The following results were obtained by data processing:

#### Summary Statistics

	I_god	III_god	m_svi
Count	18	18	18
Average	5,55556	5,55556	5,55556
Variance	26,1144	47,4967	36,1732
Standard deviation	5,11022	6,89179	6,01442
Minimum	0,0	0,0	0,0
Maximum	14,5	23,5	22,5
Std. skewness	0,917744	3,03299	2,57417
Std. kurtosis	-0,865212	2,05	2,0687
Sum	100,0	100,0	100,0

	svi	usa	z_svi
Count	18	18	18
Average	5,55278	5,55611	5,55556
Variance	31,906	3,25311	29,3203
Standard deviation	5,64854	1,80364	5,41482
Minimum	0,0	2,92	0,5
Maximum	18,5	9,38	20,5
Std. skewness	2,22207	1,56436	2,5555
Std. kurtosis	0,800495	0,305845	1,99548
Sum	100,00	100,00	100,0

The StatAdvisor

This table shows summary statistics for each of the selected data variables. It includes measures of central tendency, measures of variability, and measures of shape. Of particular interest here are the standardized skewness and standardized kurtosis, which can be used to determine whether the sample comes from a normal distribution.

Values of these statistics outside the range of -2 to +2 indicate significant departures from normality, which would tend to invalidate many of the statistical procedures normally applied to this data. In this case, the following variables show standardized skewness values outside the expected range:

- III\_god
- m\_svi
- svi
- z\_svi

The following variables show standardized kurtosis values outside the expected range:

- III\_god
- m\_svi

	svi	usa	z_svi
I_god	0,9278 ( 18) 0,0000	0,4520 ( 18) 0,0597	0,8119 ( 18) 0,0000
III_god	0,9517 ( 18) 0,0000	0,5846 ( 18) 0,0108	0,8834 ( 18) 0,0000
m_svi	0,9422 ( 18) 0,0000	0,6194 ( 18) 0,0061	0,7657 ( 18) 0,0002
svi		0,5503 ( 18) 0,0180	0,9259 ( 18) 0,0000
usa	0,5503 ( 18) 0,0180		0,4813 ( 18) 0,0432
z_svi	0,9259 ( 18) 0,0000	0,4813 ( 18) 0,0432	

**Correlations**

	I_god	III_god	m_svi
I_god		0,7983 ( 18) 0,0001	0,8889 ( 18) 0,0000
III_god	0,7983 ( 18) 0,0001		0,9174 ( 18) 0,0000
m_svi	0,8889 ( 18) 0,0000	0,9174 ( 18) 0,0000	
svi	0,9278 ( 18) 0,0000	0,9517 ( 18) 0,0000	0,9422 ( 18) 0,0000
usa	0,4520 ( 18) 0,0597	0,5846 ( 18) 0,0108	0,6194 ( 18) 0,0061
z_svi	0,8119 ( 18) 0,0000	0,8834 ( 18) 0,0000	0,7657 ( 18) 0,0002

The StatAdvisor

This table shows Pearson product moment correlations between each pair of variables. These correlation coefficients range between -1 and +1 and measure the strength of the linear relationship between the variables. Also shown in parentheses is the number of pairs of data values used to compute each coefficient. The third number in each location of the table is a P-value which tests the statistical significance of the estimated correlations. P-values below 0.05 indicate statistically significant non-zero correlations at the 95% confidence level.

**5. DISCUSSION**

There is a high correlation coefficient amongst the group of students with equal level of education and upbringing regardless the sex. The correlation coefficient is somewhat lower amongst fresh students and those at the end of their studies. A very low correlation coefficient is obvious between our students and the USA workers, but there I a noticeable correlation coefficient increase after schooling, in other words, the standpoints of the 3. year students are to a certain extent closer to the USA workers standpoints (from 0,4520 to 0,5846 ). Although the convergence to a market approach in business is considerable, it is still not sufficient. There are clearly noticeable differences concerning certain values, such as: consumer satisfaction,

responsibility, (our students give more importance to these fundamental values than the polled USA workers). This standpoint is primarily seen amongst final year students. Fundamental values such as: variability in work, power transferring and trust are greatly more valued by the USA workers. Our students expect much from a job, as seen from a high importance value – workplace satisfaction.

## **6. CONCLUSION**

In transitional period, a change of reasoning is expected amongst the people that used to live under a socialist regime. Education system should provide a great contribution to this. This research shows insufficient and unsuitable influence on accepting fundamental values of market economy amongst students. Also, some aspects of adopting new values are overemphasized, while some of the more important are being overlooked. The general conclusion is that the demands that young people put before themselves are overemphasized. After graduating from high school (or completing the first year, in case of students), the fundamental value system of market economy is not widely accepted, which changes later during the studies. This brings to front the importance of the influence of studies on adopting new values.

This research can be followed by a social value system research of other relevant categories in society, such as employed workers, unemployed workers, workers with different level of education and so on. The research should be repeated after several years so the effects of the transition in time could be seen.

## **7. LITERATURE**

[1] “AMA Corporate Values Surveu, ([www.amanet.org](http://www.amanet.org)), 30. oktobar 2002

[2] S. Robbins, M. Coulter : Menadžment, Beograd 2005

[3] Hrvoje Tadin : “Menadžment-program za rukovoditelje”, I IZDANJE 2003. godine

## **8. CORRESPONDANCE**

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# WHY DO COMPANIES PURSUE MC MANUFACTURING STRATEGY?

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**Abstract:** *Mass customization (MC) is an inviting concept practically for any company. However, there seem to be differences between companies regarding whether MC is seen as a possible and sustainable manufacturing strategy. Various goals for pursuing MC exist.*

*In this paper, interviews from 37 companies are analyzed to shed light on the following research questions: What benefits are reached for when pursuing a MC manufacturing strategy? What are the factors that cause differences between companies in MC utilization?*

*The results show that the main drivers for MC are the ability to shorten delivery times and to improve variety management. The origin of the company (mass vs. custom manufacturing) seems to have an effect on MC implementation.*

**Key Words:** *Mass Customization, Manufacturing Strategy, Variety Management*

## 1. INTRODUCTION

Customer requirements and demand for customized products are increasing constantly. Simultaneously, companies are facing pressure regarding their delivery times and cost efficiency. Thus, mass customization – the ability to produce customized products without sacrificing the speed and cost effectiveness of mass production – is, by definition, an inviting concept practically for any company. Mass customization has become one of the buzzwords of management consultants.

However, as straightforward as the definition of mass customization may appear, the realization of a mass customization manufacturing strategy seems to vary quite a lot. Some consider locate-to-order and customizable product manufacturing as mass-customization. Others require customer involvement in specifying the product configuration, thus the initial point of customer involvement in the production cycle is set after design stage, but before the point of delivery. Mainly, assembly-to-order, or manufacture-to-order are such strategies.

For practitioners, the definition is even more unclear, if that is possible. They do not necessarily know whether their mode of operation should be called mass

customization at all. Some see themselves as pursuing lean production, some may refer to customization in general, while others may speak of configurable production. There are only few who say, 'yes, we are systematically pursuing mass customization and we know it'. The only thing that everyone seems to agree on is that there is not only one single way to mass customize.

The objective of this paper is to understand why different companies mass customize. What are the market trends that they try to tackle with mass customization? To find out what the actual drivers and goals of mass customization are, 37 companies and over 60 individuals, mainly managers, were interviewed. The main research questions are: (1) Why do companies pursue a mass customization manufacturing strategy? (2) What benefits are reached for in pursuing mass customization? (3) What are the factors that cause differences between companies in mass customization utilization? The interviews were conducted, as part of a larger research project, between October 2006 and March 2007.

## 2. MASS CUSTOMIZATION

The term "mass customization" was first introduced in a book "Future Perfect" by Davis [1]. It was defined as a way to manufacture one-of-a-kind products, based on customer specifications, without sacrificing scale economics. Mass customization became more popular in 1993 when Pine published his book "Mass Customization: The New Frontier in Business Competition" [2]. Pine defined mass customization as the ability to design and manufacture customized products at mass production efficiency and speed. Furthermore, he defined mass customization as a process by which companies provide variety and customization through flexibility and quick response. However, Pine did not define that mass customization should be directly linked to manufacturing. The goal was that almost anyone would find exactly what he or she wanted without penalty in price. So, the definition of mass customization remained somewhat unclear. Some scholars include variety management, locate-to-order strategy, customizable [3] and self-customizing [4] products as mass customization.

In this paper we take quite a strict view on mass customization and require customer involvement to take place during the production process. Thus, we hold to the view of “full” mass customization – customers are involved in specifying the product configuration and the “mass” in mass customization is obtained primarily by standardized components and product modularity within standardized processes [5]. This view is quite similar to Customized Standardization as it is defined by Lampel and Mintzberg [6]: the utilization of product modularity and configurability to assemble customized products with standardized design and standardized components. However, in some cases customization affects to manufacturing process and the strategy can be classified as Tailored Customization [6].

Customization and mass customization are often justified because different customers can give different value to the same product [7]. Customers require different features and performance and one size does not anymore fit all. Thus, there are obvious needs for customized products, but what are the advantages a producer can achieve by customizing or mass customizing a product? Customization can be a way to increase market share and it is said to have a positive effect on profit and customer satisfaction [4, 8-10]. Spring and Dalrymple [11] present four different business roles for customized products, which are Entry barrier, Vehicle for learning, Symbol to industry, and Profit-taker. In the first three roles, a product itself may be unprofitable, but other motives justify customization. Only the last role, Profit-taker, expects a product to be profitable and that is achieved (mainly) by the higher price that customers are willing to pay. Moser [12] talks about mass-customization strategies and adds up three more justifications for mass customized products. Moreover, he divides strategies into sustainable mass customization business and support of non-customization business ones. The former include Profit-taker, Vehicle for market entry, and Path to mass producer. However, the last two are actually ways to become profit-takers and thus the sustainability of the strategy can be questioned. For the latter support strategies, Moser adds up one, Vehicle for increasing operational efficiency, which, however, can be seen same as Vehicle for learning, only that the learning is defined in more detail. However, these reasons, roles, or strategies can be applied equally to customization, as well as to mass customization, and thus, they do not justify mass customization.

If customization is done during the production phase it might lengthen delivery time, while quick deliveries can be a winning criterion for customers. This problem is referred to as the “customization-responsiveness squeeze” [13]. Mass customization is presented as one solution to alleviate this squeeze and positive results have reportedly been achieved. For example, Alfnes et al. [14] report that the Norwegian office chair manufacturer, Håg, has shortened its delivery time from 20 to 5 days. Similar results can be achieved by using product configurators, with simultaneous engineering productivity increases [15]. However, a product configurator itself is not the answer; product and process re-design has to also be conducted. In any case, based on

the evidence, mass customization is one way to react to a customization-responsiveness squeeze.

It is said that mass customization and increased product variety may increase cost [4, 16]. However, it is also stated that these do not increase costs or that the increase is not significant [17, 18]. The cost increase is explained, for example, by increased set-up and support costs [19, 20]. The cost savings are, on the other hand, justified by the decrease in finished goods and work-in-process inventory [18]. Similarly there should be savings due to reductions in obsolete and redundant products, because every product is manufactured based on customer order. It is also important to realize that, when the origin of company’s manufacturing is in mass production, it is more likely that there will be a cost increase than is the case with custom manufacturing origin. In any case, regardless of cost effects, mass customization can be profitable because of increased customer value and price.

There are certain barriers in pursuing mass customization and, at the top of the list, are inflexible factories [4], which might, in turn, cause other problems, such as increased manufacturing costs. Information technology was ranked 3rd in a list of barriers. Moreover, Åhlström and Westbrook [4] studied difficulties of customization and ranked understanding customer needs the highest, followed by supply chain management and culture and organizational change. These can be also found in the list of barriers.

Depending on the company’s background, the implementation of mass customization differs. Where mass manufacturers seek increased variety and customer satisfaction, craft manufacturers are more likely to aim for operational efficiency and short delivery times [14]. Similarly, the way in which companies adapt mass customization also varies based on their backgrounds [21]. Craft manufacturers tend to let customers be involved in manufacturing at the earlier stages. Most of these would be either Designers or Involvers. Standard producers tend to have a higher involvement with Modulizers and Assemblers.

### 3. INTERVIEWS

This study is based on semi-structured interviews conducted in 37 companies. The companies represent quite a large variation in size (personnel, turnover), production volume, and industry backgrounds. The aim was to interview at least two relatively similar companies from each industry. In this way, it was possible to define how advanced each company was in mass customization. Moreover, some companies were selected because they were known to be mass customizers. The biggest group, 15 out of 37, consisted of machine construction companies. Most companies (26/37) were brand owners that sell their own products to end customers and 33/37 companies had their own production facilities. The remaining four had outsourced the production and operated like engineering and project management companies. In seven companies, production was purely assembly work and the manufacturing of sub-assemblies was outsourced.

All interviewees were asked to join the research and, after receipt of approval, a questionnaire was sent to an

interviewee. Interviewees were also asked if another person from a different function of the company could join the interview. The aim was to get a broader picture of company's operation. Altogether 63 persons, mainly managers, were interviewed. The largest single group was made up of production people (19) and the other two large groups were engineering (15), and top management (13).

Normally, interviews took about two hours and at least two researchers participated. Even though the same questionnaire was used for every interview, the topics covered in separate interviews varied a lot. This was partly due to the role of the interviewee in the company, and partly because each company utilized mass customization at different levels. With production personnel, we discussed more production-related issues, while with marketing personnel, marketing relates issues etc. With more advanced mass customizers, typically one of the research topics was discussed more closely. These kinds of topics were, for example, modularization, logistics, configurators, and information communications technology (ICT). However, at the beginning of each interview, certain background information was asked in order to establish the history of company, the products, and operation practices. In many cases, there was a factory visit, and production was studied closely. Interviews were bi-directional and, quite often, they were actually dialogues rather than formal interviews. Every interview was recorded, and afterwards, a report was written and sent to interviewees for approval.

#### 4. RESULTS OF THE INTERVIEWS

As part of the interview, companies were asked their views on changes in market and customer behavior. To do this, closed questions were used similar to those in Åhlström and Westbrook's survey from 1999 [4]. The results are shown in Table 1. The samples in both studies were similar, making the comparison relevant, and both studies gave similar results. Customer needs are changing faster than five year ago, demand of non-standard goods is increasing, and companies are planning to increase the degree of customization. Even though the second survey does not support these trends as strongly as the first one, these market trends supporting mass customization are obvious. Only the shorter market lifetime of products is not supported by our survey.

Table 1. *Customer requirements and market conditions*

	Year	2007	1999
Country		FIN	UK
n		32	40
Are customer needs changing faster than five years ago?	Yes	23	39
	No	5	1
Increasing demand on non-standard goods?	Yes	20	34
	No	9	6
Is the market lifetime of your products less than it was five years ago?	Yes	15	29
	No	16	11
Do you plan to increase the degree of customization?	Yes	19	22
	No	9	6

Interviewees were asked how familiar they were with the term "mass customization" and what their attitude

was towards it. Most of the interviewees had heard of the term but its meaning was fuzzy. The following quotations describe attitudes quite well.

"Necessity for our operations"

"Only way for us to operate"

"One buzzword among many"

There were some who were very favorable to mass customization and others who did not see any use or novelty in it at all. For some interviewees mass customization had no meaning, but after it was explained to them, we heard phrases like "That is the way we try to operate". It could be said that mass customization was not well known as an actualized operational strategy, but was recognized as a goal.

Companies were also asked if they had taken action towards mass customization and what the motives were behind these actions (Table 2). The motivation most often mentioned (19) was to shorten delivery time. Typical actions were standardization and modularization. However, these were not sufficient without process and product redesign. Mass customization was also used to help in the management of product variety. Quite often, variety had been increasing to such an extent that the companies could not handle it anymore. The problems associated with high variety were connected with manufacturing and material handling. Companies had to carry slow-moving inventory because some variants (options) were seldom sold. Similarly, seldom sold options caused extra inspections and problems with quality. Furthermore, high variety caused problems with spare parts sales. Products were too much one-of-a-kind, and typically, product data management and customer information systems did not handle the information well enough. Thus, companies had to do extra work to ensure that they sent the correct spare part. Companies tried to manage variety by limiting their offerings and by using modular products.

Companies were also aiming for cost efficiency by standardization and modularization. The aim was to increase volume and thus reduce set-up costs. Similarly, ICT and, especially, product configurators were used to achieve operational efficiency. Other motives for mass customization that were mentioned were production efficiency, controllability of operations, increased customer satisfaction, and improvements in quality. The means were similar in almost every case, and included stable standardized production processes (quite often pull-processes), standardization of components and modules, and efficient use of ICT.

Table 2. *Motivations and means of mass customization*

Goal	N	Means
Shorten delivery and/or through-put time	19	Product re-design, modular products, standardization, use of configurators
Product variety management improvement	11	Modularization, production process re-engineering, product offering simplifying
Cost efficiency/reduction	10	Increased volume by modularization, component standardization, delayed differentiation, efficient use of ICT and configurators,
Production efficiency/flexibility	9	Production process re-engineering, ICT, product re-designing,
Controllability of operations	9	Production process re-engineering, supply chain re-engineering, order management improvement, quality management
Increase customer satisfaction	7	Mass producers: customer orientated focus, configurable products Custom producers: understanding customer value, integrating customer into configuration process
Quality improvement	7	Stable production process, standard components, pre-designed options

If the motivation was to increase customer satisfaction, the means were a bit different. Companies tried to understand true customer value and to change their offerings to fulfill customer requirements. For mass producers, this meant broadening their product lines with modular products. For custom manufacturers, the way was to better integrate the customer into the configuration process.

Companies were asked the reasons that had either triggered the change into mass customization or had restrained the movement (Table 3). Companies had been facing the “customization-responsiveness squeeze” and mass customization was one way to shorten delivery times. Also increased volumes were mentioned, which had required changes in operations. This was often the case with custom manufacturers whose production volume was increased so much that companies had to find effective and systematic ways to manage the material flow. It was said that, with low volumes, material flow was possible to manage even manually. With higher volumes, and especially combined with increased variety, this became impossible.

Table 3. *Pros & cons of moving into mass customization*

Pros	Cons
Fast delivery and low costs	No obvious needs, everything operates fine
Configurable product, customers want influence product features	Customers do not want customized products
Need to rationalize operations – potential has been recognized	No time or resources for significant process re-engineering
Need to manage increased volumes	Too busy because of merging companies → new parts, products, and customers
Client is organizing its production more customer orientated – requires same from sub-contractor	Client (b-to-b) have detailed requirements to the product

In some companies, no reason was seen to move towards mass customization. These companies had not faced any problems with delivery time or operations, and everything ran fine, as they said. Furthermore, customers did not want customized products, or the volumes were so low that mass customization did not provide any advantage. In some companies, the variation point was in the first phase of production and only a few modules could be used. Moreover, if a product had an integrated design and variations were in size, diameter, length, or weight, it was hard to operate as a mass customizer. The aim, in these cases, was to shorten the whole production time to a minimum, and methods like standardization and modularization were used if possible. The advantages of mass customization were recognized, but some companies did not have enough resources, mainly time or personnel, to do the required changes. It could be said that they were too busy running their current operations to be able to improve them.

## 5. CONCLUSIONS

Mass customization, as a term, was not well known within the group investigated. Similarly, what was seen as mass customization varied a lot. In any case, mass customization was linked to assembly and manufacturing, and thus it was in line with “full” mass customization. Modularization and standardization were the most often mentioned means of mass customization. ICT and especially product configurators also had an important role in implementation. One interesting fact was that, even when a company stated that it mass customizes its products, on closer inspection, it was typically found out that it actually only mass customized a small fraction of its production. And vice versa, companies that did not state that they mass customized, actually fulfilled many criteria of mass customization [22].

When discussing market trends, this study supports the findings of Åhlström and Westbrook [4]. Even though there are eight years between these two studies, the market trends still seem to be very similar. Only the shorter market lifetime of products was not supported,

which was a bit of a problematic question because, in some companies, the market lifetime of some products has shortened and simultaneously with other products it has been extended. In quite a few companies, it was noticed that modular products and product families have extended the market lifetimes. Moreover, it is not necessary to focus on product lifetime, but rather focus should be placed on either module or product family lifetimes.

In answer to the first research question, concerning why companies pursue mass customization manufacturing strategy, it can be said that internal problems were often the reason that forced companies to change. The most often mentioned reasons were shorter delivery time, lower costs and the need to rationalize operations. The initiative towards mass customization came almost always from inside the company. Only in four cases was it said that customers had required mass customized products. However, external factors such as increased volumes and demand for shorter delivery times can be seen as causing internal problems. Moreover, quite often the change has been reactive; companies had to face problems or competitive actions before making any moves. At least in one company case, it was realized that a Finnish company could not compete with standard products and low prices. The company had come to the situation where radical actions had to be done, and to survive, had to lay-off workers and redesign all its product and processes. After these long and painful changes, the company is now one of the top performers on its industry. And actually, it is the leading mass customizer in that industry.

The benefits of mass customization can also be seen as answers to the question of why companies pursue mass customization. Shorter delivery time was by far the most often mentioned. Moreover, in closer discussions, it was noted that delivery accuracy also had increased significantly. Other often mentioned benefits were improved product variety management and cost efficiency. Even though mass customization helped with product variety management, companies still had problems. Many companies said that they had to be flexible, but often they were too flexible and they could not say 'no' to certain customers. This caused extra options and the numbers of variants increased. Quite often the only way to limit the number of options was to kill the old product and introduce a new product, in which those options were not available anymore.

Increased customer satisfaction was mentioned in seven companies. Mass manufacturers saw it more often as a benefit, because mass customization was a way to increase variety. For craft manufacturers, it was not so obvious. Mass customization limited possible variations and it was not always clear that a customer's requirements could be fulfilled. However, shorter and more reliable delivery times, which were achieved by mass customization, were mentioned as a benefit, as this increased customer satisfaction.

In response to the third question, concerning the factors that cause differences between companies in mass customization utilization, it can be said that the origin of mass or custom manufacturing affected this significantly. For custom manufacturers, mass customization was a

way to operate systematically and a way to standardize product offerings. In these cases, mass customization typically shortened delivery times and decreased costs, and in this way, mass customization had the potential to improve the competitiveness of a company. When moving into mass customization, it was important that customers' non-standard requirements could still be fulfilled with pre-defined options. It was pointed out on several occasions that this could not always be done and that companies were forced to manufacture specials that required engineering and were manufactured off the normal production line.

However, those companies that had a long history of mass customization had an almost opposite opinion. They pointed out that systematic analysis of customer requirements revealed those product features that were relevant to the customer's value. By focusing design efforts on value-adding features and by systematically removing unnecessary options, companies were able to provide enough customization and yet simultaneously standardize their operations.

Most often, increased customer satisfaction was mentioned as the reason for mass manufacturers to pursue mass customization. The other reason was that the company had faced severe problems and radical changes had become necessary. Typically, companies could not compete with prices and customers no longer wanted to pay a higher price for a standard product. Typically, the change had not been so obvious. Mass manufacturers had increased variety and they had been forced to customize products, which had resulted in smaller batch sizes. The change had been gradual and typically only a small part of production was customized, mainly by advanced manufacturing technology in which the companies had been investing.

However, there are other factors that cause differences in mass customization utilization, such as a product type, a manufacturing technology etc. Furthermore, the transition to mass customization, whether gradual or radical, also varied a lot. More often it was radical with those companies that had a mass manufacturing origin. Furthermore, a radical change was top management driven. For craft manufacturers, the change was most often gradual and middle management driven. Similarly, there were differences in the management of the change. In some cases, it was ordered from the top, while in other companies, employees participated in the change, with training sessions and workshops being organized. However, this study cannot answer which way predicts better results.

Comparing the barriers of mass customization to a previous study by Åhlström and Westbrook [4], the results from this study were quite different. Inflexible factories (or manufacturing processes) were seen as a barrier only in a few cases. Similarly, high product cost was not seen as a problem. Even more surprising was the fact that information technology, which was seen previously as a barrier, is nowadays seen as an enabler of mass customization within Finnish companies. There are many reasons that can explain these differences. The most important might be the fact that most companies (27) in this study had a custom manufacturing origin. Thus, they were used to customizing, and mass

customization limited their options and brought them a systematic way to operate. The change in role of ICT can be explained by the fact that ICT has improved over the years and every company has learned to use it.

The fact that custom manufacturers are dominating the sample has an effect on the results. However, the sample, in this sense, is similar to the Finnish industry. In Finland, there are only a few machine construction companies that have high production volumes. The results cannot be generalized, however, as they shed a little light on the case of relatively low volume manufacturing companies. The short delivery time was mentioned most often, but whether that is a sustainable reason or merely a result of high economic activity is not clear, as practically every company had problems with delivery accuracy. However, the short delivery time is in line with previous studies and confirms those findings [13-15].

As in every study, many questions remain unanswered and further research is needed. One interesting thing to investigate would be to determine if mass customization is sustainable manufacturing strategy or just one more fad and that, after a while, the means of mass customization will be renamed to something else. Also it would be rewarding to study more closely those custom manufacturers that have changed to mass customization - have they used previous pull production process, JIT, lean management etc. and how have these affected the change?

## 6. REFERENCES

- [1] Davis, S., *Future Perfect*. 1987: Addison-Wesley.
- [2] Pine, B.J.I., *Mass customization: the new frontier in business competition*. 1993, Boston: Harvard Business School Press. 333.
- [3] Logman, M., *Marketing mix customization and customizability*. *Business Horizons*, 1997. 40(6): p. 39-44.
- [4] Åhlström, P. and R. Westbrook, *Implications of mass customization for operations management*. *International Journal of Operations & Production Management*, 1999. 19(3): p. 262-274.
- [5] Duray, R., et al., *Approaches to mass customization: configurations and empirical validation*. *Journal of Operations Management*, 2000. 18(6): p. 605-625.
- [6] Lampel, J. and H. Mintzberg, *Customizing Customization*. *Sloan Management Review*, 1996. 38(1): p. 21-30.
- [7] Bolton, R.N. and M.B. Myers, *Price-Based Global Market Segmentation for Services*. *Journal of Marketing*, 2003. 67(3): p. 108-128.
- [8] Sriram, V. and H.J. Sapienza, *An empirical investigation of the role of marketing for small exporters*. *Journal of Small Business Management*, 1991. 29(4): p. 33-43.
- [9] Simon, H. and R.J. Dolan, *Price customization*. *Marketing Management*, 1998. 7(3): p. 11-17.
- [10] Fitzgerald, B., *Mass Customization - at a Profit*. *World Class Design to Manufacture*, 1995. 2(1): p. 43-46.
- [11] Spring, M. and J.F. Dalrymple, *Product customisation and manufacturing strategy*. *International Journal of Operations & Production Management*, 2000. 20(4): p. 441-467.
- [12] Moser, K., *Mass Customization Strategies: Development of a competence-based framework for identifying different mass customization strategies*. 2007, Technische Universitaet München: München. p. 293.
- [13] McCutcheon, D.M. and A.S. Raturi, *The customization-responsiveness squeeze*. *Sloan Management Review*, 1994. 35(2): p. 89-99.
- [14] Alfnes, E., L. Skjelstad, and J.O. Strandhagen, *How to implement the mass customisation strategy: guidelines for manufacturing companies*. in *The 2007 World conference of mass customization and personalisation*. 2007. MIT Cambridge, USA.
- [15] Forza, C. and F. Salvador, *Managing for variety in the order acquisition and fulfilment process: The contribution of product configuration systems*. *International Journal of Production Economics*, 2002. 76(1): p. 87-98.
- [16] Hayes, R.H. and S.C. Wheelwright, *Link manufacturing process and product life cycles*. *Harvard Business Review*, 1979. 57(1): p. 133-140.
- [17] Kekre, S. and K. Srinivasan, *Broader product line: a necessity to achieve success?* *Management Science*, 1990. 36(10): p. 1216-1231.
- [18] Kotha, S., *Mass customization: Implementing the emerging paradigm for competitive advantage*. *Strategic Management Journal*, 1995. 16(5): p. 21-42.
- [19] Yeh, K.-H. and C.-H. Chu, *Adaptive strategies for coping with product variety decisions*. *International Journal of Operations & Production Management*, 1991. 11(8): p. 35-47.
- [20] Mughal, H. and R. Osborne, *Designing for profit*. *World Class Design for Manufacture*, 1995. 2(5): p. 16-26.
- [21] Duray, R., *Mass customization origins: mass or custom manufacturing?* *International Journal of Operations & Production Management*, 2002. 22(3): p. 314-328.
- [22] Blecker, T. and N. Abdelkafi, *Complexity and variety in mass customization systems: analysis and recommendations*. *Management Decision*, 2006. 44(7): p. 908-929.

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