Collaborative Product and Service Customization in Fashion Companies

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Abstract. This paper focuses on the identification of collaborative strategies and practices adopted by companies of the fashion industry in the management of customized offerings (both products and services) along their supply chain (SC). A multiple case study approach is applied and four companies (both medium and large) were interviewed. The cross-case analysis enabled mapping the cases following two dimensions: type of market asking for the customization (B2B vs. B2C) and scope of customization (products vs. services). The analysis highlights the practices and processes related to the customization, the enabling technologies adopted, and the actors involved by a focal company in the collaboration (both in upstream and downstream networks) to offer the product or service that meet customer needs.

Keywords: Product customization · Service customization · Personalization · Collaboration · Fashion · Supply chain

1 Introduction

Nowadays, fashion industry is characterized by the growing demand for personalized products and services according to clients' preferences and opinions [1]. Fashion products are characterized by short life cycles, high volatility in demand, and increasing variety with low predictability [2]. The fashion industry has a significant relevance worldwide, and it is fragmented, extremely competitive and globalized [3].

The ability of accurately understanding the customer's personal demand, and the consequent adoption of appropriate practices, is fundamental to improve the companies' core competitiveness and the customer satisfaction and loyalty [4]. Fashion

companies willing to focus on customization should consider the full implementation of collaborative production network as a key issue to respond to ever-changing consumers' demand [4].

Previous literature on customization strategies in the fashion industry has mainly focused on specific activities of supply network management, such as: i) the downstream network, by debating the importance of the SC to respond promptly to the changing demand (e.g. [3]), ii) the upstream network by discussing, for example, the design phase [5, 6]; and, iii) the production process of personalized products (e.g. [7]) or services (such as distributed 3D printing services [8]).

In this sense, a comprehensive study considering the implications on supply network from both product and service perspectives, and the collaborative practices along the overall SC (integrating i, ii and iii), is still missing. This study aims to investigate strategies and practices carried out by companies of the fashion industry in the management of customized goods and services along their SC. To accomplish this goal, a multiple case study methodology is used to highlight different customization strategies and to identify the collaborative practices within the fashion network considering the actors involved (other businesses or final customers).

2   Theoretical Background

Customization represents a relevant opportunity for value creation, but it also remains a key challenge, especially for fashion industry. This industrial sector is characterized by high levels of complexity in terms of products and manufacturing processes, as well as a high number of SC partners [4]. The successful implementation of customization relies on important factors, such as: understanding the market needs, postpone the variety until real demand arises, and establish flexible production processes [9]. Therefore, collaborative and adaptive customization practices are important for the alignment between the market demands, the design of a product and the effective setup of production [10]. From the one side, the co-creation of value represent a benefit both for company, which can adjust the offer, and for customers who have the confidence to obtain the best alternative that meet their needs [11]. From the other side, customization enables producers to integrate with suppliers, as it facilitates the cooperation in the decision making process [12].

To manufacture a personalized product, new technologies can be supportive for the design (e.g. virtual reality) and manufacturing activities (e.g. reconfigurable production system, and additive manufacturing). The design phase for a personalized product is supported by product configurator systems, which ensure to tailor a product according to the specific needs of the customers [5]. Other important tools for the design are the 3D scanner, to acquire data [6], and the CAD 3D tools and 3D printing for the creation of personalized prototypes [13]. 3D printing represents an alternative for customized production because of its ability to produce objects with almost any shape or geometry [8]. Moreover, personalized products require large amount of flexibility, with reconfigurable, on-demand manufacturing systems [14].

In the last years, customization has not been limited only to the development of unique products for the customers, but also to the personalization of the services offered

to customer as a strategy to lock them into long-term relationships [15]. A few examples of this strategy are [16]: (i) sale of redesigned clothing (consumers purchase clothing that has been redesigned from old clothing items); (ii) clothing repair/alteration service (consumers are provided with repair services to maintain their clothes); (iii) clothing renting (consumers acquire a certain number of items to be used for a short time period); and (iv) style consultancy service (providing customers with a style consulting, in-store or online, on how to use their clothes or to create new looks). The personalization of services consists of modifying certain components of the service offering, including service delivery, service products and service environments, based on personal profiles [17]. This means that customers are allowed to be involved in the purchase transaction so that their specific needs can be met, e.g. in terms of different delivery options [18]. The service personalization has been mainly analyzed in service marketing theories that debate the greater customer satisfaction, customer shopping experience, service quality, and customer loyalty that can be achieved by adding personalized services to fashion products [18, 19]. In the last years, research has focused on services developed for online purchase and personalization services [19] (i.e. options for personalizing lists, options to save preferences' information, personalized product selection aids). The delivery services offered by e-retailers have become one of the fundamental factors influencing an online shopper's decision [20]. In [18] in fact, it is suggested for the online retailers to improve their abilities in logistics service quality control and establish joint-venture logistics service providers, or build their own logistics network.

Companies can offer the product or service personalization at different levels of the SC, meaning that collaboration is established with the final customer or other business. The theme of product customization has always been closely connected to the Business-to-Consumer (B2C) sales channel [21] to collect personalization requests and needs directly in brick-and-mortar, as well as in online shops. In the Business-to-Business (B2B) world, the personalization is often offered as a combination of customized product and service [22]. Product customization has been a fundamental pillar of the B2C market, often exploited to increase revenues and maintain loyal customers. Conversely, it is still difficult to implement a well-defined customization strategy in the B2B context, even if the growing theme of personalization of services seems to be very supportive for companies to offer other companies a combined customized product and service [22]. The B2C and B2C market segments are radically different, thus, current personalization discussions should also consider customization options that pertain these market segments' peculiarities.

Summing up, few studies investigated the collaborative practices carried out by companies of the fashion industry to support the customization strategies (both at product and service level) and their implications at different SC echelons. Moreover, several technologies were identified to support customization, but they weren't analyzed as enabling the collaborative relationship between the actors in the fashion network. In order to build a complete framework and therefore analyse the practices implemented by fashion companies for customization, two dimensions should be considered: the scope of personalization (i.e. services vs products) and the type of market to whom offer the personalization (i.e. B2B vs B2C).

3   Methodology

Aiming to integrate different perspectives in the investigation of practices and strategies for customization along the SC of the fashion industry, we adopted a multiple case study approach [23]. We selected four companies, creating a sufficiently heterogeneous sample in terms of: dimensions, main business activity (they belong to different SC echelons) and SC processes involved in customization (from sourcing to selling and distribution). According to [23] the number of case studies is sufficient to obtain relevant results since the in-depth case studies allow to gather a large variety of relevant information. An overview of selected cases is shown in Table 1 (data on employees and turnover refer to end of year 2018).

Table 1. Sample of cases from fashion industry.

Company	Employees	Turnover	Fashion sector	Main activity
Case A	96	280 M €	Fashion accessories	Management of design and production of multi-brand accessories
Case B	100	53 M €	Eyewear	Production and delivery of finished and semi-finished lenses (recently also frames)
Case C	3.200	543 M €	High-luxury fashion	E-commerce business platform for selling and retailing luxury fashion items
Case D	80	25 M €	Sportswear (especially footwear)	Design and production of sports shoes and clothes, especially for cycling and snowboarding

Data collection was based on both primary and secondary data, also for triangulation purposes [23]). Primary data sources were semi-structured interviews, based on a common interview protocol. The research protocol was organized to collect data of each company on:

- SC structure and customization strategies;
- Level of collaboration and integration with other SC actors;
- Challenges and enabling technologies in collaborative customization.

A total of 8 interviews (2 per each case) were performed between May and October 2019 by multiple investigators at company site or via Skype call with key roles involved in SC and customization management including CEOs, product owners, SC managers and operations managers. The interviews were recorded and transcribed, and then triangulated with secondary data from annual reports, company websites and press releases of each company.

Data analysis involved two phases: a within-case analysis and a cross-case analysis [24]. In the first phase, data from each company was organized to identify main

practices for customizing products and/or services in different SC dimensions, and the qualitative analysis (coding) was mainly aimed at identifying the ones involving collaboration at different SC echelons. In the second phase, the cross-case analysis allowed to extract common and diverse patterns of practices, informed by literature on customization of products and services, and involved channels or SC actors. This step resulted in the classification of the cases along the relevant perspectives to be considered in the customization of products and services in the fashion industry.

4   Case Studies in Fashion Industry

The current section briefly presents the findings of the multiple case study conducted in companies of the fashion industry.

Case A. Company A is the leather goods and footwear division of an international fashion group that includes several brands. The company is based in Italy and manages the design and production of all the shoes and bags of the brands belonging to the group. Based on the type of product, different production channels are used: the luxury segment shoes are made in Italy, while the mass-market segment finds its production in China, guaranteeing the manufacturing of standard products at low costs. Each brand is characterized by its own style and the company is able to guarantee the uniqueness of the products and customize them. The company also manages the distribution of the products towards the brands' retailers and shops in the world. It strictly collaborates with the designers of each luxury brand to carry out the design and the industrialization of the new shoes and accessories collections (more than 100 per year). The collaborative design of fashion collections is supported by the development of the 3D models and prototypes.

Case B. Company B is an Italian medium enterprise of the eyewear industry producing and marketing finished and semi-finished lenses (and recently also frames). The company serves daily more than 600 wholesalers and optical laboratories across the world. Company B relies on collaborative relationships and coordination mechanisms built on trust, mutual economic advantage and technological support to manage the long and globally distributed SC. Collaborative practices mainly focus on the coordinated planning of worldwide deliveries, tailored to customer requests, and personalized packaging. A trade-off between efficiency and flexibility is reached thanks to a balanced level of automation for both production and outbound logistics, the adoption of optimization models for inventory and transportation loading, and a strategy of stock sharing with customers with the support of an on-line platform constantly updated.

Case C. Company C is an English high luxury fashion online retailer. It created a digital marketplace with over 2.900 brands ranging from heritage brands to emerging designers. The company connects creators, curators and consumers, creating a global business ecosystem which enables the matching between the customer requests for high luxury goods and the offer/availability of boutiques around the world. To allow for customization in terms of procurement and distribution in a global SC, the company makes use of digital technologies and a strong collaboration among their distribution delivery carries allow to send products in 190 countries in 3–4 days (in average). Customers can choose between different personalized delivery options: from standard

and premium delivery, and click and collect, to same-day delivery in 19 major global cities and store to door in 90 min. The company also offers data-driven services for its customers based on information management tools (i.e. big data analytics and API designs), to provide targeted advertising and customer support, and personalize the shopping experience.

Case D. Company D is an Italian company, specialized in the production of sportswear (especially cycling and snowboarding). Standard products are produced in Asia, while the top-of-the-line items are developed at the Italian headquarter, with selected materials exclusively from "Made in Italy" artisans. The downstream network is divided into a direct (for Italy and Germany) and an indirect market, with several distribution companies worldwide. The customized products are based on specific requirements of customers, with development of ad-hoc prototypes of new models of shoes and clothing, influencing also all the decisions regarding sourcing and production. The customer experience ranges from the selection of materials to the personalized distribution and the after-sale services that guarantee the replacement/repair of products during the use. The collaborative process is supported by 3D modelling on shoes for personalized fit and 3D printing systems.

5 Discussion

According to the collected data and information, the cross-case analysis was organized to map strategies and practices for customization in fashion companies differentiated according to two dimensions, defining the matrix shown in Fig. 1:

Customization of services	**Case B**	**Case C**
Involved processes	• Delivery and packaging	• Delivery and advertising
Enabling technology	• On-line platform	• Data-driven marketplace platform
Collaborative relationship	• Logistics providers	• Logistics providers and boutiques
Customization of products	**Case A**	**Case D**
Involved processes	• Design and industrialization of shoes and bags	• Design and production of sport shoes
Enabling technology	• CAD 3D	• 3D printing
Collaborative relationship	• Brands and designers	• Final customer
	B2B	*B2C*

Fig. 1. Results of customization strategies and practices in fashion industry.

- Scope of customization: product (Case A and D) versus service (Case B and C);
- Type of market asking for the customization: company on the SC (Case A and B), versus final customer (Case C and D).

By crossing the two dimensions, the practices for customization identified in the cases where studied in terms of:

- Involved processes;
- Enabling technology;
- Collaborative relationships.

On the one hand, product customization mainly relies on the direct involvement of customers (both final customer and brands), and requires the adoption of technologies such as 3D tools, product configurators and 3D printing, to support design and production of prototypes and final goods. In Case A, the collaboration between focal company and designers allows for the realization of product ideas requested by brands into product features on the 3D models to produce. In case D, the use of 3D printing is aimed to realize the prototype of the shoes in strict collaboration with the final customer to satisfy their need of high performance product for sport activities. Each order implies specific materials and components into "customized projects" that need to be coordinated with collaborative work between designers and production managers.

On the other hand, service customization is based on a stronger collaboration with other actors of the downstream network (i.e. intermediaries, retailers, logistic providers), enabled by cloud platforms, to provide a customized service that fulfills the final requirements. Case B offers to its business clients (retailers) the customization of logistics activities (according to single packaging and delivery needs or constraints) through an online platform and the adoption of optimization algorithms for inventory and transportation loading. Company B is able to manage a high variety of packaging solutions and it leads the delivery tasks for the clients collaborating also with other logistics providers to ensure a high level service. The use of an online platform that supports collaborative practices for customized services is present in Case C, which offers several delivery options and targeted advertising to the final customers. To ensure these kinds of service, Company C has to strictly collaborate (also through offer of data-driven services) with logistics providers and the boutiques, which sell their products on the platform, ensuring the availability of goods.

The matrix shows that the involved processes in the customization of products mainly refer to the upstream side of the SC. It focuses on the design and production both for B2C and B2B markets to ensure the best products that fit with the requested characteristics. The processes of the downstream network are mainly addressed for the customization of services, involving personalized logistics (offering different delivery options) and targeted communications services to enhance the shopping experience.

This leads to the implementation of different enabling technologies: the additive manufacturing and the CAD 3D tools support the rapid development of the design and the creation of prototypes for customized products, while the use of online platforms facilitates the sharing of information during delivery services and the communication of personalized advertising to increase customer loyalty.

Focusing on the actors to be involved in a collaborative relationship along the fashion SC, the case studies show there are two main practices to be established. It is clear that, in case of collaboration with logistics providers, designers and other business, it is necessary to establish long-term strategic networks with framework agreements for answering to punctual requests (both form B2B market and B2C). In case of collaboration with final customer, it is necessary to define frameworks for goal-oriented networks with the possibility to have one-to-one formal collaboration.

Therefore, case studies show that is crucial for companies to decide the scope of customization, in terms of involved processes, enabling technologies and actors involved in collaborative relationships, in relation to the reference market. At the same time, the level of collaboration within supply networks is a key point: the cited cases show that collaboration between the SC partners becomes the only way to effectively achieve the objectives of customization. For example, in the cases of 3D CAD and online customization platforms it is evident that the rapid exchange of information between the company and its suppliers can be a critical success factor in order to create exactly the personalized product or service requested by customers.

6   Conclusion

Considering the high importance of the collaboration in the nowadays fashion market, this paper contributes to the debate by deepening how the theme of customization should be developed in accordance with the specific reference market. This work aims to contribute to the debate on customization in fashion industry by a cross-case analysis that highlights the collaborative practices and enabling technologies adopted by companies to offer customized product or services to B2B or B2C markets.

The paper is therefore part of a rapidly growing field of research (i.e. product customization), highlighting how appropriate study of the reference market and of the relations between supply network partners are also absolutely relevant aspects for defining a customization strategy. To this end, the paper considers how a company interfaces within the supply network for the development of customized products and services. The link between personalization, market and supply network relationships represents an interesting research area and new works are encouraged in this line.

Results show that companies should directly collaborate with final customers, and actors of the upstream network (e.g. designers), relying on tools of 3D modelling and 3D printing, to realize virtual models and prototypes aimed at realizing customize products. In case of customized services, focal companies need to collaborate not only with their clients (other businesses or final customers), but also with other actors of the downstream network (e.g. logistics providers). This collaboration, enabled by digital technologies as cloud platforms, improves the service level (e.g. delivery) and meets customers' needs.

The main constraints of the study concern the qualitative design and the limitation to a single industrial sector (fashion industry). Nevertheless, obtained results could be extended to companies of other industries in terms of dimensions that are judged as strategic for customization purposes. Additionally, future works can extent further the impacts of using enabling technologies for collaboration purposes, as well as their role in decision-making that has implications throughout multiple SC echelons.

Future investigations of these studies may bring interesting insights considering, for example, the reference market of companies offering customization in order to analyze in which contexts a personalized product is most appreciated. At the same time, a reasoning on the structure of the supply network will allow to combine a business development plan from the point of view of customization to the feasibility at the supply network level.

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