



APPAREL MANUFACTURING AND MASS CUSTOMIZATION EXPERIENCE

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Abstract: *This paper examines the manufacturing experience of clothing configuration within the mass customization approach. It is within this context that 'mass individualism' is examined; a phenomenon which in a climate of globalization can provide novel and environmentally sustainable consumer opportunities for major fashion manufacturers. It has become increasingly difficult for companies to offer interesting products and respond to the specific needs and desires of clients who have become much more savvy and aware of traditional methods of marketing. Thus, the industry must add real value to previously standardized products, in the form of customer specific services to better respond to consumer demand for authenticity and individuality. We find there some problem is related to the manufacturing aspects with measurements, adaptation of patterns and flexibility in methods and experience on the part of the manufacturers to properly use the configuration systems. It is in this respect that mass customization is examined, and several key implementation strategies are developed for manufacturers. From the start, mass customization needs to directly involve customers in the designing and manufacturing phases. Furthermore, this approach must provide opportunities to generate savings by reducing stocks and allowing for better integration of all actors in the supply chain. Mass customization offers possibilities to reach, or even surpass, customers' expectations. Therefore, it needs to provide a knowledge base of consumers' needs and preferences and thus create opportunities for market segmentation and market targeting. Fashion Apparel Industry and smart mass customization approach with digitization makes the supply chain more efficient, agile, and customer-focused.*

Key words: *Fashion Industry, Mass Customization Program, Sticky Information, Fitting Clothing, Configurator.*

1. INTRODUCTION

The fashion and apparel industry faces the urgent need to rethink and strengthen strategy and identify alternative levers for sustainable growth. Past research has demonstrated the importance of understanding the mass customization approach within the context of trade globalization, which has led to ever more ferocious competition in the apparel industry. Moreover, as apparel products now seem to have an even shorter life cycle, a phenomenon which is exacerbated by the introduction and implementation of new business models, businesses' commercial strategies face mounting tension. Nevertheless, fashion retailers and manufacturers are confronting growing pressures on their margins and stocks. Over the past few years, increasing vertical integration and the relentless rise of online sales have created fundamental structural and mechanical shifts in the fashion and apparel industry. This situation forces fashion and apparel industry players to revise their organizational strategies in order to survive in this highly competitive market. Organizations must reinvent



themselves and find new ways to satisfy their customers. In order to grow and to maintain the current level of employment and possibly increase it, clothing producers will need to develop new manufacturing strategies by orienting local production toward a flexible, quick-response system that allows for the fulfillment of various types of orders (small quantities, short deadlines, skilled labor, etc.). Thus, it will become essential for businesses to implement new strategies that correspond to the reality of current markets, in order to keep up with the rhythm of short cycle production. With this approach, manufacturing businesses need to focus on flexibility, adaptability, agility, and traceability. Managers in this industry need to take a close look at the current evolving market and, in some cases, quickly change or adapt their business models. To succeed at this, a company cannot rely solely on its popularity. Above all it must tap into the unique strength of its offering, because there's no room for error.

2. THE GOAL OF MASS CUSTOMIZATION

Reviewing the writings on this subject tells us that paradoxically, at a time where the global keyword in most industries is standardization, the focus in the apparel industry is on “uniqueness.” Today's consumers are increasingly demanding and will no longer settle for the mass offerings proposed by major retailers. They want what they buy to have a personal quality. A mass customizer must first identify the idiosyncratic needs of its customers, specifically those product attributes along which customer needs to diverge the most [1]. The increased use of mobile devices due to convenience of the Internet is likely to influence consumer shopping behaviors, such as time spent in searching various channels and other ways in which they can use digital devices [2]. Add to this the strong influence the Internet and digital technology have on consumer habits and choices. They are no longer satisfied with standardized products that force them to make compromises. The Internet influences customers' buying habits by creating needs that have to be satisfied instantaneously. At an increasing rate, people are losing interest in mass produced items and are seeking a little piece of the manufacturer's DNA, that which makes the item authentic. They're looking for the experience, but not at any price. The goal of mass customization is to efficiently provide customers with what they want, when they want it, at an affordable price. According to Pine [3] the success of mass customization rests mainly on a successful integration of the value chain.

2.1 One of the issues

In the apparel industry, these expectations not only imply having to constantly provide consumers with new options in terms of styles and colors, but also to allow them to find an affordable well-fitting product item and make it available to them almost as rapidly as if it were a standard-sized product. In order to meet these expectations, apparel companies must now propose custom-made products. Brands that offer personalized products (mass customization) are taking over both traditional and online stores. According to McKinney et al. [4] this is made possible by identifying the key points of body measurement necessary to produce well-adjusted, well-fitting garments. However, being able to take these measurements effectively and efficiently is crucial. Although efficient and affordable technologies are available to provide a body scan, few businesses are able to meet the requirements of custom-made products for the following reasons: lack of reliability of the measures provided by the body scan, problems related to the transmission of a large quantity of data to potential manufacturers, and interface issues between the data generated by the body scan software and that used by pattern making, cutting and assembly. Many apparel businesses are currently researching technological ways to produce, adjust, sell, and deliver, in a systematic and automatized fashion, personalized and made-to-measure products. Thus, for example, manufacturers will have to change their positioning from simple manufacturer to positioning solutions and service

providers. This example demonstrates the profound changes that traditional clusters will have to make. It is precisely on this point that digital interventions will allow implementation of an agile organization. Nevertheless, mass customization somehow remains misunderstood or is rarely used by actors in the clothing industry mainly because of the widely variable measurements, the problems in adapting patterns, and the need for flexibility in manufacturing delays and methods. Many authors have produced research on mass customization; however, few of them have sought to identify the problems related to sizing and to so-called hidden data coming from the customers (ease allowance, fullness, etc.). On the other hand, the strengths of 3D body scanning are the speed and the low cost (nowadays), while its main weaknesses are in the measurement inconsistencies due to movement and the lack of accuracy when compared with manual measurements [5].

4. MASS CUSTOMIZATION EXPERIENCE

In recent years, we have been working with manufacturers on product configuration. Our objective was to develop a configurator for clothing mass customization embedded in apparel industry, using computerized digital information systems, that could be used to analyze and decode measurement data coming from peripheral devices in order to identify the necessary information to produce a well-fitting garment. Hence, it was necessary to identify the fundamental variables and data that are necessary to produce custom-made clothing. Parsimony in fundamental variables (length, circumference, density, textile matter) allowed us to significantly diminish the amount of data to analyze and send out in order to create an “smart” pattern during the experiment.

2.2 Smart configuration for clothing product design

In this context, configuration is an essential aspect of mass customization because it creates the possibilities to guide customers as they are making choices. Recently, a number of mass customizers have connected their sales configurators with social software applications and this is not surprising, as social software enables an interactive and socially rich shopping experience, which makes shopping with a mass customization toolkit more similar to retail shopping [6]. Here (Figure 1), configuration processes play a crucial role in managing this task by providing customers with support and navigation in co-designing their individual product or service.



Fig. 1: Mass customization configurator for clothing



According to Kwon et al. [7], online self-customization (OSC) enables customers to design a product tailored to their preferences and needs via the online platform. The successful OSC experience goes beyond simply increasing a consumer's choice in preferred fit; it provides an opportunity to develop a meaningful relationship with customers by allowing them to embed their sense of self into the customized products and thus identify themselves with the products.

However, a lack of expertise eventually requires investments in terms of time and effort; moreover, it forces employees to keep up to date with frequent technical changes and improvements. At the same time, many industrial companies will need to develop digital skills sets around creative digital strategy design, technology, architecture, and user experience design. As a result, the smart configuration of a product to meet a customer's requirements can become a complex task, which gets more demanding as the number of components and options increases. When the configuration requires numerous variations, the possibility of making errors also rises, which can result in production delays. Mass customization creates various technical challenges that need to be overcome before mass customized garments can be produced.

4. DISCUSSION AND FINDINGS

The first problem is related to the apparel manufacturing aspects with measurements, adaptation of patterns and flexibility in methods and manufacturing deadlines. The second is the lack of knowledge and experience on the part of the manufacturers to properly use the configuration systems. It has become increasingly important to understand how to create an approach for configurator implementation for the clothing personalization and mass customization program. For producers to make the most of this approach, they need to understand what can be done in terms of clothing personalization and mass customization capabilities.

We discuss custom clothing in conjunction with the effects stemming from the evolution of mass production practices. This led us to explore from different angles the problems related to the automation of standard sizes and integration of "fits" done in traditional ways as well as computerized ways with respect to product adaptation. In terms of research, we also analyze the mass customization concept and propose technological and transparent operational approaches aimed at initiating useful discussions to better understand these issues and the new culture that has been created.

Our tests with a configurator confirm the validity of our variables and the future potential for rapid prototyping via mass individual production and assurance of well-fitting garments via online request. This method can be applied for professional, commercial, technical, and mass consumer apparel. Through this work, it is also seen that it would be beneficial to label ready-to-wear clothing with silhouette-type information that best displays the style. This would no doubt allow the customer to filter more quickly through non-desired styles or models. This simple approach provides new perspectives with respect to new and interesting concepts such as "fitthinking" theory for this industry, which could serve well in future tasks. These elements include product sustainability, sustainable supply-chain management, design practice, business innovation, operational effectiveness, and consumer engagement – the strongest indicator of customers' feelings about your brand.

This project offers numerous innovative possibilities and could provide a major opportunity for those implicated in the fashion apparel industry and contributes an analysis of how the design process can support the development of new and competitive business models for a sustainable fashion industry. Typically within the field of sustainable apparel, the strength has been on technological adaptations within the mass customization supply chain. Although these efforts can



significantly reduce environmental impacts, the outsourced manufacturers are more in control, thus limiting the influence of a fashion brand.

One of the innovative trends approach is fashion apparel industrie 4.0 called a “smart apparel factory” is the current trend of automation and data exchange in apparel manufacturing technologies. The combination of several major innovations in digital technology it includes the Internet of things, cloud computing, and cyber-physical systems communicate and cooperate with each other in real time used by participants of the value chain driving a new shift of change across the economy, with major implications for fashion market – including RFID, sophisticated sensors, digital printing and fabrication, 3D product development and more. This trend is more with the digital transformation merging with Industry 4.0. Manufacturers need to transform their processes and products to become more digital. This becomes more attractive for manufacturing as part of a mass customization program.

After discussion and meeting with experts from the sector, we are able to define the priority of five key success factors for fashion apparel industry : (1) customer excellence focus (the voice of the customer) and brand performance profile, (2) seamlessness in the omnichannel user experience integration, (3) renewed focus on physical retail, (4) operational excellence and innovation, and (5) process integration and traceability. To remain strong and competitive, a company has to demonstrate its capacity to adapt in terms of creativity, production, quality, timing, and price.

These findings should encourage the actors that make up this industry to readjust. In an age where innovation and technological developments play an increasingly crucial role in counteracting the effects of lower wages found in other countries, the objective of this research is to demonstrate the importance of implementing mass customization and rapid manufacturing systems adapted to the needs of all players in the clothing industry. If the vision of Industry is to be realized, most business processes must become more digitized. A critical element will be the evolution of traditional supply chains toward a connected, smart, and highly efficient and agile supply chain ecosystem.

5. CONCLUSIONS

Fashion apparel industry businesses must be proactive, adopt, and adapt to new mindsets and management tools and digital culture to take full advantage of information technologies. To successfully implement mass customization, it is of the utmost importance that they emphasize analysis, decision making, performance evaluation, and added value. Indeed, flexibility is a must as the market increasingly expects it. Mass customization offers much potential for extending brand awareness, acquiring new markets and generating profits.

However, as stated, in order to do so, manufacturers must adjust their business practices and clearly define the limits of their operational strategy so that they do not radically alter a structure that took years to build. Mass customization must not be seen as a strictly short-term marketing strategy. When introducing new products or practices, a brand must be in synergy with its new offers, even if the company initially loses money.

Manufacturer must commit to sustainable development with demonstrated leadership, vision, challenges, directions, areas of intervention, and objectives as “clear as possible,” in order to be an example to follow. If actors in the fashion and clothing industry accept this change of direction, this project could evolve into an extremely competitive business model, which could also represent a viable option for companies in different sectors.



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