The Effects of Personalization on Collaborative Production Networks Location

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Abstract. This paper focuses on the identification of proper localization for collaborative production networks for personalized products. By the analysis of five case studies of the Italian footwear industry, the research provides the relationship between the type of personalization and the required supply network configurations by considering the production location issue, which is a topic not addressed in the literature.
The research demonstrates that since personalization is most of the time managed in parallel with mass production thus companies should be able to manage different network configurations by developing a local or global network based on the level of product personalization.

Keywords: Fashion industry, Personalization, location, supply chain, supply network configuration.

1 Introduction

Personalization represents an important market-niche, which accounts for about 10% of the entire fashion industry and leads to greater consumer satisfaction and a decrease in unsold products and inventories along the supply chain [1]. But the introduction of product personalization in manufacturing activities is not an easy task because it requires the realization of small batches of products (or even single products) with unique features that implies not only radical changes in the way to organize production but also requires o reorganize the location of production network in order to provide these personalized products in reasonable times with the required cost and quality levels.

This study concerns the footwear industry, strongly influenced by variation in product styles and customers' preferences, thus providing a suitable context in which to explore the personalization. Moreover, very different and complex supply chains characterize the footwear system in terms of both fragmentation of production activities and geographical dispersion of the actors involved. However, previous literature still lacks of an extensive analysis that could link the personalization issue with the location decision of production facilities within the supply chain. In this context, this research aims to analyse how a production network's configuration

should be designed according to different types of personalization by suggesting the use of local or global networks based on the types of personalization.

A recent study established that more than 3 million visitors each month access the site www.Nikeid.com to try to personalize their own shoe [2]. Personalization brings many advantages for companies in terms of increased sales, improved customer satisfaction and loyalty and, thanks to the application of premium prices to products, the possibility of avoiding competition based on low prices [3]. A company may decide to offer just some personalized products (or just some options), or it could adopt a fully made-to-measure approach within its production. Moreover, according to this decision, companies will develop also proper information and communication technologies (ICTs), such as product virtualization and configurators, 3D scanning tools and computer-aided design technologies, to collect customers' data, identify and test in real time many personalization opportunities and also support manufacturing processes ([4]; [5]; [6]; [7]; [8]). Therefore available literature still approaches the personalization issue by underlining the importance for the modern industry to catch the personalization possibility to enlarge their business but it lacks in debating how personalization impacts on the reorganization of production networks. In fact, even if companies have the possibility to buy the technologies necessary to implement personalization (such as 3D scanning tools) they should also be able to reorganize their production networks in order to ensure that customers can have the required personalized products in the required times.

1.1 Collaborative Production Networks

Growing competitiveness in the global market encourages manufacturing companies to form alliances among them for mutual benefit. Many forms of collaboration emerged as response to business environment transformations and the rapid developments in ICTs [8] [9] [10]. Collaboration in the form of stronger business relationships are a powerful instrument to achieve strategic objectives such as short lead time, high quality, and cost competitiveness especially for SMEs which need to create critical mass to stay competitive and collaborative networks represents a combinations of improved inter and intra-organizational business processes [8] [11]. In this paper we mainly analyse the organizational perspective of collaborative networks. From the perspective of SMEs, the collaborative business improves traditional supply chains, since they can manage the business better and increase their added value [12] [13]. In regional or sectorial Business Communities, trust can be built and communication streamlined, creating an environment suitable for the fast and efficient creation of partnerships or collaboration projects to respond to specific business opportunities [8] [10]. Moreover, the location of the companies participating to collaborative networks seems to have some strong influence on the final result of the relationship especially with customization strategies since it allows to better streamline the information and product flow [11].

1.2 Configuration of Collaborative Production Networks in Terms of Location

Even if the personalization benefits in terms of sales improvements are well known by companies and encourage these companies towards adopting customization practices, much care should be taken in the organization of production aspects. Developing personalized products requires a reorganization of processes, both internally within companies and externally with production network partners, to be able to create and produce new, small personalized collections (or even just one personalized product) with compressed lead times. Therefore, the issue of production network location assumes a crucial relevance ([14]; [15]; [16]; [17]) in particular for collaborative networks [18]. Indeed, personalization within the footwear sector remains a challenge considering the complexity of production processes connected to the assembly of the many parts composing a shoe, which are created with different materials and manufacturing technologies that may be located far-away countries. Production activities are assigned to many actors who are responsible for specific phases of the process requiring higher level of cooperation to be established among them. In the Italian footwear industry, this production network complexity drove companies to establish strong relationships with partners in the supply chain and, since the 1950s, led to the birth of local industrial districts characterized by peculiar inter-company synergies each specialized in the production of shoes typologies (sneakers, formal, fashionable woman, etc.). However, since the 80ies, a significant percentage of footwear production is outsourced and localized in other countries and widespread networks, making the realization of customized products more difficult. In this scenario, some companies have undertaken a backshoring path, shifting production from countries characterised by low labour costs to Italy (or to areas closer to their European headquarters) so that they can both respond quickly to changing customer requirements and control production quality ([16]; [17]; [14]; [15]). Hence, for Italian footwear companies, the latest strategic challenge seems to be the identification of a new trade-off between delocalized (and distant) activities and local ones in order to produce the personalization of products in shorter times for customers but, at the same time, to produce traditional collections, with longer wait times, that could require different collaborative production network structures. Therefore, where and how to locate production in a global scenario are critical decisions to achieve competitive advantage with a personalization approach and have become an increasingly important part of firms' competitive priorities ([8]; [14]; [16]; [17]; [18] [19]; [20]; [21]).

1.3 Research Objectives

New models and solutions for collaborative production network configuration are thus required, both from a scientific and an industrial point of view, to be able to catch customers' personalization necessities and to increase companies' capability to quickly react to mutable market demand [16]. This is particularly true in very complex and fluctuating environments such as the footwear industry.

Despite the importance of the personalization issue within the footwear industry, literature lacks of studies that deepen the relationship between personalization and the

proper supply chain location. The literature highlights the need to study the personalization issue in relation to production network configurations, particularly in terms of production location decisions (e.g., [16]; [17]). Examples of such reorganization can include backshoring delocalized activities and searching for a new trade-off between international and local activities to compress market lead times ([14]; [16]; [17]; [19]; [20]; [21]). Given these considerations, many authors have recognised the centrality of the issue of geographical production diversification and how it is linked to personalization, but none have focused on the footwear industry. The introduction of different types of personalization strongly changed the production processes of the footwear industry, making decisions of production network configurations very critical. Thus, the research question is as follows:

RQ. How production network should be located accordingly to different types of personalization in the footwear industry?

2 Methodology

Considering the explorative nature of the research question, data collection and analysis were conducted accordingly to the multiple case study methodology ([22]). Theoretical sampling and replication method were adopted to structure the research [23]. Moreover, the focal companies of the supply chain were selected as unit of analysis accordingly to the following criteria: the focal company holds the brand licence; it controls the entire supply chain and is responsible for the realization of the final product and for the location of the production within the entire supply chain; the focal company should occupy different market positions to provide a complete overview of the footwear market. Five companies agreed to participate in the study.

Table 1 – Companies' collection selection criteria

	Company A	**Company B**	**Company C**	**Company D**	**Company E**
Owned brand	✓	✓	✓	✓	✓
Market positioning	Luxury	Luxury	Mass market	Mass market	Luxury

To adopt an accurate case study approach and ensure data triangulation, we used different sources of observation, including data derived from direct observation during company visits, systematic interviews with company managers, and archives and documents shared with the interviewers. Industrial and operations managers and entrepreneurs were interviewed during company visits in 2015. We selected these profiles since they have a deep knowledge about the firms' processes and strategies. An interview protocol was developed for the research and information were collected during company visits; email or telephone contact were used where necessary [24]. In particular, the interview protocol was divided into three areas. The first area was dedicated to the main collection of data related to the company (such as turnover, employees and main economic indicators). The second area was dedicated to studying companies' ongoing decisions regarding personalization. The third area dealt with

determining production networks' configurations in order to identify business relationships with supply partners and different production configurations. The interviews were recorded with the permission of the respondents [24].

Analysis of the collected data was based on two main components: within and cross case analysis [15]. The within case analysis was useful to study for each supply chain in the presence of personalization, and then the cross case was used to compare the constructs of interests in other settings [22]. In particular, within case analysis was used to reduce and manage data to structure, define, reduce and organize of collected information and avoid bias. It explored the relations between different types of production networks (i.e. the unit of analysis of the research) and the personalization issue in footwear production networks. Then, the cross-analysis was used to underline these differences among the cases study in order to identify how supply chain should be organized accordingly to different personalized products. The process of data analysis was based on the achievement of full agreement between the research team also doing a check and a thorough discussion of any individual author's biases that could have obfuscate the analysis.

3 Results: The Relationship between Personalization and Production Network Configurations

This research identifies the collaborative production network configurations in terms of locations that can support different types of personalization within the Italian footwear industry (RQ). In particular, first it was analysed how production networks are structured by identifying the presence of different production areas: the first is located in the Far East, mainly for reasons of low cost (companies C and D); the second is in Italy or near the Italian headquarters to take advantage of specific manufacturing specialization (company C) and lead time compression (companies A, B, C, E). However, the research shows a growing push for the footwear industry to open new factories in or near Italy. This aspect is particularly interesting in relation to the backshoring phenomenon (e.g., [16]; [21]), which is assuming an increasing importance in the footwear sector and within the fashion industry in general since it allows a strong reduction in delivery times and logistical costs, as well as the avoidance of cultural differences and communication problems easing the collaboration mechanisms with suppliers. For instance, companies C and D are building their new plants in Italy and in Eastern Europe for, respectively, 20% and 10% of their production. In these new plants, they will realize either the complete production processes (as in the case of company C) or just the final assembly (company D), but in both cases, these production relocations will allow the companies to deliver even personalized productions with compressed lead times. The new manufacturing plants opened by companies C and D will be used, in particular, to improve their segmented personalization by reinforcing the realization of new collections personalized for market trends. This is based on a different collaboration approach where, upon a strategic framework, suppliers are asked to quickly answer to specific requests of the focal company needs of the customer.

Moreover, the case studies reveal that the production network location is linked

to the personalization typology offered to customers. For the highest personalization achievable, the production network structure must ensure speed within processes by developing fast delivery times through the design of the local production network (located in Italy or in areas near Italy, such as East European countries). In fact, made-to-measure and configured products require that collaboration is based on flexibility of suppliers and the companies A, B, C and D produce their collections in local production networks. By developing local networks, companies can better communicate with suppliers and other partners to share information obtained from markets and customers and provide the right product for the specific needs of the final consumer. Moreover, in this type of production network, raw materials and components are obtained locally when possible, always with the idea of decreasing lead times. Production capacity for individual personalization is, in fact, strongly affected by demand peaks, which companies try to cope with through collaboration with partners (subcontractors and raw materials suppliers) to achieve, through personalization, a real competitive advantage towards cheaper imported products. The re-localization of the production networks is occurring particularly among the highest market segments of the footwear industry as they attempt to reduce lead times of production and to better control the quality of the final products. In fact, customers asking for personalization may often be willing to pay a higher price for products, but this price must be supported by fast delivery times and adequate quality in manufacturing. Therefore, the reason for localizing is not only the need to achieve high product quality but also the necessity of shortening the market response time.

For mass products, the production network can be organized locally but also internationally depending on the type of position that the company has in the market: luxury companies will continue to choose local networks (mainly located in industrial districts) to achieve the advantages of using a “made in” label and to maintain high quality in their products (such as company A), but to companies belonging to the low-medium level market segment, the choice of production network localization may fall on countries in the Far East for cost benefits (such as company D). However, it is interesting to note that new product development phases are all produced within the Italian territory (for both companies locate production in Italy and in other countries) that aim to design products characterised by the “Italian style”.

4 Conclusion and Discussion

This study has helped to deepen the understanding of the personalization issue by identifying what configurations of production networks in terms of location can support personalization (RQ). The case studies revealed that there are substantial differences in the definition of production networks by identifying the presence of two different production areas: the first located in the Far East, mainly for reasons of low cost, and the second characterized by local networks to take advantage of specific manufacturing specialization and lead time compression. The research highlights that to approach the personalization issue there is a strong need to shorten the required lead-time within the collaborative production network to be successful and give strength to the return of productive activities (previously outsourced) in the European

territories (i.e., the backshoring or reshoring issue). In this way, personalization provides openings for a "new industrialization" of the European countries, even if companies must be able to radically reorganize their production processes by focusing on. Thus, for Italian footwear companies, the current challenge seems to be the identification of new trade-offs among delocalized and local activities in order to produce personalized products in short times but, at the same time, to produce traditional collections, with longer production times, that could require different production network structures. The results of this study may contribute to both theory and practice since the identification of different types of personalization and their deployment into different production network configurations are key determinants in overcoming ongoing market challenges. In this way, the research contributes not only to the identification and formalization of different types of personalization within the footwear industry but also identifies a clear correspondence between different types of personalization and supply chain configurations. Also, for managers, this work may represent a significant contribution to the identification of new ways to compete in the footwear industry and, at the same time, to define the best approach to production networks in line with their type of personalization. Moreover companies aiming at approaching the personalization issue can have the possibility to achieve a higher margin. In fact, the use of local suppliers would enable companies to justify the higher price on the finished product first of all in terms of improved quality features but also to prove the sustain of the company to national labour market (that normally in European Countries have a higher labour cost to be sustained by companies). However, given that the personalization issue is a trend that is also growing in other industries, this paper contributes to extend the managerial and academic debate on this theme and further research are encouraged to investigate personalization in other sectors. Starting from this preliminary analysis, it is possible to define a quantitative model to evaluate the impact of new location of production networks with performance indicators linking the increase of flexibility, the level of personalization and the location of the companies to the overall performance of the systems. Moreover future works could consider the impact of personalization on sales and operations plans since they are extremely relevant processes that must be taken into consideration when a company decide to implement personalization.

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