



# BIBLIOMETRIC ANALYSIS OF VENTURE TEAMS OF TECHNOLOGY-BASED FIRMS

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**ABSTRACT:** Due to its growing impact on the economic development of countries, research on venture teams in new technology-based firms - TBFs has been increasing in recent years, seeking to identify the success and failure factors of this type of firms, given their high mortality rates. This paper analyzes the changes that have occurred in the intellectual structure of this discipline through the bibliometric analysis of research on the theme of venture teams in the new TBFs. The information collected was extracted from the main collection of the Web of Science (WoS) and SCOPUS databases from 1987 to 2020. The Nvivo and VOSviewer softwares are used to perform the initial analyzes as well as the analysis of citations, co-citations, co-authorship, etc. The advances associated with the main authors, sources and countries, the general citation structure and the development of this field are presented. The results show a growing publication trend as of 2009, seeing a higher production of articles between 2014 and 2019. USA is the most influential country, followed by UK and Italy. The "Journal of Business Venturing" and "Technovation" are the most influential sources. The main contribution of this work is to show the evolution of this theme, so that researchers can use it in the future in their theoretical and research frameworks.

**KEY WORDS:** *Bibliometric analysis; New technology-based firms; Teams.*

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## 1. INTRODUCTION

The new technology-based firms (TBFs) according to Litan and Song (2008), are defined as those that have a business model strongly rooted in the development and application of a new technology, and have a positive impact on the economic development of the countries. They are objects of interest due to their ability to create high-quality employment, generate knowledge, make innovations, and energize industries thanks to their disruptive technologies (Colombo & Grilli, 2005; Song et al., 2008). They are characterized by being agile and having the ability to operate in a world with a volatile,

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uncertain, complex and ambiguous context (Xing et al., 2019), facing the uncertainty of both potential demand and technology (Sommer et al., 2009).

Its high mortality rates have made some researchers get interested in identifying the most determining factors of its success and failure. Song et al. (2008) found that the survival rate of TBFs established between 1991 and 2000 in USA after 4 years was 36%, falling to 21.9% at 5 years. In their research, they defined 24 success factors, grouped into 3 large groups: the market and the opportunity, the venture team, and the resources employed. In this same study, it was found that successful TBFs were founded by venture teams of between 2 and 5 members, and not by individual entrepreneurs. These entrepreneurs had more prior experience working together, had previously held similar roles, and had been involved in fast-growing companies competing in the same industry as the nascent TBF.

Other entrepreneurship researchers have focused their efforts on relating the characteristics of new entrepreneurs and the performance of TBFs (Shrader & Siegel, 2007). Aspelund et al. (2005) for example, affirm that for the venture team of the TBFs to be effective, it does not depend only on its size but also on how it is constituted. In addition, the previous business experience of the founders of the TBFs is decisive in the performance.

With the intention of identifying the works that have had a greater impact on the investigation of the venture teams of the TBFs and to analyze the changes that have occurred in the intellectual structure of this field, a bibliometric analysis is presented, showing the main authors, countries and journals that investigate this theme.

On the other hand, in order to establish thematic associations between scientific works, and to be able to identify the existing relationships between the key ideas of the different authors who write on this theme, maps were used that allowed visualizing elements such as: bibliographic coupling, co-citation, and co-authorship. Bibliometric maps serve as an organizing tool and analysis of scientific information and their objective is to show the structure and evolution of the field of scientific research, such as the research activity of the most representative researchers, the intellectual group of leading journals, the indication of similarity of important topics and concepts, etc. These maps are used to help users better understand the domain's area of interest and address their information needs clearly (Yu et al., 2018; Sampieri Cabrera & Trejo Rodríguez, 2015).

## **2. THEORETICAL BACKGROUND**

Chandler et al. (2005), affirm that operating in complex, dynamic and uncertain conditions imposes a greater demand for work on the venture team of new firms, with a direct influence on performance. Jin et al. (2016) carried out the first meta-analysis to examine the relationship between the composition characteristics of the venture team and the performance of the TBFs; affirming that higher levels of human capital (in terms of

education, experiences, knowledge and skills) allow venture teams to better face the labor demands of new companies immersed in this context.

According to Xing et al. (2019), the effectiveness of venture teams has a high incidence on the success of their firms. In their study on technology-based firms, and observing the effect of the characteristics of venture teams on their good performance, they found that it is important to analyze the skills, personality and needs of the business team at different stages of the process; in such a way that they can exploit their competitive advantage and focus on effective results, especially in a dynamic context.

Eliakis et al. (2020) examines the characteristics that affect the performance of a mature and constantly growing technologically innovative enterprise, finding that a number of characteristics pertaining to both the profile of the entrepreneurial team, as well as of the employees, significantly affect company survival and growth in this context. The most important characteristics of the entrepreneurial team are: perseverance and passion for long-term goals, flexibility, prior work experience in the same industry of the new firm, team size (the more members that take part in the founding team, the greater is the probability of survival for a new venture), team heterogeneity, entrepreneurial experience.

De Mol et al. (2019) conducted a study with high-tech startups, to investigate how the average level of business passion and the diversity of passion of venture teams contribute to the performance of the firm in the short and long term. They found, among other things, that encouraging teams to discuss passion in the firm's operating agreement, and to address known mechanisms to address interpersonal conflicts productively, can help lessen conflict in later stages of the company, when they are taken strategic decisions that impact performance.

Birley and Stockley (2000) state that despite the existence of many studies about the venture team and its impact on the growth of companies from the organizational, strategic and psychological perspective; the dialogue is incomplete, and they suggest that studies on this issue should be delved in order to know the how and why of their successes and failures. Eliakis et al. (2020) and Bolzani et al. (2019) state that despite the fact that the venture team is a subject that has grown substantially in interest to researchers, the literature is quite fragmented.

### **3. METHODOLOGY**

The bibliometric method allows us to analyze a specific research field and build a general image of it, taking into account articles, journals, authors, institutions and countries (Merigó et al., 2015).

There are different bibliometric indicators such as quantitative indicators of scientific activity, where the number of publications is included, thus measuring the productivity of the researcher; and impact indicators, based on the number of citations obtained by the works, and that characterize the importance of the mentioned production, based on the recognition granted by other researchers (Merigó et al., 2018; Bordons & Zulueta, 1999).

To perform the bibliometric analysis of this study, the main collection of the Web of Science (WoS) database was consulted using the following search equation: THEME: (“New Technology Ventures” OR “Technology Entrepreneurship” OR “Tech start up” OR “Tech startup” OR “High tech Start up”) AND (“team” OR “funding team”), finding 28 documents. Additionally, the same search strategy was executed in the main collection of the SCOPUS database: TITLE-ABS-KEY (“New Technology Ventures” OR “Technology Entrepreneurship” OR “Tech start up” OR “Tech startup” OR “High tech Start up”) AND (“team” OR “funding team”). In this occasion, 77 documents were recovered.

Duplicates were eliminated, resulting in 83 documents in total, published between 1987 and September 2020, of which 51 are Journal Articles, 29 are works published in the Proceedings of a Congress and 3 are Books. With these results, the bibliometric analysis was performed.

The bibliometric analysis was carried out, graphically mapping the bibliographic material using the VOSviewer software, which collects the data and builds up maps in terms of bibliographic coupling, citation, co-citation, co-authorship and co-occurrence of keywords (Merigó et al., 2018). In order to identify the main terms most frequently found in the performed systematic data search, the NVivo software (version Release 1.3) was used. This software is used for qualitative and mixed methods research, and facilitates comparison and identification of different relationships in the data (Bergeron & Gaboury, 2019).

## 4. FINDINGS

### Publications and citation structure

When identifying the general panorama of the main publications about the venture teams of the new TBFs between 1987 and September 2020, and analyzing the changes that have occurred in the intellectual structure of this discipline, it was found that there is not much literature published about the venture teams in the new TBFs. However the annual number of published documents has been gradually increasing, having published 72.3% of the documents between 2010 and 2020.

To facilitate the identification of these terms, a word cloud graph was used. The most widely used works in searches were: team, technology, entrepreneurship, start, business, tech, management, among others. It is important to point out that the terms: “team”, “technology” and “entrepreneurship” begin to be used more often from 2004, finding that it is from 2009, when their use increases more significantly, which indicates that the theme of venture teams in TBFs is beginning to gain relevance among researchers.

### Main authors and countries

When carrying out the analysis of the most productive authors, it is found that authors like Knockaert M. and Bjornali E.S. are highlighted with five and four publications,

respectively. All the other authors have two publications on this theme, and are classified in the ranking after considering the number of citations per author. Of the 13 authors who have published the most, three receive more than 100 citations, with Clarysse B. at the top of the list with over 300.

When analyzing the countries with more publications on new TBFs' venture teams, USA has more works with 34 publications and 771 citations, followed by UK, Italy and Belgium, with 9, 7 and 6 publications, and 280, 295 and 381 citations, respectively.

### **Main sources**

The leading sources in publishing documents related to new TBFs' venture teams were: "ASEE Annual Conference and Exposition, Conference Proceedings", "Journal of Business Venturing", "Technovation" and "Proceedings - International Conference on Software Engineering", with 7, 3, 3 and 3 publications, respectively. "Journal of Business Venturing" and "Technovation" had an h index of 3. Despite "ASEE Annual Conference and Exposition, Conference Proceedings" having the most publications, its h index was 2.

## **5. CONCLUSIONS**

The number of published documents has gradually increased since 2004, with more documents being published between 2010 and 2020. This can be explained due to the interest aroused in recent years to understand the key success factors of this type of firms (among which are venture teams), given their strong impact on socio-economic development and their high business mortality rates.

When carrying out the analysis of the most productive authors, it is found that Kockaert M. (Belgium) and Bjornali ES (Norway), are the authors with the biggest number of publications, but they are not the most influential, because Clarysse B. (Belgium) and Li H. (United States), received many more citations, even though they published fewer documents.

USA is the most productive country for publications on this subject, with an annual number of documents well above the rest of the countries, followed far behind by UK, Italy, Belgium and Norway.

An analysis of the citation structure of the most published sources in the area was carried out, defining the h index for each of them. In this ranking, it is observed that "ASEE Annual Conference and Exposition, Conference Proceedings" is the source that has the largest number of documents published on this theme, but it is not the most influential, because it did not receive the biggest number of researcher citations. The most relevant sources in this regard are "Journal of Business Venturing" and "Technovation".

This theme is becoming a field of growing interest for researchers, entrepreneurs, and even for governments in the design of their public policies. The main contribution of this work is to show the evolution of this topic, so that researchers can use it in the future in their theoretical and research frameworks. For example, topics such as entrepreneurship,

venture capital, technology entrepreneurship, business growth, and innovation could be further explored.

It is expected that, with the evolution of research in the technological field, similar dynamics of knowledge creation will occur that will contribute to growing the field of research of venture teams and their influence on new technology-based firms even more.

## CONFLICT OF INTEREST

The authors declare not to have any competing financial, professional, or personal interests from other parties.

## AUTHOR CONTRIBUTIONS

*Ribes-Giner Gabriela*: Conceptualization, Methodology, Investigation, Writing - Review & Editing Supervision. *Moya-Clemente Ismael*: Conceptualization, Methodology, Investigation, Writing - Review & Editing Supervision. *Alzate-Alvarado Ana Lucia*: Formal Analysis, Resources, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualization.

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