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INDUSTRY 4.0: THE STRATEGIC ROLE OF MARKETING

November 2017

Marco Fanno Working Papers - 213

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Abstract
A fourth industrial revolution is occurring in the global manufacturing system related to new technological solutions enabling new forms of production inside the firms as well as new relationships between the firm and its market. Manufacturing firms need to cope with the new industrial challenges in order to sustain their competitive advantages. The paper is an exploratory study about the adoption of the Industry 4.0 new technologies by the Italian manufacturing firms, focusing on the central role that marketing has for the firm's decision to adopt and in terms of results achieved. Based on a survey of about 650 Italian firms specializing in Made in Italy industries, the research analyze motivations for adopting and not adopting Industry 4.0 technologies and the strategic implications of adoption. The results highlight the relevant role of customers and marketing variables in terms of motivations about the decision to invest in the new technologies and the type of technologies adopted, both in B2C and in B2B markets. Marketing and theoretical implications, in addition to some research limitations and directions for the future research are presented.

Introduction

In the recent years, industry is undergoing a transformation that concerns a full digitalization of manufacturing processes. Smart manufacturing technologies (autonomous robots, additive manufacturing, laser cutting), big data and cloud-computing, Internet of Things (IoT), augmented reality are some new technologies are driving the rise of the new digital industrial revolution, known as Industry 4.0 (Almada-Lobo, 2016). A greater flexibility of production processes and a greater attention to the customers are necessary to face the increasing complexity on markets. Recent literature shows that new technologies of Industry 4.0 allow manufacturing firms reaching such results and, specifically, achieving higher efficiency and productivity rates, quickly customized products and time to market responses (Berman, 2012). To support the new digital challenges, policy-makers in several countries are planning a research and technology agenda.

In Italy, national policy-makers are placing a great attention to the strategic value of Industry 4.0 and have planned a series of financial policies to help Italian firms facing this new industrial revolution (Lucchese, Nascia and Pianta, 2016). On the one hand, the Italian small and medium-sized firms (SMEs) are characterized by a slight delay in the implementation of the Industry 4.0 technologies even though they are aligned with other pioneer European countries, such as Germany and Denmark, in the adoption of Robotics, Additive Manufacturing and Cloud computing (OECD 2017). Such results show that the adoption of Industry 4.0 technologies may be linked to the specific industry firms belong and/or their production process. On the other hand, Italian manufacturing firms believe in the revolution of Industry 4.0 and consider it essential to increase their competitiveness (Bottoncini, Pasetto and Rotondi, 2016).

The paper aims at understanding the role of marketing within the adoption of Industry 4.0 technologies. As the literature and media pointed out, Industry 4.0 is a technological revolution happening at the factory level, changing the way products are made. In this context, marketing seems to play a marginal role in respect to the production function. From this perspective, engineers are overtaking managers. On the contrary, we maintain that marketing is at the base of the decisions of adoption by firms. Our hypothesis is that Industry 4.0 are market-driven technologies that help firms to improve the quality of relationships with the customers, in addition to reduce production costs and increase flexibility.

Theoretical background

The Industry 4.0 is a new phenomenon aimed at changing economic rules in all industries with main attention to the manufacturing ones. The peculiar feature of this industrial revolution is its higher degree of complexity compared to the previous ones. Essentially, Industry 4.0 considers the usage of new technologies with the aim to integrate objects, humans and machines across organizational boundaries to form a new type of networked value chain. Firms implement a three-types of integrations: horizontal, vertical and end-to-end integration, which allow them to improve the efficiency of production processes and maximize the customization of products (Weller, Kleern and Piller, 2015). In this sense, the most relevant findings of scholarly research scholars refer to: (a) the increase of firms' productivity and (b) to the

growing role of customers in the firms' production processes. In the approach of Industry 4.0, recent research found some technologies, such as robotics, additive manufacturing technologies, laser cutting are have principally the potentiality to provide more efficient performances (Yeo, Pepin and Yang, 2017). Others, such as IoT, Big data, or Cloud computing allow instead improving firm's knowledge about the customer needs (Porter and Heppelmann, 2015). As a matter of fact, certain technologies and applications seem, therefore, to be more appropriated for the business-to-consumer (B2C) domain while other ones for business-to-business (B2B) markets.

Notwithstanding this scenario, customization is an important asset of this fourth industrial revolution bringing together the B2B and B2C perspectives. Firms need to be closer to their customers and more reactive in interpreting their needs, through deeper customer's involvement and engagement at the value chain level - in designing and the developing processes of products. With this respect, the new technologies are changing the buyer-seller relationship, either in the B2B and in the B2C markets, stressing the firm's capability to quickly respond to the customer desires (Obal and Lancioni, 2013). Other recent studies have highlighted how B2B firms have started to use digital marketing tools, especially the social media marketing, in the same way of B2C firms (Wang, Pauleen and Zhang, 2017). This new marketing approach of B2B companies is connected with the growing international competitiveness of industrial markets. Final customers and business clients should be managed in the same way, because of the great complexity governing the economic markets. This involves the establishment of customer-centric business systems using the new technologies to understand the customer and engaging him in the production processes.

The study aims at analyzing the Industry 4.0 technologies adoption rate by Italian manufacturing firms, in order to assess the motivations about the adoption as well as the no-adoption decision, the kind of technologies principally adopted by firms and the activities of value chains where the investment in these new technologies is focused. Then, concentrating on the relevance of marketing aspects (over efficiency related reasons) the present study aims at comparing B2C and B2B firms to explore similarities and differences in motivation and results achieved.

Methodology and results

The present research is a first exploratory study of a larger project about Industry 4.0 in the Italian manufacturing production system. The study focused on the firms of Made in Italy sectors located in the North of Italy. The choice is due to the relevance they have for the Italian Gross Domestic Product (GDP) and for the national competitiveness in the international markets. The universe consisted of 5,421 manufacturing firms drawn from AIDA database. Based on a structured questionnaire submitted through CAWI methodology, firms have been contacted and 646 firms (11.9% of the universe) answered to the survey. The questionnaire assessed the adoption of the following technologies: (1) Robotics, (2) Additive manufacturing, (3) Laser cutting, (4) Big data and cloud, (5) Scanner 3D, (6) Augmented reality and (7) IoT and Intelligent products. These technologies are those that more than others fit the strategic needs of the manufacturing firms either in B2C and in B2B markets

(Sanders, Elangeswaran and Wulfsberg, 2016). The subsequent questions aimed to assess the motives underlining the adoption and the no-adoption of the technologies mentioned before. For the adopting firms, the questionnaire continued assessing (a) the output of the production process (products for final customers vs products for business clients), (b) the activity of the value chain where the firm focused the investment in the new technologies and (c) the results obtained.

The firms adopting one or more of the technologies listed in the questionnaire were the 16.9% of the sample (109). The firms' motivations regarding the decision to not adopting the technologies investigated are centered in cultural beliefs and/or missing of information. For these firms the technologies are not interesting for the activity performed (66.4%), they have a poor knowledge about the topic (18.8%), or they consider themselves as artisan firms (17%). Reasons are not linked to the lack of financial resources (7.7%) or the uncertainty about the return on investments (5.5%).

The group of adopting firms is composed by large part of small firms (67,6%). The medium firms are 25.7% and the big ones the 6.5% of the adopting sub-sample. This result is very interesting because the recent the data show that these new set of technologies is not only for the big firms, as it is believed. Such sub-sample is composed by 58 (53.2%) of B2B and by 51 (46.8%) of B2C firms. Table 1 summarizes the firm's adoption rate by the different kind of technologies and how many technologies each firm adopted, differentiating B2C and B2B profiles.

Table 1: *Technologies adopted by the whole sample and by B2C and B2B firms*

Technologies	**Total**	**B2C**	**B2B**
Laser cutting	46.8%	54.9%	39.7%
Robotics	43.1%	35.3%	50.0%
Additive manufacturing	43.1%	45.1%	41.4%
Big Data – Cloud	39.4%	37.3%	41.4%
IoT/Intelligent products	25.7%	23.5%	27.6%
Scanner 3d	15.6%	11.8%	19.0%
Augmented reality	12.8%	15.7%	10.3%
Number of technologies adopted			
One technologies	35.8%	39.4%	41.4%
Two technologies	64.2%	60.6%	58.6%
	N = 109	*N = 51*	*N = 58*

Note: the questions about the adoption was a multiple-choice

From the marketing viewpoint the high adoption of Big data and Cloud (39.4%) and the IoT and Intelligent products (25.7%), either in the B2C and B2B firms, without significantly differences between the two different market logics, is an interesting finding that shows how important is the marketing in the Industry 4.0 approach. Technologies are enabling firms to better understand the customer desires. Big data analytics allow firms studying more in depth the customer preferences and improving the customer experience with their products and/or brands. Also the

adoption of Augmented reality presents a good adoption rate by B2B firms (10.3%), highlighting a possible new marketing approach of B2B firms. With regard to the number of technologies each firm adopted, it is interesting see that the higher part of B2C and B2B firms adopted two or more technologies. Other interesting findings about the technologies adopted and the relevance of marketing in driving the decision to adopt them refer to the main motivations driven firms to adopt the new technologies, the main activities of value chain where firms focused the investment in Industry 4.0 and the main results obtained with the technologies adopted, summarized in the table 2.

Table 2: *Main motivations, value chain activities and results obtained*

Motivations about the adoption	**B2C**	**B2B**
Improving the customer service	51.0%	50.0%
Improving the firm's efficiency	41.2%	43.1%
Value chain activities where firms focused the investment in new technologies		
New products development	56.9%	-
Prototyping	51.0%	41.4%
Manufacturing activities	-	55.2%
Marketing activities**	35.3%	10.3%
Results obtained with the new technologies		
Increasing of performances through services*	29,4%	17,2%
Customer involvement in the co-design process*	15,7%	13,8%
Customer involvement in the co-production process*	3,9%	6,9%

Note: * = differences no-significantly; ** = difference significantly.

How the results show for both types of firms, the improvement of services offered to their customers is the main motivation concerning the adoption of the Industry 4.0 technologies. In addition to the investments in the domain related to the production processes (new product development and prototyping for B2C; production process management and prototyping for B2B), B2C and B2B firms also adopt Industry 4.0 technologies in marketing activities – with differences between the two groups. However, when it comes to the results achieved both B2B and B2C firms principally obtained an increasing of performances through the improvement of services offered to the customers. Moreover, they had a higher involvement of customers in the co-design and co-production processes. The differences about such latter results are not significantly, therefore it can be stated that the marketing perspective about the adoption of these new technologies of Industry 4.0 has a strategic role for both the B2C and B2B markets.

Conclusions

Industry 4.0 is characterizing the evolution of manufacturing industries, affecting the way they perform the business processes. The results of the analyses suggest that the adoption of Industry 4.0 technologies in the Italian manufacturing firms is still

low, mainly due to a cultural thinking and strategic attitude rather than a lack of financial resources. Therefore, policy-makers have to focus their actions on the diffusion of the knowledge about Industry 4.0 and the advantages related to the adoption of the new technologies. In addition, our results highlight the relevance of the marketing reasons in the adoption paths. Managers should think to the new technologies as enabling factors that solve the trade-off between production and marketing areas of the firm, that aim at improving the overall customer experience, through a higher involvement (in the production processes) and a higher customization, in B2C as well as B2B markets. Theoretically, the marketing purposes seem to be the real drivers of this fourth industrial revolution. However, the study presents some limitations that can represents the directions for the future research. In particular, as the research is ongoing, the sample is going to be enlarged and, then, should be useful replicate the research at international level in order to generalize the findings.

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