

Innovation in “Low-Tech” Industries: Portuguese Footwear Industry

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Abstract—The Portuguese footwear industry had in the last five years a remarkable performance in the exportation values, the trade balance and others economic indicators. After a long period of difficulties and with a strong reduction of companies and employees since 1994 until 2009, the Portuguese footwear industry changed the strategy and is now a success case between the international players of footwear. Only the Italian industry sells footwear with a higher value than the Portuguese and the distance between them is decreasing year by year.

This paper analyses how the Portuguese footwear companies innovate and make innovation, according the classification proposed by the Oslo Manual. Also, analyses the strategy follow in the innovation process and shows the linkage between the type of innovation and the strategy of innovation.

The research methodology was qualitative and the strategy for data collection was the case study. The qualitative data will be analyzed with the MAXQDA software.

The economic results of the footwear companies studied shows differences between all of them and these differences are related with the innovation strategy adopted. The companies focused in product and marketing innovation, oriented to their target market, have higher ratios “turnover per worker” than the companies focused in process innovation. However, all the footwear companies in this “low-tech” industry create value and contribute to a positive foreign trade of 1.310 million euros in 2013.

The growth strategies implemented has the participation of the sectorial organizations in several innovative projects. And it's obvious that cooperation between all of them is a critical element to the performance achieved by the companies and the innovation observed.

The Portuguese footwear sector has in the last years an excellent performance (economic results, exportation values, trade balance, brands and international image) and his performance is strongly related with the strategy in innovation followed, the type of innovation and the networks in the cluster. A simplified model, called “Ace of Diamonds”, is proposed by the authors and explains the way how this performance was reached by the seven companies that participate in the study (two of them are the leaders in the setor), and if this model can be used in others traditional and “low-tech” industries.

Keywords—Footwear industry, innovation strategy, low-tech industry, Oslo Manual.

I. INTRODUCTION

THE Portuguese footwear industry has two important clusters in the north of Portugal. First one is located in Felgueiras and Guimarães; the second one is located in São João da Madeira, Oliveira de Azeméis e Santa Maria da Feira.

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Porter's clusters definition [1], [2] fits well in these two industrial regions. Also the sectorial organizations are located in the north of Portugal. Portugal is the eleventh world exporter (Table I) with an exportation value of 2.305 million USD\$ [3]. The average price is 31 USD\$ (average price/pair of shoes), the second highest in the world. In 2013, there were 1.337 companies employing over 35.000 people, which produced over than 75 million pairs of shoes.

TABLE I
WORLD TOP 15 EXPORTERS IN 2013 (VALUE)

| # | Country | Value (million USD\$) | Average Price (\$) (Rank) | Export Markets (Top 3) |
|----|-------------|-----------------------|---------------------------|-------------------------|
| 1 | China | 48 145 | 4,55 (15 ^o) | USA/Japan/Russia |
| 2 | Italy | 10 722 | 48,78 (1 ^o) | France/Germany/USA |
| 3 | Vietnam | 10 030 | 15,44 (11 ^o) | USA/France/Belgium |
| 4 | Hong Kong | 4 848 | 15,46 (10 ^o) | USA/Japan/China |
| 5 | Belgium | 4 688 | 23,89 (5 ^o) | France/Netherlands/UK |
| 6 | Germany | 4 446 | 23,73 (6 ^o) | France/Netherl./Austria |
| 7 | Indonesia | 3 755 | 21,12 (8 ^o) | USA/Belgium/Germany |
| 8 | Netherlands | 3 201 | 20,51 (9 ^o) | Germany/France/Italy |
| 9 | Spain | 3 036 | 21,70 (7 ^o) | France/Italy/Germany |
| 10 | France | 2 717 | 30,78 (3 ^o) | Italy/Germany/Spain |
| 11 | Portugal | 2 305 | 31,01 (2 ^o) | France/Germany/Nether. |
| 12 | India | 2 268 | 13,14 (13 ^o) | UK/USA/Germany |
| 13 | UK | 1 876 | 13,02 (14 ^o) | Germany/Irel./Nether. |
| 14 | Romania | 1 304 | 24,75 (4 ^o) | Italy/Austria/Germany |
| 15 | USA | 1 165 | 14,11 (12 ^o) | Canada/Korea/Mexico |

Innovation is a strategic priority in all the APICCAPS (Associação Portuguesa dos Industriais de Calçado, Componentes e Artigos de Pele e seus Sucedâneos) plans and programs since the 90's. First strategic plan to the footwear sector was launched in 1994, at the same time that Michael Porter had to coordinate a large strategic analysis of the Portuguese industry. The last strategic plan to the Portuguese footwear cluster- FOOTURE 2020 - has again “to innovate” as a critical action to keep the present competitiveness and increase the future sustainability [4]. Usually, time periods considered in the strategic plans coincide temporally with the Community support frameworks (e.g. Horizonte 2020). Present Community framework “Horizonte 2020” is focused in industrial investments and can be a huge opportunity to make sustainable the progress already achieved in many sectors.

The footwear sector is considered as “low-tech industry” by several authors [5]. Pavitt proposed taxonomy for innovation in different industrial sectors, and the footwear is positioned in the production-intensive sectors [6]. In Italy, textile, clothing

and footwear have the lowest results regarding the number of innovative companies [7].

In Portugal, SMEs are predominant in the footwear industry. The companies with less than 10 workers and the SMEs represent almost 98% of the total, according the INE (Instituto Nacional de Estatística).

All these facts and figures are important in the definition of the research methodology to study the innovation in firms that belongs to a “low-tech” industry.

II. RESEARCH METHODOLOGY

The methodological approach to the research was defined considering the specificities of the footwear sector and the proposed research objectives. The research methodology can be quantitative or qualitative: the qualitative analysis is presented as the most recommended when the researcher wants to study a small sample of entities and the study is focused on a theme or sector. It is also recommended when the investigation aims obtaining detailed and in-depth information on situations, events, people, organizations, interactions and behaviors observed by the investigator during the field research [8]. When the industrial sector consists mainly of SMEs, the qualitative approach is recommended to reduce the distance between the administrator or owner and the investigator [9].

The research methodology was qualitative and the strategy for data collection was the multiple case studies. A case study uses different sources of evidence and is relevant to answer to the questions “What”, “Why”, “How” and “When”. “What is happening here?”, “Why is it happening?”, “How has it come to happen this way?” and “When did it happen?” are examples of questions that the researchers will put during the investigation [10]. It is also recommended when the researcher has little or no control over the behavior of the events, if the study is based in the real world and reports events that take place at the present time [11].

To define the sample composition formed only by seven companies were used the purposive or intentional sampling. The companies selected were: FELMINI, SAVANA, CENTENÁRIO, PROCALÇADO, KYAIA, SOZÉ/DKODE and ACO. Regarding the number of cases considered appropriate, some authors [12] say that a number between four and ten works normally well. Other author [13] considers that although numerous cases diluting the overall analysis, the researcher typically chooses “no more than four or five cases.”

The logic and the power of purposive or intentional sampling is based on the selection of cases that are rich in information for in-depth study of a particular phenomenon, and on which can be drawn from relevant information and central to the purpose of the investigation [14]. There are several strategies to select the footwear companies using the intentional sampling. The maximum variation strategy and the sampling with criteria are the most appropriate to the present investigation [8]. The collaboration of the APICCAPS was very important to define the initial group of companies that has innovation in their strategic and industrial behavior. To obtain the data, were used different techniques: interviews,

document analysis and observations in real context. The interviews were semi-structured and they have been finished after a pretest with footwear industry experts (APICCAPS and CTCP – Centro Tecnológico do Calçado de Portugal).

The qualitative data was analyzed with the MAXQDA software.

III. RESEARCH RESULTS

A. General Data

To obtain the data of the seven firms, the investigators made twelve semi-structured interviews during more than five months (in four companies were made interviews to more than one person, but the owner or the administrator was always included). They had visited the seven footwear companies several times and all the interviews were digital recording and after transcribed to text. Table II synthesizes the more relevant data from these innovative footwear companies.

TABLE II
GENERAL DATA OF THE FOOTWEAR FIRMS ANALYZED IN 2013

| Firm | a | b | c | d | e | f | g |
|-------------------------------|--------|--------|---------|---------------|--------|--------|--------|
| Foundation Year | 1973 | 1988 | 1941 | 1973 | 1984 | 1976 | 1975 |
| Turnover (Million €) | 13,443 | 8,954 | 9,187 | 21,0 | 56,0 | 10,0 | 33,49 |
| Nº workers | 183 | 142 | 74 | 296 | 620 | 160 | 741 |
| Ratio Turnover/Worker | 73.460 | 63.050 | 124.150 | 70.950 | 90.320 | 62.500 | 45.200 |
| Number Pairs/Year (Thousand) | 300,17 | 440,48 | 174,84 | 5.000 (soles) | 1.000 | - | 1.491 |
| Exportation Value (Million €) | 13,028 | 7,880 | 9,064 | 10,5 | 50 | 9 | 28,658 |
| % Own Brand | 100% | 10% | 0% | 60% | 90% | 60% | 10% |
| % Outsourcing | 1% | 50% | 4,3% | 24% | 25% | - | 30% |

Codes for the firms: a-felmini; b-savana; c-centenario; d- procalçado; e- kyaia; f-soze/dkode; g-aco

There are big differences between the ratio “turnover/worker” registered to ACO and Centenário.

Centenário was founded in 1941, accumulating a large experience in the production of leather shoes using complex techniques to assembling different raw materials. The “Goodyear” assembling process demands high quality work, including cork in the raw materials, and the final products go to sophisticated Nordic markets. It is the oldest company of the group analysed and works with very expensive raw materials (crocodile, alligator, snake, skin fish, lamb and Italian leathers).

Kyaia has the second higher ratio and it’s the leader in the Portuguese footwear sector.

Outsourcing is a common feature of all the seven cases, but the percentage is different. The cases with a lower ratio “turnover/worker” (ACO and Savana) use more the outsourcing in other footwear producers, while working mainly in the “private label” regime to other European clients. They transfer some phases of the production process (cutting

and sewing) to smaller firms of the cluster. Savana produces half of their sales in external companies using outsourcing and is the reason why the ratio “turnover/worker” is higher than to ACO.

Procalçado is mainly a components producer (plastic and rubber soles) and is exporting half of his production. This is the direct export value since many sales are made to Portuguese manufacturers who export after the finished shoes for their customers.

B. About Innovation (Oslo Manual)

Categorizing innovation helps to understand how innovation works in the industrial context. Also helps to measure the results and impacts of innovation activities in the performance of the innovative firms. Oslo Manual [15] gives the guidelines for collecting and interpreting innovation data and identifies four main types of innovation: product innovations; process innovations; marketing innovations; and organizational innovations. This classification was used during the interviews to avoid an individual definition and define a similar approach to the seven cases.

Table III shows how the innovation is present in the footwear companies according the Oslo Manual classification [15]. Innovations in product are reported by five companies and innovations in process by two. Innovations in marketing are mentioned by four cases and are coincident with a high percentage of own product in the sales of the companies. Own brand implies an effort in marketing with high investments in human resources and teams with designers and marketers. It is

evident the relation between the product and/or marketing innovation and the higher ratio “Turnover/worker” for the companies that adopt this approach to the innovation. Innovation in marketing is directly associated with the existence of own products and own brands in the footwear clusters.

There isn't direct relation between innovation and firm's size [16]. The large firm has material advantages (financial, technological and human resources) but the small firm has behavioural advantages (entrepreneurial dynamism, quick-response to the market changes and internal flexibility) [17] and this is an obvious fact in this research.

C. About Innovation Strategy

The innovation strategy, according the approach proposed by Freeman and Soete [18], followed by the companies shows significant differences between them. A dependent strategy is followed by Centenário because works almost exclusively to a European client (mainly private label production regime). Offensive strategy is followed by Kyaia and Procalçado, leaders in the Portuguese footwear industry, with innovations in product and marketing, and with “learning-by-producing”, “learning-by-interacting” and “learning-by-searching” as incremental innovation approach.

Traditional strategy is followed by Savana and ACO, the only companies that haven't product or marketing innovations. They have mainly process innovations (increasing efficiency and productivity).

TABLE III
INNOVATION IN THE CASES ANALYZED

| Firm | Type of Innovation (Oslo Manual) | Category of Incremental Innovation (Learning-By-...) | Innovation Strategy (Freeman/Soete) | Ratio “Turnover/Wrk.” (€/Worker) |
|------|----------------------------------|--|-------------------------------------|----------------------------------|
| A | Product Marketing | Producing Using Searching | Defensive | 73.460 |
| B | Process Organisat. | Doing Producing | Traditional | 63.050 |
| C | Product | Producing Searching | Dependent | 124.150 |
| D | Product Marketing | Producing Interacting Searching | Offensive | 70.950 |
| E | Product Organisat. Marketing | Producing Interacting Searching | Offensive | 90.320 |
| F | Product Marketing | Producing Searching | Defensive | 62.500 |
| H | Process | Doing Producing | Traditional | 45.200 |

codes for the firms: A-felmini; B-savana; C-centenario; D-procalçado; E-kyaia; F-soze/dkode; G-aco

Defensive strategy is followed by the companies Felmini and Soze/Dkode because they intend to keep their markets, making shoes according wants of their customers. They intend to enter new markets, but also want to defend their current positions. Furthermore, the incremental innovation is dominant among the companies considered, which is consistent with the previous analyses of authors who focused their investigations in sectors dominated by SMEs [16] and low and medium-low technology industries. Only in Kyaia it is clear the radical innovation related with the project “High Speed Shoe Factory”. In this project, the consortium prepared a radical solution to a really fast fashion: they can design, produce and deliver a customized shoe to a European customer in a maximum of two days.

“Learning-by-producing” is the category of incremental innovation [19] present in all the companies studied.

“Learning-by-doing” [20] is in the companies that develop process innovation, where the workers are critical in the success of the results achieved. In these two companies, the ratios “Turnover/worker” are the lowers.

“Learning-by-searching” is present in the companies that innovate in products (five cases). “Learning-by-interacting” [21] is followed by the leaders Kyaia and Procalçado, and they have an offensive strategy, according Freeman and Soete definition.

IV. DISCUSSION AND MODELS

Innovation is present in all the analyzed companies, regardless the type of innovation, the innovation strategy implemented, the results obtained and the degree of this innovation.

Innovation in products and innovation in marketing are the most representatives among companies with innovation studied, according to the approach and categories proposed by the Oslo Manual. Companies that follow these two innovation categories have the best economic results (see Table III) and have the best sectorial image.

Innovation in products requires a deeper knowledge of construction processes and raw materials used to make shoes, normally corresponding with an incremental innovation. Because footwear companies belong to a traditional and mature industry, with low technological intensity, the "learning-by-doing" and "learning-by-producing" are very important innovation achieved by the workers.

Chain-linked model proposed by Kline and Rosenberg [22] and open innovation theory suggested by Chesbrough [23], helps to understand how works the innovation in the footwear sector.

Clusters in the Portuguese footwear industry are important to the global performance achieved. There are several examples of cooperation and synergies between sectorial organizations, components producers, equipment producers and shoe producers to develop projects funded by national and European programs. But to compete in the international markets and win this global game, the simplified model "Ace of Diamonds" (Fig. 1) can give the guidelines to prepare an approach more efficient and profitable from the footwear companies. In the center of the model is "INNOVATION" in products and marketing. Better economic results are associated with these types of innovation, reason why they are the core of the model. On the top of the diamond is the first vertex called "Creativity, design and brand". Creativity comes from different actors in the companies: the owners and administrators or design departments and workers. International fashion fairs specialized in leathers and shoes, visits to the most important clients and street shots in several situations are relevant sources of information to develop the collections. Development of own brands was suggested by the Monitor Company [24] to increase the competitiveness of the Portuguese footwear industry. Achieved the quality of the products, was necessary to upgrade in the value chain. Know-how and skills were warranted by the workers of this traditional sector. Dimension of the companies is important to develop collections, design products and promote the new brands in markets. Because is expensive, not all the SMEs has the conditions and the dimension to launch collections and own brands.

Second vertex is "Strategy, vision and leadership". These conditions are linked with the competences and skills of the management, CEO's and directors in different levels of the value chain. Leadership is a notorious skill of the CEOs and administrators that participate in the meetings. The way how they deal with all the subjects, including threats and opportunities related with competitors and markets, is critical to the results achieved. They recognize the importance of the cluster to be more competitive, doing outsourcing mainly in others members of the cluster.

On the third vertex is placed "Internationalization for new markets (outside Europe)". European markets have a huge importance in the sector. As is show in Table I, France, Germany and Netherlands are the top 3 of the Portuguese footwear importers. Others markets as United States or Canada, although their dimensions, doesn't have relevance on the exportation's value. Japan and others Asian markets also doesn't a significant market share. Internationalization to markets outside of Europe is the solution to continue increasing the sales and turnovers of the companies.

On the fourth vertex is placed "Cooperation and partnerships in the cluster". Cooperation is important in all the activities of the cluster. No matter how or whom, but the fact that companies can share some resources and knowledge gives benefits for all of them. CTCP and APICCAPS are sectorial organizations respected and recognized not only for the cluster, but also by international players as GSD Dusseldorf that collaborates in the preparation of international statistics of the footwear industry. Outsourcing in the cluster is important to obtain low production prices in order to compete with others global competitors. These production contracts are often times informal agreements and allows for micro-enterprises with only a few operations of the production process work and be specialized on these phases of the value chain. Finally, it's very important the cooperation between equipment producers and the footwear.



Fig. 1 Simplified model "Ace of Diamonds"

V.CONCLUSIONS

Innovation is critical to the competitiveness and sustainable development of the world economies [25]. In traditional and "low-tech" industries, dominated by SMEs, innovation plays an important role in the performance shown by the sector. The simplified model "Ace of Diamonds" gives a complete framework with multiples components of the value chain where the companies had to concentrate their resources and efforts. Competitiveness is possible and easier in cases in which the innovation is centred on own products (shoes

collections) and own brands (product and marketing innovation). Economic results in the last four years emphasize the advantage of this strategic approach to innovation done by these innovative firms of the Portuguese footwear industry.

The main impacts of innovation identified by all the companies were the financial results, the sales volume and the possibility to entry into new markets. The experience and know-how shown by the workers is also very important for the incremental innovation verified and recognized by the companies.

Investment in qualification of human resources, innovation and internationalization should allow the Portuguese footwear sector to consolidate its performance and positioning among the world's leading exporters of fashion footwear, mainly leather shoes.

Future research will take into account the importance of innovation in products and marketing. Barriers to innovation, sources of innovation and impact of innovation will be the next research topics to continue the study of innovation in "low-tech" industries as the Portuguese footwear industry.

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