RN
Revista de Negócios
Studies on emerging countries

Programa de Pós-Graduação em Administração Brasil ISSN 1980-4431

FURB
UNIVERSIDADE DE BLUMENAU

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Volume 22, Number 1, January, 2017

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PRESENTATION

Revista de Negócios is located in Blumenau, state of Santa Catarina, Brazil, in the campus of Uni-versidade Regional de Blumenau—FURB, post-graduate programme in Business Administration. Revista de Negócios is published quarterly in January, April, July and October on the website furb.br/rn.

POSTMASTER: Universidade Regional de Blumenau-FURB, Rua Antônio da Veiga, 140 - Victor Konder, Blumenau - SC, 89012-900. Department: PPGAD/FURB - D102.

MISSION

Revista de Negócios advances the knowledge and practice of management learning and education. It does it by publishing theoretical models and re-views, mainly quantitative research, critique, exchanges and retrospectives on any substantive topic that is conceived with studies on emerging countries. Revista de Negócios is an interdisciplinary journal that broadly defines its constituents to include different methodological perspectives and innovative approach on how to understand the role of organizations from emerging countries in a globalized market.

SCOPE AND FOCUS

Revista de Negócios aims to create an intellectual and academic platform, under the perspective of Strategic Management Organization, to promote studies on Emerging Countries. The Journal looks and reviews for contributions to the debate about researches on two specific topics: innovation and competitiveness and strategic organization in emerging countries. The topic of innovation and competitiveness covers all studies and researches related to how organizations can sustain their competitiveness, particularly focusing on innovations, entrepreneurship and performance. The second topic covers studies and researches on strategic management of organizations, more specifically on how companies can or should act at strategic level looking mainly but not only to external context, supply chain, competitive strategies in international market, and marketing approach. The editorial policy is based on promoting articles with critical perspectives seeking for the understanding of the differences and similarities among emerging countries and in comparison with experiences and theories on strategic management in developed countries. It intends to promote specific contributions of how theoretical and empirical studies on emerging economies may contribute to the advance of theories related to innovations and competitiveness and strategic management of organizations. It is welcome scholars particularly working on such topics to submit theoretical essays, empirical studies, and case studies. The Revista de Negócios is open to different methodological perspectives and innovative approaches on how to understand the role of organizations from emerging countries.

TARGET AUDIENCE

The target audience of Revista de Negócios is the Brazilian international academic community in related fields of knowledge on business management.

EDITORIAL STRUCTURE

The Editor

RN Revista de Negócios
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FURB UNIVERSIDADE DE BLUMENAU

Editorial Letter

In this current issue, we organized four articles that make significant contributions in topics related to International Business and Entrepreneurship, as well on creativity and innovation. In line with our editorial policy, we attempted to publish contributions that attempted to make theoretical and empirical contributions in the field of strategy and entrepreneurial management from the perspective of emerging economies.

The first article **Family influence on internationalization: an analysis of risk acceptance**, authored by Waldir Goede, Dinorá Eliete Floriani, Ademir Furtado Filho, aims to contribute to the literature on family business (FBs), particularly from the perspective of commitment and influence of family on the FB internationalization regarding risk acceptance. The findings corroborate the characteristics proposed by the Uppsala School, which claims that internationalization occurs in an unplanned, opportunistic manner, following sequential phases, through incremental learning and via the establishment of networks.

The second article **Contribution from different domains for creativity management in the context of innovation**, authored by Patrícia Wielewicki and Rui Ferreira Roda, aims at contributing originally for clarifying the relation between creativity and innovation by analyzing it under the point of view of three domains: Design, *Haute Cuisine* and Art. The study suggests the existence of three integrated models of creativity management in the context of innovation, each one referring to a given domain analyzed. Furthermore, the study contributes to the literature by providing a general framework that may supports firms that are seeking for new creativity management models for innovation, as well as a starting point for the conception of a more robust theoretical body for the study of creative processes in different domains in the context of innovation.

The third article **Corporate Entrepreneurship and International Performance: a Cross-Country Study,** authored by Marianne Hoeltgebaum, Tales Andreassi, Mohamed Amal, Svante Andersson and Marleen Hensbergen, has the purpose to examine the theoretical connections between Corporate Entrepreneurship-CE and International Performance-IP. More specifically, it aims at addressing two main research questions: (1) How do different dimensions of CE influence IP and (2) To what extent the context of host country matters?. The results show that country matters for the perception of the relationship between CE and IP. They show that it is meaningful to separate the different dimensions of CE (innovative behavior, new business ventures, competitive aggressiveness, product/service and process innovation, self-renewal, proactiveness, and risk taking) when examining their influence on International Performance, particularly in the context of an emerging economy.

The fourth article **Ferramentas e Bases de Dados Open Science para Pesquisa em Inovação,** authored by André Moraes Santos, Cláudia Terezinha Kniess, Luc Quoniam and Emerson Antonio Maccari, aims to propose a set of tools for the retrieval and analysis of information in public databases, useful for the study of innovation. As an application context, two public databases were selected: (a) National Database of the Directory of Research Groups; (b) International patent base Espacenet. The quintuple helix innovation model was chosen to illustrate the possibilities of analysis. Based on the artifacts and databases, a framework was proposed for the extraction and analysis of information. It has been demonstrated that the data resources, frameworks and artifacts identified and developed in this research allow us to study different relations and aspects of innovation, both nationally and internationally.

Before concluding this Editorial, as always, we want to express our gratitude to all reviewers that helped us to achieve this current issue. We thank you and hope we can continue to count on your contributions to our Journal in future issues.

To our readers, we hope you will enjoy reading the articles, and expect you to contribute with our Journal in future issues on business strategies and emerging economies.

Mohamed Amal
Editor

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Family influence on internationalization: an analysis of risk acceptance

Waldir Goede[1], Dinorá Eliete Floriani[2], Ademir Furtado[3]

[1] Universidade do Vale do Itajaí (UNIVALI) - dwgoede@yahoo.com.br
[2] Universidade do Vale do Itajaí (UNIVALI) - dinora@univali.br
[3] Universidade do Vale do Itajaí (UNIVALI) - ademir.furtadof@gmail.com

KEYWORDS

Family business;
Risk acceptance,
Internationalization;
Familiness;
Networking.

Received 03.09.2017
Revised 25.10.2017
Accepted 29.11.2017

ISSN 1980-4431
Double blind review

ABSTRACT

This article aims to contribute to the literature on family business (FBs), particularly from the perspective of commitment and influence of family on the FB internationalization regarding risk acceptance. Qualitative in nature, the study involved the use of a single longitudinal case study, based on in-depth interviews, storytelling and secondary data. Primary data were collected through semi-structured personal interviews with the company's board chairman and vice-chairman, commercial director, European director and export manager; and secondary data were obtained using documental and scientific sources. It could be seen that family commitment and ownership influenced the internationalization process due to the proactivity of its European descendant founders, and particularly because in this company studied the process was initiated by a non-family member. However, family participation encourages risk acceptance, since the attachment to the family business creates an eagerness for growth. The findings corroborate the characteristics proposed by the Uppsala School, which claims that internationalization occurs in an unplanned, opportunistic manner, following sequential phases, through incremental learning and via the establishment of networks.

PALAVRAS-CHAVE

Empresas familiares;
Aceitação de risco,
Internacionalização;
Familiness;
Network.

RESUMO

O artigo tem como objetivo contribuir com a literatura de empresas familiares (EFs), especificamente sob o aspecto do comprometimento da família na internacionalização de uma EF, sobretudo no que tange a aceitação de risco. A pesquisa qualitativa apoia-se na técnica do estudo de caso único longitudinal, baseado em entrevistas em profundidade, *Storytelling* e dados secundários. Os dados primários foram coletados por meio de entrevistas pessoais semiestruturadas; e os dados secundários foram provenientes de fonte documental e científica. Verifica-se que o comprometimento da família influencia o processo de internacionalização pela pró-atividade de seus fundadores, ascendente pela sua origem europeia e teve a particularidade de ser iniciado por um membro não familiar. Contudo, a participação familiar impulsiona a aceitação de risco, uma vez que o apego pelo negócio da família propicia uma contundente busca pelo crescimento enquanto protegido pelo acordo de multifibras. Os achados corroboram a Escola Nórdica de Uppsala pela aprendizagem incremental, bem como pelo estabelecimento de networks o que reduz a percepção do risco, porém o senso de familiness é mais forte reduzindo o investimento internacional.

1 Introduction

Family businesses (FBs) are considered the most common form of starting a company all over the world (Hostettler, 2017). Besides contributing significantly to global economy, they make up from around 70% to 95% of all businesses in the world (European Family Businesses, 2012). In Brazil, 79% of the FBs have shown growth over the last 12 months, compared to 65% in the world (PWC, 2014). These companies generate 60% of the jobs in the country and account for 62% of the GDP (FDC, 2017).

In the Brazilian context, however, FBs total 80% of businesses (SEBRAE, 2017), and, within the textile industry, which is the focus of this study, this number is even higher, 91% of Brazilian textile companies start as a FB (SINTEX, 2017). SINTEX (2017) ranks the state of Santa Catarina as the national leader in textile exports, totaling approximately USD 60 million in the period from January to April 2017.

For many FBs, the only way to survive in an increasingly competitive market is through internationalization (Kontinen; Ojala, 2010; Lin, 2012; Etemad, 2013). However, the difficulties faced by these companies are huge, especially after the end of the WTO Multifibre Arrangement (2017), which has exponentially increased market competitiveness and the level of risk acceptance in their decisions.

Studies of FBs are well timed, since they have been an emerging focus around the world (Schulze and Gedajlovic, 2010), although it is still an undeveloped area of research (Chua et al., 2003). In addition, current studies focus on companies from developed countries, and little is known about the internationalization of FBs in emerging countries (Ramamurti, 2009).

There is no consensus on the definition of FB, which corroborates the claim that the area is an emerging field of study. However, the definition of Mandl (2008) mentions that, in a FB, a family owns the majority of the capital and, therefore, defines its management, and the family has great influence on the property and its management.

The theoretical relevance of the study is justified by the importance of research on FBs in Brazil, as well as by providing a clearer view of the risk acceptance process and consequent family involvement in FBs.

From the practical point of view, the significance of this study is that its results serve as an opportunity for business owners to reflect on their business. It is also significant for the family involved. This study might be a useful tool for decision-making and for professionals who work in the area of international business, especially in family businesses.

Thus, it is important to stress that the risk acceptance level in FBs is different from that of non-family firms (Zahra, 2005). This fact justifies this study, keeping in mind that the company studied is not exclusively familiar, as it underwent an internationalization process in which the end of the WTO Multifibre Arrangement made it take new risks.

This article, then, aims to contribute to and broaden the knowledge about internationalization of FBs, with the main objective of identifying how family commitment and family influence affect the internationalization process of a large Brazilian FB in the textile industry, from the beginning of its international operations in the 1970s to the 2000s.

A qualitative research method was used, based on the technique of a single longitudinal case study, using semi-structured in-depth interviews and storytelling, as well as secondary data collected from institutional material and statements with the main features of the FB Karsten and the factors that affect the internationalization process of businesses.

2 The Internationalization Process of Businesses

Internationalization of FBs can be defined as an incremental and dynamic learning process in which family integration directly influences the level of the internationalization process (Hamilton, 2016). For Pukall and Calabrò, (2013) the involvement of the family is the difference when it comes to internationalization decisions.

Research on FBs has been advancing, gaining momentum and showing remarkable growth in terms of scientific production (Kontinen; Ojala, 2010; Sharma et al., 2012). The authors also reveal that family nuclei control a significant number of organizations, which reinforces the importance of these enterprises for the movement of the economy. Kontinen and Ojala (2010) state that positive factors influence internationalization, such as the long-term vision and care in decision-

making by the family. In addition, Zahra (2005) and Hamilton (2016) argue that family involvement is positively related to the FB targeting of international alliances and foreign markets, and that family ownership and involvement support internationalization, the way family members behave as good managers of their resources, considering that they are not only professionally but also emotionally involved in the organization.

Leone (2005) notes that internationally accepted is also the concept of FBs that includes three main strands: a) ownership, control of business in the hands of a family that owns or controls the majority of capital; b) management of the company, management influenced by the family, whose top places of the company are occupied by the members of the family; and c) succession process, second generation assumes the places of relatives and so on successively.

These singular characteristics of FBs, Habbershon and Williams (1999) are called familiness, a set of own resources that are the result of the presence of the family in the management of the firm and are source of long-term competitive advantage (Zellweger et al., 2010). The study by Zellweger (2010) focuses on the behavioral perspective of the Uppsala model. This perspective comes from the model developed by a group of researchers from the University of Uppsala (Sweden), who were initially interested in explaining the process by which companies internationalize their activities. The model proposed by Johanson and Wiedersheim-Paul (1975) is known as the Uppsala Model and indicates that internationalization occurs through four distinct phases, from non-regular export activities to the production abroad, through a production plant.

In the Uppsala Model, the process of internationalization is gradual and is the result of the difficulties faced by companies due to their limited knowledge about the country of destination of the investment, difficulty in obtaining information and increase in the level of uncertainty faced when operating outside their home market (Coviello, 2006). The deepening and central expansion of the Uppsala model lies in the notion of psychic distance, which is considered the sum of factors that interfere in the information flow, such as level of development of the host country, language, cultural differences (Johanson & Vahlne, 1977).

With the evolution of the global context, particularly from the 1980s onwards, new perspectives emerged as a way to fill in the gaps in the theoretical field, with emphasis on the Network Theory, an evolution of the Uppsala model. The Network Theory states that firms can skip phases of the internationalization process when they are part of a business network (Johanson & Mattson, 1988). Johanson & Vahlne (2009) updated the theory, and the concept of Outsidership, or the non-presence in relevant networks, rather than psychic distance, became the main cause of uncertainty and pace of the internationalization process.

Due to its precursor nature along this line of thought and since it incorporates cultural, psychological and competitive aspects, which help explain the challenges faced by FBs in the internationalization scenario (Cyrino et al., 2010), the behavioral approach is the base for this study.

Although the behavioral approach serves as the base of the study, in relation to the internationalization process of FBs, studies have identified, in a different and often controversial way, that FBs become internationalized in a gradual or direct more advanced way.

Claver, Rienda and Quer (2009) showed that, in the long-term view, the presence of non-family managers in the FB is positively related to the modes of entry with a greater international commitment, although self-financing problems may limit this commitment.

Lack of resources has been seen to be the reason why FBs tend to internationalize later and more slowly than non-family firms, and studies point to the fact that FBs contain intrinsic emotional aspects, leading to the prioritization of business longevity, many times called the "family business" (Revilla, 2016).

Revilla (2016) notes that FBs are slower and less likely to internationalize than non-family firms. His findings, based on data collected in companies, were confirmed by Medina and Pichardo (2017).

The conservative attitude towards risk in FBs varies in all attitudes, a fact commonly demonstrated by the high difficulty in delegating activities and high retention of power, as Revilla (2016) concludes. In addition, the author mentions that it is possible to expect family businesses to show and mention such conservatism when faced with the risk of bankruptcy.

Hamilton (2016) mentions that when the family controls the majority of shares, there is greater risk aversion, the geographic scope is smaller and the family does not want to lose control of the business, making the internationalization process exponentially time-consuming; however, when the family has fewer shares, there is less risk aversion and the international process advances with greater speed. Risk appears to be one of the main blockers or barriers for a FB to develop new businesses, as Medina and Pichardo (2017) corroborate, especially when family ownership of shares is greater (Hamilton, 2016; Revilla, 2016).

FB ownership has a special meaning because it involves a strong "personal" or "sentimental" appeal. Family owners are aware that ownership does not only encompass social and cultural capital, but also people, products, responsibilities of personal commitment to the enterprise as well as to the community (Graves; Thomas, 2006). FB ownership is an ownership built and developed by the family over several generations and this implies an automatic and constant evaluation of managers' actions and decision-making processes (Mandl, 2008).

Most studies use a minimum percentage of ownership in combination with the requirement of at least one family member in a management position in the firm as the defining characteristics of a family business (Graves; 2006, Claver; Rienda; Quer, 2008; Abdellatif; Amann; Jaussaud, 2010; Revilla, 2016).

3 Method

Research focus and procedures involved a singular case study, with a longitudinal standpoint to better capture the dynamics of the company over time (Pettigrew, 1990), giving an understanding of the phenomenon as a whole and its complexity (Yin, 2010). The approach is qualitative in nature (Creswell, 2010), of exploratory and descriptive type. Storytelling strategy was also used, including narration by subjects and gathering of supporting secondary data to identify the experiences experienced by the precursors of the internationalization process (Weick, 1973).

The relevance of the company chosen is justified due to its trajectory. With more than 135 years of operation, the company is one of the largest firms in the linen industry in Brazil, being considered one of the first Brazilian exporting companies, currently present in more than 20 countries.

Secondary data were collected on institutional material, balance sheets and websites, resulting in a detailed data analysis for preparing the interviews, as well as providing additional data for the discussions and analysis of primary data. Primary data were collected through semi-structured interviews (Yin, 2010), which were recorded in the first half of 2015, at Karsten's headquarters in Blumenau (SC), and then transcribed. Interviews were with the Chairman and Vice-Chairman of the Board, the Commercial Director, the Export Manager, who started the international process, and with the former Director of the company in Germany, who began the process of internationalization in Europe, totaling 5 people and 4h45m of recorded audio. Table 1 presents the list of people interviewed, their position and duration of interviews.

Table 1. List of interviewees, their position and duration of interviews at Karsten

Name of Interviewees	Position	Abreviattion of Position	Total Time (Approx.)
João Karsten Neto	Chairman of Board	KARSTENPRES	04:45m
Carlos Odebrecht	Vice-Chairman of Board.	KARSTENVICE	
Alwin Rauh Neto	Commercial Director	KARSTENDIR	
José De Pin	Export Manager	KARSTENEXP	
Wilhelm Schwarzien	European Director	KARSTENINT	

Source: Survey data.

Table 2 presents family members and family history of Karsten, important points in this study, considering the presence of commitment and level of participation of the family, which has always been involved in decision-making processes of the company.

Table 2. Karsten's Family Members and Family History

Board of Directors		
João Karsten Neto	Chairman of Board (4th generation)	
Carlos Odebrecht	Vice-Chairman of Board (4th generation, founder's great-grandson)	
Family History		
Name	**Family Generations**	
Johann Karsten	Founder (1839-1918)	1st generation
João Karsten	Founder's Son	2nd generation

	(1887-1976)	
Walter Karsten	João's Son (1917-1989)	3rd generation (founder's grandson)
Ralf Karsten	João's Son (1927-2014)	3rd generation (founder's grandson)
Gunar Karsten	Walter's Son (1945-1997)	4th generation (founder's great-grandson)
Carlos Odebrecht	Edeltraud's Son (João's Daughter)	4th generation (founder's great-grandson)
João Karsten Neto	Ralf's Son	4th generation (founder's great-grandson)
Gil Karsten	Gunar's Son, Member of the Board	5th generation

Source: Survey data.

Table 3 brings the central conceptual and operational definitions for this study, considering internationalization, family ownership, commitment and risk acceptance, as well as authors, definitions and indicators, and the scale of measurement for each of the points listed.

Table 3. Conceptual and Operational Definitions of the Analyzed Characteristics

Internationalization Process	Conceptual Definition	Author	Indicators	Scale of Measurement
Internationalization	The level of internationalization is the extent to which a company has business outside its home country.	Johanson & Vahlne 1977; Sullivan, 1994;	Depth of expansion (external sales in total revenue,% of export share); External Scope (No. of countries).	% of sales in the foreign market.
Family Ownership	When the family is the owner, owning the majority of the shares.	Gersick *et al.*, 1997; Casillas and Acedo, 2005; Leone 2005;	% of shares held by the owner family.	% shares
Family Commitment	When the family is active and committed to the company, board, daily management.	Chua *et al.*, 1999; Astrachan *et al.*, 2002; Casillas and Acedo, 2005; Chrisman *et. al*. 2005; Hamilton, 2016	No. of active family members in management; No. of family members on the Board of Directors; No. of family generations currently in the company.	No. of members in the company and in the Board of Directors; No. of generations; Holding (yes or no).
Risk Acceptance	Decisions are made on the basis of variables that reduce risk and consequently increase safety	Kontinen and Ojala, 2010 Hamilton, 2016 Revilla, 2016	% of capital targeting expansion % of business targeting unexplored markets	% of turnover in the foreign market invested in new businesses

Source: Elaborated by authors (2017).

3.1 Internationalization Process of the Company Karsten S.A.: the case

The company KARSTEN S/A was founded in 1882, by the German immigrant Johann Karsten. It is located in Blumenau (SC), has been in operation for more than 135 years, manufacturing home textiles. "*The family has always been at the forefront of business and this commitment has been present in everything, from accompanying international visits and participating in international fairs to searching for new technologies and partnerships, and this was a singularity that enabled the company to be at the top and to become internationally recognized*" (KARSTENEXP).

In 1940, the company began to import looms seeking innovation as a competitive feature of its brand. The 1970s marked the beginning of operations with exports to South Africa, and the 1990s marked the peak of exports with the opening of three sales subsidiaries abroad. However, in the early 2000s, textile companies faced changes in the international trade rules. From 1974 to the end of the Uruguay Round of GATT (General Agreement on Trades and Tariffs) in 1994, trade in textiles was governed by the Multi-Fiber Arrangement (MFA). This agreement established quotas by which imports were limited in countries where the rapid increase of such imports represented a serious injury to the domestic industry. However, these rules went against the GATT system, which privileged tariffs rather than quantitative restrictions.

In 1995, the Multifibre Arrangement was replaced by the Agreement on Textiles and Clothing (ATC), which has been incorporated into the World Trade Organization. The agreement provided for a transition period (1995 to 2004) to a free market, with gradual reduction of trade barriers and their total extinction by January 2005 (Seyoum, 2007; WTO, 2017).

The end of this agreement favored countries such as China and India, which did not have openness in certain markets, even though they were highly competitive in the textile sector. With increased competition, Karsten consequently lost considerable market share in its largest markets, the US and the European Union.

Since 2007, the company has been experiencing a decrease in revenues from the foreign market. In that year, it ended operations of its sales subsidiaries in Europe and, in 2008, in the United States. Between 2007 and 2009, gross external revenue fell by 47%.

In 2010, the company acquired the Brazilian company Trussardi, driving its focus to higher income public. In 2015, the company underwent a financial restructuring and the family decided to split the company's shares with another family. Part of the company was bought by the Dudalina family.

Table 4 lists the evolution of Karsten's internationalization process and the timeline from the 1970s to 2016, based on interviews and secondary sources, structured to provide an understanding of the company's international trajectory.

Table 4. Evolution of Internationalization

International Process	Evolution of Internationalization (timeline in decades)
1970s	**Beginning of Foreign Market Operations**
1971: 1st exports to South Africa.	The Export Manager (José De Pin) contacts Buyers and Importers from South Africa during a visit to Blumenau (SC). Karsten was one of the first textile companies in the region to enter the export market, according to the Export Manager: "[...] *the first export took place in the 1970s, bounded to South Africa, a result of contacts with a firm in Blumenau, Artex, which was at the time already internationalized and had already with established contact networks. Karsten was then visited by African importers, starting the first phase of internationalization"* (KARSTENEXP). The first export operation took place with orders totaling US$ 1 million for exclusive products (curtains). Soon after, businesses started in the Canadian market. In that same year the company opened its capital. According to the European Director, in the early 1970s the German authorities authorized the trade agreement and reduced tariffs also for imports from Brazil. The international purchasing agent from Germany and Austria, Süllwold and Resch GMBH (S&R), made the first contacts with Brazilian companies at Expo Brasil (Brussels and Berlin), becoming the commercial representative of a few Brazilian companies.
1972/1973	Gunar Karsten (4th generation, son of Walter, CEO), who returns from his studies in Switzerland, began to lead the export department, taking care of marketing, product development and seeking trade agreements. The great-grandson of the founder, Carlos Odebrecht (4th generation, son of Edeltraud), who developed the technical area, also returned from Europe. The family invested in state-of-the-art technology, importing machinery that enabled a great differential and made the company reach the foreign market with innovative products.
1974	In 1974, during the first trip of the European Director (Wilhelm Schwarzien) to Brazil and to Blumenau, the talks with the Karsten family began, resulting in the S&R partnership. The good impression made by the company due to its creativity in setting up a drawing studio, its self-sufficient production and its ability to conduct the meetings in German, were important in forming a relationship of trust. According to the European Director, "[...] *the decision and involvement of the Karsten family to start the export business was correct and the decision was taken by all those responsible for the operation*" (KARSTENEUR). Also in 1974, according to the European Director, a small collection of tablecloths (niche market) was developed and sales began in January 1975 at the International Trade Fair for Home and Contract Textiles HEIMTEXTIL in Frankfurt, Germany.
1975: Start of exports to Europe	Europe's first orders came in, and following the visit to the Heimtextil fair, the largest customers, catalogs and department stores were visited to strengthen partnerships already established. At the beginning of this same decade, German authorities authorized the WTO arrangement (WTO agreement for free trade and tariff reduction) for imports from Brazil. Larger import quotas were authorized for Brazil, motivating companies to export. The Brazilian authorities implemented an export aid program (tax credits) and business evolved in an increasingly faster pace and expansion.
1976	The Export Manager recalled that "[...] *in 1976, Karsten started the production of towels and mats exclusively destined for export. New markets were added, Holland, Switzerland, England, Norway, Sweden, Denmark, Finland and several contacts were made with international clients visiting the Textile Industry National Fair (FENIT) in São Paulo. In 1981, in a fair in the United States, Brazil Export (in NY, Miami, Los Angeles), sponsored by the Brazilian government, we expanded the business with sales of beach towels and towels and mats worth US$ 1.8 million for one of the largest American customers, Kmart*" (KARSTENEXP).
1976-1980	New markets were added, Austria, Denmark, Finland, Holland, England, Norway, Sweden, and Switzerland, continuing a strong pace of expansion, hiring agents and expanding the customer base. Karsten created the new management structure and introduced the Export Department.

Source: Elaborated by authors (2017).

In the 80's, the centenary of the company marked the beginning of sales to Mercosur countries and the company ranked first place in exports of textile products.

1980s	The centennial marked a new era of expansion.
1980	Latin American countries first sales, to Venezuela, Chile and Paraguay. Karsten imported new Swiss looms to start a new portfolio of products, fluffy towels (bath and face) and, soon after, beach towels, meaning a new technological breakthrough. New teams of Traders were hired and trained to support sales, visit international clients and fairs to expand this phase.
1982: 100 years of history (1882-1982).	It was the exclusive owner of the Walt Disney license, occupying the first place in the Brazilian exports of textiles for tablecloths. It served the European Common Market, Scandinavia, the United States, Australia, New Zealand and South America, totaling 25 countries, buyers of 40% of its production (Karsten, 1982). It invested in modern air-jet looms, one flat and one cylinder-stamping machine, new processing machines. It reached a monthly production of 1,250.00 linear meters (2,000.00 units). Through constant exchange with the world's leading workshops, the company was also well informed about new trends in patterns and colors, and it had a modern CAD/CAM department. The Vice-Chairman emphasizes that the investment of a textile industry is capital intensive and that the family has always been at the forefront of business, applying its own capital to maintain the plant with up-to-date technological expertise and qualified people in all areas. "*Today it is different, the company that is not able to adapt to the market and does not have flexibility, does not survive, it is Darwin's theory of evolution already*" (KARSTENVICE).
1990s	**Export Sales Peak and Opening of Sales Subsidiaries Abroad**
	The 1990s marked the peak of exports and of the internationalization process. The company was exporting to more than 45 countries and the export volumes reached of 50 to 60% of turnover. Karsten was the leader of Brazilian exports of tablecloths with 70% of total and towels with 23% of total. Of the total linen products exported, 27% were from Karsten. It was also one of the largest manufacturers of Christmas tablecloths in the world, offering a range of designs and sizes (Karsten, 2006). This decade is marked as the most international phase. The company opened three subsidiaries, the first in the United States, in New York (1996); next in Argentina, in Buenos Aires (1997); and in Germany, in the city of Düsseldorf (1998), to promote a stronger presence and the name Karsten in its markets abroad. Also, according to the European Director, Karsten achieved in Europe a special position among the usual import suppliers with its exclusive Walt Disney products. "*The decision about taking the risks of the rapid renewal of production plant was right and, besides, it placed Karsten among the most successful exporters. With innovative products, better prices were achieved, which otherwise would not have been achieved in this business. The profits expected by the exporter in these areas were not easy to achieve* "(KARSTENINT). A highly qualified team in international sales made the difference in the negotiations and was supported by the Karsten family.

1994	It should be noted that in 1994, the Brazilian government launched a new stabilization program, the Real Plan, with a new currency, the REAL (BRL), in an attempt to overcome the inflationary culture. At the beginning, this caused serious problems due to the Real (BRL) high value in relation to the US dollar (1 USD = 1 BRL).
1997	The decision was made to open a sales subsidiary to serve Europe. The International Director (Mr. Schwarzien, long-time partner who began the process of internationalization in 1975) took over the Management of Karsten Europe, remaining in this position until his retirement in 2002. Following the death of Vice-Chairman, Mr. Gunar Karsten in December 1997, who was at the forefront of international business, the company maintained its pace of international expansion with the involvement and commitment of family Directors. In 1998 the company was passed over to the control of the 4th generation, with Mr. Ralf Karsten (Chairman of the Board, 3rd generation), Mr. Carlos Odebrecht (President, 4th generation) and Mr. João Karsten Neto (Vice President, 4th generation) taking office.

The year of 1998 marked another big step for Karsten, when the European subsidiary was established in Dusseldorf, Germany.

1998 Opening of Karsten Europe GmbH	Karsten decided to establish a Subsidiary in Europe (Düsseldorf-Germany) to be closer to its market. Another reason for choosing Germany was the cultural proximity, language and the distribution logistics present in this market to serve the European Union. Karsten Europe had a warehouse in Bremen, Germany, for the distribution of exclusive licensed products (Disney, Warner Bros., F-1, Towels Marina K.) among others. This experiential process had already been tried previously with the opening of the Subsidiaries in the United States (1996) and Argentina (1997). In this same decade, more than 50% of the production were export-driven and Karsten products were exported to more than 40 countries, mainly to the United States and Europe (especially Germany). The Export Manager of Brazil (Waldir Goede) was expatriated in 1998 to Germany to continue the process in this new phase of Internationalization, later becoming the Manager of Karsten Europa GmbH, transferred from Düsseldorf to Krefeld (NRW) between 2002-2006.
1990-2000: Exports (volume)	Thus, the internationalization process phase of utmost relevance took place in the 1990s. Below, see export volumes in US$, as well as the export coefficient in percentages: the data below prove the high representative export indices, varying from US$ 41 million in 1990 to the peak of $59 million in 1995. Turnover at that time reached historical records (US$ 1,000 FOB).

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
41.8	43.1	48.5	58.3	51.5	59.8	55.7	55.2	45.9	43.5	44.5
44%	64%	70%	66%	57%	53%	51%	55%	44%	49%	48%

	The European Director, commenting on the family involvement in the business, stressed: "*An essential part for the success in the structure of international trade was that of the Karsten family, seeking cooperation with partners in Europe and in the USA, which culminated in a sustainable, exclusive and continuous business. My opinion is that, in all international connections with producer companies, Karsten has played by far a positive, superior role. The partnership relation with family owners and key employees, mutual understanding of the needs of others has led to extraordinary success*" (KARSTENINT). In the speech of the Commercial Director: "*... two entrepreneurs of the family, the two directors of the 4th generation, who had both recently returned from their studies in Europe, Gunar Karsten (Walter's son), who had a clear vision of the external market and which ways to follow, led the company to its great uniqueness, to the point of being the largest Brazilian exporter of home textile products. Carlos Odebrecht (great-grandson of the founder), in turn, had a technical vision and was very fond of innovation. Together they made a good pair that worked and took the company to a level of excellence in the 90's. Karsten was already a big company, but with this 60% export volume, it was perhaps the largest Brazilian export-oriented company at the time*" (KARSTENDIR).
2000s	**Changes in WTO rules and loss of international market share**
	In the late 1990s and early 2000s, there were radical changes in markets in Europe. The World Trade Organization (WTO) had also relaxed trade agreements (import quotas) and the Brazilian textile industry faced fierce competition from Asians (China), which entered market at very low prices. Importers from Portugal and Turkey were strong competitors for Brazilian companies and increased their market share with shorter delivery times and products free of import taxes (14% for articles coming from Brazil). Karsten, due to its successful and exclusive range of products in the European market, remained active longer than other Brazilian competitors, progressively losing its market share in Europe at this phase. It was also notorious that the pace of internationalization changed, however, the involvement of the family, seeking to perpetuate the international business, remained.

From 2000 on, prices are no longer competitive and sales automatically fall.

2000-2006	As a result, prices were no longer competitive, with Karsten progressively losing market share in its two largest markets, the US and the European Union. According to the Chairman of the Board (John Karsten Neto), in the US (North/ South Carolina), all textile firms went bankrupt, and today there are only nine global players that hold 90% of the North-American market. "*Karsten's internationalization brought to it a worldwide vision, which has sustained the company in the forefront of trends and technologies, but today, with the lack of long-term vision of the government, unfavorable exchange rates, the so-called cost Brazil among other barriers, plus the entry of competitive products from China, India, Pakistan, the reality is different. Even these countries currently also use all the new technologies, which hampers our international competition*" (KARSTENPRES).
2005/6	The two directors (Carlos Odebrecht and João Karsten Neto) remained in charge until September 2006, when the professionalization process ends, and the members of the controlling family become members of the board of directors, guiding the general policies and guidelines of the company.
2001-2007 Turnover exportação	In a retrospective of Karsten's foreign sales, while 2001 sales were still US$44,734,000, in 2002 it reached US$ 45,634,000 due to the devaluation of the Real against the US dollar and the increase in the physical volume of production. Until 2004, more than half of the company's revenues came from the foreign market. In 2005, however, the percentage of foreign sales fell to 46%, in 2006 to 38%, and in 2007, 5%. Currently (2014), this percentage is around 5/10%, basically exporting to MERCOSUR, the US and the EU.
2014 Family Holding	Karsten opened its capital in 1971 and has maintains a policy of dividend-sharing, organizing the family holding company. According to the President: "[...] *in October 2014, 25% of its capital was sold to the AMAR group, created by the former partner of Dudalina, with an investment of R$ 40 million. The Karsten family remains with 50% of the capital, and the remaining shares are in the market, since the company is listed on Bovespa*" (KARSTENPRES). Throughout all generations, from the foundation in 1882 to the present (2014 - 4th generation), the family has been present in the management and Board. During the interviews, it was clear that the entrepreneurial and long-term vision of investing in the foreign market has been in the DNA of the family. Acquiring new technologies and making partnerships has brought competitiveness and a superior development standard, noticeable even in the domestic market.

Two major events must be considered in addition to those listed in the narrative above. In the

years 2007 and 2008, the sales subsidiaries in Europe and also in the US were closed. A setback in the ever-increasing growth experienced. In addition, during the period from 2010 to 2016, Latin America became the main external market, where before Europe represented the most expressive share of the company's exports.

Karsten's internationalization began with irregular exports, through agents/ distributors, and later, it was strengthened by the opening of sales subsidiaries. This process has enabled managerial and operational experience, expanding the networks established over the decades, among suppliers, customers, etc., and which have served to promote a joint and lasting learning, corroborating what Johanson & Vahlne (2009) mention in their study as common in the internationalization process.

An outsider began the internationalization process, but there was family involvement in all business phases throughout the company's timeline. As shown in Table 4, the first export took place in 1971, with the subsequent opening of the European market as early as 1975. These data reveal a case of continuous search for expansion, although the scenario in Brazil at the time was still protected by the quota system of WTO. Although founded in 1882, the first export took place in 1971, evidencing a period of 89 years until the first sign of the internationalization process.

For the European Director (W. Schwarzien): "[...] *the company was always led by family members, older members were accustomed to pass over resources and management to the next generations to multiply them. This meant avoiding high risks and fast decisions for expanding international initiatives*" (KARSTENINT). This approach evidences a deep-rooted presence of familiness (Zellweger, 2010), and the desire to perpetuate the company's attitudes in order to avoid high risks, as revealed in the Director's own words which point to risk aversion, considering that the decisions reflected a risk controlled by protection of the quota agreement.

Table 5. Karsten Family Ownership and Commitment

Indicadores	Family Ownership	Family Commitment
Family percentage of shares	50% of shares (since October 2014)	X
Active Members (management/board)	X	Chairman of Board Vice- Chairman of Board Board Member
Family Holding	Yes	Yes
Current Generation	4ª e 5ª	4ª e 5ª
Resources	Yes	Yes
Family Influence on Internationalization Process	Since its foundation in 1882, it belongs to the family. Business vision. Long-term vision.	Agile decisions, resources, technological expertise, sales in scale and scope, relationship networks, subsidiaries.

Table 5 shows Karsten's ownership and family involvement structure. It shows, particularly, the generations involved beyond the points of long-term vision and relationship networks.

In this scenario, it is important to note the constant presence of the family generations in charge of the company.

4 Analysis

Among the reported periods, two milestones were mentioned, namely, sales booming in exports and expansion through the opening of overseas sales subsidiaries during the 1990s (more precisely at the peak of 1995, where revenue reaches a record mark of US$ 59 million) and the loss of this achievement in the 2000s, after the changes to the WTO rules and loss of international market share.

In this scenario, it is important to consider the longitudinal analysis, which shows more than two decades of continual growth in Karsten's exports, starting in 1971 and lasting for more than 25 years, until the sudden change in the international market and at the same time, the introduction of the plan Real in Brazil, equating the value of the domestic currency with the US dollar, a fact that also contributed to the decline of Karsten's insertion in the international market.

The family, during that period, decided for retracting, eliminating risk. It is imperative to analyze that the strategy was rapidly changed in order to lessen the financial implications of continuing to invest and innovate, in a free market including Asian competition. The decision then was to focus on the internal market.

At all times, both those of high international competitiveness and at the company's fall, the "owner's eyes" were present in the business management. This shows the well-rooted presence of familiness in the studied company.

Since the family was the owner, the decisions were faster "[...] *The owners themselves, who are at the forefront of the business, struggle to maintain their own capital, it is their investment, their history, decisions are made faster, and difficulties are also faced in a stricter and faster manner*" (KARSTENDIR).

However, although decisions were rapidly made in the company, justified by the directors themselves since it was a family business, it is important to mention that, on the one hand, family participation influenced the internationalization process, especially in decision-making and, at their best moment, also with support and investment in the process.

On the other hand, when the first problems of strong competition began to surface and the internal market reacted back to consumption, the company quickly left the foreign market. The problem of lack of competitiveness to face the end of the protection offered by the quota agreement presents evidence that risk acceptance is linked to family commitment and ownership, that is, the sense of familiness makes the family move back and retract from foreign investment and protect their capital in the internal market, corroborating the studies by Kontinen and Ojala (2010), Hamilton (2016) and Revilla (2016) when they approach the sense of shrinking when faced by risk to protect resources and the company, influenced to a large extent by the emotional attachment to the business.

This retraction when faced with risk is crucial in the analysis of commitment and risk in FBs, as discussed in the theoretical analysis of this article. The studies of Ojala (2010), Hamilton (2016) and Revilla (2016) corroborate these points. It is, however, important to mention the end of the agreement that protected this FB and, consequently, a highly prone environment for accommodation and risk aversion.

Several operational changes, including the expansion to three shifts were made in the period in which the company held international market share and increasing operations. However, the aggressive attitude and high investment in the international market up to 2005 can be explained by the fact that the company was protected under a quota regime that favored it to decide for bolder actions. As discussed above, the quota regime is again seen as a protection or strong risk reduction by which the company also anchored to be competitive.

After the end of the quotas, the company closed its operations in the international market, returned its efforts to the domestic market, reducing the risk and the cost of international operations. Of the 70% of sales in exports at the peak of international performance, in 2016 exports represented only 8% of the company's sales, a giant and significant change.

Although the company was internationalized and had a bold stance, this attitude towards the competitiveness of the external market reflects and infers conservatism and self-protection, risk aversion in a FB that was previously very active in the international market

5 Conclusion

It is evident, at the end of this work, that, in the case analyzed, the family participated actively in the internationalization process. On the other hand, it was also observed that in this FB, where family members are involved in management, there is risk aversion seeking a more controlled and reduced risk in the internationalization process.

At the best momentum of the internationalization process, this FB came to operate with a sales subsidiary in the international market, but with the increase in risk in the foreign market after the end of the quotas, the company began to export only, with a reduced geographic scope, in a number of smaller countries and only to nearby countries.

It is possible to infer from the results that when the family owns the majority of the shares, there is a greater risk aversion and the geographic scope is smaller, thus reducing the chances of losing control of the business, making the internationalization process considerably slow.

The attitudes and, above all, the directions taken in FBs, do not share the same procedure of non-family companies, especially in their attitude towards international risk, Revilla (2016). This study corroborates this, studying a FB with deep family commitment, since its foundation, presenting a stance averse to risk in its international action.

In addition, the study shows that family involvement and family ownership were relevant to creating international relationships and acting gradually and rapidly in the process of internationalization, both in international expansion and in redirecting decisions to the internal market.

Although the presented case has its importance in the presentation of the facts, the identified effects cannot be generalized to all the FBs, not even for those of the exclusives of the

textile sector.

This qualitative study served as a contribution to how and why the family influences the internationalization process of the company. However, from this study, a quantitative study could contribute to confirm the factors analyzed herein, that is, identify the importance of family in relation decision-making speed, commitment and risk in the process of internationalization.

6 Implications and Recommendations for Future Research

Most studies on corporate internationalization are in developed countries, whose institutional environment is different from the reality of emerging economies, as it is the case in Brazil. This study, besides presenting a critical moment of an emerging country in the export of textiles, shows how internationalization can be affected by institutional decisions.

Empirically, this case study serves as an example of the need for companies in emerging countries to innovate continuously, regardless of institutional protection. The discontinuity of presence in the international market implies not only in the reduction of international competitiveness, but also impacts on the image of the company in the domestic market.

Thus, this work contributes to the theory in order to identify whether the speed of decision making in family companies affects internationalization, whenever there is a form of protection of the investment, and, consequently of the resources of the family.

This study has limitations and draws attention to points that require future research. Among them, we suggest a research within FBs addressing the peculiar characteristics of family business governance compared to corporate governance, deriving from the unification of ownership and control (Aronoff and Ward, 1996; Carney, 2005). How these characteristics affect the perception of environmental pressures, as well as the formation of environmental values and the adoption of quality practices in a particular context are also relevant points, since in this study case there is a change in the environment (extinction of the quota agreement), strongly impacting a FB.

Several studies suggest that firms can modify their business behavior by trying to adapt to a competitive environment. The risk of failure, in particular, can have a substantial influence on the propensity of FBs to engage in adapting changes (Miller & Chen, 2004). Further research can build on this evidence to gain a more refined view of the consequences on FBs of the relationship between family involvement and business failure, especially in emerging markets and internationalized companies.

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RN Revista de Negócios
Studies on emerging countries

Contribution from different domains for creativity management in the context of innovation

Patrícia Wielewicki[1], Rui Ferreira Roda[2]

[1] Universidade do Porto/ Portugal - patriciafw@gmail.com
[2] Politecnico di Milano/ Italy - rui.roda@me.com

KEYWORDS

Creativity management;
Innovation;
Design;
Haute Cuisine;
Art.

Received 24.10.2017
Revised 21.12.2017
Accepted 07.03.2018

ISSN 1980-4431
Double blind review

ABSTRACT

Creativity is an ever-increasing theme of interest in the context of management due to its importance for the innovation process. Current literature suggests that the interaction between the concepts of innovation and creativity is not clear, being that the absence of referential frameworks with basis on the systemic approach in the relation between creativity and innovation identified in current studies. Considering the difficulty to deeping by traditional research approaches, this study aims at contributing originally for clarifying the relation between creativity and innovation by analyzing it under the point of view of three domains: Design, *Haute Cuisine* and Art. The study articulates two investigation methods structured in two parts: (i) literature review and (ii) systematic literature review. Both methods are bound to the construction of a theoretical framework which points out contributes of the studied domains for the optimization of creative processes in the organizational context. The study suggests the existence of three integrated models of creativity management in the context of innovation, each one referring to a given domain analyzed. The framework presented is featured as a contribute for enterprises in the search for new creativity management models for innovation, as well as a starting point for the conception of a more robust theoretical body for the study of creative processes in different domains in the context of innovation.

PALAVRAS-CHAVE

Gestão da criatividade;
Inovação;
Design;
Haute Cuisine;
Arte.

RESUMO

Criatividade é um tema cada vez maior de interesse no contexto da gestão, devido à sua importância para o processo de inovação. A literatura atual sugere que a interação entre os conceitos de inovação e criatividade não é clara, sendo que hã uma ausência de quadros teóricos referenciais com base na abordagem sistêmica na relação entre criatividade e inovação identificada nos estudos atuais. Considerando a dificuldade de se aprofundar nas abordagens tradicionais de pesquisa, este estudo visa contribuir originalmente para o esclarecimento da relação entre criatividade e inovação, analisando-a sob o ponto de vista de três domínios: Design, Haute Cuisine e Arte. O estudo articula dois métodos de investigação estruturados em duas partes: (i) revisão da literatura e (ii) revisão sistemática da literatura. Ambos os métodos estão vinculados à construção de um referencial teórico que aponta contribuições das áreas estudadas para a otimização de processos criativos no contexto organizacional. O estudo sugere a existência de três modelos integrados de gestão da criatividade no contexto da inovação, cada um referente a um dado domínio analisado. O quadro apresentado é um contributo para as empresas na busca de novos modelos de gestão da criatividade para a inovação, bem como um ponto de partida para a concepção de um corpo teórico mais robusto para o estudo de processos criativos em diferentes domínios no contexto da inovação.

1 Introduction

Creativity is assumed as a fundamental concept for the innovation process in the organizational context (Nonaka, 1991, 1994), besides being a recorred theme in literature (e.g. Anderson, Potočnik, & Zhou, 2014; Caniëls & Rietzschel, 2015; Oddane, 2015; Sarooghi, Libaers, & Burkemper, 2015). However, although the relation between creativity and innovation is acknowledged and the sequence of such a process seems logical – "creativity involves the generation of novel and useful ideas while innovation entails the implementation of these ideas into new products and processes" (Sarooghi et al., 2015, p. 714); in practice, organizations still find it difficult to manage creativity in the innovation processes. Thus, given the pressing need for organizations to turn creativity into innovation, more research into mechanisms for strengthening links between them is seems to be necessary (Litchfield, Ford, & Gentry, 2015).

Current literature suggests that the interaction between those two concepts is not clear (Anderson, Potočnik, et al., 2014; David H Cropley, James C Kaufman, & Arthur J Cropley, 2011), since both phenomena are cognitive and nebulous concepts and therefore are difficult to access by traditional and dominant research approaches (M. Stierand & V. Doerfler, 2012, p. 947). In that sense, it is found out that efficient creativity management models in the scope of innovation remain 'enigmatic' for researchers and managers (Caniëls & Rietzschel, 2015). Im, Montoya, and Workman (2013, p. 171) point out that "prior research on creativity has generally treated creativity as the ultimate outcome variable. This suggests a need for further study of creativity as a predictor of strategic innovation outcomes".

In that sense, it is here stressed out that creativity as a research field was first studied by psychology (Guilford, 1967), although it is now a transversal study object it has been object of different domain transversal studies, besides being a recurrent theme in political and economic agendas worldwide. Hennessey and Amabile (2010, p. 571) point out: "since the 1990s, we have seen a virtual explosion of topics, perspectives, and methodologies in the creativity literature". In such a context, it is understood that "the staggering array of disciplinary approaches to understanding creativity can prove to be an advantage, but only if researchers and theorists work together and understand the discoveries that are being made across creative domains and analytical levels. Otherwise, the mysteries may deepen" (Hennessey & Amabile, 2010, p. 590).

Thus, assuming the need for clarification on the role of creativity as a fundamental factor for innovation management (David H Cropley et al., 2011), this study had the following main question as guide: "how can the articulation of theories deriving from different creative domains contribute for the construction of referential frameworks bound to the optimization of activities related to creativity and innovation in the organizational context?" Starting from such point of view, this study aims at contributing for the theorization on the relation between creativity and innovation by analyzing it under the perspective of three different domains: Design, *Haute Cuisine* and Art.

That research strategy is based on the need for a systemic view of creativity according to Hennessey and Amabile (2010, p. 590): "only by using multiple lenses simultaneously, looking across levels, and thinking about creativity systematically, we will be able to unlock and use its secrets"**.** In addition, the increasing interest in the field of creativity for the study of processes in different domains is stressed (Furnham, Batey, Booth, Patel, & Lozinskaya, 2011; Glaveanu et al., 2013; Mumford, 2003) as well as the belief that "more progress will be made when more researchers recognize that creativity arises through a system of interrelated forces operating at multiple levels, often requiring interdisciplinary investigation" (Hennessey & Amabile, 2010, p. 571).

In this sense, the creative sector becomes strategic and has been seen as a priority for development and growth, and for the exit from the economic crisis (Lazzeretti, Innocenti, & Capone, 2015). Thus, as Lazzeretti et al. (2015) highlight, the motivations behind our choice of focusing on domains connected to creative industries are, first of all, that they have raised a strong interest in management literature, because they are increasingly seen as the right sectors for driving our economies out of the present crisis.

Thus, Design, *Haute Cuisine* and Art are the domains selected for the study for the following reasons:

(i) The protagonism of creativity and the acknowledged relevance of these domains for the

study of innovation in the current scientific context (e.g. Capdevila, Cohendet, & Simon, 2015; Garel, 2015; Glaveanu et al., 2013; Lane & Lup, 2015; Nissley, 2010; Petruzzelli & Savino, 2014; Petruzzelli & Svejenova, 2015; van den Broeck, Cools, & Maenhout, 2015; van der Meer, 2016).

(i) Work in a triangulation system where three relevant domains to the study of creativity management and with distinct characteristics should be chosen - the same analysis frame was applied for all domains with the aim of uncovering possible patterns of similarity and differences between them.

(ii) In a previous research in the ISI Web of Science database, Design domain - within the group of Creative Industries - was the field that presented the largest volume of studies related to innovation and creativity;

(iii) With an equally significant number of studies, the Art domain was selected due to its diversified and comprehensive character and to be one of the first areas to be studied in the field of creativity (Baumol & Bowen, 1965; Craft, 1979; Harris, 1999; Wijnberg & Gemser, 2000);

(iv) The *Haute Cuisine* domain, although not considered a Creative Industry - which is strongly contested in works like Pedersen (2012) and Caves (2002) was chosen instead of other areas – such as Advertising, Architecture, Computer programming activities, Photographic activities, Publishing, Sound and music recording – due to the recognition in the organizational literature in the last decade as an emerging domain of reference for the management of creativity (see Ottenbacher & Harrington, 2007; Pedersen, 2012; Surlemont & Johnson, 2005).

The operationalization of investigation unfolded from the main question of the study from which derived the sections: Part 1, which presents the main approaches on the relation between creativity and innovation identified in current literature, and Part 2, which presents how the three domains selected approach the themes identified in Part 1.

One of the aims for selecting three creative domains and using the same analysis frame for all the groups was to uncover possible similarity or difference patterns between them.

This study suggests the existence of three integrated models of creativity management in the context of innovation, each one referring to a given domain analyzed; as well as the possibility for articulating them. These models place different emphases for the non-consensual themes in the organizational literature favoring creativity and innovation.

Besides the theoretical deepening on two relevant topics in the organizational context – creativity and innovation - results signal interdisciplinar investigation as a possible and necessary path due to contemporary challenges faced by enterprises. That can be translated not only by the articulation between the academy and enterprises, but also by the need to develop transdisciplinar investigation bound to innovation in the organizational context.

2 Method

Whit basis on theoretical exploration leading to new propositions this study articulates two investigation methods as follows: (Part 1) literature review and (Part 2) systematic literature review.

2.1 Part 1 – Literature review

The first part of the study aims to understand how creativity and innovation are studied and related in the literature as an attempt to identify the themes used as basis for the analysis framework of the domains approached.

The papers analyzed were searched in the online data base *ISI Web of Knowledge*, according to the criteria showed in figure 1 (using the term "innovat*" rather than "innovation" to amplify the investigation scope).

This database was defined as the main source of research given its meticulous process of selection of scientific works. Moreover, according to Zimmermann, Ferreira, and Moreira (2016) it has been a common strategy used in other literature reviews in the scope of innovation.

The following question served as guide for the selection of the papers: "what are the main approaches in scientific literature on the relation between creativity and innovation"?

Six main approaches were identified based on the qualitative analysis of a sample of 32 studies considered relevant to the theme, published between 1998 and 2015 (Table 1): (1) individual creativity; (2) creative groups; (3) leadership; (4) environment; (5) incentive or compensation policies; (6) basic skills and learning.

Table 1. Works analysed in Part 1: literature review

Author / year	Title	Journal / Source
Caniels and Rietzschel (2015)	Organizing Creativity: Creativity and Innovation under Constraints	Creativity and Innovation Management
Litchfield et al. (2015)	Linking Individual Creativity to Organizational Innovation	The Journal of Creative Behavior
Sarooghi et al. (2015)	Examining the relationship between creativity and innovation: A meta-analysis of organizational, cultural, and environmental factors	Journal of Business Venturing
Sok and O'Cass (2015a)	Examining the new product innovation – performance relationship: Optimizing the role of individual-level creativity and attention-to-detail	Industrial Marketing Management
Oddane (2015)	The collective creativity of academics and practitioners in innovation Projects	International Journal of Managing Projects in Business
Ghosh (2015a)	Developing organizational creativity and innovation	Management Research Review
Ahlin, Drnovsek, and Hisrich (2014)	Entrepreneurs' creativity and firm innovation: the moderating role of entrepreneurial self-efficacy	Small Business Economics
Anderson, Potocnik, and Zhou (2014)	Innovation and Creativity in Organizations: A State-of-the-Science Review, Prospective Commentary, and Guiding Framework	Journal of Management
Elerud-Tryde and Hooge (2014)	Beyond the Generation of Ideas: Virtual Idea Campaigns to Spur Creativity and Innovation	Creativity and Innovation Management
Squalli and Wilson (2014)	Intelligence, creativity, and innovation	Intelligence
Sleuwaegen and Boiardi (2014)	Creativity and regional innovation: Evidence from EU regions	Research Policy
Dul and Ceylan (2014)	The Impact of a Creativity-supporting Work Environment on a Firm's Product Innovation Performance	Journal of Product Innovation Management
Stierand, Doerfler, and MacBryde (2014)	Creativity and Innovation in Haute Cuisine: Towards a Systemic Model	Creativity and Innovation Management
Im et al. (2013)	Antecedents and Consequences of Creativity in Product Innovation Teams	Journal of Product Innovation Management
Cerne, Jaklic, and Skerlavaj (2013)	Authentic leadership, creativity, and innovation: A multilevel perspective	Leadership
Somech and Drach-Zahavy (2013b)	Translating Team Creativity to Innovation Implementation: The Role of Team Composition and Climate for Innovation	Journal of Management
M. B. Stierand and V. Doerfler (2012)	Reflecting on a phenomenological study of creativity and innovation in haute cuisine	International Journal of Contemporary Hospitality Management
David H. Cropley, James C. Kaufman, and Arthur J. Cropley (2011)	Measuring Creativity for Innovation Management	Journal of Technology Management & Innovation
Lee, Florida, and Gates (2010)	Innovation, Human Capital, and creativity	International Review of Public Administration
Sohn and Jung (2010)	Effect of Creativity on Innovation: Do Creativity Initiatives Have Significant Impact on Innovative Performance in Korean Firms?	Creativity Research Journal
Gehani (2011a)	Individual Creativity and the Influence of Mindful Leaders on Enterprise Innovation	Journal of Technology Management & Innovation
Oakley (2009)	The disappearing arts: creativity and innovation after the creative industries	International Journal of Cultural Policy
Perez-Luno Robledo, Cabrera, and Wiklund (2009)	De la creatividad al lanzamiento de productos: el papel del conocimiento en los procesos de innovación e imitación	Cuadernos de Economía y Dirección de la Empresa
Gumusluoglu and Ilsev (2009)	Transformational leadership, creativity, and organizational innovation	Journal of Business Research
Ohly and Binnewies (2009b)	The Ambiguity of Creativity and Innovation	Industrial and Organizational Psychology
Paulus and Dzindolet (2008)	Social influence, creativity and innovation	Social influence
Joy (2008)	Personality and Creativity in Art and Writing: Innovation Motivation, Psychoticism, and (Mal)Adjustment	Creativity Research Journal
Li, Wang, Li, and Zhao (2007)	Design creativity in product innovation	International Journal of Advanced Manufacturing Technology
Brennan and Dooley (2005)	Networked creativity: a structured management framework for stimulating innovation	Technovation
Nijhof, Krabbendam, and Looise (2002)	Innovation through exemptions: building upon the existing creativity of employees	Technovation
Bharadwaj and Menon (2000)	Making innovation happen in organizations: individual creativity mechanisms, organizational creativity mechanisms or both?	Journal of Product Innovation Management
Heunks (1998)	Innovation, Creativity, and Success	Small Business Economics

Source: Survey data.

It is important to stress that no time cut was used, being therefore the selection of texts restricted to the relevance and convergence of the problem approached.

Figure 1. Research criteria for the selection of the papers analyzed – Part 1

	Title Terms	Topic terms	Areas	Type of documents	Languages	Total obtained	Total analyzed
Part 1							
RELATIONSHIP INNOVATION AND CREATIVITY	Innovat* AND Creat*	-------	All	Articles Reviews	English	1.114 18/02/16	32

Source: Survey data.

2.2 Part 2 – Systematic literature review

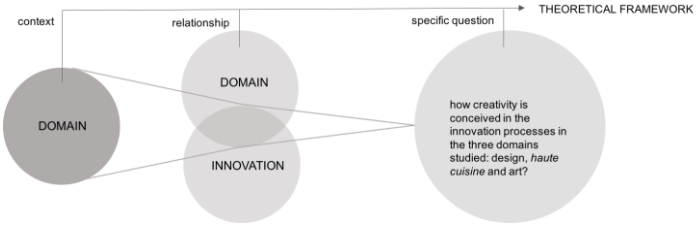
The results of part 1 provided the guidelines for the research carried out in the second part, with the support of the systematic literature review method which consists on the identification, selection, analysis and synthesis of a research on a particular topic and its presentation in a clear manner in order to meet what is known and not known about the topic (Denyer & Tranfield, 2009).

This part follows the five steps proposed by Denyer and Tranfield (2009): (1) definition of the research question; (2) location of studies; (3) selection and evaluation of studies; (4) analysis and synthesis; (5) presentation of results. The method tries to ensure that the review is transparent, auditable and replicable, and is oriented by the following question: how creativity is conceived in the innovation processes in the three domains studied: Design, *Haute Cuisine* and Art?

With the six main approaches identified on literature review and the methodological sequence as guide; the second part of this study attempts to identify the relations established between creativity and innovation in the referred domains aiming the construction of a framework offering contributes of such areas for the optimization of innovation processes in the organizational context.

Thus, this section presents how the three domains selected approach the main issues presented in this study. For the sake of evaluation, issues were considered: (i) the number of studies in each domain (e.g. creativity in groups is often studied in the domain of Design, in opposition to *Haute Cuisine*, which gives priority to individual creativity); (ii) which approach predominates within each domain (e.g. in Arts, the environment is a protagonist for innovation activities, in opposition to leadership, in the *Haute Cuisine* domain); (iii) how the different approaches are related in what concerns innovation (e.g. in the context of *Haute Cuisine*, individual creativity is more often approached, what can be clearly inferred due to the chef strong influence in the innovation process. As a result, all creative activity becomes inevitably centered in the figure of the leader; being therefore, the articulating approach in that domain.

Figure 2. Methodological sequence of Part 2



Source: Elaborated by authors (2017).

2.2.1 Location, selection and evaluation of the studies

As in the part 1, the starting point of part 2 was a search in the online data base *ISI Web of Knowledge* using the term "innovat*" associated to the specific terms (the investigation criteria varied according to each domain studied). It is pointed out that the term "creat*" was not used as a key-word in order to not limit the investigation because creativity is here understood as a domain intrinsic feature. Similarly, in Part 2 no time cut was used, prevailing therefore the relevance and convergence of issues for the sake of selection of studies.

All the articles identified (total obtained) were entered into an electronic spreadsheet and the abstracts and keywords were read, since this analysis has the following as focus: do the articles help answer the research questions? Then, the articles were read thoroughly with the same criteria in mind.

Figure 3 shows the criteria used to search the studies, the total number of papers available and the number of papers selected after the analysis. Tables 2, 3 and 4 shows the works analysed in Part 2: Systematic literature review – Design, *Haute Cuisine* and Art.

Figure 3. Research criteria for the selection of the papers analyzed – Part 2

	Title Terms	Topic terms	Areas	Type of documents	Languages	Total obtained	Total analyzed
Part 2							
DESIGN	Innovat* AND Design	-------	Engineering, business economics, architecture, art, psychology, arts humanities other topics, operations research management science, social science other topics	Articles Reviews	English	897 21/12/16	85
HAUTE CUISINE	Innovat* AND	Gastron* OR Haute Cuisine OR culinar* OR chef* OR cook*	All	Articles Reviews	English	162 29/12/16	46
ART	Innovat* AND	Art	Business economics, art, psychology, behavioral sciences, education educational research, arts humanities other topics, social sciences other topics, theater	Articles Reviews	English	434 07/01/17	27

Source: Survey data.

Table 2. Works analysed in Part 2: Systematic literature review – Design

Author / year	Title	Journal / Source	Country of origin
D. W. Karger, R. G. Murdigk (1966)	Product Design, Marketing, and Manufacturing Innovation	California Management Review	United States
Guy Bonsiepe (1995)	The Chain of Innovation Science · Technology · Design	Design Issues	Germany
Robin Roy, Johann C.k.h. Riedel (1997)	Design and innovation in successful product competition	Technovation	United Kingdom
Raimonda Riccini (2001)	Innovation as a Field of Historical Knowledge for Industrial Design	Design Issues	Italy
Harri Haapasalo and Pekka Kess (2002)	Managing Creativity: is it possible to control the birth of innovation in product design?	International Journal of Technology Management	Finland
P. Bertola, J.C. Teixeira (2003)	Design as a knowledge agent: How design as a knowledge process is embedded into organizations to foster innovation	Design Studies	Italy and United States
Shih-Wen Hsiao, Jyh-Rong Chou (2004)	A creativity-based design process for innovative product design	International Journal of Industrial Ergonomics	Republic of China
Christian Marxt, Fredrik Hacklin (2005)	Design, product development, innovation: all the same in the end? A short discussion on terminology	Journal of Engineering Design	Switzerland
S.C. Hallenga-Brink, J.C. Brezet (2005)	The sustainable innovation design diamond for micro-sized enterprises in tourism	Journal of Cleaner Production	Netherlands
Roberto Verganti (2006)	Innovation through design	Harvard Business Review	Italy
Yan Li, Jian Wang, Xianglong Li, Wu Zhao (2007)	Design creativity in product innovation	Intern. Journal of Advanced Manufacturing Technology	Republic of China and United Kingdom
Sara L. Beckman, Michael Barry (2007)	Innovation as a Learning Process: embedding Design Thinking	California Management Review	United States
Barry Wylant (2008)	Design Thinking and the Experience of Innovation	Design Issues	Canada
Roberto Verganti (2008)	Design, Meanings, and Radical Innovation: A Metamodel and a Research Agenda	Journal of Product Innovation Management	Italy
Marina Candi, Rognvaldur J. Saemundsson (2008)	How different? Comparing the use of design in service innovation in Nordic and American new technology-based firms	Design Studies	Iceland
Claudio Dell'Era, Roberto Verganti (2009)	Design-driven laboratories: organization and strategy of laboratories specialized in the development of radical design-driven innovations	R&D Management	Italy
Yen Hsu (2009)	Exploring design innovation and performance: the roles of issue related to design strategy	Journal of Engineering Design	Republic of China
Katrin Talke, Soren Salomo, Jaap E. Wieringa, Antje Lutz (2009)	Exploring design innovation and performance: the roles of issue related to design strategy	Journal of Product Innovation Management	Netherlands
Claudio Dell'Era, Roberto Verganti (2010)	Collaborative Strategies in Design-intensive Industries: Knowledge Diversity and Innovation	Long Range Planning	Italy
Katharina Kalogerakis, Christian Luthje, Cornelius Herstatt (2010)	Developing Innovations Based on Analogies: Experience from Design and Engineering Consultants	Journal of Product Innovation Management	Germany
Marc H. Meyer, Tucker J. Marion (2010)	Innovation for effectiveness: lessons from design firms	Research Technology Management	United States
Jeremy Legardeur, Jean Francois, Boujut Henri Tiger (2010)	Lessons learned from an empirical study of the early design phases of an unfulfilled innovation	Research in Engineering Design	France
Constantine Andriopoulos, Marianne W. Lewis (2010)	Managing Innovation Paradoxes: Ambidexterity Lessons from Leading Product Design Companies	Long Range Planning	United Kingdom
Claudio Dell'Era, Alessio Marchesi, Roberto Verganti (2010)	Mastering technologies in Design-driven innovations	Research Technology Management	Italy
Leon Cruickshank (2010)	The Innovation Dimension: Designing in a Broader Context	Design Issues	United Kingdom
Mike Hobday, Anne Boddington, Andrew Grantham (2011)	An Innovation Perspective on Design: Part 1	Design Issues	United Kingdom
Maria Santolaria, Jordi Oliver-Solà, Carles M. Gasol, Tito Morales-Pinzón, Joan	Eco-design in innovation driven companies: perception, predictions and the main drivers of integration. The Spanish example	Journal of Cleaner Production	Spain Colombia

Author / year	Title	Journal / Source	Country of origin
Rieradevall (2011)			
Silvia Cantarello, Anna Nosella, Giorgio Petroni, Karen Venturini (2011)	External technology sourcing: evidence from design-driven innovation	Management Decision	Italy San Marino
Dean Bruton (2011)	Learning creativity and design for innovation	International Journal of Technology and Design Education	Australia
Abbie Griffin (2011)	Legitimizing Academic Research in Design: Lessons from Research on New Product Development and Innovation	Journal of Product Innovation Management	United States
Scott K. Radford, Peter H. Bloch (2011)	Linking Innovation to Design: Consumer Responses to Visual Product Newness	Journal of Product Innovation Management	Canada
Per-Anders Hillgren, Anna Seravalli, Anders Emilson (2011)	Prototyping and infrastructuring in design for social innovation	CoDesign	Sweden
Hartmut Esslinger (2011)	Sustainable Design: Beyond the Innovation-Driven Business Model	Journal of Product Innovation Management	Austria
Lucia Rampino (2011)	The Innovation Pyramid: A Categorization of the Innovation Phenomenon in the Product-design Field	International Journal of Design	Italy
Cinzia Battistella, Gianluca Biotto, Alberto F. De Toni (2012)	From design driven innovation to meaning strategy	Management Decision	Italy
André Liema,Eric Brangier (2012)	Innovation and design approaches within prospective ergonomics	Work 41	Norway France
Gaia Rubera, David A. Griffith, Goksel Yalcinkaya (2012)	Technological and Design Innovation Effects in Regional New Product Rollouts: A European Illustration	Journal of Product Innovation Management	United States
Joseph Lampel, Pushkar P. Jha, Ajay Bhalla (2012)	Test-Driving the Future: How Design Competitions Are Chonging Innovation	Academy of Management Perspectives	United Kingdom
Martin Schreier, Christoph Fuchs, Darren W. Dahl (2012)	The Innovation Effect of User Design: Exploring Consumers' Innovation Perceptions of Firms Selling Products Designed by Users	Journal of Marketing	Austria Netherlands United States
Pietro Micheli, Joe Jaina, Keith Goffin, Fred Lemke, Roberto Verganti (2012)	Perceptions of Industrial Design: The "Means" and the "Ends"	Journal of Product Innovation Management	United Kingdom
Rebecca Currano and Martin Steinert (2012)	A Framework for Reflective Practice in Innovative Design	*International Journal of Engineering Education*	United States
Elizabeth Gerber, Jeanne Marie Olson, Rebecca L. D. Komarek (2012)	Extracurricular Design-Based Learning: Preparing Students for Careers in Innovation	*International Journal of Engineering Education*	United States
Sarah K. Oman, Irem Y. Tumer, Kris Wood, Carolyn Seepersad (2013)	A comparison of creativity and innovation metrics and sample validation through in-class design projects	Research in Engineering Design	United States
Julien Nelson, Stéphanie Buisine, Améziane Aoussat (2013)	Anticipating the use of future things: Towards a framework forprospective use analysis in innovation design projects	Applied Ergonomics	France
Bulent Menguc, Seigyoung Auh, Peter Yannopoulos (2013)	Customer and Supplier Involvement in Design: The Moderating Role of Incremental and Radical Innovation Capability	Journal of Product Innovation Management	United States
Anabel Fernández-Mesa, Joaquín Alegre-Vidal, Ricardo Chiva-Gómez, Antonio Gutiérrez-Gracia (2013)	Design management capability and product innovation in SMEs	Management Decision	Spain
Mercedes Paulini, Paul Murty, Mary Lou Maher (2013)	Design processes in collective innovation communities: a study of communication	CoDesign	Australia
Donald W. de Guerre, Daniel Séguin, Alicia Pace, Noel Burke (2013)	IDEA: A Collaborative Organizational Design Process Integrating Innovation, Design, Engagement, and Action	Systemic Practice and Action Research	Canada
Hakil Moon, Douglas R. Miller, Sung Hyun Kim (2013)	Product Design Innovation and Customer Value: Cross-Cultural Research in the United States and Korea	Journal of Product Innovation Management	United States Korea
Gaia Rubera, Cornelia Droge (2013)	Technology versus Design Innovation's Effects on Sales and Tobin's Q: The Moderating Role of Branding Strategy	Journal of Product Innovation Management	Italy
Wen Huei Chou, Chung-Wen Hung, Teng-wen Chang, Ya-Ling Kao, Chorng-Sii Hwang (2013)	Teaching Design Interdisciplinarly	Procedia - Social and Behavioral Sciences	Taiwan
Cabirio Cautela, Alessandro Deserti, Francesca Rizzo, Francesco Zurlo (2014)	Design and Innovation: How Many Ways?	Design Issues	Italy

Author / year	Title	Journal / Source	Country of origin
Philips Kembaren, Togar M. Simatupang, Dwi Larso, Dudy Wiyancoko (2014)	Design Driven Innovation Practices in Design-preneur led Creative Industry	Journal of Technology Management & Innovation	Indonesia
Pradip Khandwalla (2014)	Designing a creative and innovative India	The Intern. Journal of Human Resource Management	India
Donald A. Norman, Roberto Verganti (2014)	Incremental and Radical Innovation: Design Research vs. Technology and Meaning Change	Design Issues	United States Italy
Ezio Manzini (2014)	Making Things Happen: Social Innovation and Design	Design Issues	Italy
Tevfik Balcıoglu, Bahar Emgin (2014)	Recent Turkish Design Innovations: A Quest for Identity	Design Issues	Turkey
Hakil Moon, Jeongdoo Park, Sangkyun Kim (2014)	The Importance of an Innovative Product Design on Customer Behavior: Development and Validation of a Scale	Journal of Product Innovation Management	United States
Paul Gardien, Tom Djajadiningrat, Caroline Hummels, Aarnout Brombacher (2014)	Changing your Hammer: The Implications of Paradigmatic Innovation for Design Practice	International Journal of Design	Netherlands
Lisa Carlgren, Maria Elmquist, Ingo Rauth (2014)	Design Thinking: Exploring Values and Effects from an Innovation Capability Perspective	The Design Journal	Sweden
Jamie Brassett, John O'Reilly (2015)	Styling the future. A philosophical approach to design and scenarios	Futures	United Kingdom
Cynthia Selin, Lucy Kimbell, Rafael Ramirez, Yasser Bhatti (2015)	Scenarios and design: Scoping the dialogue space	Futures	Denmark United States United Kingdom
A. Idil Gaziulusoy (2015)	A critical review of approaches available for design and innovation teams through the perspective of sustainability science and system innovation theories	Journal of Cleaner Production	Australia
Mosarrat Farhana, Eric Bimenyimana (2015)	Design Driven Innovation as a Differentiation Strategy - in the Context of Automotive Industry	Journal of Technology Management & Innovation	Sweden
A.Idil Gaziulusoy, Han Brezet (2015)	Design for system innovations and transitions: a conceptual framework integrating insights from sustainablity science and theories of system innovations and transitions	Journal of Cleaner Production	Australia Netherlands
Yao-Tsung Ko, Ming-Shih Chen, Chih-Chieh Yang, Meng-Cong Zheng (2015)	Modelling a contradiction-oriented design approach for innovative product design	Journal of Engineering Manufacture	Republic of China
Heidingsfelder Marie, Kimpel Kora, Best Kathinkaa, Schraudner Martina (2015)	Shaping Future — Adapting design know-how to reorient innovation towards public preferences	Technologial Forecasting & Social Change	Germany
Gilles Garel (2015)	Lessons in Creativity from the Innovative Design of the Swatch	Technology Innovation Management Review	France
Pennie Frow, Suvi Nenonen, Adrian Payne, Kaj Storbacka (2015)	Managing Co-creation Design: A Strategic Approach to Innovation	British Journal of Management	Australia
Paolo Landoni, Claudio Dell'Era, Gregorio Ferraloro, Mattia Peradotto, Helena Karlsson, Roberto Verganti (2016)	Design Contribution to the Competitive Performance of SMEs: The Role of Design Innovation Capabilities	Creativity and Innovation Management	Italy Australia Brazil Sweden Denmark United States
Martin Cloutier, Laurent Renard, Sebastien Arcand, Michael Laviolette (2016)	Rejuvenating the Cider Route in Quebec: An Action Design Research Approach to Stakeholder Collaboration and Innovation	Technology Innovation Management Review	Canada France
Krause, W Schutte, CSL (2016)	DEVELOPING DESIGN PROPOSITIONS FOR AN OPEN INNOVATION APPROACH FOR SMEs	South African Journal of Industrial Engineering	South Africa
Fabrizio Ceschin Idil Gaziulusoy (2016)	Evolution of design for sustainability: From product design to design for system innovations and transitions	Design Studies	United Kingdom Australia Finland
Yinze Hu, EL-Sayed Aziz, Constantin Chassapis (2016)	Creativity-based design innovation environment in support of robust product development	International Journal on Interactive Design and Manufacturing (IJIDeM)	United States Egypt
JohnDavis, Catherine Ann Docherty & Kate Dowling (2016)	Design Thinking and Innovation: Synthesising Concepts of Knowledge Co-creation in Spaces of Professional Development	The Design Journal	United Kingdom
Søren Ingomar Petersen, Ji Eun Kim & Brigitte Borja de Mozota (2016)	Comprehensive Capability Model for Managing Business Driven Innovation through the use of Design Quality Scorecards	The Design Journal	United States South Korea France
Paul Gardien, Maarten Rincker and Eva Deckers (2016)	Designing for the Knowledge Economy: Accelerating Breakthrough Innovation Through Co-creation	The Design Journal	Netherlands
Chen, Ji-Wena; Yang, Hong-Juanc; Cui, Jia-Jiaa;	Concept semantics driven computer aided product innovation design	Journal of Computational Methods in Sciences	China

Author / year	Title	Journal / Source	Country of origin
Zhang, Jin-Sheng (2016)		and Engineering	
Pedro Nevado; José Monteiro Barata; Rita Almendra (2016)	Boosting innovation and growth through the use of design	Journal of Business Economics and Management	Portugal
Sihem Ben Mahmoud-Jouini, Christophe Midler, Philippe Silberzahn (2016)	Contributions of Design Thinking to Project Management in an Innovation Context	Project Management Journal	France
Chen-Fu Yang and Tung-Jung Sung (2016)	Service Design for Social Innovation through Participatory Action Research	International Journal of Design	Taiwan
Sylvain Lenfle, Pascal Le Masson, Benoit Weil (2016)	When Project Management Meets Design Theory: Revisiting the Manhattan and Polaris Projects to Characterize 'Radical Innovation' and its Managerial Implications	Creativity and Innovation Management	France
Alexander Brem; Petra A. Nylund; Gerd Schuster (2016)	Innovation and de facto standardization: The influence of dominant design on innovative performance, radical innovation, and process innovation	Technovatio n	Denmark Spain Germany
Stephen Ropera, Pietro Micheli, James H. Lovea, Priit Vahterca (2016)	The roles and effectiveness of design in new product development: A study of Irish manufacturers	Research Policy	United Kingdom Estonia

Source: Survey data.

Table 3. Works analysed in Part 2: Systematic literature review – *Haute Cuisine*

Author / year	Title	Journal / Source	Country of origin
Katharina Balazs (2001)	Some Like It Haute: Leadership Lessons from France's Great Chefs	Organizational Dynamics	France
Katharina Balazs (2002)	Take One Entrepreneur: The Recipe for Success of France's Great Chefs	European Management Journal	France
Robert J. Harrington (2004)	Part I: The Culinary Innovation Process – A Barrier to Imitation	Journal of Foodservice Business Research	Canada
Michael Ottenbacher & Robert J. Harrington (2007)	The Culinary Innovation Process	Journal of Culinary Science & Technology	Germany and United States
Silviya Svejenova, Carmelo Mazza and Marcel Planellas (2007)	Cooking up change in haute cuisine: Ferran Adrià as an institutional entrepreneur	Journal of Organizational Behavior	Spain and France
Michael Ottenbacher & Robert J. Harrington (2007)	The innovation development process of Michelin-starred chefs	International Journal of Contemporary Hospitality Management	United States and Canada
César Vegaa, and Job Ubbink (2008)	Molecular gastronomy: a food fad or science supporting innovative cuisine?	Trends in Food Science & Technology	United States Switzerland
Michael Ottenbacher & Robert J. Harrington (2008)	U.S. and German Culinary Innovation Processes: Differences in Involvement and Other Factors	Journal of Foodservice Business Research	Germany United States
Juan-Carlos Arboleya, Idoia Olabarrieta, Andoni Luis-Aduriz, Daniel Lasa, Javier Vergara, Esther Sanmartín, Leire Iturriaga, Antonio Duch & Iñigo de Marañón (2008)	From the Chef's Mind to the Dish: How Scientific Approaches Facilitate the Creative Process	Food Biophysics	Spain
Jeou-Shyan Horng, Meng-Lei Hu (2008)	The Mystery in the Kitchen: Culinary Creativity	Creativity Research Journal	Taiwan
Marc Stierand and Paul Lynch (2008)	The art of creating culinary innovations	Tourism and Hospitality Research	United Kingdom
Shoshanah M. Inwood, Jeff S. Sharp, Richard H. Moore, Deborah H. Stinner (2009)	Restaurants, chefs and local foods: insights drawn from application of a diffusion of innovation framework	Agriculture and Human Values	United States
Michael Ottenbacher & Robert J. Harrington (2009)	Institutional, cultural and contextual factors: Potential drivers of the culinary innovation Process	Tourism and Hospitality Research	Germany United States
Jeou-Shyan Horng and Meng-Lei H (2009)	The Creative Culinary Process: Constructing and Extending a Four-Component Model	Creativity Research Journal	Taiwan
Jeou-Shyan Horng and Yi-Chun Lee (2009)	What environmental factors influence creative culinary studies?	International Journal of Contemporary Hospitality Management	Taiwan
Meng-Lei Hu(2010)	Discovering culinary competency: An innovative approach	The Journal of Hospitality Leisure Sport and Tourism	Taiwan

Author / year	Title	Journal / Source	Country of origin
John Cousins, Kevin O'Gorman and Marc Stierand (2010)	Molecular gastronomy: cuisine innovation or modern day alchemy?	International Journal of Contemporary Hospitality Management	United Kingdom Ireland
Silviya Svejenova, Marcel Planellas and Luis Vives (2010)	An Individual Business Model in the Making: a Chef's Quest for Creative Freedom	Long Range Planning	Spain
Line Holler Mielby, Michael Bom Frøst (2010)	Expectations and surprise in a molecular gastronomic meal	Food Quality and Preference	Denmark
Anastasios Zopiatis (2010)	Is it art or science? Chef's competencies for success	International Journal of Hospitality Management	Cyprus
Meng-Lei Monica Hu (2010)	Developing a core competency model of innovative culinary development	International Journal of Hospitality Management	Taiwan
Richard N.S. Robinsona and Lisa G. Beesley (2010)	Linkages between creativity and intention to quit: An occupational study of chefs	Tourism Management	Australia and United Kingdom
Marie-Léandre Gomez and Isabelle Bouty (2011)	The Emergence of an Influential Practice: Food for Thought	Organization Studies	France
Hanne Larsen and Susanne Österlund-Pötzsch (2012)	"Ubuntu in Your Heart"	Food, Culture & Society	United States and Finland
Anneke Geyzena, a Peter Scholliers and Frederic Leroy (2012)	Innovative traditions in swiftly transforming foodscapes: An exploratory essay	Trends in Food Science & Technology	Belgium
Marc B. Stierand and Viktor Dorfler (2012)	Reflecting on a phenomenological study of creativity and innovation in haute cuisine	International Journal of Contemporary Hospitality Management	Netherlands United Kingdom
Benedict Beauge (2012)	On the idea of novelty in cuisine A brief historical insight	International Journal of Gastronomy and Food Science	France
Pilar Opazo (2012)	Discourse as driver of innovation in contemporary haute cuisine: The case of elBulli restaurant	International Journal of Gastronomy and Food Science	United States
J. Albors-Garrigos , V. Barreto , P. García-Segovia , J. Martínez-Monzó and J. L. Hervás-Oliver (2013)	Creativity and Innovation Patterns of Haute Cuisine Chefs	Journal of Culinary Science & Technology	Spain
R. J. Harrington and M. C. Ottenbacher (2013)	Managing the Culinary Innovation Process: The Case of New Product Development	Journal of Culinary Science & Technology	United States Germany
J. Albors-Garrigos, V. Barreto, P. García-Segovia , J. Martínez-Monzó and J. L. Hervás-Oliver (2013)	Creativity and Innovation Patterns of Haute Cuisine Chefs	Journal of Culinary Science & Technology	Spain
Isabelle Bouty and Marie-Léandre Gomez (2013)	Creativity in Haute Cuisine: Strategic Knowledge and Practice in Gourmet Kitchens	Journal of Culinary Science & Technology	France
Kang-Lin Peng, Ming-Chu Lin and Tom Baum (2013)	The constructing model of culinary creativity: an approach of mixed methods	Quality & Quantity Journal	Taiwan and United Kingdom
Haldor Byrkjeflot, Jesper Strandgaard Pedersen and Silviya Svejenova (2013)	From Label to Practice: The Process of Creating New Nordic Cuisine	Journal of Culinary Science & Technology	Norway Denmark
Antonio Messeni Petruzzelli and Tommaso Savino (2013)	Search, Recombination, and Innovation: Lessons from Haute Cuisine	Long Range Planning	Italy
Henry Chesbrough, Sohyeong Kim and Alice Agogino (2014)	Chez Panisse: Building an Open Innovation Ecosystem	California Management Review	United States
Florian Aubke (2014)	Creative Hot Spots: A Network Analysis of German Michelin-Starred Chefs	Creativity and Innovation Management	Austria
Marc Stierand, Viktor Dörfler and Jillian MacBryde (2014)	Creativity and Innovation in Haute Cuisine: Towards a Systemic Model	Creativity and Innovation Management	Switzerland and United Kingdom
Christel Lane and Daniela Lup (2015)	Cooking under Fire: Managing Multilevel Tensions between Creativity and Innovation in Haute Cuisine	Industry and Innovation	United Kingdom
Antonio Messeni Petruzzelli and Tommaso Savino (2015)	Reinterpreting Tradition to Innovate: The Case of Italian Haute Cuisine	Industry and Innovation	Italy
Ignasi Capdevila, Patrick Cohendet, and Laurent Simon	Establishing New Codes for Creativity through Haute Cuisine: The Case of Ferran Adrià and elBulli	Technology Innovation Management Review	France and Canada

Author / year	Title	Journal / Source	Country of origin
(2015)			
Vanina Leschziner (2015)	At the chef's table: Culinary Creativity in Elite Restaurants	Stanford University Press - *Book	Canada
Pilar Opazo (2016)	Appetite for innovation: creativity and change at elBulli	Columbia University Press - *Book	United States
Nicola Caporaso Diego Formisano (2016)	Developments, applications, and trends of molecular gastronomy among food scientists and innovative chefs	Food Reviews International	Italy
Andreas Braun Laura Bockelmann (2016)	An individual perspective on open innovation capabilities in the context of haute cuisine	International Journal of Innovation Management	Germany
Celine Abecassis-Moedas, Francesco Sguera, John E. Ettlie (2016)	Observe, innovate, succeed: A learning perspective on innovation and the performance of entrepreneurial chefs	Journal of Business Research	Portugal and United States

Source: Survey data.

Table 4. Works analysed in Part 2: Systematic literature review – Art

Author / year	Title	Journal / Source	Country of origin
Don Foresta Georges-Albert Kisfaludi Jonathan Barton (1999)	The Souillac II Conference on Art, Industry and Innovation: Final Report	Leonardo	France and United States
Craig Harris (1999)	Art and innovation: The Xerox PARC artist-in-residence program	MIT Press - *Book	United States
Nachoem M. Wijnberg Gerda Gemser (2000)	Adding Value to Innovation: Impressionism and the Transformation of the Selection System in Visual Art	Organization Science	Netherlands
Mary-Anne Mace Tony Ward (2002)	Modeling the Creative Process: A Grounded Theory Analysis of Creativity in the Domain of Art Making	Creativity Research Journal	New Zealand Australia
Rob Austin Lee Devin (2003)	Artful Making: What Managers Need to Know About How Artists Work	FT Prentice Hall - *Book	United States
Lotte Darso (2004)	Artful Creation: Learning-Tales of Arts-in-Busines	Samsfundlitteratur - *Book	Denmark
Ted Buswick Alastair Creamer Mary Pinard (2004)	(Re)Educating for Leadership: How the Arts Can Improve Business	**Electronic document	United Kingdom United States
Mary-Ellen Boyle Edward Ottensmeyer (2005)	Solving business problems through the creative power of the arts: catalyzing change at Unilever	Journal of Business Strategy	United States
Lotte Darso (2005)	International opportunities for artful learning	Journal of Business Strategy	Denmark
Jean-Paul Fourmentrau (2007)	Governing Artistic Innovation: An Interface among Art, Science and Industry	Leonardo	France
Jason Potts (2007)	Art and innovation: An evolutionary view of the creative industries	The e-Journal: Multi-disciplinary Journal in the Arts	Australia
Luke Jaaniste (2009)	Placing the creative sector within innovation: The full gamut	Innovation: management, policy & practice	Australia
John Reaves David Green (2010)	What good are artists?	Journal of Business Strategy	United States
Nick Nissley (2010)	Arts-based learning at work: economic downturns, innovation upturns, and the eminent practicality of arts in business	Journal of Business Strategy	Canada
Graeme Thomson (2010)	The art and science of experiential leadership: culture at the core of process change success	Journal of Business Strategy	United States
Suzanne Merritt (2010)	What does beauty have to do with business?	Journal of Business Strategy	United States
Robert Austin Lee Devin (2010)	Not just a pretty face: economic drivers behind the arts-in-business movement	Journal of Business Strategy	United States
Marion Botella Franck Zenasni Todd Lubart (2011)	A dynamic and ecological approach to the artistic creative process of arts students: an empirical contribution	Empirical Studies of The Arts	France
Adrian Furnhama, Mark Batey, Tom W. Booth, Vikita Patel, Dariya Lozinskaya (2011)	Individual difference predictors of creativity in Art and Science students	Thinking Skills and Creativity	United Kingdom
Guillaume Fürst Paolo Ghisletta Todd Lubart (2012)	The Creative Process in Visual Art: A Longitudinal Multivariate Study	Creativity Research Journal	Switzerland France
Vlad Glaveanu, Todd Lubart, Nathalie Bonnardel, Marion Botella, Pierre-Marc de Biaisi, Myriam Desainte-Catherine, Asta Georgsdottir, Katell Guillou, Gyorgy Kurtag, Christophe Mouchiroud, Martin Storme, AlicjaWojtczuk and Franck Zenasni	Creativity as action: findings from five creative domains	Frontiers in Psychology	Denmark France

Author / year	Title	Journal / Source	Country of origin
(2013)			
Marion Botella, Vlad Glaveanu, Franck Zenasni, Martin Storme, Nils Myszkowski, Marion Wolff, Todd Lubart (2013)	How artists create: Creative process and multivariate factors	Learning and Individual Differences	Denmark France
Jonathan Sapsed, Feichin Ted Tschang (2014)	Art is long, innovation is short: Lessons from the Renaissance and the digital age	Technological Forecasting & Social Change	United Kingdom Singapore
Herman van den Broeck Eva Cools Tine Maenhout (2015)	A Case Study of Arteconomy – Building a bridge between art and enterprise: Belgian businesses stimulate creativity and innovation through art	Journal of Management & Organization	Belgium
Piers Ibbotson Lotte Darsø (2015)	Directing creativity: The art and craft of creative leadership	Journal of Management & Organization	United Kingdom Denmark
Gerardo Patriotta Paul Hirsch (2016)	Mainstreaming Innovation in Art Worlds: Cooperative links, conventions and amphibious artists	Organization Studies	United States United Kingdom
Han van der Meer (2016)	Entrepreneurs, Art and Innovation	International Journal of Innovation and Technology Management	Netherlands

Source: Survey data.

It is highlighted that, in addition to the studies identified in the *ISI Web of Science* database, other reference sources have been included in the set of studies analyzed (e.g. books, reports, articles), both presented in Tables 2, 3 and 4 (tagged as "*"). Those were identified in the bibliographical references of the studies selected in Part 2 - Systematic literature review. Thus, having title and abstract as basis, studies converging to the problem and issues here approached were considered for the sake of analysis, even though not included in the Systematic literature review. According to Denyer and Tranfield (2009) this procedure aims to enrich the results of the systematic literature review.

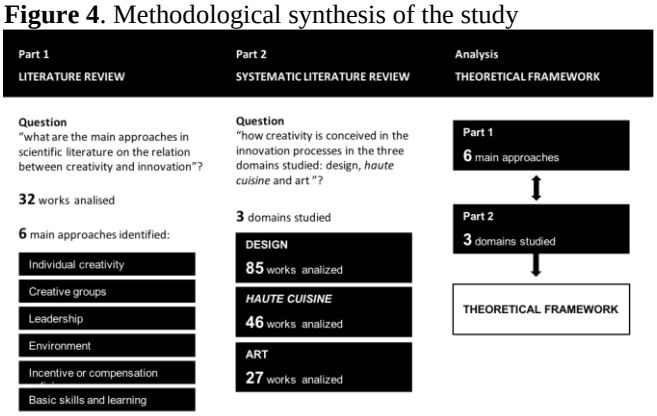
Following the suggestion of other studies, and as a way to increase the reliability of the selection, the articles were evaluated simultaneously by the three researchers and doubts and disagreements were discussed until consensus was reached. The articles were only included if all reviewers agreed.

2.2.2 Analysis and synthesis

After selecting the most relevant studies in each domain, the articles were analyzed and synthesized in order to examine and dissect individual studies as well as to identify relationships between the components (Denyer and Tranfiled, 2009). Due to such a challenge the domains were firstly presented and contextualized (context); then it was observed how each domain approaches innovation (relationship), to furtherly mention studies which specifically contribute to answer the investigation question (specific question).

With basis on the analysis of 85 works selected in the domain of Design (published between 1966 and 2016 – Table 2), 46 works concerning *Haute Cuisine* (published between 2001 and 2016 – Table 3), and 27 works concerning the Art domain (published between 1999 and 2016 – Table 4) the data obtained in parts 1 and 2 of the study were analyzed aiming the construction of a theoretical framework. Figure 4 presents the synthesis of the methodology used.

Figure 4. Methodological synthesis of the study



Source: Survey data.

3 Review of literature: relation between creativity and innovation

An expressive number of recent studies places creativity in the roots of innovation (e.g. Anderson, Potočnik, et al., 2014; Brennan & Dooley, 2005; Caniëls & Rietzschel, 2015; Dul & Ceylan, 2014; Hennessey & Amabile, 2010; Sarooghi et al., 2015; Somech & Drach-Zahavy, 2013a).

For Brennan and Dooley (2005) the organization creative process is the seed for innovation. Under that perspective, while

creativity has been defined as the generation of new and useful ideas (Hennessey & Amabile, 2010; Sarooghi et al., 2015), innovation is usually understood as the production of creative ideas in a first stage, being those implemented in a second stage (Anderson, Potočnik, et al., 2014; Lane & Lup, 2015; Sarooghi et al., 2015)

Anderson, Potočnik, et al. (2014, p. 1298) illustrate that proposing an integrated definition of creativity and innovation: "Creativity and innovation at work are the process, outcomes, and products of attempts to develop and introduce new and improved ways of doing things. The creativity stage of this process refers to idea generation, and innovation refers to the subsequent stage of implementing ideas toward better procedures, practices, or products". Thus, it can be observed that investigation on creativity, typically explores the idea generation phase - or *fuzzy front end*; while studies on innovation, usually include the idea implementation phase (Anderson, Potočnik, et al., 2014; Brennan & Dooley, 2005).

In opposition to the theorization of creativity as an innovation antecedent, Sarooghi et al. (2015) argue that in a well succeeded innovation process, creativity is a determinant factor concerning the equalization between the idea generation and the implementation phases. They justify their reasoning by stressing the complexity, tensions, paradoxes, dilemmas and unpredictability which feature the process of converting creative ideas into innovative outcome.

Similarly, in what concerns the nonlinear relation between creativity and innovation, Oddane (2015) mentions one of the biggest difficulties in managing creativity in the innovation process by comparing it to a "relay race" - where the idea of an individual is passed from hand to hand in a group of people who put them in practice. Such a view, according to the author, fails in neglecting the complexity and diffuse character of the innovation management process in practice.

Thus, due to the need for further studies on creativity as a predictor of strategic innovation outcomes (Im et al., 2013), a research was carried out with basis on current literature about studies relating creativity and innovation. Among the 32 studies analyzed, six main approaches were identified:

1. **Individual creativity** (Ahlin, Drnovšek, & Hisrich, 2014; Anderson, Potočnik, et al., 2014; Bharadwaj & Menon, 2000; Černe, Jaklič, & Škerlavaj, 2013; Ghosh, 2015b; Litchfield et al., 2015; Oddane, 2015; Ohly & Binnewies, 2009a; Sarooghi et al., 2015; Somech & Drach-Zahavy, 2013a; Stierand, Dörfler, & MacBryde, 2014);
2. **Creative groups** (Anderson, Potočnik, et al., 2014; Brennan & Dooley, 2005; Černe et al., 2013; Nijhof et al., 2002; Oddane, 2015; Paulus & Dzindolet, 2008; Somech & Drach-Zahavy, 2013a);
3. **Leadership** (Ahlin, Drnovšek, et al., 2014; Anderson, Potočnik, et al., 2014; Černe et al., 2013; Gehani, 2011b; Ghosh, 2015b; Nijhof et al., 2002; Sok & O'Cass, 2015b; Somech & Drach-Zahavy, 2013a);
4. **Environment** (Anderson, Potočnik, et al., 2014; Caniëls & Rietzschel, 2015; Černe et al., 2013; Dul & Ceylan, 2014; Ghosh, 2015b; Im et al., 2013; Lee et al., 2010; Litchfield et al., 2015; Nijhof et al., 2002; Paulus & Dzindolet, 2008; Sleuwaegen & Boiardi, 2014; Sohn & Jung, 2010; Somech & Drach-Zahavy, 2013a);
5. **Incentive or compensation policies** (Joy, 2008; Lee et al., 2010; Sohn & Jung, 2010);
6. **Basic skills and learning** (Lee et al., 2010; Perez-Luno Robledo et al., 2009; Sohn & Jung, 2010).

In what concerns individual creativity and creative group approaches in the context of innovation, Anderson, Potočnik, et al. (2014, p. 1298) point out the existence of levels of work: "creativity and innovation can occur at the level of the individual, work team, organization, or at more than one of these levels combined".

For Litchfield et al. (2015) innovation is usually seen as a process which depends on individual creativity where the creativity of each employee is critical to the innovativeness of the organization regardless of whether the job is usually described as highly creative (Nonaka, 1991, 1994). Im et al. (2013) find that influenced by their basis in psychological theory, most creativity studies focus on how individuals generate, develop, and react to creative ideas in certain social and contextual environments, which, according to Sohn and Jung (2010), depends directly on what the authors call the basic skills to innovation described as: the ability to adapt to circumstances; leadership; application skills; interpersonal relationships; communication skills; the ability to solve problems; analytical ability. In addition, Gehani (2011b, p. 84) points out some of the commonly considered indicators of a creative

individual are: (1) cognitive abilities including general intelligence, (2) mastery of a discipline, and (3) the subjectivity of their actual creative output such as performance on creativity tests involving puzzle-solving ability.

Litchfield et al. (2015) emphasize that the innovation research generally does not directly examine individual creativity despite its importance in a wide variety of jobs. Moreover, according to Gehani (2011b), unfortunately, developing the creative mindsets of different individuals has been often neglected by many enterprises.

A commonly noted requirement for converting creativity into innovation involves the integration of knowledge across multiple perspectives (Boland & Tenkasi, 1995), which, according to Litchfield et al. (2015), is still a challenge to enterprises, since those face many difficulties in uniting individual creative contributions from different functions and areas in coherent "wholes". In that sense, it can be observed that investigations of creative behavior and the creative process have, over time, shown a progression from attention to the individual to a focus on the creative performance of groups (Hennessey & Amabile, 2010, pp. 578-579).

Somech and Drach-Zahavy (2013a) indicate that creativity and innovation researchers have recently adopted an interactional approach, arguing that situational and personal factors jointly contribute to team innovation. This approach suggests that to fully understand how to promote innovation in teams, we should look simultaneously at team members' characteristics and at team context, that is, there is a strong relation between creative groups, environment and individual creativity approaches (in some cases represented by the leader).

Thus, considering that leaders influence and set the contextual environments under which their employees express creativity, Gehani (2011b), Somech and Drach-Zahavy (2013a) argue that members with high creative personalities may help team members to generate many alternative solutions to an open-ended problem. By introducing alternative interpretations and contrasting ways of thinking, they may encourage critical thinking that facilitates team creativity. In this sense, according to Anderson, Potočnik, et al. (2014), the emergent phenomena require skillful leadership in order to maximize the benefits of new and improved ways of working.

Considering what was presented, the study on the relation between creativity and innovation can be benefited by the use a systemic approach, since the interdependence between the main approaches identified is evident in literature. It is understood that can contribute to demystify contradictory situations such as those pointed out by Litchfield et al. (2015, p. 282): despite the strength of prior theory and research suggesting team creative environment can improve the transfer of creativity to innovation, some research suggests that highly creative team environments might inhibit the impact of creativity on innovation.

This second set of studies, according to the authors, is based lack of engagement and lack of change of perspectives on the part of the team members, such as failing to share, support, or even consider ideas in ways that do not directly benefit the team; all directly related with the themes: individual creativity, creative groups, leadership, environment, incentive or compensation policies and basic skills and learning.

Therefore, considering the organizational environment an important concept investigated by many scholars in the area of creativity with direct influence on the creative process (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Dul & Ceylan, 2014), we understand that this example illustrates challenges in studying the relation between creativity and innovation, since the research on creativity at the team level remains limited (Im et al., 2013).

4 Systematic literature review: relation between creativity and innovation in different domains

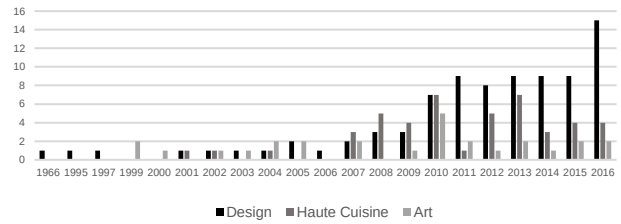
4.1 Descriptive results: characterizing the literature

This section aims at showing the context of the literature regarding the relationship between innovation and creativity and the three domains. For this analysis, the *HistCite* software was used.

The literature on the domain of Design was the first to explored the relationship with innovation and creativity - the oldest article identified was published in 1966. However, 50% of the articles were published in the last five years, what shows the topicality of the topic. The domains of *Haute Cuisine* and Art also show an

improvement in the number of articles in the last decade (figure 5).

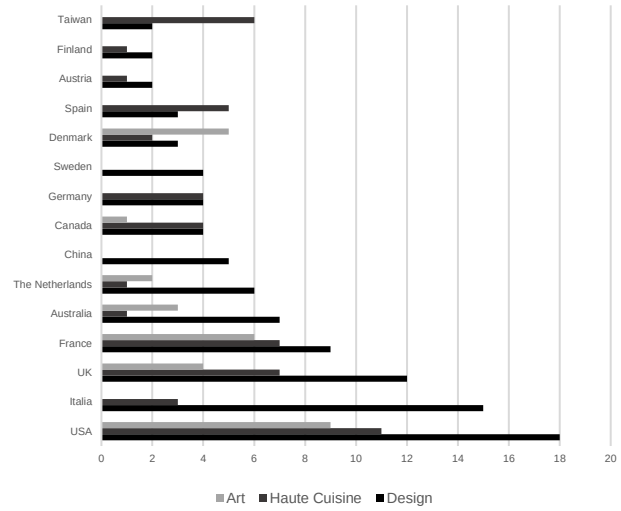
Figure 5. Number of articles per year of publication



Source: Survey data.

The articles feature a considerable geographic dispersion (authors from 34 countries were identified), demonstrating that the subject is of global interest (figure 6).

Figure 6. Countries with the largest number of publications



Source: Survey data.

Since 2010 publications relating Design and innovation have greatly increased in the United States and Europe - namely in Italy, a country with a strong tradition on that domain. In what concerns *Haute Cuisine*, the first studies identified were published in the beginning of this century in France, a country with a strong tradition in the field of gastronomy. From 2007 on, with the boom of elBuli phenomenon in Spain (which gave place to a change in paradigm in that domain), there has been an increase in the number of studies developed in countries with tradition in innovation approaching *Haute Cuisine* as a promising field in the study of creativity and innovation - e.g. United States, UK, as well as Spain and Taiwan. On the other hand, in the field of Arts, as well as in the other domains, the United States stands out, for revealing constant investigative interest in what concerns the relation between Art, innovation and creativity.

In the domain of Design the articles have been published in 42 different journals, what shows the relevance of the topic and its embracing character. The Journals with the largest number of articles are *Journal of Product Innovation Management* and *Design Issues*. It is a clear indication that the topic is not only relevant in that domain (design research) but also in the field of management and innovation research.

In the *Haute Cuisine* domain, there is a predominance of studies in journals related to the areas of culinary, gastronomy and hospitality, although recently some management and innovation journals have published papers on this relationship. However, we point out the multidisciplinary approach of the journals which have published an expressive number of works on the merger of management, innovation and creativity.

Finally, in the Art domain, like in *Haute Cuisine*, an improvement of the interest of fields related to business management and economics on the study of the creative process to innovation management becomes clear. It can be observed since the journal with the largest number of articles – Journal of Business Strategy – demonstrates the relevance of that area contribution.

Figure 7. Main sources of publication

Journal	Design	Journal	Haute Cuisine	Journal	Art
Journal of Product Innovation Management	12	Journal of Culinary Science & Technology	6	Journal of Business Strategy	7
Design Issues	12	International Journal of Comtemporary Hospitality Management	6	Leonardo	2
Journal of Cleaner Production	4	Journal of Foodservice Business Research	2	Creativity Research Journal	2
The Design Journal	4	Trends in Food Science & Technology	2	Journal of Management and Organization	2
Management Decision	3	Creativity Research Journal	2		
International Journal of Design	3	Tourism and Hospitality Research	2		
California Management Review	2	Long Range Planning	2		
CoDesign	2	International Journal of Gastronomy and Food Science	2		
Design Studies	2	Creativity and Innovation Management	2		
Futures	2	Industry and Innovation	2		
Journal of Engineering Design	2				
Journal of Technology Management & Innovation	2				
Long Range Planning	2				
Research in Engineering Design	2				
Research Technology Management	2				
Technovation	2				
Creativity and Innovation Management	2				
International Journal of Engineering Education	2				

Source: Survey data.

4.2 The context of the domains

Featured as a plural and diffuse domain, according to Bonsiepe (2013, pp. 67-68) Design experiences the proliferation and coexistence of current approaches within its domains (e.g. Social Design, Eco-Design, Life-style Design, Author

Design, Design-Art, Handcraft Design, Strategic Design, Design Research and Experimental Design). Therefore, literature reveals that systematic-natured design emergent approaches (e.g. Design Thinking; Human Centered Design; Co-design) coexist with subjective approaches – like that presented Brassett and O'Reilly (2015), based on style design; or presented by Selin, Kimbell, Ramirez, and Bhatti (2015) based on de design of sceneries; since both can provide different and important contributes for the innovation process.

On the other hand, in the context of the food industry, *Haute Cuisine* has experienced a notable revival particularly in recent years. Radical innovators, such as the Spanish chef Ferran Adrià, have brought novel ideas into fruition in an open collaboration and sharing with other local and international chefs, and in a dialogue with rather distant fields, such as Art, Design, industry and science; they have paved the way to a new language for *Haute Cuisine*, transforming the nature of the culinary profession and initiating change in the culinary field (Petruzzelli & Svejenova, 2015, p. 650).

In the introduction to the special issue of the Industry and Innovation Journal called Innovation and Entrepreneurship in the Food Industry, Petruzzelli and Svejenova (2015) point out some of the studies based on *Haute Cuisine* that favor the creation of opportunities for creativity and value creation through: (i) search, recombination and reproduction, (ii) entrepreneurial capabilities and novel business models, (iii) as well as through apprenticeships with well-known masters whereby they learn to manage competing demands for novelty and familiarity.

The field of Art, understood as the oldest covered in this study, has experienced some explosive expressive possibilities that surpasses the traditional practices of painting, sculpture, drawing and photography in the last decades.

For the sake of delimitation this study has its focus on what is understood by ‘visual arts’, assuming the limitations of studying the vast and plural domain currently marked by practices of difficult disciplinary framing such as: mixed media, street art, temporary art, abstraction, appropriation, covers, remakes, sampling, performance art, conceptual art.

In order to contextualize the artistic domain, as in previous ones, the work "Archive Fever: Uses of the Document in Contemporary Art" of Okwui Enwezor (director of Haus der Kunst in Munich, 56th Venice Biennial) was used. In an analysis of the artistic domain based on the study of archives, Enwezor (2008) points out artistic practices in different fields that highlight two great creation currents in the context of contemporary art: (i) the "ethnographic condition" of art (art and information, art and identity, art and technology) and (ii) the "domestication of the archive" by the arts (with works characterized by recombination, manipulation and re-reading of facts in the creation of fictional narratives). Complementarily Darsø (2004) positions "ambiguity" as a relevant condition and a reflection of the current society - a key dimension in artistic processes and results.

In this sense, some general current themes in this domain include: the limits of what can be considered art; political and ethical subjects; sustainability; economic disparities; race and gender issues and rights; personal narrative works.

4.3 Relationship between the domains and innovation

A qualitative analysis of the studies investigated revealed the predominance of two approaches of Design in the context of innovation:

a. Product innovation - the role of Design in the innovation process is discussed in a instrumentalised way with focus on product performance and clients’ satisfaction, as well as issues related to product looks and style and systematization of the idea generation process for product innovation (e.g. Chen, Yang, Cui, & Zhang, 2016; Moon, Miller, & Kim, 2013; Schreier, Fuchs, & Dahl, 2012).

b. Process innovation - with focus on Design based innovation strategies for application in the development of products, these studies approach themes like social innovation, process models, Design Thinking, collaborative practices (co-design, Human Centered Design), creation of sceneries and highlight for approaches in the scope of Design Driven Innovation (Ben Mahmoud-Jouini, Midler, & Silberzahn, 2016; Carlgren, Elmquist, & Rauth, 2014; Davis, Docherty, & Dowling, 2016; Norman & Verganti, 2014; Yang & Sung, 2016).

On the other hand, a qualitative analysis of the studies investigated revealed the predominance

of three approaches of *Haute Cuisine* in the context of innovation:

a. **Science and technology** - This approach has explored the comparatively new phenomenon of molecular gastronomy with an emphasis on the relation between food science and technology. Vega and Ubbink (2008) argue that science-based cooking is closely associated with significant technological developments, as the realization of novel dishes frequently requires the use of non-traditional ingredients or preparation techniques, which are often derived from those used in industrial food production. Other authors like Mielby and Frøst (2010), Cousins, O'Gorman, and Stierand (2010) and Caporaso and Formisano (2016) also discuss how chefs are dealing with the available systematic knowledge on food and cooking, and how molecular gastronomy can facilitate the creative process in the innovation context.
b. **Social and sustainability actions** - collaboration, network participation, as well as integration and articulation of different kinds of knowledge and domains are the basis of this approach, which are often related to initiatives such as Slow Food and Terra Madre. Examples of studies based on external collaboration are: Chesbrough, Kim, and Agogino (2014) and Byrkjeflot, Pedersen, and Svejenova (2013).
c. **Recombination and tradition**: This approach investigates the development of new products and process within cultural and creative industries resulting from the use of traditional or regional elements. In particular, it analyzes methods facilitating the recombination of traditional elements into new products, as highlight Petruzzelli and Savino (2014), Petruzzelli and Savino (2015) and Byrkjeflot et al. (2013).

In the context of art, a qualitative analysis of the studies investigated revealed the predominance of two approaches:

a. **Innovation in the artistic creative process**: This approach investigates variations in artistic creation processes (Botella, Zenasni, & Lubart, 2011; Mace & Ward, 2002). Studies such as "Individual difference predictors of creativity in Art and Science students" by Furnham et al. (2011) and “Creativity as action: findings from five creative domains” by Glaveanu et al. (2013) compare and (or) relate the creative processes of art to creative processes in other domains. Still under this approach Sapsed and Tschang (2014) study the influence of context on innovation in art, and Fürst, Ghisletta, and Lubart (2012) explore art as a fertile field for studies for educational purposes and for deepening the theory of creativity in the context of Psychology and art research.
b. **The artistic creative process for innovation**: Many studies approach the contributions of the process and artistic production to economy and business in what concerns innovation and creativity. It seems important to remark some with focus on (i) promoting collaboration (Darsø, 2005; Foresta, Kisfaludi, & Barton, 1999; Fourmentraux, 2007; Harris, 1999; Ibbotson & Darsø, 2015; Nissley, 2010; Potts, 2007); (ii) incorporating creative practices for organizational change (Austin & Devin, 2003; Buswick, Creamer, & Pinard, 2004; Darsø, 2004; Reaves & Green, 2010; Thomson, 2010); and (iii) learning (Austin & Devin, 2010; Boyle & Ottensmeyer, 2005; Darsø, 2005; Ibbotson & Darsø, 2015; Merritt, 2010; Nissley, 2010; van der Meer, 2016).

The increasing amount of studies approaching process innovation by means of Design was mainly observed from 2010 on, what determines a shift in the instrumental participation of design for strategical action in the innovation process - from "artefact design" to "process design". In *Haute Cuisine* domain, a gradual shift in focus concerning innovation was observed - from "artefact", or dish, to complex sensorial experience (in which creativity assumes a vital role). As a result, a growing number of scientific studies on innovation and creativity apply to its domain as “case studies”. On the other hand, the domain of Design is addressed in studies on innovation and creativity as a “process”, or a means to facilitate and articulate creativity and complexity. From such a perspective Design domains contribute to innovation as mediation and integration agents (Bertola & Teixeira, 2003).

A significant increase in number of studies on the “artistic creative process for innovation" in contrast to "innovation in the artistic process" (similarly to shifts identified in the Design domain) has been observed recently. It is here understood that such an approach has expanded in the last years due not only to the already consolidated direct association between creativity and art by

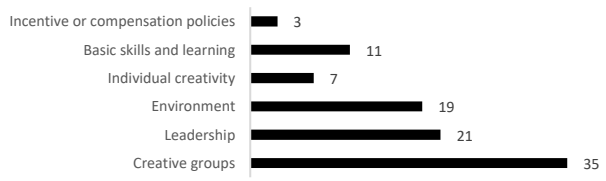
enterprises themselves, but also to the positive repercussion of successful integration instances between art and business for the sake of innovation in renowned enterprises (e.g. Boyle & Ottensmeyer, 2005; Merritt, 2010). The reflexes of this new collaborative scenario are clear in instances like the non-profit organization Arteconomy (e.g. van den Broeck et al., 2015) as well as the scenario pointed out by Darsø (2005) highlighting variables: (i) art in enterprises (practical applications for enterprises); (ii) art and business in the academy (mainly management professors who see great value in arts); and (iii) artistic, business and academic collaboration (where these are grouped together for mutual exploration).

5 Theoretical framework

The starting point for the construction of the Theoretical Framework was the identification of the central axis of creativity management models in each domain studied. With basis on a qualitative analysis, the interaction dynamics of the issues in the different contexts was observed, as well as the volume of studies approaching, isolatedly or as a group, the six issues identified in Part 1 of this study.

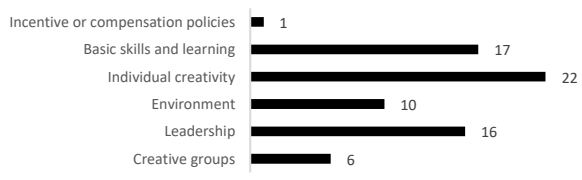
Matching data with the findings of Part 1 of the study, Figures 8, 9 and 10 are presented as follows:

Figure 8. Amount of studies on Design identified x investigation main lines of Part 1 of the study



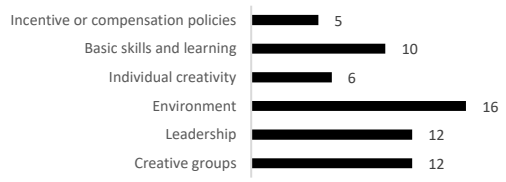
Source: Survey data.

Figure 9. Amount of studies on *Haute Cuisine* identified x investigation main lines of Part 1 of the study



Source: Survey data.

Figure 10. Amount of studies on art identified x investigation main lines of Part 1 of the study



Source: Survey data.

The findings reveal the existence of a central axis corresponding to each creativity management model: in Design, the Creative groups; in *Haute Cuisine*, the leadership; and in Art, the environment. In practice, such data match the volume of studies which approach the issues pointed out as central axis within each domain studied. An exception was observed in *Haute Cuisine*, highlighting the predominance of studies on individual creativity, but having leadership as the central axis of the its creativity management model.

The domain of on *Haute Cuisine*, highlight individual creativity; an approach that in its turn, presents a strong connection with leadership in that domain. Since in *Haute Cuisine*, a field featured by vertical hierarchy, the role of the chef is determinant and crucial; the study revealed, a clear division of tasks in the creative processes where the authorship and "chef's signature" overlaps the team work; and very often, the restaurant itself. In that sense, most of the published studies on culinary innovation have concentrated on the *cuisine* of Michelin-starred chefs or innovation leaders such as Ferran Adrià. That leadership is what determines how other topics are approached (e.g. the environment is studied considering the leadership features; the leader's skills are studied and the creativity of the groups itself is based on the study of the external nets established by the leader).

The incentive or compensation policies in *Haute Cuisine* is not a highlighted in literature, in spite of being in practice, pointed as relevant by chefs. That can be mainly due to the difficulty of formation of the "creative hard core", or confidence restrict group of workers who assist the chef in the creation of dishes. For chefs, it is fundamental that those professionals, as well as the chef himself/herself, are constantly motivated, despite the absence of the theme in literature. It is important to point out that such theme can be the link between leadership, creative groups and the environment issues what reveals a gap in the

investigation concerning creativity and *Haute Cuisine.*

In contrast with data obtained in the domain of *Haute Cuisine*, the studies on Design reveals the predominance of creative groups approach in contrast with individual creativity. It is understood that, although there is difficulty in integrating knowledge through multiple perspectives in enterprises (Litchfield et al., 2015), it was observed the progressive increase of studies focusing on creativity in groups in that domain where the hierarchic horizontal model prevails in what concerns creative processes. That is a distinctive feature of Design in contrast with *Haute Cuisine* and Arts. Although different approaches coexist (Bonsiepe, 2013), as Design becomes closer to the business universe and more distant from the artistic universe, the designer operates more and more according to the logics of Strategic Design and Design Research; and consequently, less and less in the logics of Author Design, Design-Art and Handcraft Design. The result of such a shift is the prevalence of the collective work in collaborative nets in which the group creative dynamics overlap the leader's and individual members' and thus represent a group e not a single author. Under such a perspective, it was observed that the "basic skills and learning" topic is approached as a set with the study on the promotion of collective creative dynamics as well as on the ability of the leader in conducting such processes.

Leadership has been a relevant theme in the domain of Design, evidencing a gradual shift from instrumental to Strategical Design. That was observed in the first part of the qualitative analysis in which the designer can have the role of process articulator – inside or outside the domain of Design. As a result, designers' creative competencies began to integrate the innovation process in all stages, not only along development specific phases.

As observed in the *Haute Cuisine* domain, the "incentive or compensation policies" topic in Design is an issue not highlighted in literature, being approached with leadership and environments topics. The expressive number of studies stressing the positive influence of applying Design for creativity in the organizational environments was also observed, markedly the implementation of approaches like Design Thinking or collaborative practices in the organizational environments.

The analysis of studies on the field of art revealed group creativity as more recurrent in literature in contrast to individual creativity. However, it is important to highlight clear boundaries between such typologies within the scope of the approaches identified in the qualitative analysis: (i) 'innovation in the artistic creative process' emphasizes individual creativity whereas (ii) 'artistic creative process for innovation' emphasizes creative groups. That reveals different sets of interests in the works analyzed concerning the relation between innovation and creativity in the context of art, being the first observed in the context of the art, education and psychology (with focus in understanding and describing what artists do during the creation process), and the latter in the context of management and economy (aiming to identify possible contributions of the artistic process to innovation in enterprises). In this sense, the great volume of studies on contributions of art to the improvement of the environment in the context of innovation stand out, highlighting the direct relationship between learning, art and leadership to create an environment conducive to creativity in enterprises.

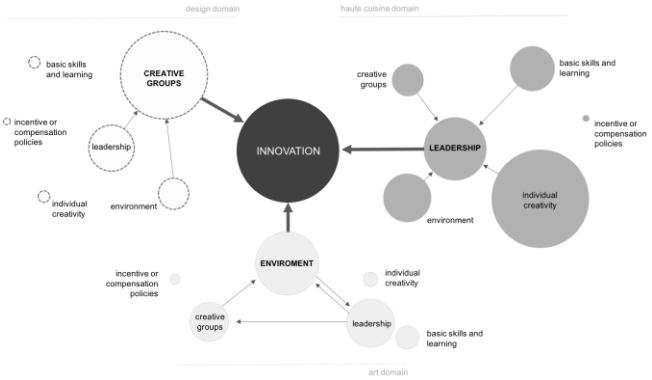
In contrast to *Haute Cuisine* in the field of art, leadership is directly associated with creative groups, as it discusses how leaders can build on artistic skills to manage collective creativity for innovation. Examples of artists characteristics useful to leaders: (i) Unpredictability and versatility - artists can engage in many creative stages at the same time (Botella et al., 2013; Botella, Zenasni, & Lubart, 2010); (ii) receptivity - openness to new experiences, fantasy, and imagination; lively, ambitious and nonconformist nature (Botella et al., 2013); (iii) interaction ability - need to interact, exchange ideas and be evaluated (Botella et al., 2013; Glaveanu et al., 2013).

Last, but not least, it is important to point out that in the domains of Art, "basic skills and learning" and "incentive or compensation policies" topics do not have clear boundaries in studies on innovation, in spite of being little expressive in literature. That may be due to the strong relation of such themes with the environment topic, since Art is seen as an agent able to interfere positively in the physical space and consequently in the emotional status of individuals, what consequently has an impact on creativity and innovation in the organizations.

Taking that into account, the role of the environment in the domains under investigation becomes evident and relevant:
(i) in Design - the inner motivating environment concerning creativity; (ii) *Haute Cuisine* - influence in the external environment, markedly the cultural and regional aspects; (iii) Art - a combination of inner motivating environment and influence in the external environment (highlighting the exploration of art as the motivation tool for creativity and innovation inside organizations).

Taking that into account, the following theoretical framework (figure 11), illustrates three creativity management typologies identified in the study to be applied in the context of innovation:

Figure 11. Theoretical framework



Source: Elaborated by authors (2017).

6 Implications and Further Research

It was observed as a field of study, creativity experiences a disciplinary overlapping barrier phase and undergoes changes as it creates new connections with different knowledge fields. As a result, it raises issues similar to those presented by Hennessey and Amabile (2010): What is it that contemporary creativity researchers claim to be investigating, and how do they operationalize this entity they call creativity? Thus, given the challenge of contributing to the clarification of the theory on the relationship between creativity and innovation, this study assumes the complexity of the theme and does not intend to exhaust the discussion on the "conceptual definition of creativity". In that sense, the main contributions of the study are highlighted.
The analysis of the findings reveals: (1) the comprehensive variety of fields of knowledge that investigates the relationship between creativity and innovation under different domains' lens (and the growing interest of the management field); (2) the geographic dispersion of the studies; and (3) the progressive increase in the number of studies relating the studied domains to the investigation in creativity and innovation. We understand that these results reveal the topicality and relevance of the theme.

Creative groups are the central axis of the creativity management model identified in the field of Design, heavily influenced by leadership and the environment (highlighting the increase of acknowledgment of the Design role as a creative articulator in the organizational innovation process). In Haute Cuisine emphasis given to leadership can be observed in a model strongly marked by individual creativity. On the other hand, in the model identified in the field of Art, a great attention is given to environment, a topic which is influenced and influences leadership besides presenting a strong connection with creative groups as well.

That is understood here as a relevant contribution to the studies on the relationship between creativity and innovation, since findings suggest the possibility of articulating and adapting both creativity approaches as well as the type of leadership depending on the size, area of action and even the characteristics of each enterprise. In the domains studied, it was also observed that creativity provides supports for innovation throughout the whole process, in contrast with models and studies that place it as a start (the production of creative ideas in a first stage), what matches the integrated definition of creativity and innovation proposed by Anderson, Potočnik, et al. (2014).

The nonlinear relationship between creativity and innovation (Oddane, 2015) contributes to process fluency and results optimization, and also reinforces the idea that alternative models of creativity management can be used in the innovation process inside organizations (e. g. sources of ideas, external influence, partnerships, relationship between domains). In addition, the analysis of the domains context reveals different approaches to innovation within the fields studied, which can be understood as a fertile soil for detailed studies of creativity in different domains, as well as a starting point for future studies in the area of creativity management.

Future research could expand these findings by means of direct observation of the domains

discussed. Although it can imply a limitation of this study the methodology used could be applied to other creative domains such as music, literature or cinema, as well. Thus, it is understood that the framework presented is featured as a contribute for enterprises in the search for new creativity management models for innovation, as well as a starting point for the conception of a more robust theoretical body for the study of different creative processes in different domains in the context of innovation.

Last, but not least, as a limitation of the study, it is stressed that although there is plenty of literature on creativity and innovation, literature on the domains under analysis in this study is relatively scarce and recent. In addition, relevance for carrying out empirical studies which evaluate the propositions and framework here presented is pointed out.

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RN Revista de Negócios
Studies on emerging countries

Corporate Entrepreneurship and International Performance: a Cross-Country Study

Marianne Hoeltgebaum[1], Tales Andreassi[2], Mohamed Amal[3], Svante Andersson[4], Marleen Hensbergen[5]

[1] Universidade Regional de Blumenau (FURB) - profamarianne@gmail.com
[2] Fundação Getúlio Vargas (FGV-EAESP) - tales.andreassi@fgv.br
[3] Universidade Regional de Blumenau (FURB) - mohamedamal.amal@gmail.com
[4] Halmstad University/ Sweden - svan@hh.se
[5] Universidade Regional de Blumenau (FURB) - marleen.hensbergen@gmail.com

KEYWORDS

Corporate Entrepreneurship; Cultural Distance; Institutional Distance; Performance of Foreign Subsidiaries; High Tech Multinational subsidiaries.

Received 03.03.2018
Accepted 28.03.2018

ISSN 1980-4431
Double blind review

ABSTRACT

The overall purpose of this article is to examine the theoretical connections between Corporate Entrepreneurship-CE and International Performance-IP. More specifically, we address two main research questions: (1) How do different dimensions of CE influence IP and (2) To what extent the context of host country matters? Using a two-case study approach, we employ hybrid qualitative–quantitative analyses to address the effects of different dimensions of CE on IP. We adopted four statistical techniques: descriptive statistics, decision tree, cluster analysis, and principal components (factorial maps). The results show that country matters for the perception of the relationship between CE and IP. They show that it is meaningful to separate the different dimensions of CE (innovative behavior, new business ventures, competitive aggressiveness, product/service and process innovation, self-renewal, proactiveness, and risk taking) when examining their influence on IP. The paper focuses on three level of the organization: the production sector (staff), middle management (managers), and top management (CEO and directors). Such perspective allows to explore the role of first-level managers in a "bottom-up" process of corporate entrepreneurship. Furthermore, we distinguished between two levels of corporate entrepreneurship: results and entrepreneurial behavior.

PALAVRAS-CHAVE

Empreendedorismo corporativo; Distância Cultural; Distância Institucional; Desempenho de subsidiárias estrangeiras; Subsidiárias de multinacionais de alta tecnologia.

RESUMO

O objetivo geral deste artigo é examinar as conexões teóricas entre o Empreendedorismo Corporativo-CE e o Desempenho Internacional-IP. Mais especificamente, abordamos duas questões principais de pesquisa: (1) Como as diferentes dimensões do EC influenciam a PI? e (2) Em que medida o contexto do país-sede é importante? Utilizando uma abordagem de estudo de dois casos, empregamos análises qualitativas-quantitativas híbridas para abordar os efeitos de diferentes dimensões de EC em PI. Adotamos quatro técnicas estatísticas: estatística descritiva, árvore de decisão, análise de cluster e componentes principais (mapas fatoriais). Os resultados mostram que o país é importante para a percepção da relação entre CE e PI. Eles mostram que é significativo separar as diferentes dimensões do CE (comportamento inovador, novos empreendimentos comerciais, agressividade competitiva, inovação de produto / serviço e processo, auto-renovação, proatividade e tomada de risco) ao examinar sua influência na PI. O artigo se concentra em três níveis da organização: o setor de produção (pessoal), a gerência intermediária (gerentes) e a alta administração (CEO e diretores). Essa perspectiva permite explorar o papel dos gerentes de primeiro nível em um processo "de baixo para cima" de empreendedorismo corporativo. Além disso, distinguimos entre dois níveis de empreendedorismo corporativo: resultados e comportamento empreendedor.

1 Introduction

Entrepreneurial and international business research indicates that the international performance (IP) of firms is highly correlated with their abilities to develop unique strategies to enter and grow in the foreign markets as global players. In particular, the entrepreneurship literature shows that proactiveness and innovativeness affect the performance of firms in both domestic and foreign markets (Zahra and Covin, 1995). Under international performance, we understand the economic and financial performance of MNC subsidiaries in the host countries.

However, we believe that by including additional divisions in the number of dimensions can provide the corporate entrepreneurial perspective with specific avenues that may add better understanding of the complex relationship between CE and IP.

However, when examining the relationship between corporate entrepreneurship (CE) and International Performance (IP) is particularly important to establish how multinational corporations (MNCs) cope with cultural and institutional differences among countries.

We posit that this multidimensional approach of CE is more effective for cross-country comparative studies. Thus, we adopt more dimensions to capture the effects of CE in different institutional environments and industries.

The overall purpose of this article is to examine the theoretical connections between CE and IP and test them by analyzing two cases of MNCs. Our study contributes to the literature in several ways. First, although prior research has generally found that CE has a positive impact on organizational performance (Zahra and Covin, 1995), few studies have explicitly focused on how different components of Corporate Entrepreneurship affect International Performance. Second, we specifically examine how different contexts shape the strategic orientation of firms. Third, the link between CE and IP represents a theoretical opportunity to examine the differences and hierarchies among the variables and to explore how they affect strategies and performances of multinational subsidiaries operating in different national contexts.

We decide to study the case of Brazil for several reasons. The country hosts subsidiaries from both MNCs. It is one of the leading countries among emerging economies. Finally, studying the case of Brazil provides the opportunity to include context analysis in the general framework of corporate entrepreneurship and international performance.

We decided to address the case of high tech industries to capture the effects of innovation and its effects in different contexts.

The article proceeds as follows: First, we provide an account of the theoretical foundations of our study, after which we present relevant theory and present our general framework. Second, we provide the method and approach. We conclude with our research findings, drawing attention to how CE influences IP in different international contexts.

2 Theoretical Framework

2.1 International Performance

Firm internationalization has been extensively investigated by scholars in the field of International Business (Johanson and Vahlne, 1977, 2009). According to Penrose (1995) and Eriksson et al. (1997) internationalization refers to a process of increasing experiential knowledge.

When firms grow according to a deterministic path, decision makers are largely unable to influence and shape the strategic choices of the firm. However, studies have shown that firms have different international strategies that are strongly influenced by the decisions and choices of managers (Andersson, 2000). Several researchers in the international entrepreneurship field have highlighted the importance of top management in international business (Keupp and Gassman, 2009; Jones et al. 2011). Research has also found that the accelerated process of internationalization by firms operating in specific high-tech industries is positively associated with high innovative skills, including the ability to access effective R&D and distribution channels. This ability often occurs in partnerships characterized by close international collaboration and involving frequent, intense, and integrated efforts of cooperation across nations (Knight and Cavusgil, 1996; Madsen and Servais, 1997).

Furthermore, because internationalization involves the commitment of resources and risk taking in different countries, an organization can reinforce performance on an international level

through entrepreneurial activities, particularly in situations of high domestic uncertainty (Dimitratos et al., 2004).

International Corporate Entrepreneurship applies the dimensions of CE to higher levels of geographic expansion and exploration. Innovation and venturing are two important dimensions that must be incorporated into the general concept of international CE. Such dimensions are relevant for MNCs to identify new markets and develop new competencies (Zahra et al., 2004). In addition, Frishammar and Andersson (2009) investigate how the three dimensions of corporate entrepreneurship, proactiveness, innovativeness and risk taking (Miller, 1983; Covin and Slevin, 1991) are connected with International Performance. They find a positive relationship between proactiveness and IP but no relationship between the other two dimensions of corporate entrepreneurship (innovativeness and risk. taking) and IP.

Zahra et al. (2009) state that internationalization enhances innovation through the enriched sources of knowledge gained through exposure to diverse stimuli. Expansion into foreign markets could be considered an experience, which is different from current activities and thus stimulates innovation.

2.2 Corporate Entrepreneurship

Several authors (Covin and Miles, 1999; Antoncic, and Hisrich, 2001; Goosen et al., 2002; Kuratko et al., 2004) suggest different typologies of the CE dimensions. The classical framework of three dimensions has proved to be too restrictive to capture the diversity of the activities, particularly in cross-country comparative analysis. To overcome such limitations, we distinguish between two main perspectives of CE.

The first emphasizes the behavioral features of entrepreneurial activities, defined as entrepreneurial behavior, that subsidizes the company with more innovative inputs, which includes the dimensions of proactiveness, innovative behavior, and self-renewal. This is an important perspective to the establishment of the general firm conditions to growth. However, such perspective is not sufficient to understand how such dimensions affect the performance of firms. Proactiveness, innovative behavior and self-renewal are key factors that will support the internationalization of firms and their strategies to enter into different foreign markets. However, firms need to possess and develop a perspective of entrepreneurial result, which focuses on how to transform such firm assets in specific market outcomes.

The second perspective is entrepreneurial results that will focus on the result of the companies, which include risk taking, competitive aggressiveness, product/service and process innovation, and new business ventures. These dimensions, on the other hand, will convert the entrepreneurial behavior, particularly in different institutional contexts, in powerful assets to compete in foreign markets and generating high performance.

Lumpkin and Dess (1996, p. 136) define entrepreneurial orientation as "the processes, practices, and decision-making activities that lead to new entry." They identify seven dimensions that shape entrepreneurial orientation in an organization. The same dimensions have been also used in the literature of corporate entrepreneurship. The first three come from prior researches that show that the dimensions of innovation, risk taking, and proactiveness are strongly related to a firm's entrepreneurial orientation (Miller, 1983; Brazeal and Herbert, 1999). Lumpkin and Dess (1996) refer to the other two dimensions as competitive aggressiveness and autonomy (see Zahra and Covin, 1995). The dimensions can be independent of one another in a given context and circumstance. Certain dimensions either weigh more heavily on or have less of an influence on the performance of the firm (Lumpkin and Dess, 1996). The implicit logic behind the belief that CE add value to the company is that the key dimensions are vehicles that stimulate the identification and pursuit of lucrative opportunities while also providing a foundation for the creation of superior competitive positions (Zahra and Covin, 1995).

Entrepreneurial firms are those that identify new ways of doing business, develop new technologies, introduce new products, and enter new markets. They manage to find business opportunities and pursue them through exploitation and value creation. They also adapt entrepreneurial strategies in the pursuit of wealth. One way to achieve this is through an acquisition strategy, which facilitates access to specific assets (Farinós et al., 2011). Various scholars have shown the

importance of CE in relation to a firm's level of innovation and its competitive advantage and performance (Miller, 1983; Lumpkin and Dess, 1996; Covin and Miles, 1999). Antoncic and Hisrich (2001, p. 498) use the term "intrapreneurship" (see also Pinchot, 1985) to refer to CE and define it as "entrepreneurship within an existing organization.". They emphasize the intentional and behavioral aspects of intrapreneurship, implying that CE is primarily an activity-oriented phenomenon that enhances the development of different aspects, including products, strategy, structures, and operations, to move in new directions. Kuratko et al. (2004) focus on the antecedents of entrepreneurial behavior and find that entrepreneurial outcomes are often the result of a combination of organizational antecedents, such as management, autonomy, and rewards.

Corporate Entrepreneurship enhances the access to resources and the creation of new ones (Ahuja and Lampert, 2001). Covin and Miles (1999) argue that CE is strong related to entrepreneurial activity and entrepreneurial posture. Entrepreneurial activity is essential because it helps stimulate superior performance and is a key element in the procurement of advantages related to competitors (Knight, 1997). Using a longitudinal study, Zahra and Covin (1995) also show that there is a strong positive relationship between CE and firm financial performance in terms of growth and profitability. As such, they suggest that CE should be approached as a long-term strategy rather than a short-term focus, to achieve superior results. They also find that the benefit of entrepreneurship within the boundaries of an organization is captured mainly by its financial performance, which is more likely to come to light in the long run. In the short run, CE practices might not have sufficient time to reach their full potential impact on financial performance.

2.3 Context and International Performance

Regardless of the size or the type of an organization, an corporate entrepreneurship is of large importance for the pursuit of strategic innovation, especially when the external environment shows to be dynamic and shifting (Knight, 1997). This is also studied by Dean and Meyer (1996) who found that the structure and level of competition of an industry is closely related to the industry dynamism and the level of competitiveness. The choice for strategic orientation of an organization is often reliant on the managerial perspective of the industry through their perception and choice of strategy and direction (Weerawardena et al., 2006). Taking into account that EO is a strategic approach (Wiklund and Shepherd, 2003), it is also found by Barringer and Bluedorn (1999) that the entrepreneurial intensity is influenced by the strategic management practices such as the scanning intensity of the industry, the flexibility of their planning, the scope of the planning, the locus of the planning and the strategic control attributes. Lumpkin and Dess (1996) emphasize the relationship, there is between the strategic approach, such as EO, and a firm's performance. They argue that this relationship is context-dependent. The contextual factors that influence the EO are categorized into the organizational and the environmental context (Lumpkin and Dess, 1996; Dess and Lumpkin, 2005), or respectively as internal and external factors (Zahra and Covin, 1995).

We suggest to capture the context effect based on two main approaches. The first one, based on Porter's (1999) approach, which addresses the effects of four categories related to competition: factor condition, demand condition, firm strategy structure and rivalry, and related and supported industry. This suggests that in the case of Industries with high competition and rivalry between companies, the effects of the dimensions of entrepreneurial results may be higher than the behavioral dimensions. This suggests that the interactions between CE and IP can present differences in intensity and type of dimensions according to the type and competition level by industries.

The second approach is based on institutional theory, which predicts that the contexts of high uncertainty and institutional void are more likely to stimulate entrepreneurial behavior among firms. Sharif (2012) has pointed, in the case of Hong Kong that efforts to overcome obstacles to innovative entrepreneurship have to be connected to broader measures of transforming the existing culture and institutional environment. Therefore, we suggest that the higher the level of proactiveness, innovative behavior, and self-renewal, the greater is the IP of firms operating in

countries with high-risk and uncertainty.

2.4 General Framework

Taking into account that entrepreneurial orientation is a strategic approach (Wiklund and Shepherd, 2003), Barringer and Bluedorn (1999) find that entrepreneurial intensity is influenced by strategic management practices, such as the competitive intensity of the industry, the flexibility of planning, the scope of planning, the locus of planning, and strategic control attributes. Lumpkin and Dess (1996) emphasize the relationship between the firm's strategic approach (e.g., entrepreneurial orientation) and performance and argue that this relationship is context dependent. The contextual factors that influence entrepreneurial orientation are categorized into organizational and environmental contexts (Lumpkin and Dess, 1996), or as internal and external factors, respectively (Zahra and Covin, 1995).

The organizational factors are related to topics on a corporate level, such as size, structure, strategy, strategy-making processes, firm resources, culture, systems, and top management team characteristics. The environmental or external context contains factors that rely on the industrial level, including dynamism, munificence, complexity, governmental regulations, and industry characteristics (e.g., globalization, product–market life-cycle stage). In terms of context dependency, Dimitratos et al. (2011) find that strategic decisions are dependent on the culture of the country in which the organization is based. Covin and Slevin (1991) state that the external environment influences the presence of entrepreneurial activity in an organization. Hornsby et al. (2002) argue that middle managers should recognize five internal organizational factors to stimulate and promote entrepreneurial activity within an organization. These factors are management support, work discretion, rewards, time availability, and organizational boundaries. Of these, they show that management support has the greatest influence on Corporate Entrepreneurship.

In their model for the perception of middle management on these organizational factors, they show how this perception, limited by resources and managers' ability to overcome barriers, eventually leads to the implementation of the entrepreneurial strategy chosen by the executive management.

Dynamic environments, characterized by uncertainty and rapid change, may have a more positive influence on firm performance than a competitive aggressive posture, which is more likely to have a positive influence on performance in highly competitive industries (Lumpkin and Dess, 1996). This notion is confirmed by Robinson and McDougall (1998), which find that the creation of new ventures is significantly more prominent in industries with a relatively low degree of industry concentration and high product differentiation. They also show that the performance of new ventures is significantly dependent on the stage of the industry life cycle. The best performance occurs when firms enter an industry in the introductory stage, not in the maturity stage.

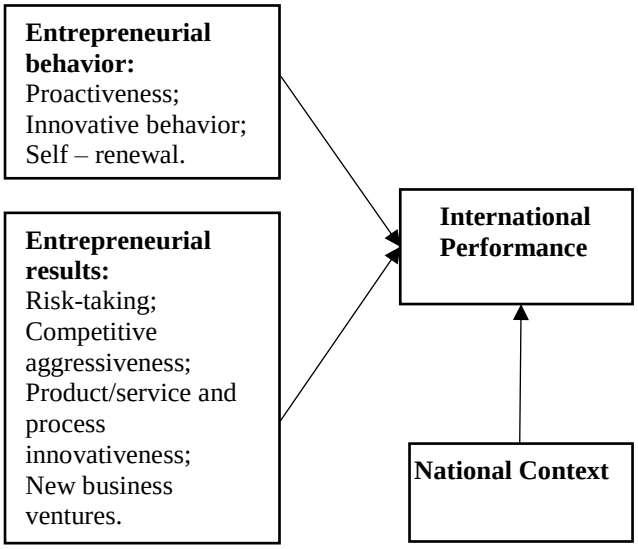
As mentioned previously, the classical corporate entrepreneurial framework of three dimensions has proven relatively too restrictive to capture the diversity and complexity of entrepreneurial activities, particularly in a cross-country comparative analysis. That is, the dimensions can lead to different outcomes when operating in different institutional and industrial contexts. For example, firms are more likely to develop complex behaviors in environments with high uncertainty or industries with high competition. The implications of such outcomes suggest that restricting the entrepreneurial dimensions would limit our understanding about how CE affects IP.

To overcome such limitations and in line with prior researches (Miller, 1983; Morris et al., 1994; Zahra and Covin, 1995; Wiklund, 1999; Messeghem, 2003), we propose distinguishing between two main perspectives of CE (see Figure 1). First, we emphasize the behavioral features of entrepreneurial behavior, which include proactiveness, innovative behavior, and self-renewal. This perspective is more oriented to capture the individual behavior. we emphasize the outcomes of entrepreneurial activities, or entrepreneurial results, which focuses on the firm performance. This perspective considers the following dimensions: risk taking, competitive aggressiveness, product/service and process innovation and new business ventures.

We also suggest that national context matters in terms of how the different dimensions shape a firm's IP. As such, we posit that the institutional

environment of the host country may have an effect on the individual dimensions and may explain why some dimensions are more effective in specific contexts than others. We advance three main sets of hypotheses based on the framework discussed previously. The first set pertains to the effect of the dimensions of entrepreneurial results on IP. The second set highlights the effects of the dimensions of CE on IP. The third aims to explicate the role of context in shaping the effects of the two sets of CE on IP. In the following subsections, we discuss each dimension separately and suggest hypotheses on the effects of entrepreneurial behavior and the entrepreneurial results dimensions on IP and why national context matters.

Figure 1. Main perspectives of CE



Source: Elaborated by authors (2017).

3 Methodology

We examine the relationship between CE and IP. Using a two-case study approach, we employ hybrid methodological procedures, using a qualitative approach, with quantitative assessments and analyses to evaluate the different levels of interactions between the different dimensions of Corporate Entrepreneurship and International Performance.

We selected two companies (Alpha and Beta) that operate in high-tech industries and engage in continuous involvement in foreign markets—Alpha and Beta, which are headquartered in Sweden and The Netherlands, respectively, both operate in Brazil. To ensure relevance to the information derived from the data collection, we selected the companies according to the following criteria: they (i) engaged in international activities using different modes of entry, (ii) operated in different foreign markets, (iii) operated in high-tech industries, (iv) and presented strong evidence of Corporate Entrepreneurship.

Our challenge was finding companies that operated in the three countries at the same time and were willing to agree to be interviewed. In particular, our goal, following other studies (Burgelman 1983a, b; 1984; Kuratko and Audretsch, 2013), was to run interviews on three levels within the organization: the production sector (staff), middle management (managers), and top management (CEO and directors). Such perspective allows to explore the role of first-level managers in a "bottom-up" process of corporate entrepreneurship.

3.1 Sample

Alpha was founded in the beginning of the twenty century, in a small city in Sweden, and is a supplier in the health care industry. According to the firm's 2013 annual report, it has a history of successes, with an average growth from 2009 to 2013 of 7.05% per year. Today, the company has three business segments: Medical Systems, Extended Care, and Infection Control. It has proprietary sales companies in 33 countries, as well as 33 manufacturing plants in 14 countries. The company principally operates in the United States, the United Kingdom, France, Germany, Japan, Italy, Canada, The Netherlands, Australia, and China.

Beta is a high-tech MNC that was founded at the end of the 1960s, in a small city of Holland, and is staffed by a functional team of highly qualified professionals. The firm also has a history of success, with an average growth of 11% per year. According to its website, in 2012 Beta had subsidiaries in Holland, Sweden, Brazil, the United States, Japan, Australia, India, and South Africa, as well as offices in China, Italy, and Spain.

3.2 Data Collection

The study consisted of documentary research and focused interviews with managers from headquarters and subsidiaries, in Sweden, Netherlands and Brazil.

Given our research interest, we designed a

questionnaire with 42 affirmations; for measurement purposes, seven variables to capture the Corporate Entrepreneurship dimensions, and one variable to capture the dimension of International Performance.

The script adopted a five-point Likert scale (1 = strongly disagree, 5 =strongly agree) for the eight dimensions (1 IP+ 7 CE). The proposed dimensions were ranked with low (negative perception), middle, and high (positive perception) intensity during the analyses.

The main dimensions and variables used to measure the impact of CE on IP, as described on table 1.

In total, we interviewed 16 employees from the two companies, in three countries, and representing the 3 different levels of organization: 1 General CEO (responding for Europe), 1 President from Brazil, 3 middle manager and 3 employees in the production area. We tried to maintain a balance in terms of the numbers of interviews for each company.

We mainly structure the questionnaire in order to capture the different perceptions of all levels of management of the two companies about the different dimensions of corporate entrepreneurship and on their perceptions of international performance. Our methodological procedures were based on the assumption that to capture the interactions between CE and IP, it is a need to collect the data not only from the subsidiaries, but also involving the high management in the home countries of the subsidiaries. This system of data collection allows an in depth approach of the phenomenon, and, also to, besides estimating the effects of different dimensions, to establish their importance and relevance for each context.

Since our main objective is to present a qualitative approach of the interactions between the corporate entrepreneurship dimensions and international performance, we adopt a methodological strategy that focus on a limited number of interviews, but we tried to approach the perceptions of different hierarchical levels of management.

In addition, we used secondary data to complete our analysis, based primarily on institutional websites.

Table 1. Variable Descriptions and Measurement

Variables	Measurement	Authors
DependentVariable		
IP	Market share, turnover, profitability, image, company expertise	Zahra and Covin (1995); Robinson and McDougall (1998)
CE dimensions		
Entrepreneurial behavior		
Proactiveness	Opportunity, creative solutions, quick decision	Goosen et al. (2002); Hill (2003); Ireland et al. (2006)
Innovative behavior	R&D, technological leadership innovation, autonomy, evaluation of employees innovativeness, recognition of new innovative ideas	Goosen et al. (2002); Hill (2003); Ireland et al. (2006)
Self-renewal	Self-improvement, individual entrepreneurship, urgency of change andinnovation, business units reorganization and autonomy	Hill (2003), Antoncic and Hisrich (2001), Ireland et al. (2006)
Entrepreneurial results		
Risk taking	High-risk project, management of uncertainty, exploring new growth opportunities, calculated risk taking	Antoncic and Hisrich (2001) Goosen et al. (2002), Hill (2003)
Competitive aggressiveness	Exploiting potential opportunities, maximizing profitability, new products or services, competitiveposture, creation of new demands	Ireland et al. (2006), Goosen et al. (2002)
Product/service and process innovation	Rate of new products, pioneering to introduce new products, improvement of processes, new product in the market	Hill (2003) Antoncic and Hisrich (2001) Ireland et al. (2006)
New business ventures	Broadening of business lines, new business in new industries, new market niches, rapid growth	Zahra and Covin (1995) Robinson and McDougall (1998)
Control Variables		
Country	Brazil, Sweden, and the Nederlands	
Company	AlphaandBeta	
Position in the company	Functional employees, middle management, and top management	

Source: Elaborated by authors (2017).

4 Results and Discussion

To analyze the relationships between International Performance and the Corporate Entrepreneurship dimensions, considering the data obtained this study opted to use four statistical techniques: descriptive statistics, decision tree, cluster analysis (dendrogram), and principal components (factorial maps). The four methods facilitate convergence of the data analysis. The adopted techniques are more suitable for small samples, with limited case studies. Our objective for the principal component analysis was to establish the underlying relationships between the entrepreneurial dimensions and their effects on IP. Cluster analysis allows for the identification of groups and subgroups, according to the host country of the subsidiary and to the position of the interviewees in the company. Finally, we used the decision tree technique (Loesch and Hoeltgebaum, 2012), with the aim to identify specific rules to establish the behavior of each dimension and its relationship to the firms' IP.

4.1 Descriptive Statistics

As reported in table 2, it seems that the respondents have a positive perception about the

international performance of the companies they belong. On the other hand, 37.5% of all respondents ranked the dimensions of innovative behavior; new business ventures, product/service and process innovation, and self-renewal on the same level. The variable risk taking was the dimension with the lowest scale perception.

Table 2. Perception of the Dimensions (per classes)

Measure	Competitive Aggressiveness Dimension (4 questions)	Self-renewal Dimension (8 questions)	Innovative Behavior Dimension (7 questions)	Proactiveness Dimension (4 questions)	Risk Taking Dimension (6 questions)	Product/Service and Process Innovation Dimension (4 questions)	New Business Ventures Dimension (5 questions)	IP Dimension (6 questions)
Low	25%	31.25%	18.75%		56.25%	25%	18.75%	18.75%
Middle	43.75%	31.25%	43.75%	43.75%	18.75%	37.5%	43.75%	31.25%
High	31.25%	37.5%	37.5%	18.75%	25%	37.5%	37.5%	50%

Source: Survey data.

4.2 Decision Tree

In the evaluation of the tests' arrangements, all 16 interviewed employees of our sample were classified correctly, with 100% accuracy occurring for all the precision and revocation of all classes (low [A], middle [B], and high [C]). We constructed the decision tree by considering the following control variables: company information, country of origin of the employees, and their position within the company (functional operation, middle management, and top management). In the following, we discuss the impact of each of these dimensions and variables. We treated the IP dimension as a separate class for the decision tree model. The minimum of observations taken was from two branches, and based on this, we derived specific rules.

The decision tree is a flowchart-like structure in which each internal node represents a "test" on an attribute, each branch represents the outcome of the test and each leaf node represents a class label (decision taken after computing all attributes). The paths from root to leaf represents classification rules. Our analysis identified 8 rules, pointing to the different paths that capture the relationships between the dimensions.

The basic rule number 2 of the tree decision construction states that if proactiveness is low (A) and self-renewal is in the middle (B), there is a 50% likelihood that IP will be scored at the low level (A). This means that proactiveness has a positive impact on the firms' IP.

The decision tree also provides rule number 6, which suggests that a middle level of proactiveness (B), combined with a middle level of innovative behavior, will negatively affect the IP(A) of Beta.

Rule number 8 of the decision tree highlights a relationship between proactiveness and IP. In 63% of the cases, a high level of proactiveness implies a middle level of IP.

According to rule number 5, a middle level of proactiveness combined with a middle level of innovative behavior will also lead to a middle level of IP in 50% of the cases.

Rule number 7 shows that a middle level of proactiveness and a high level of innovative behavior will have a positive impact on IP for 70.7% of the sample.

A low level of proactiveness and self-renewal will lead to a high level of IP in 63% of the cases, as suggested by rule number 1.

Rule number 4 explains that a middle level of proactiveness (B) and a low level of innovative behavior will result in a high level of IP, but only in 25% of the cases.

According to rule number 3, there is no relationship between the low level of proactiveness, the high level of self-renewal, and IP.

In summary, the decision tree shows that the IP dimension is high when proactiveness is low, regardless of whether self-renewal is high or low. The same result can be found for innovative behavior; however, we found that IP was high when proactiveness registered a medium score; it was indifferent regardless of whether innovative behavior was low or high and when proactiveness was medium. Furthermore, the IP dimension was low when proactiveness was low and when self-renewal was medium.

The decision tree explains that the IP is directly related to the proactiveness, innovative behavior, and self-renewal dimensions. For increased reliability of the data, the decision tree also analyzed each company. We found that the greatest relationship with the IP occurred in Alpha. For the proactiveness and self-renewal variables, in Beta, the tree shows that the highest ratios are between innovative behavior and proactiveness.

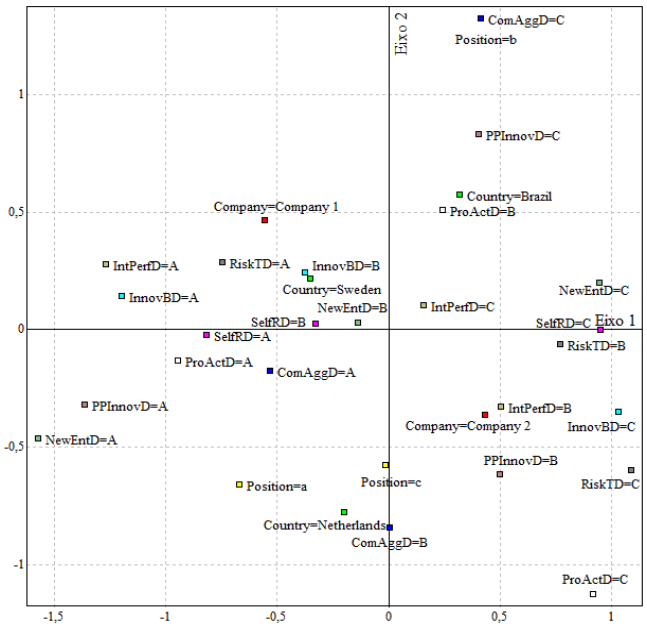
This primary result shows differences in terms of the influences of the dimensions of entrepreneurial behavior and entrepreneurial results. For Alpha, we observed that IP was related to proactiveness and self-renewal. Self-renewal is an entrepreneurial result. This company works with

high-tech medical equipment and needs more entrepreneurship focusing on results. Beta, the second organization studied, engages in obvious entrepreneurial behavior, such as R&D of agricultural products (i.e., seeds technology). We also observed that the proactiveness and innovative behavior dimensions were directly related to IP.

4.3 Principal Component Analysis (Multifactorial maps)

The results of a Principal Component Analysis are usually discussed in terms of component scores, sometimes called factor scores (the transformed variable values corresponding to a particular data point), and loadings (the weight by which each standardized original variable should be multiplied to get the component score). The multifactorial maps resulted from the principal component analysis show the interdependencies of the dimensions and their relationships, as perceived by the analyzed companies. For greater understanding, we analyzed maps in the three countries (Sweden, Brazil, and The Netherlands for each company and considering separately the hierarchical level of the respondents at the companies (see Figure 2).

Figure 2. Multifactorial map of the dimensions



Source: Survey data.

For the factorial map of Brazil, we find that Brazil is closer to the variables with the highest dimensions, including competitive aggressiveness, product/service and process innovation, IP, new business venture, and self-renewal.

Brazil finds itself in the same proximity to Alpha as to Beta, which means that it does not have a profile more directly related to the typical company studied in any of the two cases. When we use the factorial map with only the data of employees of companies in Brazil, we find that the profile of the two companies is different, with the high IP dimension lying in the middle of the two companies; Beta in the Brazil factorial map has the higher dimension of CE. The highest IP dimension appears for Sweden and Brazil, with high self-renewal and with middle proactiveness, innovation behavior, risk taking, and new business ventures.

Sweden finds itself between the middle dimensions of innovative behavior; new business ventures, and self-renewal. The lower IP is closer to Alpha in Sweden when we run the factorial map with only data of employees of companies in Sweden, the same occurs as when we analyzed the Brazilian subsidiary. Typical behavior found in businesses in Sweden was revealed as being at the middle level of the proactiveness dimension.

The Netherlands appears in the opposite quadrant to Brazil, and the closest low dimensions considered by respondents were new business ventures and product/service and process innovation, with the higher dimensions being proactiveness, innovative behavior, and risk taking. When we run the factor only with data from the employees of companies in The Netherlands, Alpha and Beta are almost the same, with the two nearest dimensions of IP and innovative behavior. Thus, the typical behavior found in businesses was revealed to be the middle competitive aggressiveness dimension.

In the following we will discuss the implications of the factorial analysis for the hierarchical position, companies, countries, and cluster analysis.

4.3.1 Hierarchical position

The factorial map points to significant differences among the three countries, particularly regarding the IP, and to differences in terms of company employee perceptions. In terms of IP, while Sweden and the Nederland registered low to middle, particularly by the employees in the higher and lower positions, in Brazil, we observed a high IP perception of employees in the middle position.

The results of the factorial map suggest that lower-level employees have a low perception of IP. Battilana (2006, p. 663), states, "Individuals who belong to higher status social groups most often benefit from the prevailing institutional arrangements, which reinforce their dominance over individuals who belong to lower status social groups." This behavior, in particular, can be observed in companies located in the developing country (Brazil).Top management gives the rules and directions, but middle managements are typically involved during the execution of the planning.

In this case, it seems that middle management has better knowledge that the top management—that is, middle management employees have higher perceptions of competitive aggressiveness, product/service and process innovation, self-renewal, and new business ventured, combined with a high IP perception in the Brazilian quadrant.

4.3.2 Countries

This study includes Brazil, The Netherlands, and Sweden. The two latter countries are developed countries with small economies and high levels of trade openness, and they are the headquarters of the studies companies. For salience, it is important that the two countries are located in West Europe, which has a high level of development and a positive institutional environment. The two countries are leaders among developed countries in terms of internationalization, technology, and innovation. Conversely, Brazil is a developing country, with a large economy, depending less on international trade.

The factorial map shows that Sweden has the lowest perception of IP, combined with a low level of risk taking and innovative behavior and a middle level of, new business ventures, and self-renewal. The case of The Netherlands shows a similar perspective: low levels of competitive aggressiveness, proactiveness, self-renewal, and product/service and process innovation and a middle level of new business ventures. It is important to note that such perceptions are related more to top management employees and functional employees. As Zahra and Covin (1995, p. 55) explain, "the environment in which CE is practiced can have a strong and persistent impact on the effectiveness of an established firm's entrepreneurial behaviors."

4.3.3 Companies

In terms of company analysis, Beta has headquarters in The Netherlands and appears in the opposite quadrant from Sweden and Alpha. In general, the scores from Beta are higher than those from Alpha for product/service and process innovation, risk taking, proactiveness, and IP. Alpha is a Swedish company with the lowest general scores.

Summing up, the results show that the higher the status of the respondent in the company, the greater is his or her impression of performance in general and the greater the impression of IP in particular. However, for CE, it seems that middle management has more positive perceptions, particularly in the case of Alpha. Finally, employees in the top management in The Netherlands have higher perceptions of IP than the top managements in Brazil and Sweden. As a person's status increases in the company, the greater is his or her impression of the company's IP. However, for CE, the map shows that middle management has a more positive perception of CE than the top management, especially for Alpha. The top management in The Netherlands realizes the international dimension of higher performance than that in Brazil and Sweden.

4.4 Cluster Analysis

The cluster analysis identified a direct relationship between IP and the position of the interviewees in the company. The country in which the company is located also influences all other variables. The country, the position of the interviewees, and IP all affect the CE variable. As the cluster analysis shows, the competitive aggressiveness and product/service and process innovation dimensions are related and have direct effects on the proactiveness and self-renewal dimensions, which are interrelated, and with the dimension of risk taking. Furthermore, new business ventures and innovative behaviors are related to each other.

The cluster analysis, have had the rating hierarchical, the variables are the grouping objects; the standardization of variables ranged between 0-1, and the measurement distance were Euclidian and the aggregation methods were the average

distance. After running the three kinds of analyses, the relationships of the 7 CE dimensions and the IP dimensions confirmed not only in terms of companies but also on the country level, and the position of the employees to the company. Brazil has developed high scores showing the CE, which is not in line, with the most traditional theories of the impact of geographic and psychic distances between headquarter and subsidiary.

5 Conclusion

The main question of this article is how do different dimensions of Corporate Entrepreneurship influence International Performance, and to what extent the context of host country matters? As the results show, country matters for the perception about the relationship between CE and IP. We found a strong association between the high entrepreneurial behavior in a country and the high perception by different levels of management of IP. The factorial maps establish differences among the sampled countries, in that Brazil shows the highest perceptions of the dimensions represented in the map to identify entrepreneurial behavior.

This study contributes in several ways to the literature on CE and IP. First, it shows that it is meaningful to separate the different dimensions of CE (innovative behavior, new business ventures, competitive aggressiveness, product/service and process innovation, self-renewal, proactiveness, and risk taking) when examining the influence of CE on IP. These dimensions were derived from an extensive literature review (Miller, 1983; Guth and Ginsberg, 1990; Morris et al.,1994; Zahra and Covin, 1995; Sharma and Chrisman, 1999; Wiklund,1999; Messeghem, 2003; Covin et al., 2006; Rauch et al., 2009; and Bierwerth et al., 2015). We concluded that proactiveness, innovative behavior, and self-renewal have direct associations with International Performance. However, the study shows that proactiveness has the clearest positive connection with IP.

Second, the study shows that the international context has an influence on CE in the same organization. Brazil presented a significantly higher perception of CE than either Sweden or the Netherlands. This contradicts previous findings that highlight developing countries as a low-cost production alternative (Dunning, 1996; Birkinshaw and Hood, 2000; Frost, 2001). This suggests that the institutional environment throughout the host country exerts a strong influence on the behavior of top management. In countries with some institutional uncertainties and high market imperfections, proactiveness and aggressive market approaches will significantly shape the performance of the firm and its commitment to the host market. We understand that foreign subsidiaries, when exposed to different institutional and cultural contexts, can develop different paths of entrepreneurial behavior, by strengthening some of the entrepreneurial dimensions (like proactiveness), or even by creating new entrepreneurial perspective. This seems to be an important outcome of the study, pointing to new avenues in corporate entrepreneurship researches. This implies that context can shape in large extent the entrepreneurial behavior of companies, particularly those operating in high-tech industries.

Third, this study shows that the perceptions of CE and IP are dependent on the position within the company. In this research, we divided the positions into top management, middle management, and functional positions. From the study, we can conclude that the lower the hierarchical position of employees, the lower are their perceptions of CE and internationalization. Although many companies are international, the research shows that employees still perceive them as more national than international. In terms of implications, it seems that the employees are national oriented—that is, they are focused more on the domestic market and have the impression that their internationalized company is quite different from everything they know. Thus, it is important to investigate in depth the relationship between IP and the internationalization perceptions of employees.

6 Implications and Further Research

These findings suggest valuable practical implications for the management in MNCs. First, the fact that IP is strongly dependent on some CE dimensions, mainly proactiveness, innovative behavior, self-renewal and innovativeness of the firm, which is in line with the meta-analysis review of Bierwerth et al. (2015). These mean that companies operating in different institutional environments have to take under consideration, mainly entrepreneurial behavior dimensions,

which are more related to individual behavior. On the other hand, this also suggests that proactiveness of Subsidiaries acting in developing countries may represent a Strategic asset to improve and sustain performance and growth.

Despite the contributions to the current knowledge to CE, the findings are constraints by Geographical limitation of the selected simple. Brazil, Sweden and Netherlands are leading countries as emerging and developed countries, but still present specific entrepreneurial behavioral that can't be fully generalizable.

Different avenues should be explored in light of the contributions of CE theories to international business. First, examining the interactions between the dimensions of entrepreneurial behavior and entrepreneurial results in different institutional and cultural contexts may open up new opportunities to clarify how MNCs manage the distances between home and host countries. Second, although some dimensions may overlap, and the conceptual and practical delimitations are sometimes not easy to capture, further research should explore the complex behavior of firms in different industrial contexts and institutions. Finally, it would be meaningful to address the effects of such dimensions for small firms or for firms with an accelerated process of internationalization.

It is important to make it clearly that the stated and the data can´t be generalized.

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Ferramentas e Bases de Dados Open Science para Pesquisa em Inovação.

André Moraes Santos[1], Cláudia Terezinha Kniess[2], Luc Quoniam[3], Emerson Antonio Maccari[4]

[1] Universidade do Vale do Itajaí (UNIVALI) - amsantos@univali.br
[2] Universidade Nove de Julho (UNINOVE) - kniesscl@yahoo.com.br
[3] Aix Marseille Université/ France - mail@quoniam.info
[4] Universidade Nove de Julho (UNINOVE) - emersonmaccari@gmail.com

PALAVRAS-CHAVE

Inovação;
Big Data;
Ciência aberta.

Received 20.11.2017
Revised 24.11.2017
Accepted 28.11.2017

ISSN 1980-4431
Double blind review

RESUMO

Este artigo tem como objetivo propor um conjunto de ferramentas para a recuperação e análise de informações em bases de dados públicas, úteis ao estudo da inovação. Como contexto de aplicação, foram selecionadas duas bases públicas: (a) Base Nacional do Diretório de Grupos de Pesquisa; (b) base internacional de patentes Espacenet. O modelo de sistema de inovação de hélice quíntupla foi escolhido para ilustrar as possiblidades de análise. A pesquisa seguiu os princípios da ciência aberta (Open Science), sendo todos os dados, artefatos e resultados obtidos disponibilizados de forma livre e aberta. O método que orientou o desenvolvimento da pesquisa foi o "Design Science Research". Utilizou-se as ferramentas Patent2Net, ScriptGP2 e Gephi. Com base nos artefatos e bases de dados, foi proposto um framework para a extração e análise das informações. Demonstrou-se que os recursos de dados, frameworks e artefatos identificados e desenvolvidos nesta pesquisa permitem estudar diferentes relações e aspectos da inovação, tanto no âmbito nacional quanto internacional.

KEYWORDS

Design Science;
Big Data;
Innovation.

ABSTRACT

This article aims to propose a set of tools for the retrieval and analysis of information in public databases, useful for the study of innovation. As an application context, two public databases were selected: (a) National Database of the Directory of Research Groups; (b) International patent base Espacenet. The quintuple propeller innovation model was chosen to illustrate the possibilities of analysis. The research followed the principles of Open Science, with all the data, artifacts and results obtained being made freely and openly available. The method that guided the development of the research was the "Design Science Research". The tools Patent2Net, ScriptGP2 and Gephi were used. Based on the artifacts and databases, a framework was proposed for the extraction and analysis of information. It has been demonstrated that the data resources, frameworks and artifacts identified and developed in this research allow us to study different relations and aspects of innovation, both nationally and internationally.

1 Introdução

O desenvolvimento tecnológico instrumental é central para o avanço do conhecimento científico. Novos equipamentos, softwares e metodologias permitem ao pesquisador coletar e analisar dados, até então impossíveis ou extremamente difíceis de serem obtidos. As novas tecnologias para o sequenciamento de DNA, por exemplo, permitiram grandes avanços na área da genética e medicina, assim como os aceleradores de partículas permitiram o estudo das estruturas subatômicas no campo da física (Goodwin, McPherson, & McCombie, 2016).

No campo científico da administração, também experimentou-se significativos avanços em função de novos métodos de pesquisa e ferramentas computacionais, principalmente com a abordagem de *BigData* (George, Osinga, Lavie, & Scott, 2016). Combinando conhecimentos de programação de computadores, métodos científicos e estatística, foi possível desenvolver novas ferramentas para explorar grandes bases de dados. Acompanhando o desenvolvimento de novas ferramentas, a comunidade científica também tem estimulado a Ciência Aberta, do inglês, *Open Science*, o que significa tornar público e acessível todos os produtos e processos envolvidos em uma pesquisa científica (OECD, 2016).

As pesquisas sobre inovação também podem se beneficiar dos avanços nos instrumentais tecnológicos e nas polícias de Ciência. As bases mundiais de patentes são excelentes fontes para estudos sobre inovação e competitividade, tanto em mercados desenvolvidos quanto em econômicas emergentes(J. Kim & Lee, 2015). Da mesma forma, bases nacionais de pesquisa científica e inovação, como a Plataforma de Grupos de Pesquisa Lattes, por exemplo, podem ser úteis em função da qualidade e grande volume de dados. Ambas são bases abertas, disponíveis ao acesso público. Combinando estas fontes de dados com ferramentas específicas para extração e análise, é possível explorar novas possibilidades de dados para pesquisa.

Este artigo demonstra como utilizar ferramentas computacionais, baseadas em código de software livre (*open source),* para extrair e analisar grandes volume de dados para pesquisas em inovação. Tendo como fonte as bases internacionais de patentes e plataforma nacional de grupos de pesquisa é possível extrair e analisar dados que seriam extremamente difíceis ou custosos de serem obtidos utilizando-se apenas os processos normais. Espera-se que a solução proposta que possa utilizada por pesquisadores em problemas reais voltados à operacionalização de suas pesquisas.

Para ilustrar as possibilidades de uso e aplicação das ferramentas e dados, tomou-se como base o modelo de inovação de hélice quíntupla. O modelo de hélice quíntupla deriva do modelo de tripla hélice e define um sistema de inovação como sendo um conjunto de relações entre governo, empresas, universidades e sociedade, pautadas pela responsabilidade ambiental (Carayannis & Rakhmatullin, 2014; Casaramona, Sapia, & Soraci, 2015). Para que se possa estudar o modelo, é necessário que existam informações disponíveis sobre governos, empresas, universidades, tecnologias e impacto social envolvidos no sistema. Também é importante identificar as relações existentes entre os atores capazes de promover a inovação por meio da produção, comercialização e uso de novos conhecimentos e tecnologias (Casaramona et al., 2015; Etzkowitz, 2003; Nelson, 1993; OECD, 1997).

O artigo está estruturado em quatro seções principais onde será apresentada a base teórica, método, resultados e discussões finais.

2 Base Teórica

Nesta seção será apresentada a base teórica e conceitual utilizada para o *framework* de extração e análise de informações proposto por este artigo. O Quadro 1 apresenta cada um dos principais tópicos e sua aplicação no contexto deste artigo.

Quadro 1. Tópicos e avaliação do contexto do estudo

Base teórica/conceitual	Aplicação nesta pesquisa
Modelo de hélice quíntupla	Modelo teórico que dá suporte a identificação de atores (universidades, empresas, governo e sociedade) e suas relações em um sistema de inovação dentro de um contexto de sustentabilidade.
Ciência Aberta e Responsabilidade social da pesquisa	Base teórica que justifica e dá suporte ao uso de ferramentas abertas e acesso incondicional aos dados e resultados da pesquisa científica e justifica a necessidade de aplicabilidade e

	retorno social da pesquisa acadêmica.
Transdisciplinaridade	Base teórica que justifica e dá suporte à análise da participação de diferentes disciplinas científicas em um problema
Artefatos tecnológicos	Base teórica que justifica a relevância científica da construção de artefatos que permitam explorar informações para a solução de problemas do mundo real.
Análise de redes sociais	Modelo teórico que dá suporte a análise das relações entre os atores de um sistema de inovação.
Modelo de Recuperação de informações	Modelo que indica a relação entre os termos de busca e as informações disponíveis na base de dados.

Fonte: Elaborada pelos autores (2017).

2.1 Modelos para análise da inovação: Hélice tripla, quádrupla e quíntupla

No final da década de 90, Leydesdorff e Etzkowitz (1996) observaram que a transição da economia industrial para a economia do conhecimento havia causado uma alteração nos papéis tradicionais do governo, empresas e universidades. Os autores perceberam que para compreender a dinâmica da inovação era necessário estudar como os próprios atores do sistema se reconfiguravam e redefiniam suas funções (Etzkowitz & Leydesdorff, 2000). A dupla de pesquisadores lançou mão do conceito elaborado por Sábato e Botana (1968) sobre a tríade de atores de um Sistema Nacional de Inovação (SNI), universidade-empresa-governo, e acrescentou a possibilidade de sobreposição e até alteração das funções destes atores, chamando este modelo de hélice tripla, do inglês, "triple-helix". (Leydesdorff, 2012).

O modelo de hélice tripla sustenta que, na economia do conhecimento, a inovação está ligada a um papel mais atuante da universidade e na hibridação das funções da universidade, indústria e governo para gerar novos formatos institucionais e sociais para a produção, a transferência e aplicação do conhecimento (Chung, 2014; Etzkowitz & Leydesdorff, 2000; Ivanova & Leydesdorff, 2014; Villarreal & Calvo, 2015).

O modelo de hélice quádrupla foi proposto Carayannis e Campbell (2009) com base no modelo de hélice tripla e inclui a sociedade como o quarto elemento ativo no processo de inovação. A sociedade participa ativamente na cocriação e coprodução de inovações. Ideias inovadoras podem surgir do meio social e serem financiadas socialmente, como nos crescentes exemplos de *crowdfunding* e *crowdsourcing* (Afuah & Tucci, 2012; Carayannis & Campbell, 2012; Mollick, 2014). Além disso, o estilo de vida, valores culturais, manifestações artísticas e outras características de uma sociedade, expressadas através dos meios de comunicação, indicam as prioridades e desejos sociais que devem ser considerados pelos atores de um sistema de inovação.

Aprofundando a pesquisa sobre a complexidade das relações entre agentes de um sistema de inovação de hélice tripla e quádrupla, Carayannis e Campbell (2010) exploraram a relação que os sistemas de inovação tem com o ambiente natural (meio ambiente, sob a perspectiva ecológica) e propuseram uma extensão ao modelos anteriores adicionando uma quinta hélice.

O modelo de hélice quíntupla é "um modelo que se baseia, e se especializa, no conjunto das interações sociais e intercâmbios acadêmicos em um Estado (estado-nação) com o objetivo de promover e evidenciar um sistema cooperativo de conhecimentos, habilidades e inovações para um desenvolvimento mais sustentável" (Carayannis & Campbell, 2010, p. 62). O modelo de hélice quíntupla considera que a desenvolvimento econômico baseado na inovação depende da interação entre universidade, empresas, governo e sociedade civil, em um contexto de desenvolvimento sustentável (Carayannis, Barth, & Campbell, 2012). A quinta hélice representa a visão transdisciplinar para a geração de inovações compatíveis com os princípios da sustentabilidade ambiental (Carayannis & Campbell, 2010). O equilíbrio entre o desenvolvimento econômico e o ambiente natural tornou-se imperativo para a própria existência humana, sendo endossado por todos os países membros Organização das Nações Unidas como prioridade mundial (Griggs et al., 2013). Como exemplo, Casaramona, Sapia e Soraci, (2015) utilizaram o modelo de hélice quíntupla para analisar a cooperação internacional na busca de soluções inovadoras para energias renováveis em países da região do mediterrâneo. O modelo de hélice quíntupla também foi utilizado por, Bifulco et al. (2016) para analisar as inovações

tecnológicas na construção de cidades inteligentes. Além de acrescentar o elemento ambiental, o modelo de hélice quíntupla também destaca a transdiciplinaridade e interdisciplinaridade do conhecimento como forma de abordar a complexidade dos problemas ambientais. Por serem problemas que envolvem o ambiente e a sociedade, simultaneamente, é necessário o envolvimento de várias áreas do conhecimento, como ciências naturais, engenharias, ciências sociais e humanas (Carayannis & Rakhmatullin, 2014).

2.2 Ciência Aberta (*Open Science*) e Responsabilidade Social da Pesquisa

Ciência aberta, do inglês, *Open Science*, é uma perspectiva que significa tornar público e acessível todos os produtos e processos envolvidos em uma pesquisa científica, utilizando, preferencialmente, a World Wide Web como forma de divulgação e acesso (Kraker, Leony, Reinhardt, & Beham, 2011). A iniciativa para a ciência aberta vem sendo adotada por diversos países, instituições e pesquisadores (OECD, 2016). Em 2012, a Comissão Europeia recomendou a todos os Estados-Membros que disponibilizassem o acesso livre aos resultados de pesquisas financiadas com recursos públicos, a fim de tornar a ciência melhor e reforçar a economia baseada no conhecimento (Kuchma & others, 2014). O princípio que norteia a premissa de "Ciência Aberta" está no direito fundamental de acesso ao conhecimento pela sociedade. O conhecimento é compreendido como um fator essencial de valorização, mobilidade social, democratização e desenvolvimento. Assim, os atores envolvidos na produção e gestão do conhecimento devem estar comprometidos com a promoção, valorização, divulgação e compartilhamento do conhecimento junto à sociedade.

A abertura da ciência também enseja a discussão sobre a responsabilidade social da pesquisa científica em proporcionar a justa aplicação do conhecimento na solução de problemas da inclusão social, desenvolvimento econômico e social e da defesa do meio ambiente (Faria & Sauerbronn, 2008). Este movimento de ênfase na responsabilidade social da pesquisa científica também vem sendo apoiado por diversos países, os quais estimulam a crítica e o acesso livre aos resultados de pesquisas financiadas com recursos públicos a fim de promover a avaliação e difusão do conhecimento gerado (Kuchma & others, 2014).

2.3 Transdiciplinaridade

A emergência de problemas complexos nas últimas décadas, como por exemplo a mudança climática global ou a pesquisa para o câncer, têm exigido novas abordagens de produção de conhecimento e práticas de pesquisa (Groß & Stauffacher, 2014; Podestá, Natenzon, Hidalgo, & Toranzo, 2013; Rosenfield, 1992). Para tratar problemas complexos, os grupos científicos estão buscando arranjos de forma multi, inter ou transdisciplinar. De uma forma geral, a transdisciplinaridade busca a articulação dos conhecimentos de diferentes campos científicos visando a solução de problemas complexos (Gibbons & Nowotny, 2001). Para obter a transdisciplinaridade, cientistas, profissionais e demais atores sociais precisam se organizar em grupos capazes de promover a integração de diferentes perspectivas de identificação, formulação e busca de soluções para um problema em comum (Stokols, Hall, Taylor, & Moser, 2008). Os grupos transdisciplinares têm sido utilizados por governos, agências de fomento e instituições privadas como uma abordagem útil na solução de problemas complexos de natureza ambiental, social, econômica e de saúde (Huutoniemi, Klein, Bruun, & Hukkinen, 2010; Wagner et al., 2011).

2.4 Artefatos Tecnológicos

Os artefatos são as criações da mente humana, ou seja, artificiais, pois não existem na natureza (Simon, 1996). No contexto do *Design Science Research* os artefatos são objetos de pesquisa, desenvolvimento e construção para a solução de problemas de interesse de organizações, grupos ou indivíduos. Ainda que existam diferentes classificações para os artefatos, para Dresch et al. (2015) os quatro tipos mais comumente utilizados nas pesquisas de DSR são os propostos por March e Smith (1995): constructo, modelo, método ou instanciação. No campo das ciências da gestão, por exemplo, os métodos de PERT/COM podem ser considerados artefatos úteis para solucionar problemas de gestão de projetos (Lacerda, Dresch, Proença, & Antunes_Júnior, 2013). Um artefato do tipo

instanciação é aquele capaz de ser executado no ambiente de contexto do problema. Neste caso, a execução do artefato e as regras para o seu funcionamento fazem parte da instanciação. Um exemplo são os *software* para computadores (Venable & Baskerville, 2012).

2.5 Análise de Redes Sociais

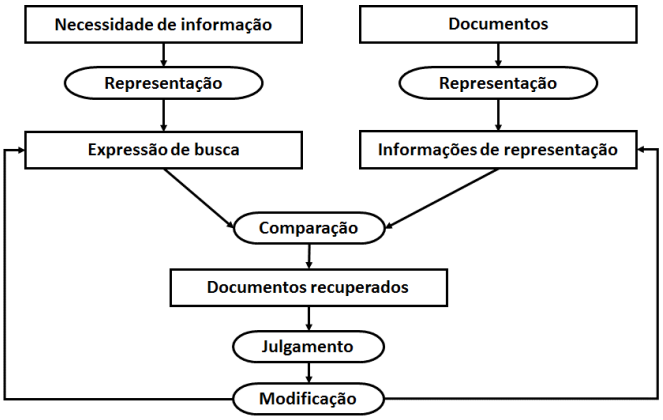
A análise de redes sociais (ARS) é o nome do campo de estudo que tem por objetivo a análise das relações existentes entre diferentes atores de uma rede (Wasserman, 1994). Por meio da representação e análise das relações é possível identificar padrões estruturais, grupos, atores principais, entre outras características (Zancan, dos Santos, & Campos, 2012). Na área de administração é bastante conhecido a influência das redes sociais nos negócios e organizações (Fracassi, 2017). No contexto desta pesquisa, a análise de redes sociais é importante para compreender a dinâmica dos relacionamentos entre os diferentes atores e elementos previsto no modelo de hélice quíntupla de inovação.

Uma rede é feita de nós e laços, também chamados de arestas, que conectam estes nós. Em uma representação simples de rede temos um conjunto de nós interligados por laços. Representações mais complexas também podem incluir variações de tamanhos para nós e laços, indicando diferentes valores para cada elemento. A partir destas relações é possível analisar aspectos de centralidade, fluxo de informações e conectividade da rede (Marteleto, 2001). Pesquisadores na área de redes sociais tem desenvolvido diferentes métricas para a avaliação e caracterização da dinâmica de uma rede sendo as mais comumente utilizadas: centralidade de informação (*degree* ou *degree centrality*), centralidade de proximidade (*closeness centrality*) e centralidade de intermediação *(betweenness centrality)* (Freeman, 2004; Y. Kim, Choi, Yan, & Dooley, 2011).

2.6 Modelo de Recuperação de informações

Recuperar as informações pertinentes em bases de dados é um dos grandes desafios quando se trabalha com grandes volumes de dados. Em geral, as bases de dados oferecem mecanismos de busca que permitem ao usuário indicar palavras ou termos que serão utilizados para encontrar resultados que correspondam a estes termos. No modelo tradicional de recuperação de informações (Figura 1), Belkin et al. (1993) identificam dois componentes principais: o usuário e o sistema de recuperação. Do ponto de vista do usuário, este deve definir corretamente quais termos definem adequadamente o tema que está sendo buscado. Já o sistema de busca deve representar e indexar adequadamente os documentos para que os resultados atendam aos critérios de busca do usuário.

Figura 1. Modelo de recuperação de informações



Fonte: Belkin (1993, p. 3).

3 Método

Esta pesquisa tem como objetivo a proposição do uso de um conjunto de artefatos para a solução de um problema prático inerente ao avanço científico. Assim, buscou-se apoio na perspectiva conhecido como *Design Science Research*.

A *Design Science Research* (DSR), tem se apresentado como uma abordagem alternativa a dominância da pesquisa comportamental nas áreas de administração, sistemas de informações e contabilidade, por exemplo (Dresch et al., 2015). Na visão de pesquisa em Design Science, o foco está no uso de teorias para o projeto e desenvolvimento de soluções para problemas do mundo real, geralmente na forma de objetos, métodos, como constructos, modelos, métodos e instâncias de soluções tecnológicas (March & Smith, 1995; Van Aken, 2005).

3.1 Etapas da *Design Science Research*

Diversas formas de desenvolvimento prático da pesquisa em Design Science podem ser

encontrados na literatura de diferentes áreas como, por exemplo, saúde (Abelson et al., 2003), gestão (Van Aken, 2005), engenharia (Lacerda et al., 2013). e sistemas de informações (Arnott & Pervan, 2012; Gregor & Hevner, 2013; A. Hevner & Chatterjee, 2010; A. R. Hevner, March, Park, & Ram, 2004). Dresch et al. (2015) revisaram 13 artigos principais que apresentam formas de desenvolvimento de pesquisas área de Design Science e destacaram quatro etapas principais comuns a maioria das propostas: Definição e contexto do problema; Desenvolvimento da solução (artefato); Avaliação da solução (artefato); Comunicação dos resultados.

3.1.1 Definição e Contexto do problema

A fase inicial de uma pesquisa se deve especificar o problema em seu contexto e justificar a relevância de uma solução (Peffers et al., 2007). Nesta etapa, o pesquisador deve atentar para a definição do problema e para as características desejáveis de uma solução satisfatória (Dresch et al., 2015).

3.1.2 Desenvolvimento da solução (o artefato)

Com base nas especificações e conhecimentos sobre o problema, o pesquisador deve iniciar a busca de uma solução. Uma vez que o problema está claramente definido e possíveis soluções são apontadas, o pesquisador deverá propor o uso, adaptação ou aperfeiçoamento de um artefato já existente ou especificar um novo artefato. Esta é uma etapa marcada por intenso esforço criativo e geralmente envolve o uso de conhecimentos transdisciplinares (Dresch et al., 2015). Em seguida, o pesquisador especifica as características do artefato e os procedimentos para sua construção e avaliação. Os resultados esperados do artefato precisam garantir uma solução satisfatória para o problema em questão (Dresch et al., 2015).

3.1.3 Avaliação da solução (artefato)

A quarta fase consiste na avaliação do artefato. Nela o pesquisador precisa demonstrar evidências do uso do artefato na solução dos problemas identificados. Também é importante descrever as limitações do artefato em alcançar os objetivos incialmente previstos (Dresch et al., 2015). A avaliação do artefato é importante para a **validade pragmática** da pesquisa. A validade pragmática é, segundo Drescher (2015), a confirmação da utilidade prática da solução proposta para o problema. A solução deve ser viável dentro das restrições que se apresentam no ambiente do problema a ser solucionado. A validade pragmática busca assegurar que a solução proposta para resolver determinado problema de pesquisa de fato funcione, garantindo que os resultados esperados sejam alcançados (Van Aken, 2005).

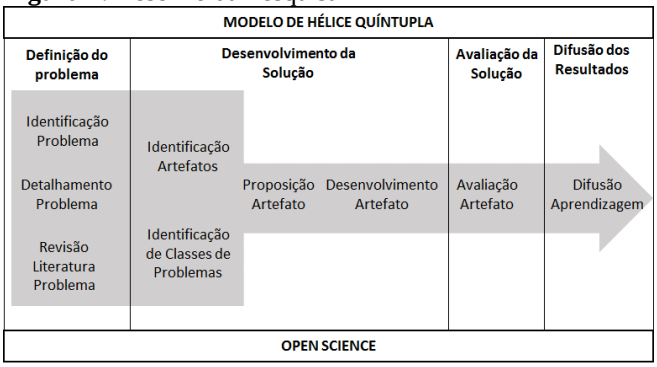
3.1.4 Comunicação dos resultados

A última fase é composta pela comunicação dos resultados e explicitação da aprendizagem gerada com o desenvolvimento do artefato. Além disso, as limitações, encaminhamentos futuros e outros fatos relevantes sobre o desenvolvimento do artefato são formalizados. Segundo Dresch et al. (2015, p. 133) “o objetivo dessa etapa é assegurar que a pesquisa realizada possa servir de referência e como subsídio para a geração de conhecimento, tanto no campo prático quanto no teórico”.

3.2 Desenho de Pesquisa

O desenho da presente pesquisa, ilustrado na Figura 2, tomou como base a proposta do *Design Science Research* para a identificação dos problemas relativos a questão de pesquisa, o desenvolvimento dos artefatos para solucioná-los e a validação destes artefatos. O desenvolvimento da pesquisa também tem como elemento norteador, o modelo de hélice quíntupla, para o qual deseja-se identificar elementos e relações nas bases de dados. Por fim, toda a pesquisa está baseada no conceito de ciência aberta.

Figura 2. Desenho da Pesquisa



Fonte: Elaborada pelos autores (2017).

3.3 Contexto de aplicação

3.3.1. Base internacional de Patentes

Uma das principais fontes mundiais de dados sobre tecnologia e inovação é o registro de patentes. A análise do conjunto de patentes pode servir como uma base de dados estratégica para o desenvolvimento de políticas públicas, geração de novas tecnologias e criação de novos conhecimentos científicos e tecnológicos (Jeong & Yoon, 2014; Tekic, Drazic, Kukolj, & Vitas, 2014). Bases internacionais de patentes ou indicadores de inovação são particularmente úteis como fontes secundárias para as pesquisas que analisam economias emergentes e cenários internacionais. (Cândido, Wielevick, & Zimmermann, 2016). Com relação às patentes, diversas bases tem sido criadas e disponibilizadas, como, por exemplo, Google Patent Search (www.google.com/patents), Patentscope (http://www.wipo.int/patentscope/en/), USPTO (http://www.uspto.gov/) e Espacenet (http://worldwide.espacenet.com/) (Ferraz, Quoniam, Reymond, & Maccari, 2016). Destas, escolheu-se a *Espacenet*, uma base mantida pelo *European Patent Office* (EPO), pois dispõe de serviços livres e gratuitos além de ser uma das bases internacionais com maior cobertura de dados (Jürgens & Herrero-Solana, 2015).

3.4.2 Plataforma Lattes - O Diretório dos Grupos de Pesquisa

O Diretório dos Grupos de Pesquisa no Brasil é uma parte integrante da Plataforma Lattes e pode ser considerado como o mais completo inventário dos grupos de pesquisa em atividade no país (Ramos & Machado, 2014). Dentre as informações constantes na base, identificam-se os recursos humanos constituintes dos respectivos grupos, as linhas de pesquisa propriamente dita, os setores de atividades envolvidos, as especialidades do conhecimento, a produção científica, tecnológica e artística e os padrões de interação com o setor produtivo. Além disso, as informações individuais de cada participante estão vinculadas aos seus respectivos currículos Lattes. No que tange às atualizações, elas são realizadas de forma compulsória pelos líderes de grupos, pesquisadores, estudantes e dirigentes de pesquisa das instituições participantes, pois constituem critério de avaliação e elegibilidade pela Capes, CNPq e outros órgãos de fomento à pesquisa (BRASIL, MCTI., 2013).

4 Análise dos Resultados

Seguindo a perspectiva da *Design Science Research*, os resultados serão apresentados na sequência das quatro etapas principais: Definição e contexto do problema; Desenvolvimento da solução (artefato); Avaliação da solução (artefato); Comunicação dos resultados.

4.1 O problema

O principal problema encontrado para se extrair e analisar informações da base de patentes e da base de grupos de pesquisa é a limitação do processo de busca e a carência de ferramentas *open source* para a análise do grande volume de dados extraído. Em geral, os mecanismos de busca apenas permitem a recuperação das informações e algumas análises simples, mas não possuem funcionalidades para analisá-las em sua complexidade.

4.2 Desenvolvimento da solução

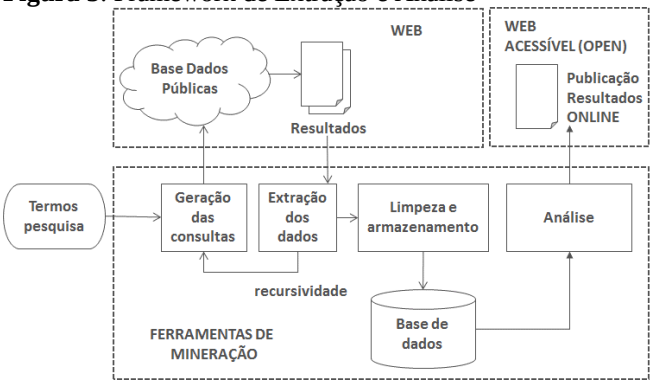
Para a extração e análise nas bases de patentes, identificou-se ferramentas comerciais - como, Intellixir (http://www. intellixir.com/); Matheo Patent (http://www.matheo-software.com/en/) e Patent Inspiration (http://www.patentinspiration. com/), todas comerciais, e gratuitas, baseadas em código aberto, como Lens software (https://www.lens.org/lens/) e o Patent2net (http://patent2net.vlab4u.info/) (Ferraz et al., 2016). As ferramentas comerciais possuem custos de uso e licenciamento bastante altos, o que dificulta sua difusão e uso, principalmente por estudantes, pesquisadores, pequenas e médias empresas e países emergentes ou em desenvolvimento. Como alternativa, comparou-se os dois sistemas gratuitos e abertos, Lens e Patent2Net, para verificar qual deles seria capaz de atender os requisitos para a solução satisfatória do problema. O sistema Patent2Net demonstrou-se mais adequado, atendendo à um número maior de requisitos e, principalmente, permitindo a exportação dos resultados. O sistema Lens, embora permita a exportação de dados, limita-os a apenas 1000 resultados por pesquisa.

Para a extração e análise nas bases de dados do Diretório de Grupos de Pesquisa da Plataforma Lattes, foi utilizada a ferramenta ScriptGP2, de código aberto, disponível em https://bitbucket.org/vlab4u/scriptgp. O ScriptGP2 já foi utilizada com sucesso para a extração e análise de grande volume de dados do diretório de grupos de pesquisa (Magalhães, Quoniam, Mena-Chalco, & Santos, 2014; Santos, Kono, & Quoniam, 2014).

4.2.1 Proposta de framework

Para realizar a extração e análise de dados nas bases de patentes e diretório de grupos de pesquisa foi proposto um *framework* que inclui uma série de etapas que vão desde a definição dos termos de pesquisa, configuração do ambiente computacional, extração dos dados e mineração e análise, conforme a Figura 3.

Figura 3. Framework de Extração e Análise



Fonte: Elaborada pelos autores (2017).

As ferramentas Patent2Net e ScriptGP2 geram um conjunto substantivo de resultados em formato html, com recursos de tabelas dinâmicas (*Pivot Tables)* e gráficos interativos. Além dos resultados tabulares, ambas as ferramentas geram arquivos no formato de grafos, podendo ser importados por softwares específicos para a análise de redes. No caso desta pesquisa, utilizou-se o software Gephi, o qual é uma ferramenta gratuita e de código aberto desenvolvida para a análise de redes gráficas (Bastian, Heymann, Jacomy, & others, 2009). Ele pode ser obtido gratuitamente no endereço https://gephi.org/. O software apresenta recursos básicos e avançados para a análise são as funções de visualização, layout e estatísticas.

4.3 Avaliação da solução

A solução proposta, composta pelos artefatos selecionados e *framework* de execução, foi testada com a aplicação em dois temas: patentes em reciclagem de terras raras e grupos de pesquisa em educação a distância. A escolha dos temas foi induzida por interesses dos pesquisadores envolvidos e pela ligação com o propósito de ciência aberta e sustentabilidade.

Foi avaliada a capacidade de extração e análise de informações que possibilitassem a identificação de elementos e relações para o modelo de hélice quíntupla. Conforme o modelo de hélice quíntupla, buscou-se informações e relações entre governo, empresas, universidades e sociedade, pautadas pela responsabilidade ambiental (Carayannis & Rakhmatullin, 2014; Casaramona et al., 2015).

4.3.1 Extração e análise de informações em patentes sobre reciclagem de terras raras

Terras raras é o nome dado à um grupo de elementos químicos composto pelos lantanídeos mais o escândio e ítrio, com diversas aplicações na indústria, sendo considerado estratégico para os setores automobilístico, aeroespacial, eletrônico, militar e médico (Dutta et al., 2016). A reciclagem de terras raras tem se tornado um tema de interesse acadêmico e comercial em razão da crescente demanda para uso em novas tecnologias eletrônicas (Massari & Ruberti, 2013), da escassez na natureza e impacto ambiental para extração (Bandara, Mantell, Darcy, & Emmert, 2015).

A expressão de consulta da base ESPACENET contemplou as patentes que continham referências à reciclagem de terras raras. Transformada para a linguagem de consulta do ESPACENET, a expressão de busca ficou no seguinte formato:

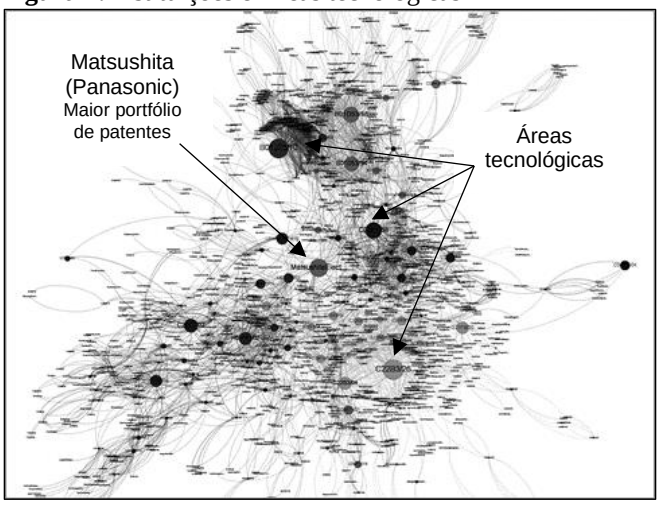
((ta="rare earth*" or ta=”rare earths*") and (ta=recy*)).

Esta expressão utiliza a lógica booleana e permite recuperar patentes que tenham eu seu título ou abstract os termos desejados. A expressão de busca foi inserida no software Patent2Net e resultou em 1603 patentes, registradas entre 1908 até 2014, totalizando 70Mb de dados brutos.

4.3.1.1 Análise dos dados para o modelo de hélice quíntupla

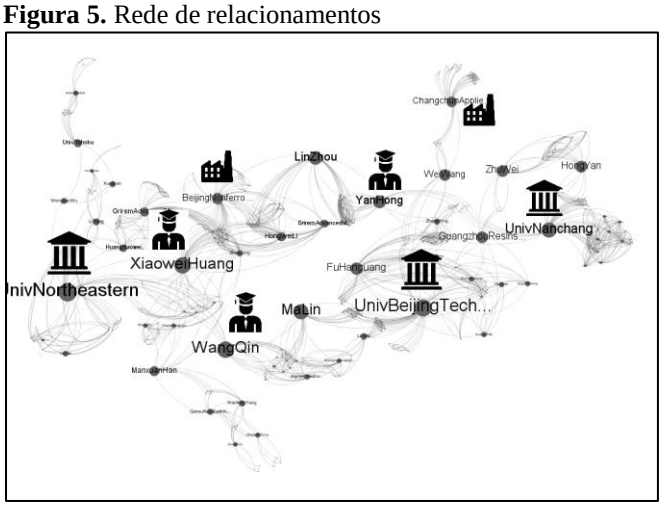
Os resultados fornecidos pelo Patent2Net, adicionados aos recursos de análise de redes da ferramenta Gephi, permitiram identificar relações entre empresas, universidades e pesquisadores em função das informações patentearias. Para exemplificar os resultados obtidos, selecionou-se a empresa Matsushita, uma empresa do grupo Panasonic, a qual possuía o maior número de patentes em terras raras. A partir desta empresa, mapeou-se as relações com as áreas tecnológicas de suas patentes, representadas na Figura 4. Por se tratarem de redes complexas, a forma mais adequada para sua visualização é no formato eletrônico, preferencialmente em mídias com alta resolução.

Figura 4. Instituições e Áreas tecnológicas



Fonte: Dados da pesquisa.

Figura 5. Rede de relacionamentos



Fonte: Dados da pesquisa.

Em outra análise, foi possível identificar redes que interligam diferentes inventores, universidades e empresas, conforme demonstrando na Figura 5. A Figura 5 exemplifica as possibilidades de análises proporcionadas pela presente pesquisa em um recorte de interações de patentes chinesas. Nela é possível verificar que certos inventores estão ligados a diferentes universidades e empresas, o que representa um forte indício de relacionamento entre estes atores. Também é possível verificar relacionamentos entre depositantes quando ambos depositaram conjuntamente uma patente.

4.3.2 Extração e análise de informações dos Grupos de Pesquisa em EAD

O EAD é uma das formas de ensino inovador que mais cresce no contexto nacional e internacional, representando uma importante ferramenta para a democratização do conhecimento (Barak, Watted, & Haick, 2016). Desta forma, buscou-se identificar os elementos do modelo de hélice quíntupla a partir das informações dos Grupos de Pesquisa em EAD.

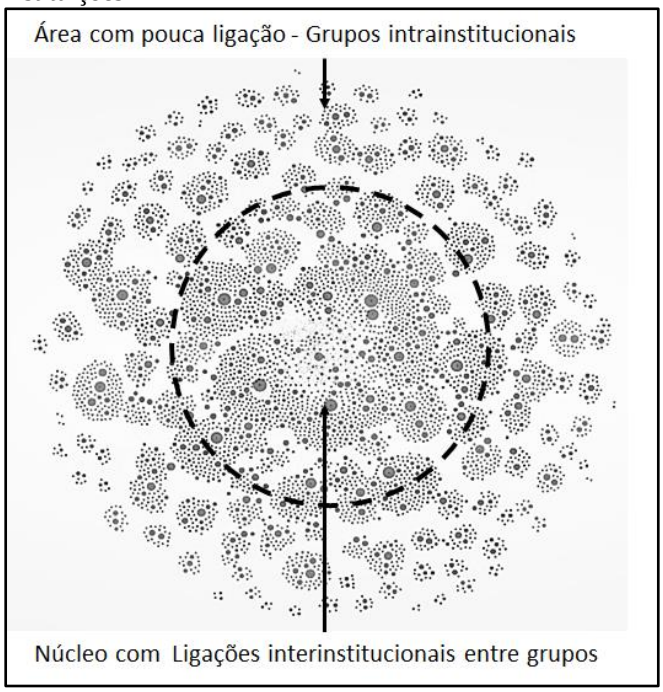
A expressão de busca formulada para a pesquisa na base de Grupos de Pesquisa continha 109 termos. Isto foi necessário devido ao amplo conjunto de palavras que podem estar relacionadas ao contexto de pesquisa EAD. Por razões de espaço a mesma não é reproduzida neste artigo. A expressão de busca foi inserida na ferramenta ScriptGP2 e executada em 2015 a partir do diretório de grupos de pesquisa do CNPq (http://dgp.cnpq.br/). Como resultado foram identificados 608 grupos de pesquisa e 4974 pesquisadores associados aos grupos.

4.3.2.1 Análise dos dados para o modelo de hélice quíntupla

A partir dos dados gerados pelo ScriptGP2 foi possível identificar as relações entre os diferentes grupos de pesquisa, interligados pelos seus pesquisadores e instituições. A rede formada pelas ligações entre grupos de pesquisa, pesquisadores e instituições é composta por 6029 nós e 12173 ligações. A análise da rede formada por estas relações demonstrou existir um grupo central com muitas conexões interinstitucionais e diversas "ilhas" isoladas, conforme ilustrado na Figura 6. O grupo central apresenta relações interinstitucionais entre os grupos, ou seja, pesquisadores participam em grupos de pesquisa de mais de uma instituição. Já os agrupamentos

intrainstituicionais são formados por grupos de pesquisa que não possuem nenhum membro externo à instituição ou que não possuem nenhum membro interno participando de um grupo de pesquisa de outra instituição. Também foram identificadas 316 relações entre instituições, sendo 150 destas relações do tipo público-privado, evidenciando as relações previstas no modelo de hélice quíntupla.

Figura 6. Redes entre pesquisadores, grupos de pesquisa e instituições



Fonte: Dados da pesquisa.

5 Considerações Finais

A contribuição esperada desta pesquisa é a geração de novos conhecimentos sobre os processos e artefatos tecnológicos para a recuperação e análise de informações em bases de dados públicas, úteis ao estudo da inovação por meio do modelo de hélice quíntupla. Espera-se que o *framework* proposto seja útil e possa ser aplicado para a prospecção tecnológica e científica, inovação e apoio a formação de políticas públicas. A pesquisa também reafirma que o uso de ferramentas *open source* contribuem para a *Open Science* por meio do acesso democrático e livre de importantes informações para o desenvolvimento científico e tecnológico, além de permitirem o desenvolvimento incremental das soluções já existentes.

De acordo com o princípio de *Open Science*, todos os dados e conteúdo desta pesquisa estarão disponíveis on-line ou poderão ser solicitados aos autores. A não inclusão de um hiperlink diretamente neste artigo visa atender aos requisitos de não identificação de autoria.

6 Implicações e Pesquisas Futuras

Ao expandir as possiblidades de acesso e análise a fontes de dados secundários, espera-se novas contribuições, instrumentais e metodológicas na coleta, armazenamento, processamento, análise e interpretação dos dados. A crescente adoção de políticas públicas de transparência de dados também contribui para o aumento de fontes secundárias disponíveis.

Pesquisas futuras podem se valer das novas possibilidades de dados para confirmar teorias existentes, testar novas teorias ou desenvolver aplicações práticas de análises preditivas.

A adoção da política de Ciência Aberta também deve contribuir para a transparência da pesquisa científica pública, tornando-a integralmente disponível, dos dados até os resultados.

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