

Customisation through Technology in small to medium furniture enterprises

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Abstract

The needs of the people are no longer homogenous but are constantly changing at a rapid rate. These changes must be met with a high level of customisation. Customisation is enhanced with advancements in flexible technology. This paper will focus on small to medium enterprises (SME's) and seeks to establish how the principles of mass customisation and investment in technology are related to the capability of a company to produce customised products. Using three cases in furniture industry, the research evaluated the extent to which technology advancement has been employed in the furniture industry SME sector, its requirement and the effect on customisation. It was established that Advanced Technological and customisation strategies play an important role in achieving customer satisfaction. Technology use can have a dramatic effect on the productivity of a company in a competitive environment.

Keywords

Customisation, small to medium enterprises, Advanced technology, furniture

1. Introduction

In a literature by (Ahmad et al, 2010) MC has emerged as a new standard in response to the increase demand for customised products at a low cost or a cost equivalent to that of a mass produced product. Nowadays the marketplace has realised an increased demand of personalised goods says (Helms M, *et l*, 1997). this phenomenon is apparent in the house hold electrical products we used, they come with great variety. The phones people carry around, come with different colours, personalised apps. People are always looking for ways of personalising their personal belongings. Gone are the days where cars would come in one colour and one type of model (Ahmad et al, 2010). Or the days when household gadgets were produced in one colour, white colour.

The change in the markets demand has a directly and indirectly impacted on the manufacturing strategies for many firms . This new phenomenon can only be addresses with mass with customisation or co-design. Mass customisation is described as a process of building or making a produce according to a customer’s specification (Probst 2013). Mass Customisation uses the principles of modular components in the aim of achieve economies of scope (Pine 1999). A permutation of different parts result in a variety of products. It is also said that MC is the process of meeting individual customer demands with near mass production (MP) costs (Moser 2007). Mass production is aimed at producing enormous volumes of homogenous products (Pine 1999). (Probst 2013) does not see the difference between mass production and mass customisation. The two approaches however differs in that mass production is purely based on the manufacture or production of item that use a dictated design, that is to say that the design is based on an assumption or prediction of what the customer might want, there is no co-designing, customers have no input in the final design (Pine 1999). Whereas in a mass customisation approach, the customer dictates or specifies specifically what they want, using flexible manufacturing the response is enhanced.

Mass customisation can be considered in three ways depending on the customer order penetration point (Qiao *et al* 2006). The first strategy they refer to is when a standardised module is used, customers can select modules on the website, these are products that have standardised functions, features, geometries, and installation procedures (Qiao *et al* 2006). The second strategy is of a “configured product”. In a configured approach , the products come in a constituted form and the customers is left to pick and choose only from a range of product already made (Qiao *et al* 2006). Lastly the literature refers to a “parameterised product strategy”: “Parameterised products possess is made up of a series of attributes or parameters which allow customers to change the actual design of the product” (Qiao *et al* 2006).

The success of a mass customisation in a focal firm depend on the information input from the external environment especially the customers. The external being the suggestions given by the customers, location and the internal being the absorptive capacity of the firm, prior knowledge and skills of the employees. Information is transferred to the firm by the use of information technology.

2. Methodology

The study was conducted using a qualitative approach. Data was collected using a questionnaire, all questions where open ended. By using a questionnaire one is able to get some consistence when interviewing the different candidates. The use of a questionnaire also assists when one has to do a comparison of the information collected.

The literature was used to get an understanding of what the topic is about and what other research has taken place regarding the topic. The topic mainly; Mass Customisation. The focus of the literature review was to gain an understanding to what Mass Customisation is all about, with regards to its principles. Within then review one looked at the current status of SMME’s with regard to mass customisation. This was done by using articles, journals and other media materials.

Appointments were made with the owners of the companies and face to face interviews were conducted with the mangers of production, CEO and production planners. The data form the interviews was compiled and was used to derive the research conclusions with comparison to the literature. The aim of the comparison is to find the relationship between the different approaches that are followed by mass customising manufactures. Once the

comparison has been completed an interpreted the information of the data will be conducted as well as a conclusion drawn up. Thereafter suggestions to what future studies will be done with regard to the field of study.

In order to get the best and credible results for the interview boundaries have to be set. These boundaries can be referred to as criteria's. Inclusions criteria's and exclusions criteria's. Criteria's will be applicable to the people that are going to be interviewed. The criteria's were as follows:

Inclusion criteria for people being interviewed

- Person being interviewed must be of a managerial position or equivalent (if there is no such a person available then a team leader someone familiar with the entity will be used)
- Person must understand the company as a whole(strategically and other wise)

Exclusion criteria for people being interviewed

- Employee that are not willing to participate
- Person not recently employed or employed at all by the company
- People how are not at a management level or equivalent.

Time frame for the interview was short participant ,the estimated time frame to conduct an interview was ranged to be approximately ten to fifteen minutes. The time frame was put in place for the following reasons: The first reason to avoid overwhelming the interviewee to an extent where they might compromise their responses. The second reason is that some interviewees had obligations that they had to attend.

The companies are located within the Johannesburg city. The interviews were conducted over a period of two weeks. The research solely focused on small to medium enterprise.

3. Methodology

Out of the ten companies that were targeted for this study, only three companies accepted the appointment. Many of the companies were reluctant to allow us in their premises to carry out interviews. The names of the companies are

Table 1. Summary of questionnaire for Case A

<i>Field</i>	<i>Comments</i>
Demographics at floor level	The average age is 45 years.
Skills level	All the employees are below metric level. They have no formal training.
Mass customisation capabilities	Capable of producing products at a low cost and producing large volumes with ease.
Use of technology	They don't have any advance technology. They use basic wood work, hand tools such as a band saw, table saw and planner.
Manufacturing process	There manufacturing process is not dedicated, jobbing environment.
Observations	More of a jobbing environment.

not provided to protect the company’s confidentiality, they are called Case “A” Case ‘B” and Case “C”. Below is a short overview of the companies as well as some of the results obtained from the interview:

Case A

The company in Case “A” is a small furniture manufacturing company that makes their products from recycled wood. The business is located about 10 km outside the Johannesburg Central Business District. The company makes basic house hold furniture such as chairs, tables, cupboard, and benches. From time to time they take the request of making a customised piece. The company is made up of the owner and five employees. The owner of the company is a male in his late fifties. The employees are all working at floor level and the owner is responsible for all the administration activities. In terms of skill most of the employees have a single skill, which is related to wood work. The owner of the business is the decision maker. The table below is a summary of the data collected for Case A.

Case A is that the company does not use any form of modularisation in the manufacturing process of their products. However their products follow a basic design framework that is slightly changed according to the customer’s specifications. The process rely on the skills of its employees. Customers are limited to one type of material, which is wood. Product quality is low. There is no evidence of the use of technology.

Case B

Company “B” is also a furniture manufacturing company makes office chairs. The company is based in an industrial area 5km from the Central business District in Johannesburg. They make different kinds of chairs all kinds of office needs and requirements. The company manufactures office furniture. The labour force of the company is made up of more than thirty employees. However, only twenty two of these employees work in production. The rest of the employees work in administration.

At floor level activities are divided into departments where specific tasks are done. The company uses a plat system when assembling their chairs. Parts are ordered form suppliers and then delivered to the plant. The majority of the parts where sourced from the external suppliers only few parts were made in-house.

Table 2. Summary of questionnaire for Company B

<i>Field</i>	<i>Comments</i>
Demographics at floor level	The age group is dominate by the ages of 36 and above.
Skills level	Nearly all workers have metric but production workers have no formal training.
Mass customisation capabilities	Capable of producing products at a low cost and producing large volumes with ease.
Use of technology	They don’t have any advance technology in house as they outsource most of their parts and assembly is done in-house. This company have a website where they show case their products, but the website is not interactive.
Manufacturing process	The manufacturing system is fixed and not flexible.
Observations	The company is well structured in that they follow a set process when making products. The company is more than capable of producing products at a mass scale.

Findings with regard to Case B, the company has a catalogue of modules that customers can select. The customer can select form a range of design, fabrics, select type of legs that a chair would have even the type of wheels. The company is only producing chairs.

Case C

Company “C” is small company that is located within the Johannesburg Central Business District. The business makes all kinds of furniture, ornaments and other house hold items. However their main focus is on making products out of sheet metal and wood. The company is partnership, two owners and five employees. The owners of the company are middle aged male and female in their late thirties, they both have, they have formal education in the field of design.

Table 3, Summary of questionnaire

<i>Field</i>	<i>Comments</i>
Demographics at floor level	The age group is dominate by the ages of 36 and above.
Skills level	Workers are multi skilled with formal education
Mass customisation capabilities	Capable of producing products at a low cost and producing large volumes with ease.
Use of technology	They don't have any advance technology in house as they outsource most of their parts and assembly is done in-house. They have an interactive website, customers can choose the colour and modules.
Manufacturing process	Depends on the product design.
Observations	The company is well structured in that they follow a set process when making products. The company is more than capable of producing products at a mass scale.

All the employees at company C where multi skilled. The company produced unfinished furniture and modules to individuals and companies who will then customise the furniture to their environment e.g. naked furniture which can painted by the customer. They also used the internet to show case some of their work.

4. Conclusion and Recommendations

Case A is still in the craft industry era they have not evolved to embrace technology. Workers in Case have a low level of education which limits the level of innovation. Innovation requires prior knowledge. Case C workers have formal education. The level of education gives them an advantage, they have a high level of absorptive capacity, and they have embraced technology which is the main element of mass customisation. Customers are able to customise their products through the use of information technology and modularisation. Producing unfinished furniture allows customers to customise and also resale their furniture after adding value. Managers of SME Companies must possess some prior knowledge to enhance their innovativeness. The other observation made is that companies that have older employees worker at shop floor level as well as management level tend to be less innovative. In conclusion for SMEs to be successful in Mass customisation process they need to consider their ability to give a customer a wide options, this can be done by using modular designs and allowing the customer to mix and match the different units. The other way that they can achieve the ability to mass customise is by having a wide range of material, finish and using quality outsourced assembling parts. A survey can be used to generalise the results obtained in this study.

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Biographies

Partson Dube is currently a lecturer in the Department of Industrial Engineering at the University of Johannesburg. Mr. Dube holds a Bachelor of Engineering degree in Industrial Engineering from the National University of Science and Technology (Zimbabwe) and a Master of Engineering in Industrial Engineering. He has taught courses in production engineering, operations research, information systems and project engineering. Mr. Dube served is a member of the South African Institute of Industrial Engineering.

Charles Mbohwa is an Associate Professor, and Director of Master of Engineering in Manufacturing Systems and Master of Science in Industrial Engineering in the A. Professor Charles Mbohwa is a Professor in the Faculty of Engineering and the Built Environment. He is currently Acting Executive Dean, Faculty of Engineering and the Built Environment at the University of Johannesburg and is an established researcher and professor in the field of sustainability engineering and energy. Upon graduating with his BSc Honours in Mechanical Engineering from the University of Zimbabwe in 1986, he was employed as a mechanical engineer by the National Railways of Zimbabwe. He holds a Masters in Operations Management and Manufacturing Systems from University of Nottingham and completed his doctoral studies at Tokyo Metropolitan Institute of Technology in Japan. He was a Fulbright Scholar visiting the Supply Chain and Logistics Institute at the School of Industrial and Systems Engineering, Georgia Institute of Technology, a Japan Foundation Fellow, is a Fellow of the Zimbabwean Institution of Engineers and is a registered mechanical engineer with the Engineering Council of Zimbabwe. He has also visited many countries on research and training engagements including the United Kingdom, Japan, German, France, the USA, Brazil, Sweden, Ghana, Nigeria, Kenya, Tanzania, Malawi, Mauritius, Austria, the Netherlands, Uganda, Namibia and Australia. He has had several awards including British Council Scholarship, Japanese Foundation Fellowship, Kubota Foundation Fellowship; Fulbright Fellowship. His research activities and interests are in sustainability engineering and Operations/Engineering Management.