

Implementation of mass customisation: the case of the apparel industry

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Abstract

Purpose

The purpose of this paper is to highlight mass customisation as an applicable and viable strategy for the apparel industry if companies focus their attentions in consumer's needs and desires, and taking advantage of new technologies.

Design/methodology/approach

Initially the paper reviews the concept of mass customisation in general. Then is done an approach to the state of the art of mass customisation in the fashion/ apparel industry, with focus to the most relevant enablers for its implementation.

Findings

It was found that mass customisation as a business strategy that combines mass production and craft manufacture, offering unique and individualized products with the benefits of mass production, can be the key for a more sustainable growth for the apparel industry. This growth is based in a closer relationship between companies and consumers, leading to the development of products where not only aesthetic and functional properties are relevant, but also the emotional and experiential characteristics lead to more meaningful products.

Originality/value

This paper contributes to underline the importance of mass customisation in the apparel sector, because besides being a strategy largely applied in other industries, in the apparel industry some regards still exist. It is important that companies realize the potential of this strategy to improve their business and become closer to their customers.

Keywords

Mass customisation, craft manufacture, fashion/ apparel industry, sustainable consumption

Article Classification

Literature Review

Introduction

“The concept of mass customisation makes business sense. Why wouldn’t people want to be treated as individual customers, with products tailored to their specific needs?” (Salvador et al., 2009:1)

Mass customisation concept first appears with Stanley Davis in 1987 in his book *Future Perfect* when he stated that “*the same large number of customers can be reached as in mass markets of the industrial economy, and simultaneously they can be treated individually as in the customised markets of pre-industrial economies*” (Davis, 1987). Later, Joseph Pine define the concept of mass customisation as “*developing, producing, marketing and delivering affordable goods, and services with enough variety and customisation that nearly everyone finds exactly what they want.*”(Piller et al. 2005). Along the last decades other’s authors gave others mass customisation definitions , as for example Gordon (1998:217), “ *the process of providing and supporting profitably individually tailored goods and services according to each customer’s preferences with regard to form, time, place and price*”, and Hart (2006:3) “*using flexible processes and organizational structures to produce varied and often individually customised products and services at the price of standardized mass-produced alternatives*”. Despite the amount of definitions, all of them have in common the consideration of the necessity to develop products or services in concordance with customer’s individual needs, with a flexible structure and considering profitable results.

Mass customisation offers consumers the opportunity to have products according to their needs and desires, in both aesthetic and functional levels, through a closer relationship between them and the companies/producers (Piller 2004; Fogliatto et al. 2012). In fact Gordon (1998) emphasize that mass customisation is a necessity to companies committed with relationship marketing. He identify three main dimensions of mass customisation, customised product, service and communication, that can be combine in different ways by the companies, where offering customised product, customised service and customised communication is the highest level of a mass customisation, and the one that leads to a more complete relationship marketing.

Concerning the studies about mass customisation Silveira et al. (2001) and later Fogliatto et al. (2012) conducted a review of literature and an updated review about the subject. These reviews allowed an overall perspective about the strategy and its implementation, namely concerning, value drivers, success factors, enables and customer-manufacturer interaction. About the value drivers of mass customisation, from the producer’s side they are related with premium prices for customised products less customisation costs and with postponement of differentiation, better access to market information and customer loyalty. On the costumer’s side the value drivers are

identified as extrinsic, e.g. utilitarian, individualism and self-expression, or as intrinsic e.g. hedonic and pride.

The mass customisation implementation success factors identified were the customer demand, markets, value chain, technology, customizable offer and knowledge. Other of the aspects reviewed and with major importance are the mass customisation enablers. One of them is related with the methodologies applied, in mass customisation lean and agile strategies are the most relevant for companies to respond to personalized demands in timely fashion and provide affordable customisation. Other is related with the processes, which can be divided in order elicitation, design postponement and product platforms where the balance between component commonality and variety is key when designing such platforms., manufacturing (customisation increases the number of variants in production, with impacts on process equipment and labor; advanced manufacturing technologies were identified also as enablers of mass customisation) and supply chain coordination (the paradox between scale production and customised demand requires that make-to-order and make-to stock supply chains co-exist). Other important enabler is technology, namely information technologies, they allow companies to fulfilled the orders correctly through the integration of information flows, construct a database of customers' demands and preferences and monitoring the configuration process. For customers these technologies allow their involvement and collaboration in the development process, enabling co-design activities and also gave the opportunity to analyze alternative customisation options (Fogliatto et al.,2012)

Another field that has received some attention by researchers is the customer-manufacturing interaction. Fogliatto et al. (2012) analyse it in four steps: building the product catalog (related to choice menu design and selection of features presented), configuring customer orders (integration of customers in activities of product specification and co-design leads to the necessity to use configurators, the web in general and e-commerce) (Piller et al., 2004) and transferring orders to manufacturing and manufacturing customer order (e.g. the use planning systems as MRP (Materials Requirements Planning) or even a configure-to-order system which integrates design and manufacturing) (Jiao and Helander 2006).

The strategy of mass customisation has been applied to a wide range of industries and product categories, from furniture to cars, as well as services, and the factors referred above, have been subject of research also in different types of industries.

But there is one category of products worth to explore, that has experienced a significant grow, the apparel industry. Apparel products by their characteristics of self-expression makes it one of

the items more attractive and with great potential for the implementation of customisation strategies (Anderson-Connell et al. 2002).

Mass customisation in the apparel/clothing industry

The apparel industry is nowadays recognized by mass production and fast fashion, models of production and consumption which prevail in the market. These models are characterized by product short life cycles, an huge variety and quantity, regular replacement and products with low quality and price, conducting to an easy disposal (Daniilidis and Enßlin 2011; Niinimäki and Hassi 2011). Although, the concepts of mass customisation and slow fashion, are gaining more importance, leading to the development of products adjusted to the social and economic reality (Kuo et al. 2011; Piller and Tseng 2009; Ulrich et al. 2003) . A closer relationship between companies and consumers through co-creation and co-design can help in the development of products with add value, more quality and durability, extended lifetime, and consequently a longer lifecycle, because consumers more strongly connect to the them, not throwing them away so easily, as they do with fast fashion products (Kim 2010; Kuo et al. 2011; Piller and Tseng 2009; Prahalad and Ramaswamy 2004; Satam et al. 2011; Schulte and Godoy 2012; Ulrich et al. 2003). Through customisation is possible to involve the customer in the product development process and improve communication between the two parts, namely new interfaces interaction product/consumer. The fact that many consumers are not satisfied with standardized products leaves them open to try experiences of customisation and even pay more for this type of product (Piller and Müller 2004). In this value-creation chain, is possible to demonstrated that "unique" products are more relevant to consumers than the standart products, based on the "extended self" theory, the energy and the associated development process, will symbolically enrich the product in the eyes of the customer (Schreier, 2006).

According to the report Strategic Research Agenda of the European Technology Platform for the Future of Textiles and Clothing (Euratex, 2006), the subject of Mass Customisation is of high importance for innovation in the textile-clothing-retail field.

Mass customisation focuses on the clothing industry without ignoring, that the clothing industry is partner in the textile-clothing supply chain and has close relationships with the textile industry, the supply chain partners (including logistic services) and a very strong link to trade / retail and the end consumer. In fact apparel products are a major category in mass customisation because of its versatility, modular properties and characteristics of self-expression (Anderson-Connell et al. 2002), and is expected that the market of customised clothing represent 27.2 billion euros in 2020, corresponding to 5% of the global fashion market (Observatory 2013).

The two most employed types of customisation in the apparel mass customisation field are: customisation of fit/made-to-measure and customisation of design/ co-design (Bae and May-Plumlee 2005). Customisation of fit/made-to-measure is based on the fit and tailoring of a product according to body measures, and in customisation of design/co-design consumers are called to think about their preferences and make specific choices in terms of product design and attributes (Piller and Müller 2004). The experience of co-design allow consumers to combine or select from a list the items that interest them most, and these combinations can better meet the individual needs than traditional products of mass production.

Despite being a strategy discussed since Stanley Davis in 1987, only in the last decade companies started to look at it as a reliable strategy and a solution to stay competitive due to the rising desire for customised products. Also, the development of information technologies and the growing of e-commerce have created the perfect environment for its implementation. Some research show mass customisation, specifically co-design of apparel products, as a solution to attract customers to online shopping, by the adding value of the experience (Fiore et al. 2004; Franke and Schreier 2007).

Specific concerns in the apparel industry

Internet and interface technologies: touch and fit

Mass customisation and e-commerce are extremely dependent of technologies. In online apparel shopping its importance is unavoidable because it is probably one of the product category with more risk associate, due to the impossibility to touch fabrics, try on clothes and see product colors accurately (Kawaf and Tagg 2012).

Because of the non-existence of physical interactions and psychical experience, the concept of need for touch has been the focus of much research in online apparel shopping (Citrin et al. 2003; Almousa 2011; Vieira 2012; Cho and Workman 2011; Peck and Childers 2003), since this is considered a “high-touch” product (Grohmann et al. 2007; Levin et al. 2003). Need for touch is considered one of most relevant barriers to online shopping and still represent a challenge for mass customisers and apparel online retailers in general, because developing virtual clothing accurately involves the simulation of drapes and fabric movements with the body (Chittaro and Corvaglia 2003; Keckeisen and Stoev 2003). Along with fabrics simulation, provide options of co-design and made to measure, leads to the creation of products that do not exist and are at the time only virtual.

The apparel fit is one of the most important aspects in clothing purchase and is the one where consumers find more problems. Apparel fit can be defined as “the relationship between the size and contour of the garment and those of the human body” (Chen 2007:132) Other authors correlate fit with physical and psychological comfort and performance (Shen and Huck 1993; Fan et al. 2000) but in the end it is all about well-being, satisfaction and happiness. We all have different types of body and mass production of clothes is based in standard measures, changing from countries to countries depending on simple aspects like height. Fan et al. (2000) reported that fit problems are essentially concerned with the “problems with size standards and grading rules; shortcomings in pattern making; manufacture-driven conflicts; consumer and industry perceptions of the body”. These fit problems happen in all forms of apparel purchase, but gain more relevance in virtual purchase channels, as catalogs and internet, and are seen as one of the main causes for returns in e-commerce and avoidance of purchase channel (Chen 2007).

In this field, the integration of interactive technologies has played a definitive role, with 3D clothing simulation and virtual try-on. These technologies provide consumers with a shopping experience more similar to real shopping in brick and mortar stores through virtual experiences, assisting product evaluation, compensating the absence of tactile information, improving memorization and increasing purchase information (Merle et al. 2012). Some researchers (e.g. Fiore et al. 2004; Fiore et al. 2005), found that consumers preferred advanced technology features in co-design to visualize the co-designed product on a figure similar to the customer's body or in virtual models with their measures and other physical characteristics. These technologies have the power to facilitate the design of the product and leading to a rich experience, enhancing the feeling of being immersed in the computer-generated environment, similar to real stores.

Nowadays are few the apparel online stores that do not have virtual models and 3D visualization of the pieces. With virtual models (e.g. www.mvm.com) consumers can develop a model with characteristics similar to them choosing body shape, hair and skin color. These models allow 3D perspectives and also simulate the fabric performance in the body (Fan et al. 2000; Lai et al. 2006; Zong and Lee 2011). Other technology that has gain relevance is the 3D body scans. Initially used for anthropometric studies of population (Fan et al., 2000), the application in apparel industry is recent and still has few followers, mainly because the expensive cost. These scans permit to obtain fast and precise body measurements without physically touch, and have CAD systems to integrate the data (measures) in patterns and produce unique and fit customised clothing (Istook and Hwang 2001; Helms et al. 2008; Zong and Lee 2011).

In fact having fit customised clothes is nothing new, is something that older people were used to have. Before mass production starting almost everyone had tailor made clothes. Nowadays having clothes made for a single individual is rare due to cost and time it takes to manually measure, create patterns, and construct garments. With 3D body scans having fit customised clothes is much easier (Lu et al. 2010; Hwang 2001; Zong and Lee 2011).

As been referred before, these scans extract accurate measures in a few seconds and can be transmitted to CAD system for production. Fiore et al. (2001:100), explain this process as “an option that involves using electronic measurements of the customer’s body form to develop a manufactured product with an individualized fit”. Exist in the market some companies developing 3D body scans and presenting them as solutions for mass customisation, for example the 3D full body scanner VITUS¹ (Vitronic), SYMCAD² (Telmat industrie) that are compatible with apparel software from Lectra systems³ and Gerber Technology⁴ respectively (Istook and Hwang 2001; Zong and Lee 2011).

There are also some examples of companies already using these systems. Brooks Brothers⁵ is one of those, with several stores in United States. Some of them have body scans to allow the production of customised clothes. Also Tailor Made London⁶ uses a body scan in the shop to provide customised suits. And one of the most successful companies using body scans is Possen⁷ in Germany that since 2000 has a body scan in shop. One year later they developed a new concept of customisation service by equipping a bus with a scanner to go all over the country. Other example is the use of scans to help the shopping experience in brick-and-mortar stores. *Unique solutions* create what they call “mybestfit kiosk”, a body-scanning stand that takes body measurements and then matched them with the kiosk's database giving a set of options for the customer to use. (Butler 2011).

Conclusion

With the last decade research, focusing mainly the development of a solution space which encounters features according to the type of product, and also surpass the barriers related to the non-existence of physical contact with products, is expected that the customisation of apparel products online continue to growth and become an established market solution.

The last reports on apparel e-commerce and mass customisation leads us to conclude that the application of this strategy is already a reality, and an option for unsatisfied consumer’s with standard products or just for those who look for different experiences.

References

- Almoussa, M., (2011), "Perceived risk in apparel online shopping: A Multi dimensional perspective", *Canadian Social Science*, Vol.7 No.2, pp.23–31.
- Anderson-Connell, L.J., Ulrich, P. V. and Brannon, E.L., (2002), "A consumer-driven model for mass customization in the apparel market", *Journal of Fashion Marketing and Management*, Vol.6 No.3, pp.240–258.
- Bae, J. & May-Plumlee, T., (2005), "Customer focused textile and apparel manufacturing systems: toward and effective e-commerce model", *Journal of Textile and Apparel, Technology and management*, Vol.4 No.4, pp.1–19.
- Butler, C., (2011), "In Retail Customer Experience: Body-Scanning Kiosks a Perfect Fit for Retailers", *Discussion Articles*, available in <http://www.retailwire.com/discussion/15239/retail-customer-experience-body-scanning-kiosks-a-perfect-fit-for-retailers> (Access in 14/1/2014)
- Chen, C.-M., (2007), "Fit evaluation within the made-to-measure process", *International Journal of Clothing Science and Technology*, Vol.19 No.2, pp.131–144.
- Chittaro, L. and Corvaglia, D., (2003), "3D virtual clothing: from garment design to web3d visualization and simulation", *Proceedings of the eighth international conference on 3D Web technology. ACM*.
- Cho, S. and Workman, J., (2011), "Gender, fashion innovativeness and opinion leadership, and need for touch: Effects on multi-channel choice and touch/non-touch preference in clothing shopping", *Journal of Fashion Marketing and Management*, Vol.15 No.3, pp.363–382.
- Citrin, A.V. et al., (2003), "Consumer need for tactile input" *Journal of Business Research*, Vol.56 No.11, pp.915–922.
- Daniilidis, C. and Enßlin, V., (2011), "A classification framework for product modularization methods", In *Proceedings of the International Conference on engineering design*.
- Davis, S.M., (1987). *Future Perfect*, Addison-Wesley Publishing.
- Euratex (2006), Report Strategic Research: Agenda of the European Technology Platform for the Future of Textiles and Clothing

- Fan, J., Yu, W. and Hunter, G.L., (2000). *Clothing Appearance and Fit: Science and Technology*, Cambridge: Textile Institute.
- Fiore, A. et al., (2001), "Relationships between optimum stimulation level and willingness to use mass customisation options", *Journal of Fashion Marketing and Management*, Vol.5 No.2, pp.99–107.
- Fiore, A.M., Kim, J. and Lee, H.-H., (2005), "Effect of image interactivity technology on consumer responses toward the online retailer", *Journal of Interactive Marketing*, Vol.19 No.3, pp.38–53.
- Fiore, A.M., Lee, S.-E. and Kunz, G., (2004), "Individual differences, motivations, and willingness to use a mass customization option for fashion products", *European Journal of Marketing*, Vol.38 No.7, pp.835–849.
- Fogliatto, F.S., da Silveira, G.J.C. and Borenstein, D., (2012), "The mass customization decade: An updated review of the literature", *International Journal of Production Economics*, Vol.138 No.1, pp.14–25.
- Franke, N. and Schreier, M., (2007), "Product uniqueness as a driver of customer utility in mass customization" *Marketing Letters*, Vol.19 No.2, pp.93–107.
- Gordon, I., (1998). *Relationship Marketing: New Strategies, Techniques and Technologies to Win the Customers You Want and Keep Them Forever*, John Wiley & Sons, Canada.
- Grohmann, B., Spangenberg, E.R. and Sprott, D.E., (2007), "The influence of tactile input on the evaluation of retail product offerings", *Journal of Retailing*, Vol.83 No.2, pp.237–245.
- Hart, C., (2006), "Creating competitive advantage through mass customization", pp.1–18.
Available at: http://www.spiregroup.biz/pdfs/06-04-07_Creating_Competitive_Advantage_through_Mass_Customization.pdf (Accessed 2/05/2014).
- Helms, M.M. et al., (2008), "Technologies in support of mass customization strategy: Exploring the linkages between e-commerce and knowledge management", *Computers in Industry*, Vol.59 No.4, pp.351–363.
- Hwang, S., (2001). Three dimensional body scanning systems with three dimensional body scanning systems with. A paper (A-1) submitted to the Graduate Faculty of North Carolina

State University in partial fulfillment of the requirement for the Degree of Doctor of Philosophy

- Istook, C. and Hwang, S., (2001), "3D body scanning systems with application to the apparel industry", *Journal of Fashion Marketing and Management*, Vol.5 No.2, pp.120–132.
- Jiao, J. and Helander, M.G., (2006), "Development of an electronic configure-to-order platform for customized product development", *Computers in Industry*, Vol.57 No.3, pp.231–244.
- Kawaf, F. and Tagg, S., (2012), "Online shopping environments in fashion shopping: An SOR based review". *The Marketing Review*, Vol.12No.2, pp.161–180.
- Keckeisen, M. and Stoev, S., (2003). "Interactive cloth simulation in virtual environments" In *Proceeding of the IEEE Virtual Reality*.
- Kim, B., (2010), "Green design-Studies about fashion handbag". In *IEEE 11th International Conference on Computer-Aided Industrial Design & Conceptual Design (CAIDCD)*. pp. 815–819.
- Kuo, D., Lin, C. and Wu, Y., (2011), "The connection between customer value creation and innovation strategy: A proposed framework and its implication in fashion products". In *IEEE International Conference on Industrial Engineering and Engineering Management*. pp. 1175–1179.
- Lai, H.-H. et al., (2006), "User-oriented design for the optimal combination on product design", *International Journal of Production Economics*, Vol.100 No.2, pp.253–267.
- Levin, A., Levin, I. and Heath, C., (2003), "Product Category Dependent Consumer Preferences for Online and Offline Shopping Features and Their Influence on Multi-Channel Retail Alliances" *Journal of Electronic Commerce*, Vol4 No.3, pp.85–93.
- Lu, J.-M. et al., (2010), "The development of an intelligent system for customized clothing making", *Expert Systems with Applications*, Vol.37No.1, pp.799–803..
- Merle, A., Senecal, S. and St-Onge, A., (2012), "Whether and How Virtual Try-On Influences Consumer Responses to an Apparel Web Site", *International Journal of Electronic Commerce*, Vol.16 No.3, pp.41–64.

- Niinimäki, K. and Hassi, L.,(2011), "Emerging design strategies in sustainable production and consumption of textiles and clothing", *Journal of Cleaner Production*, Vol.19 No.16, pp.1876–1883.
- Observatory, B.I., (2013). Report :*Advanced Manufacturing Mass customisation*
- Peck, J. and Childers, T., (2003), "Individual differences in haptic information processing: The “need for touch” scale", *Journal of Consumer Research*.
- Piller, F., (2004), "Mass customization: reflections on the state of the concept", *International Journal of Flexible Manufacturing Systems*, Vol.16, pp.313–334.
- Piller, F. et al., (2005), "Overcoming Mass Confusion: Collaborative Customer Co-Design in Online Communities", *Journal of Computer-Mediated Communication*, Vol.10 No.4
- Piller, F.T. and Müller, M., (2004), "A new marketing approach to mass customisation." *International Journal of Computer Integrated Manufacturing*, Vol.17 No.7, pp.583–593.
- Piller, F.T. and Tseng, M.M., (2009), *Handbook of Research in Mass Customization and Personalization: Strategies and concepts*, World Scientific.
- Prahalad, C.K. and Ramaswamy, V., (2004), "Co-creation experiences: The next practice in value creation", *Journal of Interactive Marketing*, Vol.18 No.3, pp.5–14.
- Satam, D., Liu, Y. and Lee, H.J., (2011), "Intelligent design systems for apparel mass customization", *Journal of the Textile Institute*, Vol.102 No.4, pp.353–365.
- Schreier, M., (2006) "The value increment of mass-customized products: an empirical assessment", *Journal of Consumer Behaviour*, Vol.327, pp.317–327.
- Schulte, N. and Godoy, I., (2012). As dimensões da sustentabilidade aplicadas em produtos slow fashion. In *IX Encuentro Latinoamericano de Diseño “Diseño en Palermo” V Congreso Latinoamericano de Enseñanza del Diseño Comunicaciones Académicas*.
- Shen, L. and Huck, J., (1993), "Bodice pattern development using somatographic and physical data", *International Journal of Clothing Science & Technology*, Vol.5 No.1, pp.6–16.
- Silveira, G. Da, Borenstein, D. and Fogliatto, H.S., (2001), "Mass customization : Literature review and research directions", *International Journal of Production Economics* , Vol.72 No.49, pp.1-13

Ulrich, P. V., Anderson-Connell, L.J. and Wu, W., (2003), "Consumer co-design of apparel for mass customization", *Journal of Fashion Marketing and Management*, Vol.7 No.4, pp.398–412.

Vieira, V.A., (2012), "An Evaluation of the Need for Touch Scale and Its Relationship with Need for Cognition, Need for Input, and Consumer Response" *Journal of International Consumer Marketing*, Vol.24 No.1-2, pp.57–78.

Zong, Y. and Lee, Y.-A., (2011), "An exploratory study of integrative approach between 3D body scanning technology and motion capture systems in the apparel industry", *International Journal of Fashion Design, Technology and Education*, Vol.4 No.2, pp.91–101.

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