

**KNOWLEDGE INTENSIVE ENTREPRENEURSHIP: A SYSTEMATIC REVIEW AND
FUTURE DIRECTIONS**

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INTRODUCTION

Over the last few years, the field of entrepreneurship research has been characterized by major changes in relation to different themes and in approach to other fields of research (BELSO-MARTINEZ; MOLINA-MORALES; MAS-VERDU, 2013). The creation of new business types and innovation have become a research trend that corresponds to the advancement of entrepreneurial practice in society. The ability to offer innovative and economically viable products and services becomes practically an obligation in private companies and also in the public demands of society (RYPESTØL; AARSTAD, 2018).

In this context, the concept of knowledge intensive entrepreneurship (KIE) emerges as a socioeconomic phenomenon that drives innovation and economic growth, through new ventures that introduce innovations with value added using knowledge intensively (MALERBA, 2010; MCKELVEY, LASSEN, 2013). These new companies are generally formed after intensive scientific and technological research, have great influence on new sociocultural relations, digital interaction, biotechnology and nanotechnology (SEKLIUCKIENE; SEDZINIAUSKIENE; VIBURYS, 2016).

The field of international entrepreneurship has been addressing this theme (KNIGHT; LIESCH, 2016; MAINELA; PUHAKKA; SERVAIS, 2014). It is understood that internationalization is directly linked to companies that are knowledge-intensive, and that some approaches, especially the concept of born global, respond to the characteristics of this type of company (ASPELUND et al., 2017).

Although a large number of knowledge-intensive small and medium-sized enterprises have been the focus of researchers in recent years and the relationship with other research fields, the theme is still considered emerging, with a large number of contributions with local and specific aspects of a given region (OJALA; HEIKKILÄ, 2011; WHITTAKER, 2009). Recurrent themes in such studies include, innovation networks, human and intellectual resources, as well as applications of digital technology (MALERBA; MCKELVEY, 2016; MCKELVEY; LASSEN, 2013).

However, despite its growth in the researcher's agendas, when analyzing the current literature, it is verified that knowledge-intensive entrepreneurship still needs theoretical articulations and a broad view of the literature on its current production. KIE is considered as a phenomenon basically focused on specific contexts, from a theoretical and empirical perspective (FLORIDA; ADLER; MELLANDER, 2017; RADOSEVIC; YORUK, 2013).

The objective of this study is to propose a framework based on the main theoretical and empirical contributions present in the literature and articulate the main paths for future studies. The systematic approach of the literature and analysis of content of the articles contributes to the topic of knowledge-intensive entrepreneurship in dealing with and relating conceptually the themes addressed by the researchers; main theoretical and empirical contributions on the theme; and finally, the gaps suggested by the researchers.

Regarding the structure, the article is organized in the following sessions. The first section is the introduction of the paper, which has already been presented. The following section gives a brief theoretical background on the subject. Next, the research methodology is presented. Subsequently, the results found in the study are analyzed. Finally, we discuss the final considerations of the work followed by the references that served as the basis for the research.

UNDERSTANDING KNOWLEDGE-INTENSIVE ENTREPRENEURSHIP

Recently researchs has identified a large growth in the number of companies that can be considered knowledge-intensive businesses. Malerba (2010) define this type of company based on four essential characteristics: (i) they are new ventures; (ii) they are innovative; (iii) present high intensity of knowledge in their activities; and (iv) they explore innovative opportunities in various industries. From these aspects, it is understood that it is still a challenge for entrepreneurs to manage this type of business (MALERBA, 2010; MCKELVEY, LASSEN, 2013), especially for the complex environment in which they operate and the main sectors to date, such as: biotechnology, nanotechnology, new sociocultural relations and digital interaction (SEKLIUCKIENE; SEDZINIAUSKIENE; VIBURYS, 2016).

A study of the creators of the KIE definition, makes an important integration on innovative entrepreneurship and intensive knowledge, from the discussions of Schumpeter. Malerba and Mckelvey (2018) present a new conceptualization about the entrepreneurs of this type of business, according to them, this phenomenon is determinant to introduce positive changes and dynamism in the economy. This integration of the emergent theme with the classical theory is necessary when one investigates the individual connected to the entrepreneurial action, since the Schumpeterian approach presents several aspects about the entrepreneur's role (SCHUMPETER, 1934).

Not only the relationship with the classics is persisted in this theme, but also the insertion of new themes by researchers. There are those who have been dedicated to understanding current issues of employability and gender within KIE (AMOROSO; LINK, 2018), ways of strategies to gain competitive advantage in the marketing of these companies (BOLES; LINK, 2017), as well as the importance of partnerships sector for more intelligent and integrative action (BRESCHI et al., 2014).

Another important focus in this theme is the importance of the location of these companies, especially in the relation of performance between developed countries and the underdeveloped (GONZÁLEZ-PERNÍA; JUNG; PEÑA, 2015). Studies have tried to understand the economic and social impacts in relation to the structure in which companies operate in society, since each place has a specific need and each country has legislation that may or may not intervene frequently (HODGES, et al., 2018).

Based on a national survey of projects funded by KIE, Hayter and Link (2018) state that the action of knowledge-intensive companies to disclose their ideas or methodologies may hinder their performance in the market in relation to their competitive advantage.

Although this theme is growing, it is found that academic production and practical activities are distributed in very distant spheres, and that there is no research with a broad vision for a general understanding of the phenomenon (FLORIDA; ADLER; MELLANDER, 2017; RADOSEVIC; YORUK, 2013). This study seeks to explore existing literature from a broad perspective and contribute to the advancement of knowledge, more specifically understanding how the theoretical and empirical contributions in KIE are structured.

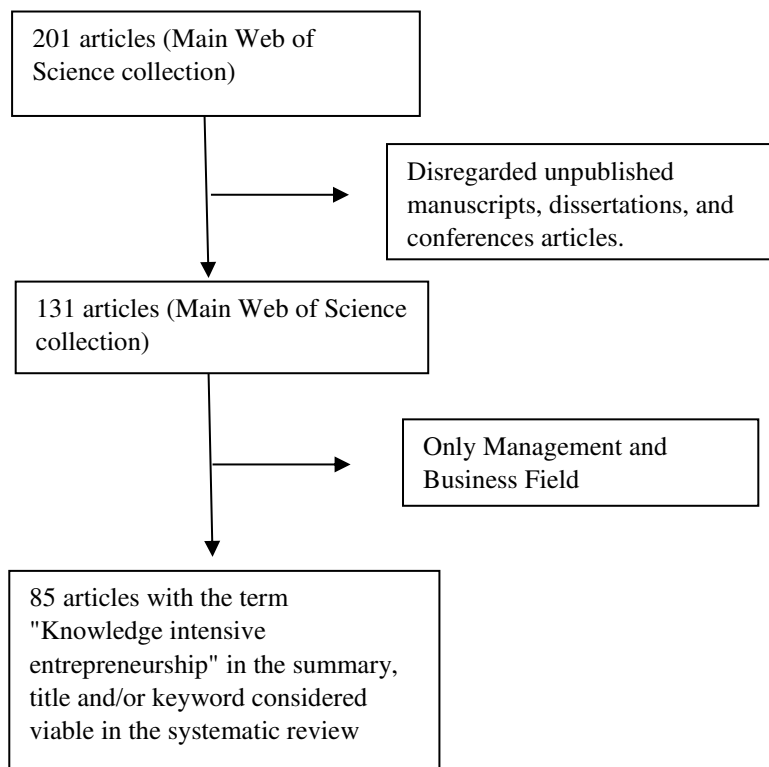
It is understood that knowledge-intensive companies are new organizations that value continuous learning in innovation and that use and transform existing knowledge, and with several startups acting in a fast and dynamic way it becomes extremely necessary to broaden the discussions in the field of entrepreneurship (SALLOS; YORUK; GARCÍA-PEREZ, 2017).

METHODOLOGY

This exploratory qualitative research uses a systematic approach in the literature. This approach allows us to systematize concepts, ideas, theories, empirical and theoretical researches to construct possible relations in the current state of the art about the theme and possible future directions (CROSSAN; APAYDIN, 2010; PITTAWAY; COPE, 2007), the appropriate approach to the proposed objective is considered.

The web of science database was used to ensure the collection of articles that contained the keyword "*Knowledge intensive entrepreneurship*" in quality journals. Figure 1 illustrates the article selection process for the systematic review:

Fig. 1 - Selection process



Source: Authors

As shown in the figure above, 85 viable articles were considered, which were checked and evaluated and proved to be consistent and adequate for the research, between the period of 2000 and 2018. This step was essential to guarantee precision in the construction of the analyzes and this became the effective number of articles used in this work.

The systematization of the information and data of the articles selected in Excel was the second stage of the research and enabled the collection of the following information: abstracts, themes, main results and contributions of the article and gaps and suggestions of future research pointed out.

We conducting a content analysis of the selected articles: (a) pre-analysis and organization of resources, (b) definition of categories of analysis, and (c) critical and reflective analysis of results. Two or more different researchers read each article at least four times. This type of analysis is recommended for more detailed analyzes when exploring concepts and phenomena using qualitative databases, in this case, investigating topics and patterns and possible relationships between current literature on entrepreneurship (GAUR; KUMAR, 2018;

TERJESEN; HESSELS; LI, 2016). The NVIVO Software was used to encode the contents of abstracts, results and gaps, allowing the categorization of texts and better content analysis (HOSSAIN; KAURANEN, 2016; PITTAWAY; COPE, 2007).

In this way, after the systematization of the articles and the accomplishment of the content analysis, it was possible to take important steps to reach the proposal of the construction of a framework (JABAREEN, 2009; GOND; HERRBACH, 2006) which define how the production in Knowledge Intensive Entrepreneurship is structured.

DISCUSSION OF RESULTS

Descriptive analysis

Considering a period from 2000 to 2018, eighty-five viable articles found in the high-impact journals of the web of science database were analyzed, 2016 and 2017 had the highest number of articles published (14 articles each). It is possible to identify that there has been an increase in the number of researches on the subject in the last ten years, as shown in Figure 2.

Table 1 - Top 10 most cited journals

Journal	N° Articles	Impact Factor SJR (2017)
Research Policy	7	3.688
Small Business Economics	7	1.937
International Journal of Entrepreneurial Behaviour Research	5	0.629
Journal of Technology Transfer	5	1.358
Entrepreneurship and Regional Development	4	1.461
Technology Analysis Strategic Management	4	0.605
International Entrepreneurship and Management Journal	3	0.746
Journal of Business Research	3	1.260
R and D Management	3	0.822
Service Industries Journal	3	0.555

Source: Authors

Table 1 below presents the most cited journals within the searched universe. Although some journals obtained SJR less than 1 were considered relevant for the analysis, because the web of science database has several quality criteria of journals. The journal with the highest impact factor and consequently the most cited is the “*Research Policy*” with seven articles, followed by “*Small Business Economics*” also with seven articles.

Table 2 - Top 5 papers most cited

Title	Citations	Authors
Improvising firms: bricolage, account giving and improvisational competencies in the founding process	284	Baker, T; Miner, AS; Eesley, DT
Conceptualizing accelerated internationalization in the born global firm: A dynamic capabilities perspective	244	Weerawardena, Jay; Mort, Gillian Sullivan; Liesch, Peter W.; et al
Networking capability and international entrepreneurship - How networks function in Australian born global firms	156	Mort, Gillian Sullivan; Weerawardena, Jay
The internationalization of small and medium-sized firms	99	De Clercq, D; Sapienza, HJ; Crijns, H
Who leaves, where to, and why worry? employee mobility, entrepreneurship and effects on source firm performance	93	Campbell, Benjamin A.; Ganco, Martin; Franco, April M.; et al.

Source: Authors

Already Table 2 lists the five most cited articles and the main individual analysis of each one, which allows a visualization and discussion about knowledge, considered as a recent subject to academic analysis.

The first most cited article addresses the topic of strategic improvisation in new knowledge-intensive businesses. With the case study approach the study contributes to the research on organizational improvisation, do-it-yourself and entrepreneurship. The authors make great strides in this relationship that emerges in the scientific literature.

The second article seeks to understand the accelerated internationalization of born global companies. Based on the existing literature and based on the dynamic capabilities vision of competitive strategy, this article presents a conceptual model that shows how companies develop products that are intensive in high level knowledge. The third most cited article also addresses the theme of international entrepreneurship. The case study method was adopted to examine the mechanisms and generative processes of network capacities.

The fourth article relates the notions of organizational learning and entrepreneurial orientation in the body of international entrepreneurship. The authors suggest that the intensive renewal and exploitation of knowledge in foreign markets and the internationalization process itself can increase internationalization by affecting the perceptions of opportunities offered by international expansion.

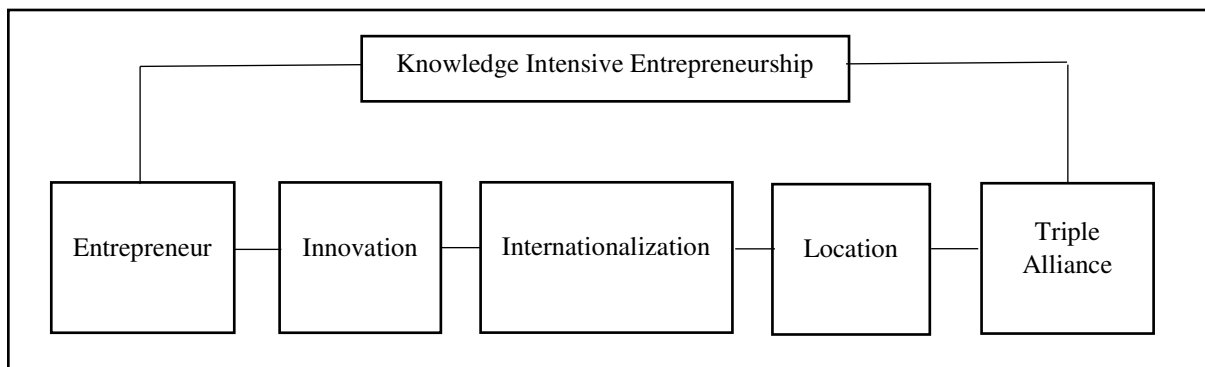
Finally, the last quoted article uses a documentary analysis approach to understand that in knowledge-intensive contexts, managers should focus on adapting pay packages to help minimize the adverse impact of employee performance.

Content Analysis

From the eighty-five (85) articles selected after the filter mentioned in the descriptive analysis section, they were conducted based on an exhaustive reading of the selection, and the mapping into categories (WEBER, 1990), which allowed a better division and understanding of the proposal for a literature review on the subject. Duriau et al. (2007) argues that this type of research that allows the analysis of content and the creation of key "constructs" enables the development of growing areas or that have not yet been explored.

The mapping of all these factors led to the creation of 5 major key categories (positioning themselves as influential to the concepts and theoretical and empirical analyzes of knowledge intensive entrepreneurship), which allowed the expansion of the fields of study and future research, as shown in the figure 2 below:

Fig. 2 - Categories of main empirical and theoretical contributions in KIE



Source: Authors

Entrepreneur

We identify that twenty-six articles (26) have their contribution based on the entrepreneur axis as a person, which allows the visualization of key characteristics such as: human capital (GUMBAU; ALBERT, 2017; COAD, 2014), entrepreneur employer. In addition, the influence and significance of the entrepreneur's role in the business model for success (FLORÉN; RUNDQUIST; FISCHER, 2016; PALACIOS-MARQUÉS; PERIS-ORTIZ; MERIGÓ, 2013).

Only two empirical studies focus on the discussion of genres in the personal and individual constructions of entrepreneurs, which allows us to conclude a niche for future research. The emphasis on this criterion refers to the proposal of demythologizing the female inferiority in the conduction and creation of entrepreneurial and innovative companies, such as KIE - knowledge-intensive entrepreneurial (AMOROSO; LINK, 2018), including in the financial valuation, in the form of profit or investments.

The network of knowledge makes its intercession with entrepreneurs, as an integral part of the business life cycle and the quest for success, is what justifies Elia, Margherita and Petti (2016) in the development of a theoretical ecosystem named "EGO System", which allows the analysis of the individual characteristics of interest and ego of the entrepreneur linked to the creation of a perfect mechanism that allows the conduction for business success.

Five studies defend the question of entrepreneurs in relation to knowledge exchange, having as main figure the question of their entrepreneurs or coordinators of entrepreneurial activities, which allow the creation of networks of development (SOETANTO, 2017), and sharing strong ideas or weak, that allow the development of knowledge and innovations to the proposed business model, even by the simple exchange of experiences already acquired (ANDERSSON; HELLERERST, 2009).

Of these five articles mentioned, only two, being one of theoretical analysis and another empirical one, relate the obligatory influence of technology and its environments, in the sharing of information among those involved, as is the case of e-learning (BOUNCKEN, KRAUS, 2013; VAN STEL; MILLAN; ROMAN, 2014).

Empirical research that deals with the subject, relates the exchange of information with interdisciplinarity even between countries, in search of continuous improvements to the productive process and to entrepreneurship, as is the case presented by Mendonça and Grimpe (2016), which promotes a comparison between innovation and the transition of experiences between two European countries, Portugal and Germany, with the main difference being the ability of their workforce, even in degrees of specialization.

Innovation

Twenty-one (21) articles are related to the category of innovation and the relation to information sharing in the whole process of entrepreneurship as a business differential, Karagouni (p.76 / 77, 2018) states that: "Intensive knowledge entrepreneurship (KIE) seems to be capable of satisfy the need to change companies, especially to face changing business environments.

After analyzing the present base, we identified the presence of one (1) mixed study, that is, with theoretical and empirical characteristics, which allows the relation of the level of innovation to the power of social, human and financial capital involving small and medium enterprises (OMRI; FRIKHA; BOURAOU, 2015), the authors further argue that this capital pool is considered as justification for improving, sharing or even acquiring meaningful information, which would conclude in organizational success.

Two theoretical articles describe the link between innovation and concepts that encompass KIEs, especially the creation of models that fill knowledge gaps and shape improvements in existing business structures (SALLOS; YORUK; GARCÍA-PÉREZ, 2017). On the other hand, Landström, Åström and Harirchi (2015), carry out the analysis of the conceptual interconnection of the fronts of innovation and entrepreneurship, which, although considered distinct, relate to issues of evolutionary interests, such as the sharing of information.

Empirically, the word innovation drives us to analyze new business concepts, including current forms of business look. We have identified one (1) study that deals with the lowtech issue, companies that have a low level of innovation and technology, such as a logging company in Greece (KARAGOUNI, 2018), as opposed to two (2) studies that demonstrate the importance of spin-offs, formulated by splits in the opening of new innovative businesses and with the retention of process knowledge, common in Italy (MUSCIO; QUAGLIONE; RAMACIOTTI, 2016).

Internationalization

This category counts with the presence of fourteen (14) articles, which allow the observation of issues involved to the power of globalization and the dynamism of information, especially in relation to sharing. All articles highlight the importance of economics, including the discussion of the maturity and opportunities of companies for international expansion (DIMITRATOS, 2016).

The theoretical highlight on the subject is found in the study of Cano-Kollmann, Hannigan and Mudambi (2018) in the relationship of concepts and fundamentals of international business and innovation, with the creation of three lines of trends: i) global marketing intermediation of value, at the entry of multinationals ii) focus on knowledge and sharing issues, mainly linked to technological dynamism and iii) emerging markets as the main impact of the world economy.

Two articles also develop the linkage of knowledge-intensive companies and the suffering of the negative issues of internationalization, especially when they involve issues of market inconstancy or turbulence in various sectors of development (KUIVALAINEN et al., 2004). The empirical notoriety allows the analysis of two (2) distinct studies in New Zealand (PELLEGRINO; MCNAUGHTON, 2015) and in Norway (ASPELUND et al., 2017), but which have the common knowledge intensity link in entrepreneurial companies and the search in the discovery of which factors of success, although in distinct markets, international and in some cases without the presence of a local tradition.

Location

This category of eight (8) studies allows a view of the regional and geographic impacts of entrepreneurial companies, allowing the mapping of intensification to local and social improvements, in favor of balance. We did not identify studies that allowed individual analysis of the theoretical spheres in an exclusive way, once the subject proposed in the axis, requires a greater empirical and theoretical interconnection, even as a model of justification.

Thus, we proceed with the analysis of three (3) empirical studies, two (2) of which allow the discussion of urban and rural circumscription and their specifications of choice, while the third covers the periphery issue as a focus on entrepreneurial issues and complex.

Both articles share the understanding that knowledge-intensive entrepreneurship, have a prevalence in relation to urban regions to the detriment of rural ones, taking into account local and economic issues, as is the case of large centers such as São Paulo-Brazil (FISCHER;

QUEIROZ; VONORTAS, 2018), or the specification of the enterprise as determining the choice of installation (FERREIRA, 2016).

In relation to the periphery, the study allowed the analysis in Cape Breton, located in Canada, which considered as periphery became a cluster of information and informatics, after the application of an innovative and intensive learning model in the molds of a startup, giving a distinct look to simply economic, geographic and social issues (RAE, 2017).

Triple Alliance

The justification for this category is the main relationship to the three main axes linked to innovation issues and to entrepreneurship processes, as a form of improvement and compliance with governmental public policies (GUERRERO, URBANO, 2017). In this way, the analysis allowed the classification of sixteen (16) studies that are involved in this triangulation: universities, industry and government.

Two articles describe the importance of public power in the development of knowledge-intensive services, including the Spanish empirical exemplification of entrepreneurial fortification (BELSO-MARTINEZ; MOLINA-MORALES; MAS-VERDU, 2013).

One (1) empirical study demonstrates the relationship of 105 European universities in academic development, the real needs of entrepreneurship in relation to practical application (VAN LOOY, 2011). At least eight (8) studies, classified as mixed, defend the importance of the university in the process of student development in relation to the entrepreneurship window and the position of process incubators that can link the triple alliance to society (SECUNDO et al., 2017). For Fernandes and Ferreira (2013) the relationship between intensive knowledge and university projects is not related to the need for technology, but to the issues of proximity between the triple alliance.

The KIE-Knowledge Intensive Entrepreneurship division, in 5 key categories (entrepreneurs, innovation, internationalization, location and triple alliance), allowed a better visualization and understanding on the subject that is in continuous evolution, not only before the theoretical conclusions, but in their relationship with practical and everyday issues.

The categories allowed the creation of a separation, aiming at a specific and singular depth, but it is necessary to increase the consideration that the categories are not presented through the 85 articles in an individualized way, which justifies their interdisciplinarity on each subject, or on each approach.

In practical terms, this relationship of subjects and articles, in view of the large approaches, have made the activity of this framework more delicate, since sometimes we come across the connection in more than one key category.

Thus, the analysis and the branching allows, above all, the opening of a window to the knowledge on the subject, although by the empirical or theoretical vies, which we use as one of the criteria for the separation of the articles within the categories, and that consequently will bring us present and future issues on the KIE approach.

Analysis of future studies.

After analyzing the contributions in the scientific production in KIE, we verified the main gaps and future directions suggested by the authors of the field.

Table 3 - Mapping of the main future research in KIE

Category	Authors	Future Directions
Entrepreneur	KARAGOUNI, 2018	Focus on case studies in KIE companies in traditional sectors of the economy.
	HSIAO; CHEN; CHOI, 2017	Understand how knowledge transfer influences relationships between acting partners.
	MENDONÇA; GRIMPE, 2016	Explore the interaction between the regional and basic infrastructure institutional capacity for entrepreneurship.
Innovation	MUSCIO; QUAGLIONE; RAMACIOTTI, 2016	Explore the impact of regulation at the departmental or individual level to distinguish between different types of spinoffs (service sector, manufacturing, etc.).
	BAVIERA-PUIG et al., 2013	Study a broader comparison, including technology centers from different countries.
	WILLIAMS; LEE, 2009	Research should be carried out on emerging organizational forms and managerial challenges related to changing focus on adventure and learning guidelines for R & D-intensive companies.
Internationalization	DE CLERCQ; SAPIENZA; CRIJNS, 2005	Future researchers can examine the process that entrepreneurial orientation helps to overcome the organizational fear of intensive cross-border systems.
	PELLEGRINO; MCNAUGHTON, 2015	A longitudinal study combining observations and retrospective reports could help to understand the challenges of companies that are in the midst of internationalization and others that have already internationalized.
	ISMAIL; KUIVALAINE N, 2015	Investigate internal and external factors in parallel with geographic scope to improve understanding of their effects on the international performance of SMEs.
Location	VAILLANT; LAFUENTE; SERAROLS, 2012	Explore new types of knowledge-based enterprises, such as manufacturing or high-tech activities associated with the creative industries.
	RYPESTØL; AARSTAD, 2018	Future studies should therefore seek to identify whether different regional characteristics can have divergent effects on business innovation and growth ambitions.
Triple Alliance	GUERRERO; URBANO, 2017	Focus on reinforcing statistical models using techniques such as multilevel analysis that allow the exploration of regional impact on innovation performance using other variables and databases.
	GEMMELL, 2017	Further research on heterogeneity of co-founders and shared cognition could have a major impact on the formation and composition of the start-up team.

Source: Authors

It is verified that the researches point out different paths for the future studies that seek the theoretical advance of KIE. Our focus here was generally to systematize and organize the main possibilities of future paths suggested by the authors of the field. In relation to the categories of entrepreneurs and innovation, which were the most frequent, we talk about human capital, skills and people relations between partners.

The entrepreneur's role appears to be crucial in the decision-making of knowledge-intensive companies, so the focus appears in action among partnerships, traditional sectors, and infrastructure training for entrepreneurs (KARAGOUNI, 2018; HSIAO; CHEN; CHOI, 2017;

MENDONÇA; GRIMPE, 2016). The innovation is more related to the sectors and the technology in which these companies are incorporating (MUSCIO; QUAGLIONE; RAMACIOTTI, 2016; BAVIERA-PUIG et al., 2013; WILLIAMS; LEE, 2009).

All categories somehow show that knowledge in KIE is still being structured, and that exploratory research and more in-depth cases are needed to unravel the most important gaps within the field of entrepreneurship and what projections for the next few years.

CONCLUSION

Returning to the initially established objectives - (i) proposing a structure of theoretical and empirical contributions in KIE- Knowledge Intensive Entrepreneurship (ii) presenting an agenda for future research - it can be said that they were fully achieved.

From the content analysis, five categories emerged: (i) Entrepreneur, (ii) Innovation, (iii) Internationalization, (iv) Location and (v) Triple Alliance. None of these categories can be considered new or unpublished. However, the present research has raised the relationship of how they are incorporated into the KIE and a broad vision needed within this theme. Our data suggest that although the literature indicates a distancing of research in KIE, there are themes and approaches that are multidisciplinary in the studies, mainly the relation with internationalization (ASPELUND et al., 2017; DIMITRATOS, 2016; MAINELA; PUHAKKA; SERVAIS, 2014) and with the local and geographic aspects of this type of company (FISCHER; QUEIROZ; VONORTAS, 2018; FERREIRA, 2016).

We focus on a systematic analysis of quality literature, however, it can be said that the sample of articles is still a limitation of the study, since the web of science database has limiting policies to some periodicals and articles which could bring new insight into the KIE theme. We recommend that the researchers identify the synergies between and within the categories found here, and that can guide new research of a broad nature or focused on a specific theme, mainly because this production requires a complex and non-linear articulation of themes that are related to entrepreneurship.

It is understood that this research offers theoretical implications as it meets a gap observed through the analysis of the previous studies, mainly by the analytical effort on the theoretical and empirical contributions in KIE. In addition, this article contributes with the mapping for future research into gaps still unexplored. Finally, it should be made clear that KIE production has made great strides in the last 20 years, and that there are still many gaps to be explored.

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