The Impact of Social Manufacturing on the Value Chain Model in the Apparel Industry

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Abstract—**Rapid development in mobile technologies, 3D printing and social networks has paved the way for the new phenomenon called Social manufacturing. Social manufacturing represents a paradigm shift in traditional manufacturing models; in social manufacturing, the role of customers changes from being passive to being fully active agents in the manufacturing of products. This shift allows for the opportunity to produce customized products according to the needs of every single customer in the society. The demand of consumers in the apparel industry is rapidly changing to becoming more personalized. Consequently, social manufacturing can dramatically contribute to customization in the apparel industry through the help of 3D printing. In this paper, we study how social manufacturing can redefine the entire value chain of the apparel industry**

Keywords—Social Manufacturing; Apparel Industry; Value chain; 3D printing.

I. INTRODUCTION

Traditional manufacturing has been facing dramatic changes in recent years. Increased demand for personalized products has forced manufacturing firms to proactively find solutions to address the various and personal needs of their customers (SoMa2020, 2014). The value of economies of scale and the "long tail effect" (Anderson, 2004) has been marginalized for many personalized products (Shang, Xiuqin, et al. 2013).

In this respect, the focus of the competition increasingly shifts away from the price and quality of the offerings toward the delivery of value to customers (Vargo, & Lusch, 2004).

Therefore, firms should seek out ways to think beyond common supply chain management techniques. Considering the ever-increasing complexity due to a multitude of factors, such as customer behavior changes, consumer culture, and market ecosystem, no one can resolve the entire problem alone (SoMa2020, 2014). The rapid development of internet technology and the emergence of crowdsourcing solutions provide the opportunity to connect different players of the manufacturing network and enable people in society to own the manufacturing capacity to respond to the demand for personalized products (Shang, Xiuqin, et al, 2013).

Therefore, crowdsourcing provides an ecosystem in which suppliers and customers are embedded and co-create in a dynamic manufacturing network (SoMa2020, 2014). This network is called "Social manufacturing".

A good method to analyze the effects of social manufacturing is to study the impact of social manufacturing on the value chain of a traditional manufacturing industry and the relevant value creating activities within the industry.

The apparel industry presents an ideal candidate for our study because demand in the apparel industry is growing rapidly for personalized products; as a result, the garment industry should react to a variety of different needs. Furthermore, the apparel industry is characterized by tough competition, where the profit margin is continuously shrinking and resource management is becoming more challenging (Shang, Xiuqin, et al. 2013).

The rest of this paper is organized as follows. We first briefly examine social manufacturing as a shifting paradigm and elaborate how 3D printing can facilitate this shift. Next, we define the Porter value chain and portray the current value chain in the apparel industry. Subsequently, we present a new value chain model in this industry based on social manufacturing. Finally, we conclude our study and propose some topics for further research studies.

II. SOCIAL MANUFACTURING AND 3D PRINTING

Social manufacturing has many advantages compared to traditional manufacturing, for example, the ability to localize, agility, and customer driven focus as well as a focus on the individual instead of the masses (SoMa2020, 2014).

The development of 3D printers in recent years offers great opportunity to fulfill the social manufacturing concept within the real world. A magazine, the Economist, highlighted social *manufacturing in its special report on manufacturing and*

innovation, "A third industrial revolution" (The Economist, 2012). Further, Professor Feiyue Wang explored more aspects of social manufacturing in his article "From social calculation to social manufacturing" (Wang F-Y, 2012).

Finally, the Institute for the Future (IFTF) is launching an initiative to provide a profound vision into the future of social manufacturing and its impact on development all around the world (IFTF, Social manufacturing, Alternative paths to development).

Nevertheless, there is still a large gap in academic research about social manufacturing.

3D printing consists of an additive manufacturing process in which products are built layer by layer via a series of cross-sectional slices (Berman B, 2012).

3D printing is basically used for "rapid prototyping", considering the low-cost and accuracy for prototyping.

However, in recent years, further applications of 3D printing are expanding very rapidly. One of these applications that has recently improved significantly is manufacturing the "end products".

Many companies, such as Shapeways, Quirky, i materialize, and kraftwurx, provide two-sided platforms that designers and customers can use to produce completely 3D printed end products.

However, there have been very few efforts for using 3D printers in the apparel industry. Twelve years ago, Anderson-Connell et al. (2002) identified that the apparel market has a huge potential to be mass customized.

Cantú and Jonsson (2012) analyzed the 3D printing of end products. They studied the value chain for the industry of companies offering 3D printed goods for end use through an e-commerce marketplace. The authors concluded that 3D printing is able to meet the customization needs of the customers and fulfills the characteristics of mass customization in the e-commerce marketplace.

In addition, they found that the role of customers in the value chain changes from being at the receiving end of the delivery of a product to being the co-creator throughout the entire value chain.

Meanwhile, 3D scanning technologies have enabled creation of virtual fitting rooms. 3D body scans allows customers to wear their favorite brand's collection in the virtual fitting rooms. Customers can check in these rooms whether the chosen cloth fits, whether like it or not and compare it with other brands on their bodies. It provides a very great chance to create more customized products.

D'Apuzzo studied different current 3D body scanning technologies with applications to the fashion and apparel industry. He concluded the expansion of these technologies would increase in near future.

Regarding these findings, we pursue a similar approach and applied the concept of social manufacturing in the apparel industry. We investigate the impact of 3D printing as an enabler of social manufacturing and observe its effect on the apparel industry's value chain.

III. VALUE CHAIN ANALYSIS

Michael Porter stated that a "Value Chain disaggregates a firm into its strategically relevant activities in order to understand the behavior of costs and the existing and potential sources of differentiation". Porter's value chain constitutes a "set of activities that are performed to design, produce and market, deliver and support its product". (Fischer, David J., et al, 2008)

Porter delineates the activities involved in creating a value into two major groups:

• "Primary" activities include inbound logistics, operations, outbound logistics, marketing and sales, and service in the core value chain creating directly value

• "Support" activities consist of procurement, technology development, human resource, management, and firm infrastructure supporting the value creation in the core value chain (Porter M, 1985).

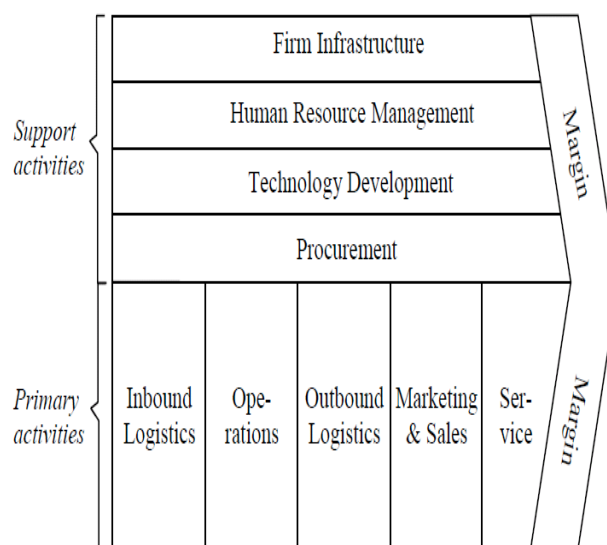Figure 1 illustrates Porter's value chain.

Fig. 1. Porter's value chain   Source: (Porter M, 1985)

In the apparel industry, the value chain is quite fragmented. The value chain begins with the production of raw material, starting with Fiber, which is then shaped into Yarn, then into Fabrics, and finally shaped into finished goods. These steps include both processing Inputs and textile designs. Next, the finished products move to cut/sew places, where they are further processed for packaging. National branding and licensing occurs at these locations for the products that have a branding strategy. After the production process ends, the final products are transported to distribution centers. This distribution might be performed by a brand marketer who is working as the agent of the brand manufacturer or by a third-party distributor. Finally, the retailers deliver the products to the customers through merchant stores, discount stores, or similar channels (Gereffi G, Frederick S-, 2010).

Figure 2 depicts the entire value chain in the current business. As we can see, customers remain at the end of the value chain, resulting in very limited opportunities for customized products. Furthermore, the customer plays no role in the most value-adding steps, such as R&D, Design, Marketing and Services.

Garment manufacturers mainly perform design, and there is a gap between the design and the marketing and sales activities, which can result in the production of customer-driven products to be less likely.
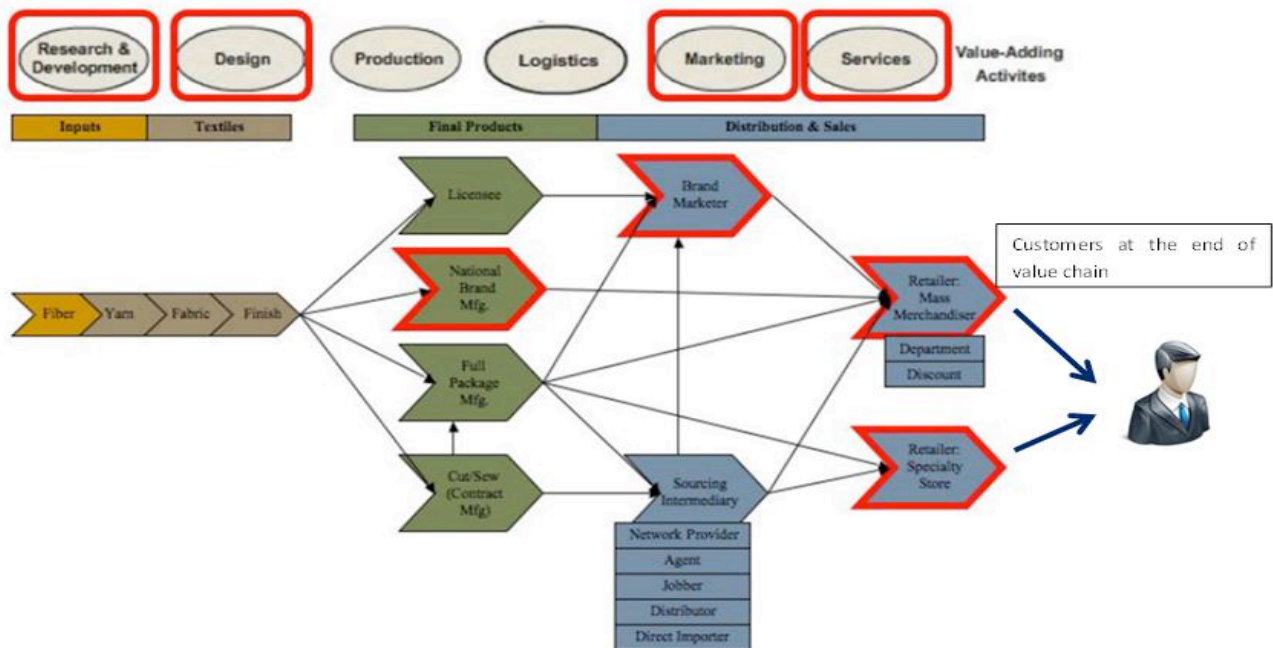

Fig. 2. Apparel industry's value chain   Source: (Gereffi G, Frederick S, 2010)

IV. NEW VALUE CHAIN: INTRODUCTION TO SOCIAL MANUFACTURING

In the new value chain promoted by social manufacturing, customers drive the entire value chain and co-create throughout the process. In the research and development phase and the design phase, customers use an online platform to upload their own designs or customize their favorite clothes.

In the production phases, customers can easily 3D print the various types of products and engage in the heart of the production process. Shang, Xiuqin, et al. (2013) visualized a social manufacturing apparel service in which a retailer can improve their logistics, marketing and service quality. Regarding the logistics aspect, the size of stores can be minimized and be flexibly distributed within the city to be located near the homes of the customers. Such an approach will save significant amounts of energy and costs regarding the outbound logistics. In addition, online stores will potentially take over physical storefronts, thereby leading to further reduced logistics costs (Shang, Xiuqin, et al.2013).

Regarding marketing, suppliers and manufacturers can analyze real-time market requirements and trends from the customer's online and physical storefront consumption data. Such an analysis contributes to rapid adaptation to the customer needs and proactive offerings. Finally, regarding the

service aspect, the retailer's service quality can be substantially improved by a combination of online and brick-and-mortar sales channels. Therefore, the stock will be reduced and inventory can be minimized. The operational cost will be reduced, and eventually, the best services will be delivered to the end customers by meeting both their extrinsic and intrinsic needs.

V. CONCLUSION

Over the past decade, traditional manufacturing has undergone many changes. Successful experiences in crowdsourcing, development of 3D printing and the popularity of social networks and other online platforms are leading to the transformation of traditional manufacturing into "social manufacturing". In social manufacturing, every consumer participates in the design of products via crowdsourcing through social media and other online platforms, thereby moving from traditional manufacturing to a sublime model of "from idea to product" manufacturing. 3D printers can promote this new manufacturing ecosystem and enable social manufacturing to develop as rapidly as possible. In this paper, we analyzed the impact of social manufacturing on a traditional manufacturing industry, the apparel industry. We addressed how the value chain can be completely reshaped by using social manufacturing, which changes the role of the customer

from only being a receiver of the final products to being a co-creator in the entire value chain.

Our research represents one of the first steps in studying the disruptive concept of "Social manufacturing".

In summary, we highlighted the sense of urgency that is needed to apply social manufacturing ideas and to displace the traditional manufacturing mindset. Further research will apply the findings and concepts of this study to other industries and observe the real impact and consequences of this new phenomenon.
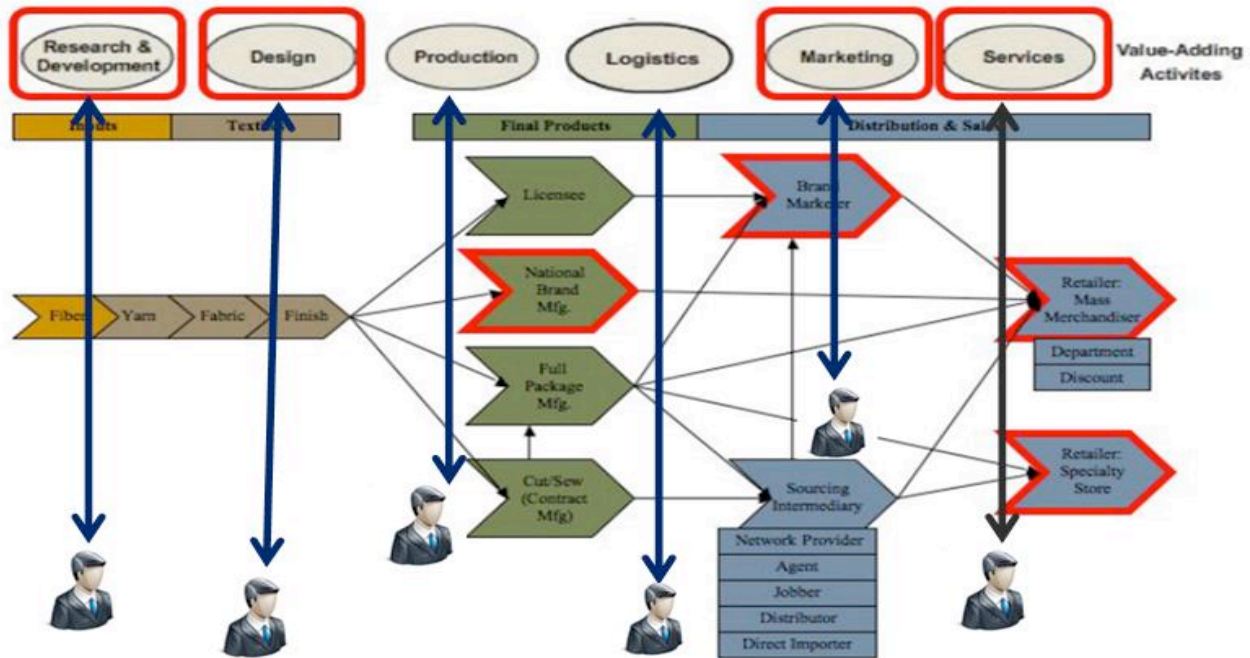

Fig. 3. The social manufacturing model places the customers at the center of the value chain

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