

## INNOVATION NETWORK IN THE PORTUGUESE TEXTILE AND CLOTHING INDUSTRY

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### KEYWORDS

Innovation networks, Survey, Portuguese Textile and Clothing Industry

### ABSTRACT

Innovating consists on doing something different or developing new input aggregations, with the goal of achieving a better solution than the current one. The ability to create new knowledge depends on the exploration of complementary skills, which might be internal or external to the operation, reflecting the changes that the organizations have been making in their management style and their relations with other economic agents. Successful innovation results from an interactive learning process between users and producers, between competitors, customers or suppliers and other knowledge and training institutions, such as universities and higher education institutions, or R&D centers.

This research aims to contribute to the theme of innovation networks in the Textile and Clothing Industry (TCI) of Portuguese companies by exploring who are the different partners of the existing innovation networks in the Portuguese TCI. A survey with 86 companies suggests that Portuguese TCI companies are preferentially focused on product innovations and process innovations, with customers and suppliers as preferred partners. Therefore, vertical cooperation with suppliers and customers plays a greater role in business innovation of Portuguese TCI companies compared to horizontal cooperation with research centers, universities and technological centers.

### INTRODUCTION

Innovation should be seen as an evolutionary and non-linear process that requires intense interaction with different external partners (Yam et al., 2011). It is these external partners who guarantee the knowledge that is lacking in the learning process of the company internally (Romijn and Albaladejo, 2002). The isolated and vertical organizational structures are replaced by partnerships that privilege communication, the combination of competences, learning and the acquisition of knowledge through the construction of networks (Ceci and Iubatti,

2012). Networks enable the creation, development and sharing of knowledge and resources, as well as a new perspective and solutions, synergies and cost reduction. Depending on the objectives of each company, different types of partners are needed, such as suppliers, consultants, universities, among others, to support the different innovation activities and specific know-how.

The Textile and Clothing Industry (TCI) is one of the most important economic sectors in the world. Portugal is no exception, and its Textile and Clothing sector has a strong representation in the economy, both in the number of existing companies and in jobs generated. In order to cope with the high competitive pressure, the companies in the sector have been challenged to adopt an innovation strategy, which should involve the development of innovation networks. Thus, the present research aims to contribute to a better understanding of the innovation networks used in the Portuguese TCI.

The paper is structured as follows. The next section presents the conceptual background of innovation and networks. Then, in the section after, a brief characterization of Portuguese TCI are presented. The research methodology presents the results of the survey created to study the innovation sources used by Portuguese TCI. In the final section, are presented the main conclusions and further research.

### INNOVATION AND NETWORKS

As innovation is the growth pillar of an organization and provides a significant competitive advantage, companies seek to innovate by developing new products and processes or by improving existing ones. However, the innovative capacity varies from company to company, being determined by a vast and complex number of internal, external and relational factors (Tidd and Bessant, 2009). To ensure success in the market it is imperative that companies do not innovate in isolation and that they gain access to external sources of innovation as a complement to their internal knowledge. The creation of so-called innovation networks with a set of different partners allows companies to ensure the necessary resources for the development and success of innovation activities. Based on the literature, an innovation network functions as a web of relationships

that the company establishes with different external partners. It results from various interactions between the different actors present in the network, with the specific objectives of acquiring new ideas, skills and resources, and entering the market with new or improved products and / or processes (Ahuja, 2008; Arranz and Arroyabe, 2012; Castilla et al., 2000; Fleury and Fleury, 2000; Julien, 2010; Lima et al., 2008).

For innovation network partners, they can range from suppliers, service providers, customers and / or competitors, as well as organizations that can somehow provide the support needed to develop a particular innovation (eg institutions financial institutions are important partners for guaranteeing financing, research organizations allow complementary know-how, government institutions provide financial support, particularly with institutional support programs for innovation (Zeng et al., 2010)).

Ritter and Gemünden (2003) and Ritter et al. (1996) believe that the importance of relationships with a particular type of partner differs significantly from company to company. Different network partners mean different innovation goals and different levels of interaction. The differences are explained by the specific characteristics of each company, the experience and work capacity of the company, as well as its willingness to invest in advantageous positions in the network. This means that companies differ not only in the choice of their network partners, but also in how they share and build innovations. Companies tend to maintain the relationships that are really important to them, since obtaining external resources has costs being an extensive and costly investment process. Thus, these authors argue that the importance of the relationship and technological orientation with a particular type of partner differs from company to company, because different network patterns are adequate to pursue different innovation objectives.

#### **TEXTILE AND CLOTHING INDUSTRY IN PORTUGAL**

The Textile and Clothing Industry is one of the most important industries in the Portuguese industrial structure with a significant role in terms of employment and development of the national economy. According to the “ATP - Associação Têxtil e Vestuário de Portugal” (Textile and Clothing Association of Portugal) (2018), Portuguese TCI currently accounts for 10% of total exports in Portugal, and represents 20% of national manufacturing, 20% of employability, 9% of turnover and 9% of total production. This significant impact on the Portuguese economy, greatly influences the sustainable development of the country. The companies that constitute the Portuguese TCI are located mainly in the north of Portugal, in the municipalities of Porto, Braga, Guimarães and Famalicão, which makes this region of the country represent 86% of turnover and 85% of employment. Over the last five years, turnover has increased by approximately EUR 2 million with an increase of more than 10 000 jobs (ATP, 2015, 2018).

Overall, economic indicators show that the activity of Portuguese TCI has increased (see Table 1).

Table 1: Economic indicators of the Portuguese TCI 2013-2017 (€ million) (ATP, 2015; 2018)

	2013	2014	2015	2016	2017
Production	6.028	6.485	6.359	7.136	7.400
Financial turnover	6.296	6.712	6.755	7.347	7.500
Exports	4.283	4.620	4.836	5.035	5.237
Imports	3.344	3.608	3.795	3.932	4.138
Trade balance	939	1.012	1.041	1.103	1.099
Employment	124.147	128.414	129.452	135.197	137.000

The increase in exports in Portuguese TCI reflects the companies' efforts to compete in foreign markets, with investment in the differentiation of their products, allowing them to respond to increasingly competitive markets.

According to the SWOT analysis of the sector carried out by ATP (2015) (see Table 2, Table 3, Table 4, Table 5) and in a perspective of innovation stand out as strength “the capacity to innovate in terms of product”, the weakness “the lack of cooperation between the various partners”, the opportunity “concentration and business cooperation to gain critical dimension and competitiveness” and the threat of “meet the competition of the most evolved partners”.

Table 2: Forces of the Portuguese TCI (ATP, 2015)

- Tradition and industrial textile know-how, including product development;
- “Made in Portugal” adds value;
- Flexibility and high reactivity;
- Resilience;
- Textile and Clothing Sector as a complete, structured and dynamic sector;
- Sector supported by consistent and developed competence centers (CITEVE, CENTI and MODATEX).

Table 3: Weaknesses of the Portuguese TCI (ATP, 2015)

- Companies that are not capitalized and heavily dependent on bank credit;
- Reduced size of the domestic market, in addition to being concentrated and depressed;
- Productivity;
- Low educational level;
- Small size of enterprises;
- Weak entrepreneurship;
- Lower tertiarization of the business fabric;
- Individualism.

Table 4: Opportunities of the Portuguese TCI (ATP, 2015)

<ul style="list-style-type: none"> <li>• Market niches for particular products and emerging markets;</li> <li>• Industrial specialization;</li> <li>• Technical and functional textiles;</li> <li>• Exploitation of licenses;</li> <li>• Young Entrepreneurship;</li> <li>• Reindustrialization as a national and European policy;</li> <li>• Concentration and business cooperation to gain critical dimension and competitiveness.</li> </ul>
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Table 5: Threats of the Portuguese TCI (ATP, 2015)

<ul style="list-style-type: none"> <li>• Difficulties in access to credit and high cost of financing;</li> <li>• High energy and environmental costs (at a disadvantage compared to competitors);</li> <li>• Competition from the most evolved partners in offering more attractive products in terms of marketing and fashion and competition from the new producing countries in higher quality ranges;</li> <li>• Risk of disruption of the Textile and Clothing sector.</li> </ul>
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It is imperative that the companies of the Portuguese TCI recognize the importance of partnerships for the development of innovation activities, since they need knowledge and know-how not always available internally.

## RESEARCH METHODOLOGY

This paper presents the preliminary results from a survey designed “Parcerias na Indústria Têxtil e Vestuário em Portugal” (Textile and Clothing Industry Partnerships in Portugal), with the objective of exploring the operation of the innovation network in the Portuguese TCI. Of the 90 respondent companies, 4 were eliminated for very incomplete answers, which allowed 86 responses considered valid. Table 6 summarizes their characteristics.

For the purposes of analysis, this article did not consider micro enterprises (less than 10 employees), which results in an analysis of 80 companies. Following is the analysis of the main results.

To characterize the innovation developed in the companies, each company was asked to distribute 100 points for the four types of innovation: product innovation, process innovation, organizational innovation and marketing innovation (Acosta et al., 2016; OECD, 2005). The Figure 1 shows the distribution of the values obtained in the set of 80 respondent companies.

Table 6: Characterization of respondent companies

	n	%
<b>Economic activity</b>		
C – Manufacturing	64	74.4
G – Wholesale and retail	8	9.3
N - Administrative and support services activities	5	5.8
S - Other activities and services	1	1.2
Do not know / Do not respond	8	9.3%
<b>District of Portugal</b>		
Braga District	74	86.0
Oporto District	8	9.3
Others Districts	4	4.7
<b>Industrial group</b>		
Yes	70	81.4
No	16	18.6
<b>Company size (number of employees)</b>		
<10	6	7.0
<50	49	57.0
<250	26	30.2
250 or +	5	5.8

When comparing the median, it is verified that the highest median is that of product innovation with a value close to 35 points out of 100, which means that 50% of respondent companies spend at least 35% of their innovation effort on: product innovation. It is also in product innovation that there is greater variability in responses, with responses ranging from a minimum of zero effort to a maximum of 80 (two outliers).

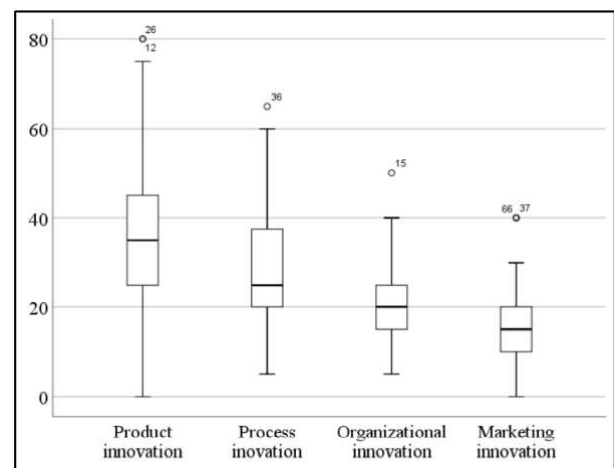


Figure 1: Innovation type effort

In order to explore possible differences due to the economic activity, it was decided to group the companies into two groups: 1) manufacturing industry (N=64) and 2) non-manufacturing industry (N=16). The results regarding the innovation effort are presented in Figure 2. Although differences in the distribution and symmetry of the scores attributed by the two groups were visualized, however, no statistically significant differences were

found in the respective innovation effort (non-parametric Mann-Whitney tests ).

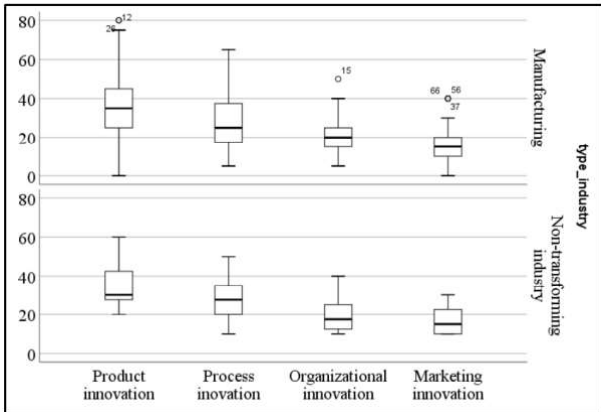


Figure 2: Innovation type effort by industry type

Considering only the manufacturing companies (N=64), it was decided to analyze possible differences between the three company size defined by number of employees (small, medium-sized and large) (see Figure 3). Small firms report a greater effort of innovation in product innovation and a minimal effort of marketing innovation. Medium-sized and large companies, meanwhile, indicate a more similar and balanced effort between product innovation and process innovation. Again, the differences found are not statistically significant when comparing effort by type of innovation across the three company size (non-parametric Kruskal-Wallis tests).

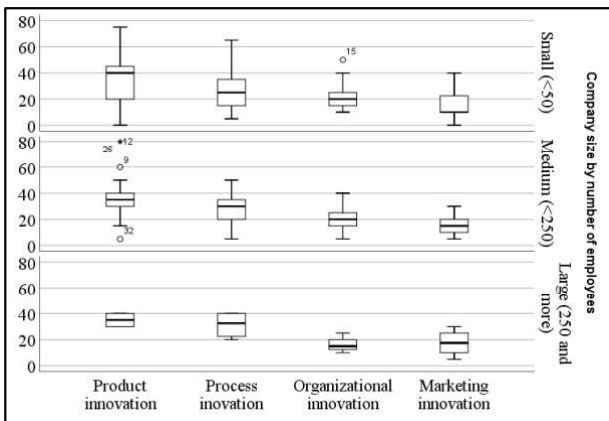


Figure 3: Innovation type effort by manufacturing company size

In order to evaluate the existing cooperation networks, the scale developed by Zeng et al. (2010) was used and each company was asked to indicate the frequency of cooperation for innovation that the company has with the different partners (on a scale of 1 - Never to 5 - Always). The results of manufacturing companies (N=64) are presented in Figure 4 (based on the calculation of the mean of responses).

As the most frequent innovation partners are, in descending order, customers, suppliers of raw material and suppliers of equipment and machinery. Innovation

partners with less frequency include universities, research centers and venture capital organizations.

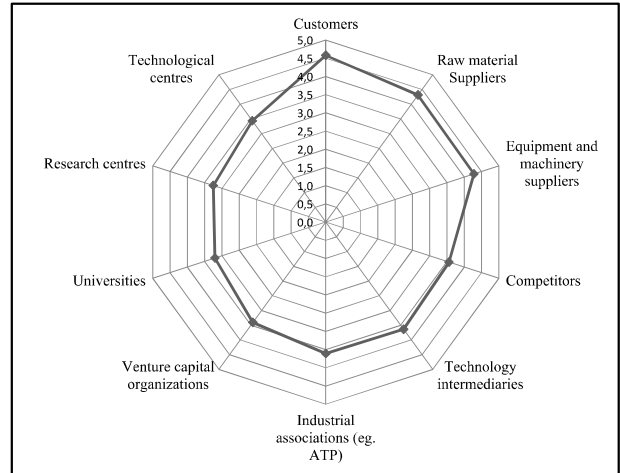


Figure 4: Innovation partners: frequency of cooperation of manufacturing companies

We also evaluated possible differences in collaboration between the three company size. Figure 5 shows the results found.

Although the most frequent partnerships continue to be customers, suppliers of raw materials and suppliers of equipment and machinery, it is possible to identify differences between different company sizes. Large companies tend to collaborate more frequently with innovation partners compared to small firms. It is possible to identify that it is the large companies that collaborate more frequently with research centers, universities, venture capital, industrial associations and competitors. In turn, small firms tend to focus more on customers and suppliers.

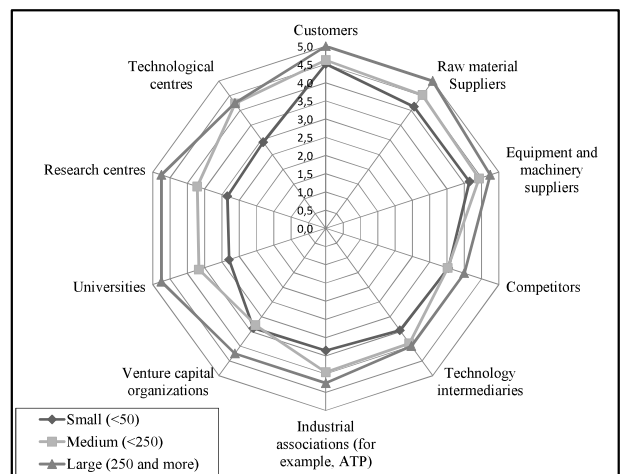


Figure 5: Innovation partners: frequency of cooperation by manufacturing companies size

In the study, statistically significant differences were verified between company sizes for collaboration with suppliers of raw materials (Kruskal-Wallis,  $p < 0.05$ ), universities (Kruskal-Wallis,  $p < 0.01$ ), research centers ,

$p < 0.01$ ) and technological centers (Kruskal-Wallis,  $p < 0.01$ ).

Subsequently, based on the score attributed by each company that revealed different priorities in terms of innovation type and effort, it was decided to explore the frequency of collaboration with partners considering the companies classified in one of five groups:

1. a company that predominantly makes product innovation (N=27),
2. a company that predominantly makes process innovation (N=12),
3. a company that predominantly makes organizational innovation (N=3),
4. company that predominantly makes marketing innovation (N=3) and
5. company with a mix in terms of innovation effort (product and process, or process and organizational, or product and organizational, ...) (N=19).

The results presented in Figure 6 allow to identify differences in the frequency of cooperation with the different partners. The frequency profile of collaboration is somewhat similar among companies with the exception of the frequency of collaboration with suppliers of raw materials (the low frequency of companies that predominantly make process innovation stands out). Companies that predominantly make marketing innovation reveal a greater frequency of partnerships with technology centers, research centers, universities, venture capital and competitors.

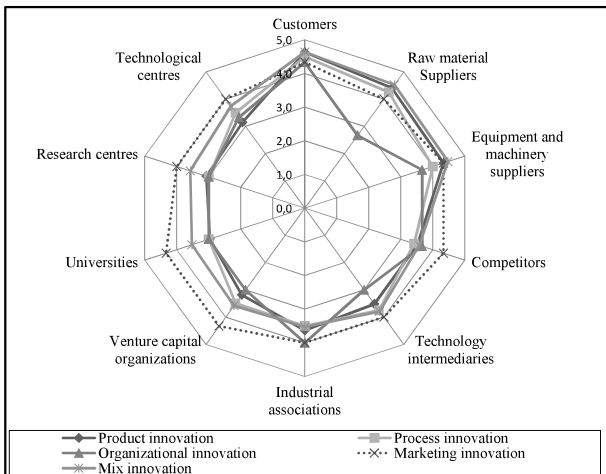


Figure 6: Innovation partners: frequency of cooperation by innovation effort

When testing whether the differences found for the five innovation effort levels were statistically significant, only differences in the frequency of collaboration with raw material suppliers were confirmed (Kruskal-Wallis,  $p < 0.10$ ).

## CONCLUSIONS AND FURTHER RESEARCH

Innovation is an important factor for the progress of companies and consequently of the economy. Innovation networks comprise and conceive spaces of interaction, confrontation and acquisition of different types of knowledge and available skills, in which the established relationship enriches the company with new and complementary knowledge in the processes of innovation.

In the study carried out with Portuguese TCI companies, there was a greater innovation effort in product innovation, followed by process innovation, organizational innovation and marketing innovation (in descending order). When the innovation effort was analyzed in terms of the size of the companies, it was found that it was the small companies that indicated a greater effort of innovation in product innovation associated to a minimum effort of marketing innovation. Medium and large companies, meanwhile, indicate a more similar and balanced effort between product innovation and process innovation.

When analyzing the innovation partners of the Portuguese TCI, the results suggested that the most frequent innovation partners are the clients, followed by suppliers of raw material and suppliers of equipment and machinery (descending order). Less frequent innovation partners include universities, research centers and venture capital organizations. When considering the effect of firm size, the results indicated that large firms tend to collaborate more frequently with different innovation partners than small firms. It is also possible to identify the large companies that collaborate more frequently with research centers, universities, venture capital, industry associations and competitors. In turn, small firms focus on customers and suppliers as innovation partners.

From the analysis between the type of partner and the innovation effort of the companies, there were no relevant differences, except for companies that are predominantly focused on process innovation with the least collaboration with suppliers of raw materials.

In general terms, the results of the study suggest that the company size may affect the choice of innovation partners, in particular of technology partners such as universities or research centers.

As the study is merely exploratory, the results obtained need further investigation, especially with the extension of the study to a larger sample. It is intended to develop in future a research study focused on the management of the innovation network by Portuguese TCI. A strategy based on innovation requires that the companies of the Portuguese TCI know and manage their partnerships in the network. It is important that companies recognize the need to have a network expertise for this innovation network strategy to work, requiring clear management of the task execution and human resources qualifications.

## ACKNOWLEDGMENTS

This work has been supported by COMPETE: POCI-01-0145-FEDER-007043 and FCT – Fundação para a Ciência e Tecnologia within the Project Scope: UID/CEC/00319/2013.

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