

# Mass Customization in Motorola (Case Study)

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**Abstract**—Motorola is a highly reputed, well established company having large customer segment and wide variety of products. Mass Customization in it, was introduced to fulfill the customer requirements, market demand and high market value. To attain mass customization different technological shift was done including the improvement in simulation which is a field of soft computing. Thus, this study shows that soft computing proves to be an effective way to attain customer satisfaction. The whole scenario is based on big data i.e. customization was done using big data techniques.

**Index Terms**— Mass Customization, Big data, Motorola, Customer Satisfaction

## I. INTRODUCTION

Motorola is a US based company with around \$22 billion of revenues in 1994. In earlier times i.e. in 1994, Motorola is not only known for cellular phones but also for personal computers, semiconductor products and pagers. Table 4.2 shows the revenue share of the products within Motorola:

**Table 4.2:** Revenue share of different products of Motorola

Product	Revenue share
Pagers and two-way radios	24%
Semiconductor products	28%
Cellular phones and personal computers	35%
Automotive systems & sensors and Iridium	13%

To support this huge business, Motorola employs around 140,000 employees located across the world. It has nearly 90 factories located all over the globe. Six Sigma Quality and Total Customer Satisfaction are the major corporate initiative in Motorola.

The recent developments of the modern technological world that have profoundly influenced the way business is conducted. They are:

- (1) Mass Customization
- (2) Big Data

Mass Customization is a system that uses information technology, flexible process and organizational structure to deliver a wide range of products and services that meet specific need of individual customer at a cost near that mass produced products and services' (M. Kay, 1993).

The term "Big Data" describes the extraction of implicitly available, non-trivial and useful knowledge from large, dynamic databases with relatively complex structures. In here, an attempt is made to fuse the two and to evolve a technique that provides a convenient means of extracting customized products, using the soft computing.

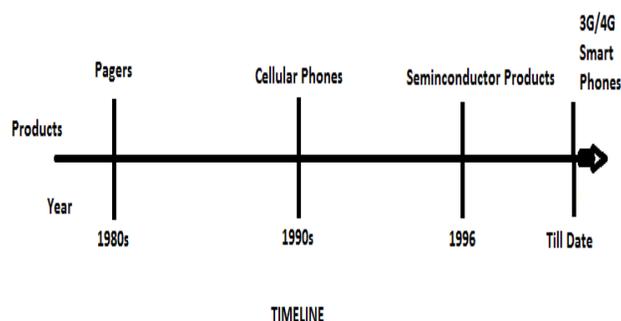
In the present time, Mass Customization can be seen majorly in every aspect of daily life as there are almost infinite possibilities for customers to customize their preferences in a product. A well-known example is mobile phones, where customers have countless options to choose, within the available range, according to their own individual needs and requirements. Customers can choose a car according to their own requirements. A customer can choose the color of every single section on their Nike sneakers and have their initials printed on it, etc. Such personalized options are now available on several products as well as services in the market.

Web based applications have entirely changed the business scenario, also changed the business functions in competitive market. The power of internet technologies has reduced the complexity in the interface process between customers and retailers; retailers and distributors; distributors and factories; factories and their suppliers. It has enabled the online transaction and also made it imperative to generate large scale real time data. With this big data including the product and all its information, data pertaining to various business transactions and customer requirement database, it is only big data that can make sense out of these big data.

## II. MASS CUSTOMIZATION IN MOTOROLA

Motorola has long history of tailoring the products as per the market needs. Luckily, it got an early start in developing capability to meet the demand. As, demand for variety has continued to increase in future. The difference in Mass Customization and early tailoring is that now customization is individualized i.e. production is done on a lot size of one.

Customers are demanding for their favorite color pager. They want their cellular phones to match their car interior. They want their semiconductor to be optimized for a specific product they are designing. This is same for all other products of Motorola. Due to these demands Motorola shifted to Mass Customization. Thus, the major issue to implement Mass Customization from beginning are: (1) Time, and (2) Cost. At different point of time Mass Customization evolved in different products at Motorola. Figure 4.1 shows this evolution.



**Figure 4.1:** Evolution Mass Customization in Motorola

### III. BANDIT PAGER

It was the maiden entry of Motorola in Mass Customization. They combined internal and external options to obtain over 20 million different product combinations. The goal was to build them in a lot size of one as per the customer order.

The major issue Motorola faced was time. Cost was overcome by the low labor rates outside US and building subassemblies in several sites like one in Singapore. The issue of time arose as it was impossible to develop subassemblies in one lot size with unique combination that too half way across the world.

The solution of this time issue was to consolidate manufacturing into one location. So, Motorola moved all manufacturing to Florida and used very high levels of automation (robots) and technology (Computer Integrated Manufacturing (CIM)). To do so, Line balancing was very important, since robots need major capital investment that had to be fully utilized. Also, preventive maintenance was the priority to avoid loss of entire production capacity during machine downtime. Factory line simulation was used for this planning.

Results were spectacular, Motorola took market leadership as the customers loved the customized products. It also resulted in reduced inventory levels, cycle time, and production defects. Motorola was convinced that Mass Customization was a good approach.

### IV. CELLULAR TELEPHONES

Cellular Telephones were relatively standard products as compared to pagers. Besides the variations in exterior and interior of the phones itself, Motorola offered hundreds of different accessories like carrying cases, batteries, etc. Motorola already has experience of pagers. So, they call automation, CIM and modeling for assistance to achieve Mass Customization. They were applied in telephones too with some improvements.

In CIM, improvements were made only in software toolkits as it was not needed to write all codes again from scratch. The software function remained same. In modeling, Motorola

included the concept of supply chain to overcome the problems of high raw material inventory and high cost. Also, Motorola included the concept of safety stock to overcome the uncertainties in logistics and distribution like breakdown of vehicle. With less safety stock, Motorola needed to be more careful in scheduling orders for customers. So, they added factory scheduling in modeling.

In automation, cylindrical robots were replaced with Cartesian and some gantry robots. Because, Motorola needed to be able to produce robots that were smaller, faster, cheaper and can be put into production quickly. Soon Motorola realized that they need separate and unique robots for unique variety. So, they achieved Mass Customization of robots themselves by developing standard platforms that creates standard product quickly and in large quantity. After that these products were finished with correct hardware and software for each application.

### V. SEMICONDUCTORS

Semiconductors are appearing in more and more products – everything from automobiles to air conditioners and microwave ovens. The variations are in both device and packaging. Customers want their semiconductor package to be as small as the products are getting smaller and compact.

Here also, automation and CIM were introduced and proved to be successful techniques in Motorola for Mass Customization.

### VI. CONCLUSION

The above case study shows that Mass Customization increases customer satisfaction with their products.

Important technologies which made Mass Customization possible are:

- Automation
- Computer Integrated Manufacturing (CIM), and
- Simulation Modeling

Also, it is clear from the study that Motorola adopted both cosmetic as well as adaptive approach of Mass Customization.

### VII. REFERENCES

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