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TRANSFORMATION FROM MASS PRODUCTION TO MASS CUSTOMIZATION IN SCM: OBSTACLES AND ADVANTAGES

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Abstract: *This paper investigates the application of mass customization in supply chain management. Throughout research of the current literature and findings authors have discovered interesting keymarks that are related to obstacles and advantages while organization is trying to transform from mass production to mass customization. Significant aforementioned findings are gleaned, expounded nad compared with a current study in the field. Results are far from panaceas but its a next step to cope with obstacles and develop advantages of MC in supply chain management.*

Key Words: ***SCM, mass customization, logistic, risk, processes, literature review***

1. INTRODUCTION

In supply chain management customer is the most significant component and mass customization (hereon reffered to as MC) is mostly related to customers due to its capability to deliver highly customized services and products in the high vicinity of customer's desires. Facing the buyers' market, many industries are now shifting from mass production to continuous improvement and to mass customization[1]. The traditional mass production company is bureaucratic and hierarchical. Under close supervision, workers repeat narrowly defined, repetitious tasks. Result: low-cost, standard goods and services[2].

In order to shift to mass customization from mass production paradigm author proposes that its not capable of doing so if beforehand in organization havent existed some type of quality practice or manufacturing strategy such as lean manufacturing. Firms must first focus on their process and tasks to be standardized and easy to deal with. Later it can be easier to cope with the obstacles one at the time. After standardization step comes flexibility which is driving wheel for agility. Agility is very important in organization while trying to implement mass customization philosophy because it corresponds to quality rate and response time to customer demands.

In MC paradigm it is crucial to provide individually designed products and services to customers through process agility, flexibility and integration.

Supply chain involves main processes starting from supplying material and ending with product delivery. The processes in supply chain are divided into two categories depending on whether they are executed in response to a customer order or in anticipation of customer orders. While Pull processes are initiated by customer order, Push processes are initiated and performed in anticipation of customer order[3]. Push processes can be reffered to as mass production or even in MC while predicting customer desires. Push process is used in MC while trying to forecast customer demands in order to facilitate costs while using a postponement strategy. Postponement is very important and it cannot be left out if organization wants to grab the economies of scale in MC. This cannot be accomplished without product modularity.

Modularity serves the purpose of enabling parts of a product to be combined using, for example assembly-to-order approach (ATO) to provide high variety or assembly of a same or different product. This also can be a good thing in supply chain, cause it later can be used to delay point of differentiation which shortens delivery time to customer. Core modules are usually made at a fabrication stage which later in supply chain can be modified in distribution centres, warehouses and even depots. Perfect example for this is personal computer industries.

In any case, MC is seen as a systemic idea involving all aspects of product sale, development, production, and delivery, full-circle from the customer option up to receiving the finished product[4].

The justification for the development of MC systems is based on three main ideas. First, new flexible manufacturing and information technologies enable production systems to deliver higher variety at lower cost. Second, there is an increasing demand for product variety and customization. Finally, the shortening of product life cycles and expanding industrial competition has led to the breakdown of many mass industries, increasing the need for production strategies focused on individual customers[2].

2. SUPPLY CHAIN MANAGEMENT IN MC

Supply chain management practices are important MC enablers. For example, Huang et. al.[5] found that both internal and external learning from supply chains contribute to MC capability development and that their effects are mediated by effective process implementation.

In mature markets, firms face stiff competittion and demanding customers. The implementation of mass production, which is based on a forecast driven strategy, leads to overstocking, extra marketing expenses and low profitability[6] which corresponds to higher lead time, and lower customer satisfaction.

Hence, many manufacturers adopt mass customization but few of them realize that "it is supply chains that compete not companies"[7]. Surely company has a great impact on creating a customer trusted brand but it cannot be done without proper supply chain. Hence, transforming firm from producer to customizer is also affecting on firm, partners, distribution centers and warehouses, even depots. Many have failed cause of the inability to free themself from mass production paradigm[8].

Some may say[9] that obstacles to transform from mass production to mass customization are: demand uncertanty, the flexibility of equipment, order fullfillment process, information system and supply chain. Hence, many have realized that supply chain also plays a critical role while transforming from mass production to MC.

In order to transform organization from mass producer to mass customizer it needs to be capable of accepting two main characteristics to achieve mass customization level of expertise. And even so, some have failed to sustain in MC environment, like, for example Toyota. Toyota's pioneer effort to transform to mass customizer run into trouble and has had to retreat, at least temporarily, from its goal of becoming mass customizer[10]. The first stage is that organization accept, implement and sustain lean approach in manufacturing system which origins can be traced in TPS (Toyota Production System)[11]. The main goal should be eliminating waste. The second stage should be transforming lean environment into more agile environment. On contrary to lean approach agile is considered more market flexible. This means that organization must be capable of rapidly changing its processes and tasks in order to quickly respond to customer demands. This must accompany lean approach since lean has difficulties in the late stages of SCM such as stocking/sales. The fact that throughput time of a product is 12 hours or less, inventory level can still be as high as two months of sales nevertheless everything seems to be working as "lean" as it possible get. While leanness may be an element of agility in certain circumstances, itself cannot enable organization to meet precise customer demands[12].

Hence, lean paradigm should be considered when company is focused on eliminating waste therefore lowering costs, and on the other hand agility should be considered when company is focused on increasing customer satisfaction.

In order to achieve quick delivery of customizated products marketing and operations must work together[13]. This doesnt mean only company itself but the whole supply chain while trying to accomplish quick delivery. Both functional areas of business must transform to more agile approach in order to produce customer services and go beyond customer satisfaction.

Feitzinger[14] also highlights that positioning of inventory, location, number structure of manufacturing and distribution facilites should be designed to provide two capabilites. First, it must be capable to supply basic products to facilites performing customization in cost-effective manner and second, it must have the flexibility to respond individual orders and deliver goods quickly.

Determining the optimum number and location of factories could be done through process integration. By integration it is meant collaborative working between buyers and suppliers, join product development, common systems and shared information[12].

One can conclude that by integration factories could mitigate risk in such challenging environment. It can be done by utilizing postponement. This enables firm first to produce generic module based on aggregate customer demands which later can be customized based on the specific cusomter demands in supply chain. Since forming the co-operation between factories, they are now focusing on their core compentences while outsourcing all other activities, which means that companies no longer compete as themselves but as a supply chain.

It requires balancing factors such as transportation time, stock outs, obsolescence, market value, response time, etc. It can be split into centralized and decentralized networks. First, usually with lower costs but second provides better customer service. Therefore, it is not easy to decide between each other. As said before marketing and operations really need to boost up their efforts to make appropriate decisions in order to grab the market niche.

3. DISCUSSION

Beforehand said it is obvious that work force, suppliers, partners and customers have a great impact on mass customization paradigm. Workers can help a manufacturer to come up with new ideas with process and product features, customers can provide knowledge about unfulfilled demands, product features and functions while suppliers can provide knowledge about market trends, which help a manufacturer to come up with new product and process ideas and thereby help to define a solution space.

Therefore, MC’s success depends on knowledge from customers, suppliers, and internal sources. Notice that internal sources is closely related to continues improvement characteristics or lean, while suppliers and customers could be used to transform to more agile organizational environment whilst maintaining some degree of standardization in processes.

The involvement of suppliers in design and production allows a manufacturer to pass the customer’s voice to its suppliers and hence increases the entire supply chain’s flexibility in response to the customer changing needs[15]. Others [16] disagree with the claim since knowledge sourced from suppliers cannot provide manufacturer with the information how to customize and configure product with current solution space. Authors of this research agree that involvement of suppliers in design of a product plays a significant role since it affects flexibilty and therefore shortening product lead time and service delivery. Ahlstrom & Westbrook[17] came up with significant findings through a survey of 40

companies[1]. Positive outcomes experienced from product customization were: increased customer satisfaction and increased market share, while negative outcomes were: material and manufacturing costs. One of the reason that this occured is that processes in that companies havent evolved into full customized company. It would be interesting to do the research related to the same topic in the present era since the information technology have evolved exponentially in the last ten years. Interesting fact is that beside those positive and negative outcomes questionnaire was also conducted related to difficulties in implementing mass customization where at the top was supply chain management. This indicate that there are opportunities for customization in late stages of logistic chain – distribution. This mode of customization is so called "adaptive customization"[18]. The point of customization or so called "decoupling point" is the point where the forecasting ends and satisfying customer demands starts. An example where the point of customer involvement starts can practicly be seen in figure 1.

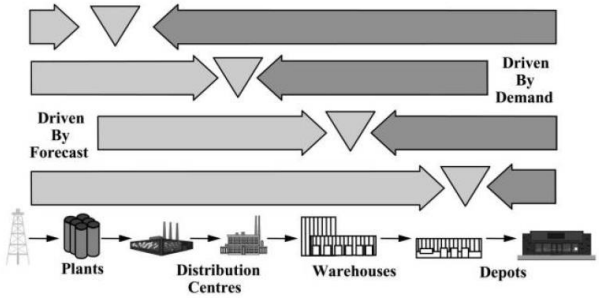

Figure 1. Material flow decoupling points and strategic inventory[19]

By [12] it is considered that challenge to supply chain management is to succesfully engineer the decoupling point. The more accurate it will easily be for a firm to achieve volume-oriented economies of scale through product standardization.

It can be seen that agility in supply chain can play significant role if the market winner is service level, while lean supply is better suited if market winner is cost[20]. Lean tools can be used effectively to eliminate waste while looking at "long run", but it cannot be used effectively in turbulent and flexibile market demands where agility requires resolving customer demands in short and uncertain planning horizons with highly customized product variants[21]. This resulted coining a new term called leagile philosophy[21].

Famous example usually used while explaining a good practice in mass customization environment using a postponement strategy is obviously PC industry. In the era since the 2000's market winner was lead time[22].

To become market winner and succesfully develop short lead times organizations must develop agility first. To accomplish that it must be initiated by building on leanness. Another thing worth mentioning is that agility requires control of all processes in the supply chain which is really hard if not impossible to achieve. Therefore, organization must go through stages of lean philosophy so it can easily overcome the difficulties in later agile market. While transforming it must be focused on process enhancement[23].

Another approach which should be taken into account is separating demands into basic and urgent. This can help organization to better focus while parsing leanness from agility. Leanness and agility correspond to basic and urgent demands, respectively. It can be a good metric required for management system and manufacturing practice. However, one must remember that lean approach is better in steady environment while agile approach is better in uncertain environment. Naylor[21] even points out that leanness and agility are mutually exclusive and cannot be applied in the same time in supply chain. Therefore, processes need to be agile in order to respond to unceratin and changing demands placed upon it, while accomplishing minimal waste due to excessive expenses and unneeded operations processes which resemble lean philosophy. Hence, one can induce that while agile presumes leanness, leanness might not presume agility. Since 2000's and later on authors propose that market winner still is lead time, especially with the development of social media and newly formed infrastructure of society so called Internet of things (IoT).

4. CONCLUSION

Our findings show that the knowledge sourced from supply chains improves firms capability to cope with the obstacles while transforming from mass producer to mass customizer.

The keymarks include knowledge sourced from indoor i.e. workforce, outdoor i.e. suppliers and consumers. With co-operation and process integration firms capability rise and so does the partnership between suppliers. It can also serve a purpose of mitigating risks in supply chain environment and lowering risk of unsatisfied customer service.

Succesful transformation from producer to customizer is easier said than done, but with accurate information of customer preferences through supply chain can be used to mitigate risk in agile environment. Achieving it organization must nourish suppliers and accept it even as partners since they are both co-dependent in new era with little brand loyalty. By integration and co-operation between firm and suppliers, firm has a better chances to aline its processes to customer demands and accomplishing higher service level and lead time, while maintaining quality and low costs. In the same time fulfilling higher profit margins and avoiding stockout penalties. Since we are entering the era of so called Industry 4.0 stockout penalties directly represent turning point in customer loyalty.

A particular important research direction should be measuring outcomes of co-operation between suppliers while trying to mitigate risk in order to achieve mass customization of product/service.

[1] Results were taken from companies that were using assembly of core modules (AC) and material processing (MP) mostly.

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