

Disentangling the relationship between prior knowledge and entrepreneurial orientation: a bibliometric study

Comprendiendo la relación entre conocimientos previos y orientación emprendedora: un estudio bibliométrico

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Abstract: This paper analyzes the theoretical relationship between knowledge and entrepreneurship through a bibliometric study. Several indicators are drawn from the Web of Science database using the HistCite software for bibliometrics, including annual publications, citation density, and journals with the highest number of publications. For the empirical application, a qualitative approach was adopted through a case study of four companies located in Valencia with the application of a semi-structured interview. The Atlas.ti software was used to analyze the data. The results indicate a relationship between knowledge and entrepreneurship constructs through theoretical modeling, highlighting the importance of the origin of knowledge for new venture creation, knowledge commercialization processes through entrepreneurship opportunities, and the origin and transmission of knowledge in organizations with entrepreneurial orientation (EO). The main limitation is the dispersion of research topics and the exclusion of publications that did not address the investigated relationship directly. The theoretical model proposed in this study can be extended to different spheres to identify and generate entrepreneurship opportunities, especially in universities and incumbent firms. Future studies should further validate the model empirically.

Keywords: Knowledge, entrepreneurship, entrepreneurial orientation, business opportunity, bibliometrics.

Resumen: Este trabajo analiza la relación teórica entre conocimiento y emprendimiento a través de un estudio bibliométrico. Se extraen varios indicadores de la base de datos Web of Science utilizando el software HistCite para bibliometría, incluidas las publicaciones anuales, la densidad de citas y las revistas con el mayor número de publicaciones. Para la aplicación empírica se adoptó un enfoque cualitativo a través de un estudio de caso de cuatro empresas ubicadas en Valencia con la aplicación de una entrevista semiestructurada. El software Atlas.ti se utilizó para analizar los datos. Los resultados indican una relación entre el conocimiento y los constructos de emprendimiento a través de la modelación teórica, destacando la importancia del origen del conocimiento para la creación de nuevos emprendimientos, los procesos de comercialización del conocimiento a través de oportunidades de emprendimiento y el origen y transmisión del conocimiento en organizaciones con orientación emprendedora (EO). La principal limitación es la dispersión de los temas de investigación y la exclusión de publicaciones que no abordaban directamente la relación investigada. El modelo teórico propuesto en este estudio puede extenderse a diferentes ámbitos para identificar y generar oportunidades de emprendimiento, especialmente en universidades y empresas incumbentes. Los estudios futuros deberían validar aún más el modelo empíricamente.

Palabras clave: Conocimiento, emprendimiento, orientación emprendedora, oportunidad empresarial, bibliometría.

1. Introduction

Traditionally, the literature has focused on entrepreneurship and knowledge as independent domains. Interest in the study of entrepreneurship has grown during the last decades (Cancino et al., 2020; Landström et al., 2012; Serida & Morales, 2011; Smirnov, 2017) on the basis that an entrepreneur is an economic agent who combines and coordinates factors of production, and moves economic resources from low productivity and low income towards higher productivity and profitability (Say, 1821). The importance of knowledge as an intangible asset has, meanwhile, gained traction with the rise of concepts like knowledge management, organizational learning (Mašić et al., 2017), and the human vision of knowledge with its focus on value in organizations (Nonaka, 1994; Prieto & Revilla, 2004).

The relationship between knowledge and entrepreneurship is based on the Austrian theoretical economics approach presented by Mises (1949) and Hayek (1945), which focuses on the role of knowledge in the market equilibrium process in which participants acquire greater knowledge from possible actions in supply and demand, thus generating entrepreneurship opportunities.

Drawing on Austrian economics, Shane (2000) points out that discovering and exploiting opportunities often requires people to have prior knowledge related to such opportunities. Mosinska (2013) focuses on the role of knowledge in technological entrepreneurship, highlighting the interest of entrepreneurs, academia, and the scientific community in establishing connections between these two fields of knowledge, as well as identifying the main ideas driving research on entrepreneurship with an emphasis on knowledge as its main resource.

The purpose of this study is to identify the elements involved in the theoretical relational model between knowledge and entrepreneurship, to contribute to the discovery of entrepreneurship opportunities, and to support the generation and consolidation of new ventures.

2. State of the art

Historically, the literature has separated its interest in entrepreneurship and knowledge, but these concepts have evolved both theoretically and in their applications to allow for the study of their relationship. Entrepreneurship was not initially a field of scholarship in its own right, but was mostly considered theoretical and used as a context to observe other phenomena. The first author to grant an economic meaning to entrepreneurship was Richard Cantillon in 1755; also in the middle of the 18th century, Adam Smith associated the entrepreneur with the establishment of new production, while Jean Baptiste Say, in 1845, identified the entrepreneur as an economic agent (Landström et al., 2012; Smirnov, 2017).

After World War II, entrepreneurship lost ground (Audretsch et al., 2006). But from the 1980s onwards, Schumpeter (1942) stood out with his economic theory based on change, novelty and the innovative entrepreneur (Van Praag, 2005, as cited in Landström et al., 2012). Schumpeter's studies gave way to the Austrian School of economic thought, in which another vision of the entrepreneur was born, represented by Menger in the 19th century and developed by Mises and Hayek in the 20th century. The Austrian school of economics argues that anyone with the kind of information needed to predict the behavior of businessmen has a good incentive to become an entrepreneur

(Casson, 1982). In 1973, Kirzner developed the concept of entrepreneurial discovery, derived from Mises' approach seeing any individual as an entrepreneur if he or she decides to act in the face of uncertainty, and from Hayek's explanation of knowledge involving creative entrepreneurs who pursue better mutual information under disequilibrium conditions (Kirzner, 1997; Landström et al., 2012; Smirnov, 2017).

At the beginning of the 21st century, entrepreneurship has been recognized as an engine of social and economic development worldwide. The definition of entrepreneurship encompasses new and dynamic businesses, as well as interactions with organizations (Acs & Audretsch, 2003). In a seminal study, Shane (2000) gave special attention to the question that has directed the research focus of the discipline in recent years: where do opportunities come from? A large part of the literature on entrepreneurship looks at how opportunities for new products and services are discovered, created, and exploited (Shane, 2000; Venkataraman, 1997), while some have focused specifically on the distinction between discovery and creation (Acs & Audretsch, 2010; Alvarez et al., 2010).

Knowledge has been studied implicitly throughout history (Wiig, 1999); since classical antiquity, the history of philosophy can be considered the relentless search for the meaning of knowledge (Nonaka, 1994). The conception of knowledge as an intangible asset, however, was not developed until the second half of the 20th century, when the notions of knowledge management and organizational learning gained traction (Mašić et al., 2017). The social purpose of knowledge began with the Enlightenment, with the pursuit of knowledge for knowledge's sake. The knowledge era in 1881 cleared the way for the scientific approach of Frederick Taylor, which introduced a management angle: progress was about finding out how existing knowledge could be better applied to produce improved results—knowledge became a resource. The knowledge era gained momentum around 1970, by virtue of the work done by Chris Argyris and Donald Schon, who first identified major differences between what people say and do, and what actually occurs. This launched the knowledge economy (Allee, 1997), in which the generation, dissemination, and productive use of knowledge has a predominant influence in the creation of wealth (Brinkley, 2006).

Today, a remarkable phenomenon of the knowledge economy is that information has become a commodity itself. The ability to learn is becoming the core competence; the greater the ability to develop knowledge, the greater the likelihood of continued success (Allee, 1997). Based on the preceding state of art, the following research questions are proposed for this study:

- In the scientific literature, there are contributions and orientations to the relationship between entrepreneurship and knowledge?
- Do the existing theoretical and empirical contributions enable the identification of a theoretical relational model between knowledge and entrepreneurship and its determinants?

3. Methodology

Bibliometric studies are an effective way to investigate and examine performance in a knowledge domain (Wallace et al., 2011); they allow the characterization of scientific production as a key strategy to unveil the implicit behavior in the dissemination of knowledge (González-Valiente, 2016).

A systematic review, on the other hand, provides an in-depth analysis of the literature to highlight strengths and weaknesses as well as existing research gaps (Ponce-Espinosa, et al., 2020, 2022; Wang et al., 2018).

Generally, the review process consists of three parts: data collection, data analysis, and synthesis. For the proper execution of a systematic literature search, a roadmap document is elaborated to provide a detailed description of the steps for a proper search. The objective of this methodology is developing a conceptual consolidation of a broad and fragmented field (Crossan & Apaydin, 2010).

The Web of Science (WOS) Social Sciences Citation Index (SSCI) database was exploited to investigate the evolution of topics covered and the contributions in this field of knowledge, this is "one of the most comprehensive databases of peer-reviewed journals in the social sciences" (Crossan & Apaydin, 2010, p.1157). The period of the study was established as between 1945 and 2016, which was available in the database at the time this research was conducted (February 22, 2017).

The first step was to identify the areas of study; this research is interested in the relationship between knowledge and entrepreneurship, for which the keywords had to relate to knowledge and entrepreneurship. The keywords identified were the following: knowledge management, knowledge generation, tacit knowledge, transfer of knowledge, entrepreneurship, entrepreneurial orientation, entrepreneur. A preliminary review of publications related to the research area verified that the selected words were appropriate, upon which it was decided to focus on the following search terms: knowledge, knowledge management, entrepreneur.

To ensure that all relevant and pertinent publications were included, the WOS-SSCI database was searched for the keywords "knowledge", "entrepreneur*" and "knowledge management", in three combined searches, considering two criteria: that the type of document was an article or a review, and that the language was English.

- First search: title (Knowledge) and title (Entrepreneur) = 221 articles.
- Second search: title (Knowledge management) and topic (Entrepreneur) = 22 articles
- Third search: title (Entrepreneur) and topic (Knowledge Management) = 34 articles

Excluding duplicate articles, a total of 200 articles were found. HistCite software was used to carry out the bibliometric analysis of this group of articles. The software generates chronological maps of collections of topics resulting from searches in the ISI Web of Science (Garfield, 2003), and it highlights the most cited works inside and outside of the collection (Oliveira et al., 2016). The publications were then grouped according to the results obtained. The first group of interest was compiled by listing the 200 articles in descending order according to the number of citations they received, using the Total Global Citation Score (TGCS; Oliveira et al., 2016). Next, taking as selection criterion the 5% of the most cited articles, fundamental documents, and the documents of main interest (Garfield, 2003), the total number of documents in this group was reduced to ten. Analysis of titles and abstracts of these ten articles was performed, and it was concluded that three of them did not focus on the knowledge-entrepreneurship relationship, so the result for this first group, or Group 1, was seven articles, which will be later analyzed in depth.

For the second group, the selection was of those articles most cited between 2010 and 2016, considering the TGCS indicator and applying the same 5% criterion. This resulted in five articles after the review of title and abstract, reduced from the original six, for a more comprehensive analysis.

Based on the premise that high impact journals publish quality articles (Crossan & Apaydin, 2010), a search for the most recent articles (2013–2016) published in the top ten journals with the highest impact index (Journal Citation Reports), yielded 16 publications. The first general analysis ruled out six of these due to a lack of relation to the research area to be conceptualized, leaving a total of ten articles for deep review.

Next, a critical analysis was made for each of the selected papers (22 articles in total), with the support of a bibliographic review spreadsheet to collect all elements of the analysis (Medina-López et al., 2010). This process enables individual examination of studies and the identification of relationships between their components (Denyer & Tranfield, 2009, as cited in Zimmermann et al., 2016).

For the empirical application of this research, a qualitative approach is used, through multiple case studies, which allows the findings to emerge (Barrio et al., 2016; Shaw, 1999; Yin, 1994) and the model to be validated. theory presented through a first approach of the theory to the reality of the object of study (Snow & Thomas, 1994, as cited in Sarabia, 1999). To define the number of cases, we consider what was stated by Glaser and Strauss (1967), the theories or models that seek to obtain a degree of general applicability can be based on a limited number of cases, since "a single case can indicate a category or general conceptual property; a few more cases can confirm the indication" (p. 30). For Eisenhardt (1989), a number between 4 and 10 cases generally works well. With fewer than 4 cases, they suggest that it is difficult to generate a theory with much complexity, and its empirical basis is likely to be unconvincing, with more than 10 cases, it quickly becomes difficult to control the complexity and volume of the data (p. 545).

For the selection of cases, intentional sampling (Marshall & Rossman, 1995) is applied, companies that meet the minimum characteristics that allow answering the research questions: the study is carried out in Valencia (Spain) through 4 case studies, a particular productive sector has not been selected in order to analyze the various possible scenarios in terms of variables and context, companies that are currently directed or managed by the founding owner, consolidated companies that have been operating for more than 42 months (Huamaní et al., 2018), companies related to entrepreneurship centers in their locality.

The companies selected for the study have been chosen based on the aforementioned criteria (Table 1), in addition to considering the feasibility of access to the company and the availability of the CEO to participate in the interview and provide the necessary information for the investigation:

Table 1:
Summary table of the
selected cases

Companies	Business industry	Number of employees	Began operations
Pyro Fire Extinction, S.L.U.	Wildfire Safety	6	2013
RUDO APPS	Information and Communication Technologies	18	2016
Be more 3D	Ingeniery and arquitectory services	4	2015
Nespra	Telecommunications	3	2016

Information analysis is based on the construction of categories and a priori codes with a deductive approach. In order to systematize and control the data analysis process, qualitative analysis software will be used (Rodríguez et al., 2005). It has been decided to use the ATLAS.ti software, since its inclusivity stands out among its advantages, that is, it admits data of a different nature that are presented through conceptual networks, to facilitate the elaboration of theoretical models and writing of the findings (San Martín, 2014).

4. Results

Knowledge differs intrinsically from traditional factors of production and is characterized by two fundamental conditions: knowledge is non-excludable (inability to exclude others from accessing and using knowledge) and non-rivalrous (the use of knowledge does not prevent others from using it as well), given the relatively high degree of uncertainty, the greater extent of asymmetries, and the higher transaction cost of new ideas.

A firm may decide not to commercialize knowledge given its particular characteristics, such as its lack of speed, or because it cannot allocate resources efficiently, among other reasons (Ganco, 2013). The result of this is known as knowledge spillover, the gap between new knowledge and commercialized or economic knowledge, reflected in the inertia related to decision-making under uncertainty within established organizations (Acs et al., 2004; Audretsch et al., 2006; Audretsch & Keilbach, 2007).

It is in this filter that entrepreneurial opportunities are created, not only by investments in new knowledge and ideas, but also by the propensity of incumbent firms to pursue and fully commercialize only a specific subset of those opportunities (knowledge under-exploitation), which occurs due to frictions in knowledge transfers or information asymmetries within the firm (Audretsch & Keilbach, 2007; Ganco, 2013).

The prior knowledge of each person creates a “knowledge corridor,” which allows them to recognize certain opportunities (Venkataraman, 1997), and this can come from various sources such as work experience, formal studies, or other means, that influence the ability to understand, extrapolate, interpret, and apply new information (Roberts, 1991, as cited in Shane, 2000).

The empirical evidence in Shane’s study (2000) shows that many types of prior information influence the entrepreneurial process. People who have developed particular knowledge through education and work experience are more likely than others to discover entrepreneurial opportunities in response to a given technological change. This prior knowledge can be further developed through a variety of roles in their experience as suppliers, users, or manufacturers (Venkataraman, 1997).

When opportunity discovery depends on prior knowledge, one of the most important implications is that people will be more likely to discover opportunities in sectors they know well, rather than in promising sectors (Shane, 2000). Agarwal et al. (2007) point out that there are two different types of knowledge sources that launch a new venture:

- Previous work experience in companies with higher performance and status, as a strategic advantage to obtain external funding to launch the new company; and

- Acquisition of skills, technological capabilities, experience, and know-how in an established high-performing company that provides the knowledge base to create a new company.

Therefore, the authors conclude that the different origins of entrepreneurship endow founding entrepreneurs with different types of knowledge. As found by [Agarwal and Shah \(2014\)](#), entrepreneurial origin matters: it systematically results in differences in knowledge and capabilities, patterns of new venture formation, relationships with established firms, and performance.

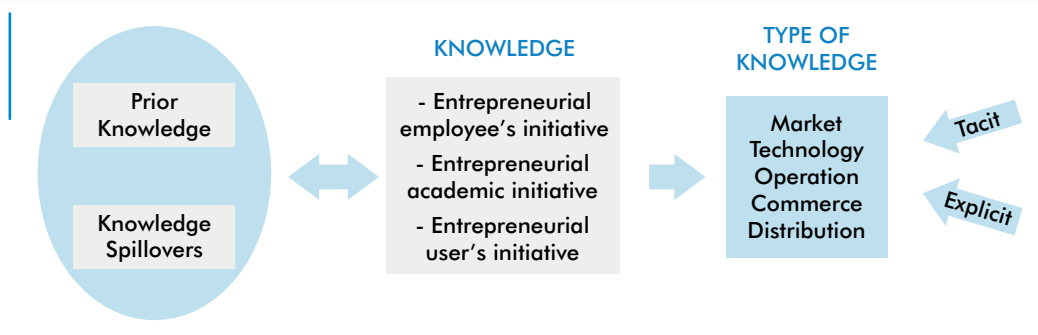
Once the source of knowledge for business creation has been defined, it is important to identify theoretical contributions to the literature regarding the type of existing knowledge. The main contributions begin with those from [Arrow \(1962\)](#), who defined knowledge as non-excludable and non-rivalrous, and continue with [Romer \(1990\)](#), who separated knowledge into two parts: (a) the total set of knowledge comprised by non-rivalrous and partially excludable knowledge, such as that codified and published in books, scientific articles, patents, and so on, which can be used in different applications based on documentation, and (b) the rivalrous and excludable knowledge, which is the personal (tacit) knowledge of individuals and groups—this is, the experience and knowledge generated ([Acs et al., 2009](#)), which happens to coincide with the contribution of [Polanyi \(1966\)](#), who classifies knowledge as tacit or explicit.

[Cohen and Levinthal \(1990\)](#) contributed by differentiating knowledge into two other forms:

1. Market knowledge, where customer problems are known and real market opportunities are identified, while determining the market value of new scientific discoveries or technological changes is relatively easy and learning about underserved markets is possible; and
2. Technological knowledge, which improves a company's ability to exploit an opportunity and respond quickly to competitive developments.

Based on the aforementioned scientific contributions, [Figure 1](#) synthesizes the first part of the theoretical model, referring to the origin of knowledge for entrepreneurship, where people's previous knowledge and non-commercialized knowledge gaps in companies lead to three main sources of knowledge for new ventures: entrepreneurship generated from knowledge as a former employee, from knowledge obtained in academia and from knowledge achieved as a user of an existing good or service. The knowledge either by experience or training, which can be tacit or explicit—can be fundamentally classified into the following types: market, technology, operation, commerce, and distribution, enabling the identification of profitable business opportunities.

Figure 1:
Origin of Knowledge
for Entrepreneurship



4.1 Commercialization of Knowledge through Entrepreneurship Opportunities

Where do these opportunities come from? To answer this question, the three channels of opportunities identified by Drucker (1985) will serve as a basis:

1. Inefficiencies within existing markets due to information asymmetries among market participants, or limitations of technology to meet certain known but adapted market needs.
2. The emergence of significant changes in social, political, demographic and economic forces that are largely beyond the control of individual agents; or
3. Inventions and discoveries that produce new knowledge.

Based on this, commercialization of knowledge becomes possible through the identification and exploitation of business opportunities by entrepreneurs. New entrepreneurs may have worked in universities or incumbent companies before deciding to commercialize new knowledge, thus inheriting the knowledge from their former employer and creating new products and even new markets through innovative new ventures (Mueller, 2006). Furthermore, the knowledge generated in universities can be commercialized in two ways: university-industry partnerships and the creation of university spin-offs.

Factors influencing opportunity exploitation

Acs et al. (2009) have pointed out that knowledge itself is only a necessary condition for the exercise of a successful enterprise in a growth model. The ability to transform new knowledge into economic opportunities implies a set of skills, aptitudes, perceptions, and circumstances that are not evenly distributed in the population but rather unevenly and exogenously distributed (Braunerhjelm et al., 2010). The theory presented by Acs et al. (2009) states that economic agents may decide not to create a new venture, even when they have a potential profit opportunity. This is explained by entrepreneurship being a function of the following factors: risk aversion, legal restrictions, bureaucratic restrictions, labor market rigidity, taxes, and lack of social acceptance, among others, such as culture, traditions, and institutions.

Figure 2 presents the second link in the proposed theoretical model, where knowledge is commercialized when the entrepreneur makes the decision to exploit existing markets or create new markets, and business opportunities are particularly knowledge intensive. This decision, along with the entrepreneur’s skills and capabilities and the interaction with environmental factors that have an important influence on markets, results in entrepreneurial action.

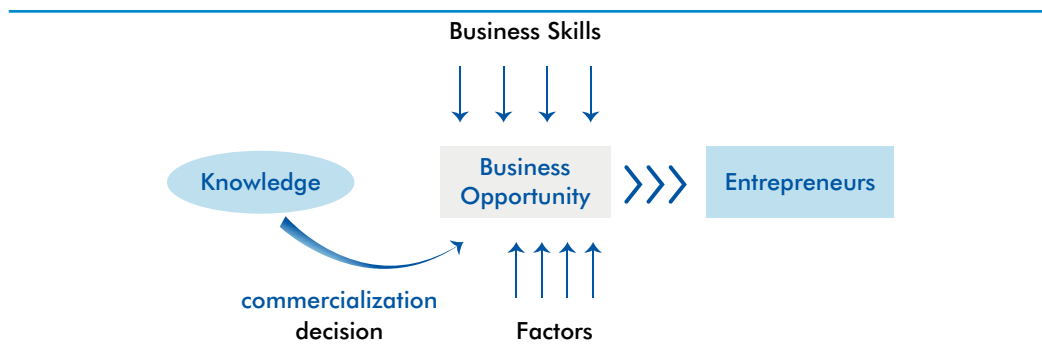


Figure 2:
Commercialization of Knowledge – Entrepreneurship

4.2 Origin of entrepreneurship Influences Entrepreneurial Orientation

As pointed out in a previous section, the institutional origin of knowledge can guide the activity and performance of the new firm. In this sense, [Agarwal et al. \(2007, p. 268\)](#) state that “[knowledge spillover-based strategic entrepreneurship] results not only in new venture formation, but also in heterogeneity in their capability and performance.” Through their experience as workers in incumbent organizations, entrepreneurs shape the capability and performance of new firms by virtue of the scientific, social, and market-based knowledge they bring from the organizations where they previously worked ([Braunerhjelm et al., 2010](#); [Carroll et al., 1996](#); [Helfat & Lieberman, 2002](#); [Klepper & Simons, 2000](#)). Endogenous learning-by-doing processes ([Nonaka, 1994](#)) can result in inter-organizational variation in the structure, strategy, routines, and culture of the new firm ([Sastry & Coen, 2001](#), as cited in [Agarwal et al., 2007](#)), suggesting that knowledge stocks in new venture creation leave a lasting imprint on a firm’s future competitiveness.

The literature suggests that when a new firm is founded, the capabilities and subsequent performance of the firm are influenced by the capabilities and knowledge acquired by the founder in the context of a practicing organization ([Agarwal et al., 2007](#)). A growing literature links the pre-entrepreneurial experience of founders to the actual entrepreneurial performance of the new firm ([Burton et al., 2002](#); [Shane & Stuart, 2002](#)): the knowledge context determines the formation and ways new firms capture value ([Agarwal & Shah, 2014](#)).

Entrepreneurial Orientation of an Organization

[Covin and Slevin \(1989\)](#) refer to entrepreneurial orientation (EO) as an entrepreneurial strategic posture characterized by frequent and extensive technological and product innovation, an aggressive competitive orientation, and a strong propensity towards risk taking from the managers. According to the knowledge-based view, a firm’s manager plays a key role in shaping EO by sharing knowledge specific to his or her functions with colleagues in other areas of the firm ([De Clercq et al., 2013](#)). Beyond the stock of knowledge held by the firm and the entrepreneur, the way in which management uses knowledge capable of impacting firm performance is of great relevance ([Wiklund & Shepherd, 2003](#)).

Authors such as [Covin and Lumpkin \(2011, p.863\)](#) conceive EO as "a sustained firm-level attribute represented by the singular quality that risk-taking, innovative and proactive behaviors have in common". It refers to "the processes, practices and decision-making activities that lead to new entry" ([Cardona et al., 2017, p. 42](#)) and is comprised by three dimensions:

Innovation: Tendency to develop and support new ideas, based on novelty, experimentation and creativity, introduction of new products or investments in long-term research and development ([De Clercq et al., 2013](#); [Lumpkin & Dess, 1996](#)). **Proactivity:** This is a posture of anticipating and acting on future market wants and needs, creating competitive advantage, bold and far-reaching strategies, and a tendency to challenge rather than respond to competitors' actions ([De Clercq et al., 2013](#); [Lumpkin & Dess, 1996](#)).

Risk-taking: This involves committing large amounts of resources to projects where the cost of failure may be high or the outcomes unknown, as well as a reliance on novel procedures and methods ([De Clercq et al., 2013](#); [Miller & Friesen, 1978](#)).

De Clercq et al. (2013) focus on investigating how knowledge exchanges and social capital can affect the formation of EO in an organization; firm EO is determined by the combination of different types of internal knowledge in an organization (Floyd & Lane, 2000) and the social mechanisms (dimensions of social capital) that underlie such combinations (Nahapiet & Ghoshal, 1998).

The exchange of knowledge induces improvements in EO, and to support this relationship, a focus is placed on the framework of knowledge. Authors such as Levin and Cross (2004) and Carlsson et al. (2009) argue that the knowledge embedded in a firm is a key resource for the generation of entrepreneurial activities; the processes of combination, selection, and retention of knowledge within the firm are fundamental for EO, because they allow the knowledge of individual managers to become the knowledge of the organization.

Figure 3 shows the third and last link in the theoretical model developed in this paper, where the origin of the knowledge prior to the creation of the venture is fundamental for its performance and outcomes. The entrepreneur's knowledge is transferred to the organization, achieving an adequate exchange of knowledge, which results in an entrepreneurial organization, one that is proactive, innovative and risk-taking.

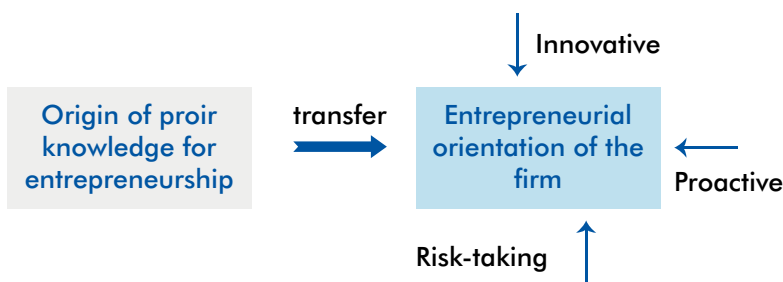


Figure 3: Origin of entrepreneurship influences the Entrepreneurial Orientation

4.3 Theoretical Model of Knowledge – Entrepreneurship

The study of the discovery of entrepreneurial opportunity has grown rapidly since the publication of Shane (2000). However, a systematic literature review shows that theoretical and empirical contributions have limited their attention to explaining entrepreneurship to a focus on individuals' characteristics and attributes. Currently, the academic understanding of the origin of opportunities continues to have limitations, but research has developed around issues such as prior knowledge and its importance for the discovery of opportunities. Further progress has been made in research on the theory of knowledge spillover, emphasizing its contributions to economic development through regional studies. It is pointed out that investments in knowledge by universities and regions are related to the amount of business activity associated with each university or region, thus evidencing the contribution of knowledge spillover to regional development and demonstrating that business decisions made under conditions of uncertainty are more likely to trigger entrepreneurship.

Existing studies have focused on the generation and exploitation of knowledge-based business opportunities (Wiklund & Shepherd, 2003); the influence of prior knowledge of markets, of ways to serve the market and of customer problems on the discovery of opportunities (Shane, 2000); and new knowledge as a crucial factor for innovation that is commercialized by transforming it into new products, processes and organizations, through university-firm partnerships or spin-offs

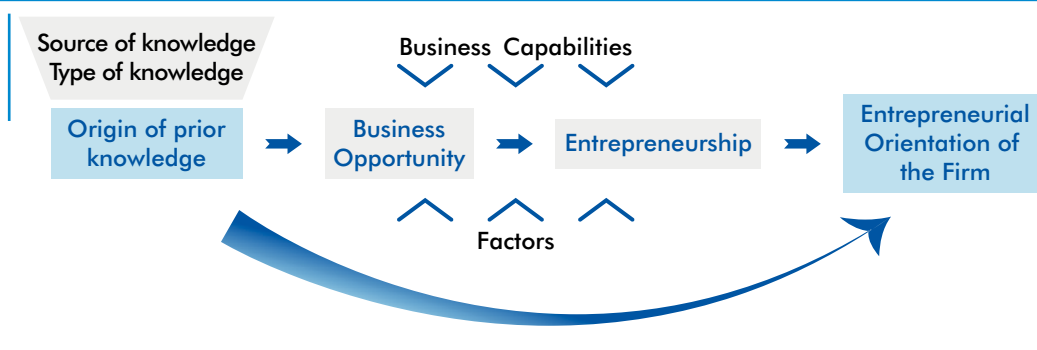
(Mueller, 2006). Audretsch and Keilbach (2007) also conclude that entrepreneurial opportunities are exogenous and systematically created by investments in knowledge by established organizations.

EO has been addressed by scholars such as Wiklund and Shepherd (2003), who refer to the positive impact of the set of knowledge-based resources on a company's sustainable performance. Among the main results are the creation and introduction of new products and technology, extraordinary economic results, economic growth, competitive advantages, dominance of distribution channels, brand recognition, and long-term performance considering three dimensions: innovativeness, proactiveness, and risk-taking. For their part, Nahapiet and Ghoshal (1998) point out that the entrepreneurial efforts of companies derive from combinations of different knowledge bases dispersed within the company. De Clercq et al. (2013) tested the premise that firms with higher levels of internal knowledge sharing show higher levels of EO, which vary according to the degree of formalization.

From the above, it can be seen that existing research has not yet focused on analyzing the importance of the knowledge base for the creation of new ventures, the influence of entrepreneurial skills and environmental factors at the time of making the decision to start an enterprise, and of the type and origin of prior knowledge that can endow created ventures with an EO. In other words, research has not yet established a relationship between the origin of knowledge for new venture creation and the EO of a company at a more solid stage.

In this sense, the existing theoretical and empirical contributions enable the identification of a theoretical relational model based on the connections between determinants of knowledge and entrepreneurship. Figure 4 summarizes the model resulting from the bibliometric analysis and the systematic review of the literature, where all the elements analyzed in previous sections finally connect. The implications of this model are diverse: the origin of knowledge is essential in the identification of business opportunities, which results in new ventures and in companies with an EO that seek sustainability and scalability. Governments, institutions, universities, and private organizations that want to promote entrepreneurship must recognize knowledge as a driver for the creation, permanence, and growth of innovative companies, while valuing the entrepreneurial capabilities of entrepreneurs and the environmental factors as determinants that motivate or limit the creation of companies.

Figure 4:
Theoretical Model
of Knowledge –
Entrepreneurship



The results of the empirical application are presented through a network diagram, where the different categories and generated codes are displayed, based on the elements that make up the knowledge-entrepreneurship model, as shown in Figure 5.

The diagram identifies 4 categories: source of knowledge, dimensions of knowledge, business opportunities and entrepreneurial orientation, each one is made up of codes that show different relationships of co-occurrence between them.

To explain the findings of this study, we start from what was stated by one of the interviewees "knowledge is very important because it is the basis on which something greater can be built, but knowledge by itself does not make a project viable".

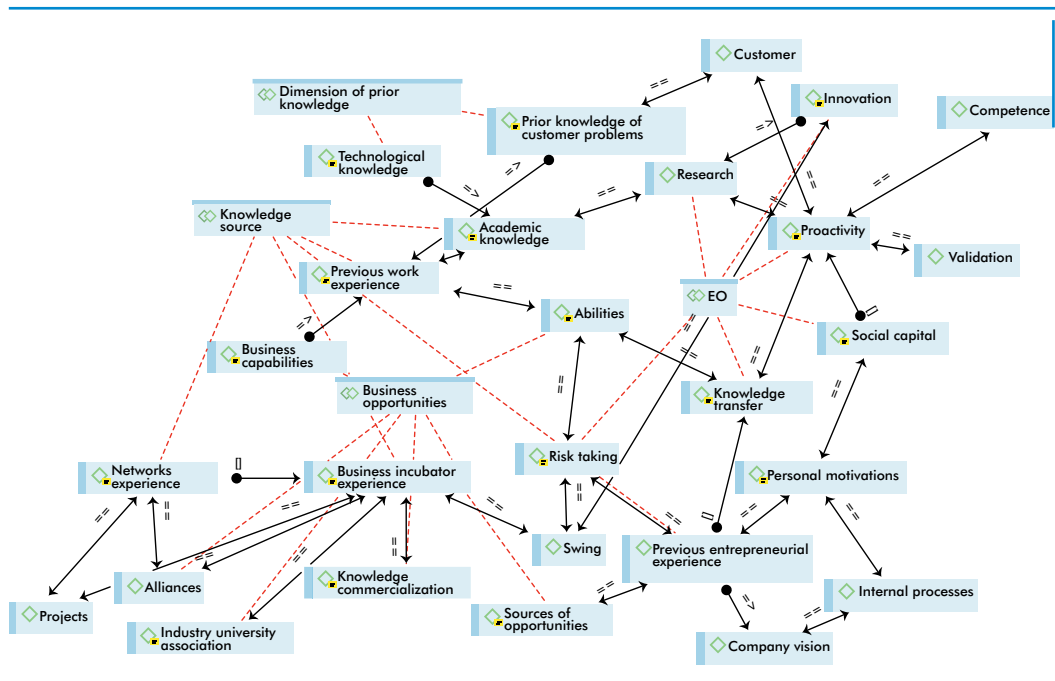


Figure 5: Network diagram on Knowledge – Entrepreneurship (created using Atlas.ti)

The sources of knowledge originate mainly from academic knowledge, previous work experience, experience in business incubators and experience in networks. Academic knowledge is reflected in the beginning of the company and in the future in the contribution of technological knowledge of entrepreneurs to produce, maintaining a culture of research and innovation.

Previous work experience mainly generates prior knowledge of the client's problems, generating a constant validation of products and services, which makes it a proactive company. The development of business skills and capacities generated by previous work experience motivates the transfer of tacit knowledge between the partners and employees of the new company, motivating the assumption of risks.

The experience in business incubators or entrepreneurship centers that is related to the experience generated through networks, contributes to the identification of necessary elements for the commercialization of knowledge, such as alliances, university-company association, possibilities to generate large projects, ease to achieve financing, which facilitates risk taking and a greater propensity to innovate.

Finally, the previous entrepreneurial experience allows the identification of sources of opportunities, the business vision prevails and the personal motivations that are transferred to the human resource as social capital, becoming proactive companies with an EO.

5. Conclusions

Through the bibliometric analysis and a systematic literature review, this research identified outstanding scientific contributions in the knowledge-entrepreneurship relationship, two concepts which are commonly studied as separate fields. Such contributions exhibit a linear trend in recent years, highlighting the need for more progress on the topic. The results highlighted different factors, such as the importance of the origin of prior knowledge for new venture creation, the process of commercialization of knowledge through business opportunities, and the origin and transmission of knowledge in an organization that leans towards an EO. The empirical application has made it possible to delve into some elements of the model and recognize those that were not theoretically identified, such as the importance of social capital as a vehicle between prior knowledge and OS.

These results are of interest to the field of entrepreneurship, which constantly seeks to explain scientifically where entrepreneurial opportunities arise and how to achieve venture sustainability.

These findings can also assist universities, given the evidence that the origin of knowledge for entrepreneurship is valuable to identify business opportunities, which tend to be discovered by people with an academic background or related work experience. In this sense, pre-professional internships in knowledge-intensive companies that allow students to become acquainted with marketing, production, and distribution practices, among others, stand out as a source of knowledge that can later be used for entrepreneurship purposes. Under this premise, the strengthening of study plans and research projects, added to internal incentives, will contribute to promoting the creation of university spin-offs, business consultancies, and the transfer of knowledge between universities and industry.

Universities can promote entrepreneurship through applied research or knowledge transfers to society and by encouraging research and internships for students that do not result solely in reports and publications, but also in the identification of business opportunities. Universities can motivate knowledge transfer with organizations through business incubators and other instances of entrepreneurship support to promote a sustainability-focused EO.

For people seeking to generate entrepreneurship without formal knowledge on how to identify opportunities, this study indicates that knowledge acquired as employees and entrepreneurs or the experiences in business incubators and networks can favor the identification of business opportunities, particularly considering entrepreneurial skills development and an assessment of environmental factors that act as enhancers or barriers.

Regarding companies, it is essential for them to recognize that the knowledge acquired by their entrepreneurs and intra-entrepreneurs must be continuously transferred to achieve sustained growth. The transfer of knowledge promotes a continuous transformation in terms of innovation, proactivity, and risk-taking; these three components contribute directly to growth and profit generation in an entrepreneurial organization.

The main limitations of this research were the relatively restricted number of articles identified and grouped by means of the bibliometric analysis, which searched the relationship between entrepreneurship and knowledge through keywords, and the relative dispersion of research topics. Despite the limitations, the results are considered valid, because they allow the connection of

theoretical elements validated in previous studies by representative authors in the field of knowledge, which will serve as a foundation for proving the model in empirical studies. Regarding the empirical approach, it is important to mention that it cannot be to discuss in detail each of the relationships or links of the model, due to the volume of data on the relationships of the different network codes, as well as the inevitable subjectivity of the researchers in the codification it is necessary to develop future works that allow to consolidate the conclusions and the generalization of the obtained results. Finally, future lines of research should apply and validate the proposed theoretical model through quantitative methods in empirical studies that could offer new findings. Regarding the knowledge-entrepreneurship relationship, comparative empirical studies in different geographical environments, in knowledge or technology-intensive industries, and in other sectors would expand the contexts investigated here and could motivate the inclusion of a new set of variables.

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