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**ORIGINAL**

## **Human capital and business growth of the Startups: an approach to the state of the art**

### **Capital humano y crecimiento empresarial de las Startups: una aproximación al estado de la cuestión**

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#### **ABSTRACT**

This document is a systematic and bibliometric review on the transitory characteristics and research trends in the last 7 years, on human capital and business growth in the field of startups. The exploration was carried out in the bibliographic database Scopus, obtaining 111 documents, including articles, book chapters, books, conferences and abstracts, in the areas of knowledge related to the topic. For this, the Biblioshiny web interface of the Bibliometrix package of the statistical program Rstudio was used, the file was processed in csv format downloaded from the Scopus metasearch engine. The results suggest a higher percentage of scientific articles (79 %), with a higher volume in 2021 (25 works), while the Journal of small business management stands out as having a great impact and one of the authors with the highest H index, was Frid C.J. with an indicator of 2 points, together with Gartner W.B., Nigam N. and Wyman D.M. Regarding the analysis of co-occurrences of words, the terms entrepreneurship and human capital are the most relevant and those that have the strongest relationship in the field of study.

**Keywords:** Bibliometric analysis; Startup; Human Capital; Business Development.

#### **RESUMEN**

Este documento es una revisión sistemática y bibliométrica sobre las características transitorias y tendencias de investigación en los últimos 7 años, sobre capital humano y crecimiento empresarial en el ámbito de las startups. La exploración se realizó en la base de datos bibliográfica Scopus, obteniendo 111 documentos, entre artículos, capítulos de libros, libros, conferencias y resúmenes, en las áreas de conocimiento relacionadas con el tema. Para ello se utilizó la interfaz web Biblioshiny del paquete Bibliometrix del programa estadístico Rstudio, procesándose el fichero en formato csv descargado del metabuscador Scopus. Los resultados sugieren un mayor porcentaje de artículos científicos (79 %), con un mayor volumen en 2021 (25 trabajos), mientras que el Journal of small business management destaca

por tener un gran impacto y uno de los autores con mayor índice H, fue Frid C.J. con un indicador de 2 puntos, junto con Gartner W.B., Nigam N. y Wyman D.M. En cuanto al análisis de co-ocurrencias de palabras, los términos entrepreneurship y human capital son los más relevantes y los que tienen una mayor relación en el campo de estudio.

**Palabras clave:** Análisis bibliométrico; Startup; Capital Humano; Desarrollo Empresarial.

## INTRODUCTION

Business growth is one of the most relevant issues in the economic and political spheres (Carmona *et al.*, 2020), and much of this importance lies in the decisive influence that business dynamics have on the prosperity of nations (OECD, 2016; Porter, 1999). A proper understanding of this interrelationship undoubtedly requires addressing the concept of human capital.

Human capital consists of knowledge, skills and health conditions for the production of goods and services that can be obtained through economic investments (Bustamante, 2003). In this sense, there is consensus around the idea that investment in human capital improves the productive capacity of companies; in other words, it increases the productivity of other factors, drives technological progress and contributes to innovation (Leyva, Espejel & Cavazos, 2020).

When there is no adequate correspondence between the demand for knowledge or skills on the part of companies and the labor supply, productivity is affected, and the possibilities of business growth are limited. The identification of these asymmetries raises the need for strategies to improve market signals, and thus reduce differences. Although it is possible to identify a growing number of studies in this area, a broader understanding of the phenomenon is still necessary to formulate practical solutions (Bartual & Turmo, 2016).

In terms of academic research, there are relatively few studies referring to these divergences between the demand for knowledge/skills and the labor supply for companies called startups. This term refers to emerging or nascent companies based on information technologies, active in different fields and that have innovation as the center of their business (Skawinska and Zalewski, 2020).

Consequently, this exercise consists of carrying out a systematic review and bibliometric analysis of the scientific production genetically related to human capital and business growth in the field of startups. For this, the *Biblioshiny* web interface of the *Bibliometrix* package of the Rstudio statistical program was used, and the file was processed in csv format downloaded from the Scopus metasearch engine.

The content is set out in three sections. The methodological section, first, distinguishes between descriptive and evaluative bibliometrics, as well as the description of the algorithm used. The second section contains the main findings and, finally, the third section provides conclusions.

## METHODOLOGY

Bibliometric analysis is a tool for analyzing databases of publications in order to identify trends, patterns and important information related to specific research fields (Glänzel, 2012), taken from (Lima, Stefan, Thomas, & Murillo-García, 2022). For their part, Pérez *et al.* (2003) differentiate between descriptive and evaluative bibliometrics. Descriptive bibliometrics explains in a general way the information produced, analyzing, in addition, its content. Evaluative bibliometrics measures the impact that the properties of the publication may have from a scientific and social point of view. This technique has had an increasing use during the last decade and for this reason it is used in this work to carry out an exploration of the literature on the transitory characteristics and research trends in the last 7 years on human capital and business growth of the Startups.

The scope of the research was descriptive, focused on reviewing, identifying, and ordering the information collected through the reading of the published works of different authors in different online databases. The collection of information was cross-sectional, since, although the historical behavior of the information was considered, it was collected at a specific moment of occurrence of the phenomenon studied (Hernández, Fernández, & Baptista, 2010).

To achieve the best results in the retrieval of information, first the keywords and terms to be used were determined, then search strategies were applied such as the use of the logical operators "AND" and "OR", then the field of study was filtered by the related areas of knowledge such as business administration, Economics and Social Sciences, by the English and Spanish languages and finally the study period is delimited between 2015 and 2022. The search equation that reflects what is described is presented below: ( TITLE-ABS-KEY ( startup ) AND TITLE-ABS-KEY ( "Human capital" ) OR TITLE-ABS-KEY ( "Business Growth" ) ) AND PUBYEAR > 2014 AND ( LIMIT-TO ( LANGUAGE , "English" ) OR LIMIT-TO ( LANGUAGE , "Spanish" ) ) AND ( LIMIT-TO ( SUBJAREA , "BUSI" ) OR LIMIT-TO ( SUBJAREA , "ECON" ) OR LIMIT-TO ( SUBJAREA , "SOCI" ) ). There were a total of 111 research papers retrieved between articles, books, book chapters and abstracts.

The documents obtained were later downloaded from the Scopus metasearch engine in a file in csv format, which was analyzed with the statistical program Rstudio Cloud, which allowed the generation of tables, thematic maps and maps of co-citation networks between authors, documents and sources. For the creation of the bar and pie charts, the Excel program was used.

#### Academic production: descriptive results

The exploration, in the indicated period, shows that in total 111 research works of 266 authors were recovered that covered the subject individually or collectively with an average of citations per document of approximately 8.7, among a total of 83 sources of information (figure 1).

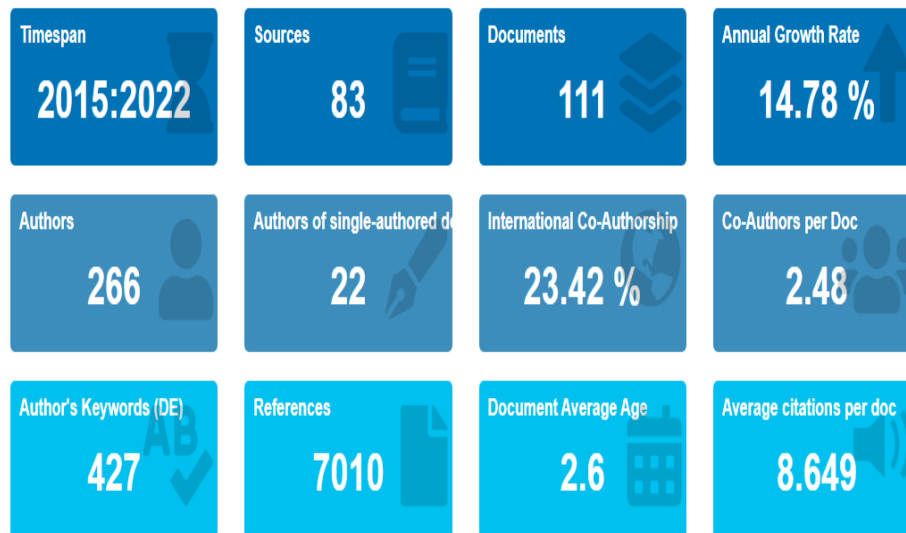
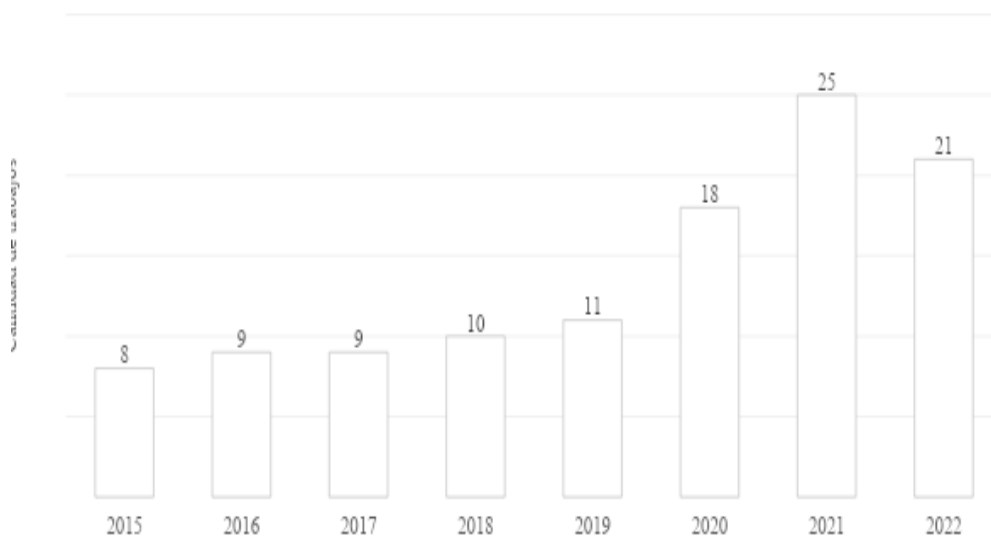


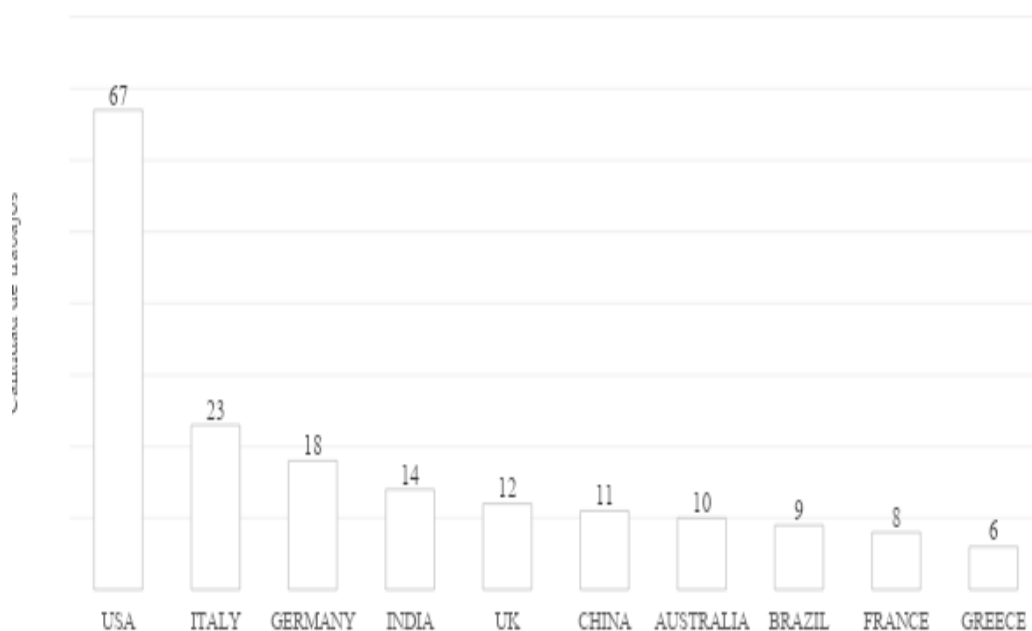
Figure 1. General data

The evolution of annual production indicates that there is a recent trend of publications (14,8 % the annual growth rate), with slight increases between 2015 and 2019 (graph 2) and considerable growth in the last 3 years, reaching the peak of production in 2021 with 25 research works, that is, 22,5 % of total production.



**Figure 2.** Evolution of the annual academic production

On the other hand, the 10 countries that make the most contributions to the study area (graph 3) are led by the United States (38 %), Italy (13 %), Germany (10 %) and India (8 %).



**Figure 3.** Academic production by country

Regarding the production by universities, Austral University and University of Western Macedonia appear with the greatest contributions, both individually and in collaboration with other institutions, these appear in 10 of the 111 documents found (Graph 3).

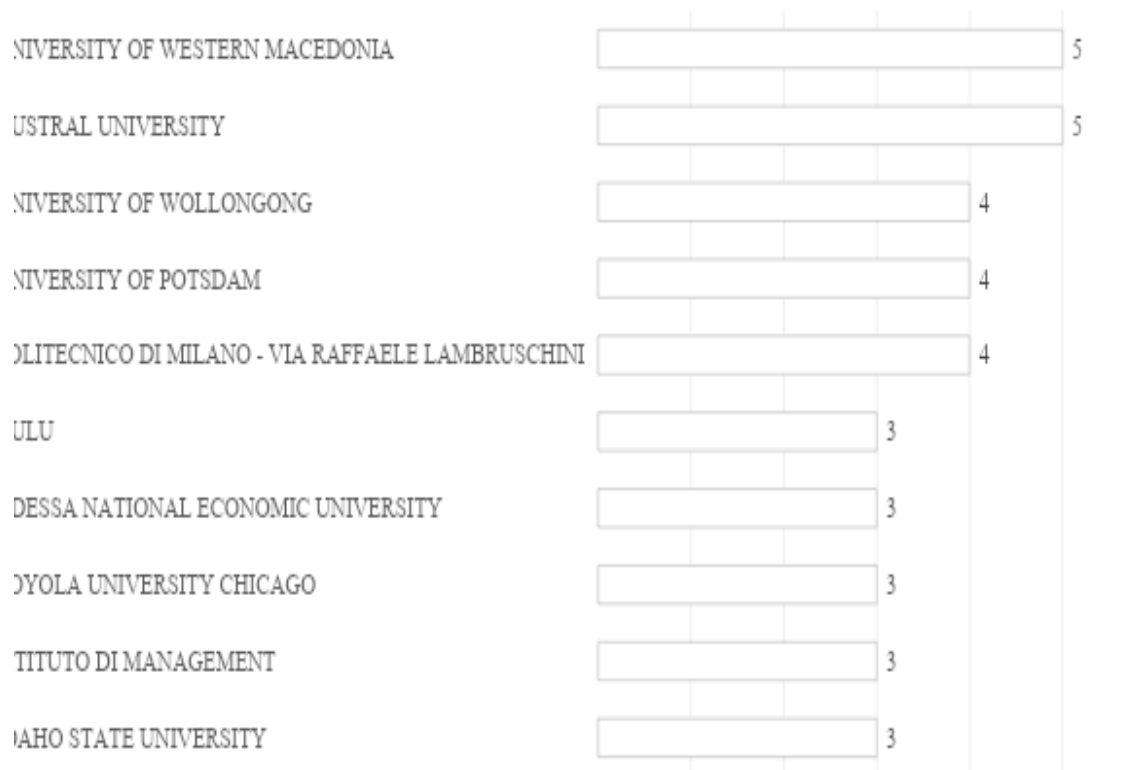


Figure 4. Academic production by institutions

On the other hand, tables 1 and 2 show respectively the authors who have contributed the most to the subject by H index, including: Frid C.J., Gartner W.B., Nigam N. and Wyman D.M. De and the journals with the greatest impact in the field of research, being the most outstanding *Journal of small business management*.

AUTHOR	H_INDEX	G_INDEX	M_INDEX	TC
Frid C.J.	2	2	0.25	22
Gartner W.B.	2	2	0.25	22
Nigam N.	2	2	0.66	16
Wyman D.M.	2	2	0.25	22
Adams F.	1	1	1	1
Alvarez Salazar J.	1	1	0.5	4
Assenova V.A.	1	1	0.5	1
At K.	1	1	0.33	7
Audretsch D.B.	1	1	0.16	2
Avlogiaris G.	1	1	0.5	1

Table 2. Journals with the greatest impact

MAGAZINE	H_INDEX	G_INDEX	M_INDEX	TC	For example	PY_START
Journal of small business management	3	3	1	35	3	2020
International journal of entrepreneurial behaviour	2	3	0.28	34	3	2016
Journal of business venturing	2	3	0.2	58	3	2015
Journal of technology transfer	2	2	0.28	15	2	2016
Organization science	2	3	0.33	53	3	2017
Problems and perspectives in management	2	2	0.33	10	2	2017
Strategic management journal	2	3	0.66	15	3	2020
Sustainability (switzerland)	2	3	0.66	18	3	2020
Academia revista latinoamericana de administración	1	1	0.5	4	1	2021
Academy of entrepreneurship journal	1	2	0.12	8	2	2015

Among the most referenced research papers presented in Table 3, the document by Muñoz & Cohen (2017), published in the journal *Technological forecasting and social change*, stands out with 203 citations, which deals with collaborative economy businesses that have emerged in recent years as a disruptive approach to the traditional way of planning. Model and do business. The phenomenon has gained significant traction within a wide range of domains including entrepreneurship, innovation, technology, and management in general.

Table 3. Most cited documents

DOCUMENT	TWO	DATING
Muñoz P., 2017, Technol forecast soc change	10.1016/j.techfore.2017.03.035	203
Haynes K.T., 2015, Jour Manage Stud	10.1111/jas.12127	96
Hornuf L., 2018, Corp Gov: int rev	10.1111/corg.12260	50
Tzabbar D., 2017, Organ sci	10.1287/orsc.2017.1152	45
Nuscheler D., 2019, Jou bus venturing	10.1016/j.jbusvent.2018.05.009	43
Zheng S., 2020, Cities	10.1016/j.cities.2019.102529	37
Stucki T., 2016, Res policy	10.1016/j.respol.2016.02.010	34
Bendickson J., 2017, Jou small bus strategy		32
Paolini P., 2015, Vine	10.1108/VINE-01-2014-0003	26
Kaiser U., 2015, Small bus econ	10.1007/s11187-015-9667-8	23

Figure 5 shows the map of co-occurrence of words on the research topic. The connections between these keywords show the knowledge base of the topic capital human and business growth of the Startups, that is, they address the fundamental questions of what the main concepts are and how these are logically connected to add value to this analysis. The map is composed of 5 nuclei, of which the most representative is the blue one, where there are terms with a strong connection and relevance such as: Entrepreneurship and Human Capital. The core that follows in relevance is the red one with words like: Innovation, Startup, Egypt, Lean Startup and Networks, with a much weaker relationship. Likewise, the term Startup appears in 4 of the 5 nuclei, indicating that it is transversal in most of the field of study.

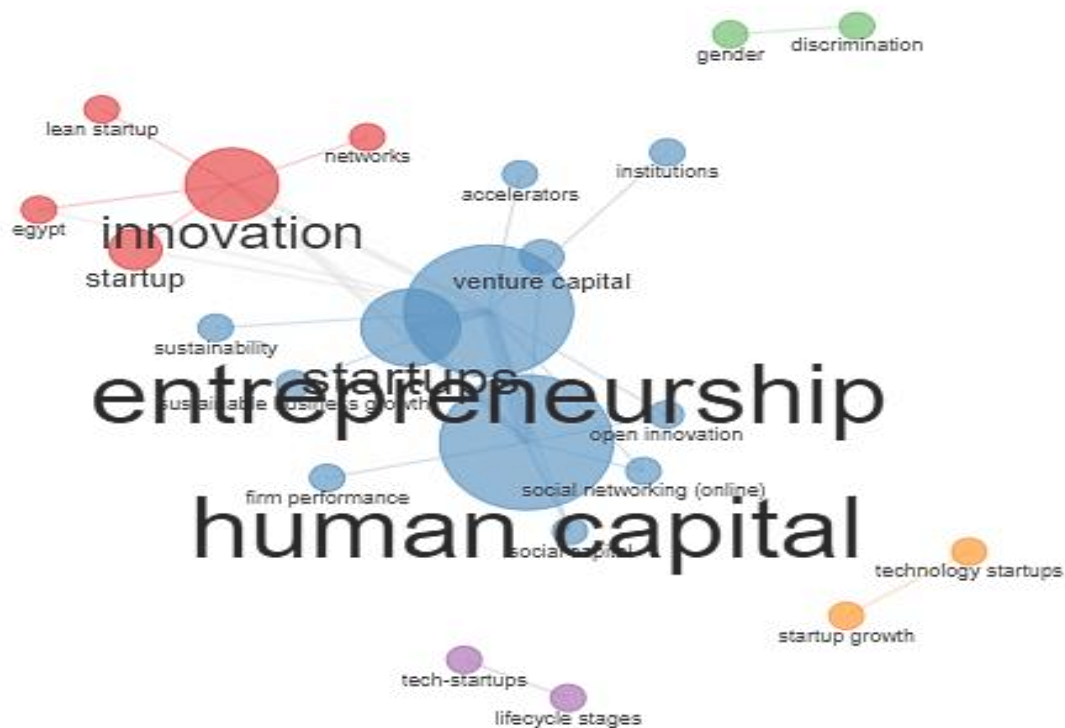


Figure 5. Word co-occurrence analysis

### Business growth of Startups: contributions from the human capital approach

Based on the bibliometric findings, a literature review was carried out focused on the most relevant publications associated with the topics startups and human capital, confirming that entrepreneurship and business development are important research topics worldwide. Studies have focused on several key aspects of entrepreneurship, such as the importance of regional entrepreneurial ecosystems, the heterogeneity of skills in startups and the identification of success factors for these companies.

The literature has also analyzed the importance of funding resources for the survival of startups, and the importance of funding and mentoring as critical factors for the success and survival of companies has been highlighted. In addition, regional and sectoral issues influencing the formation of new companies have been explored. Some of the contributions highlighted in these lines of research are summarized below.

#### *Startups and regional ecosystems*

The main works in this line have sought to deepen regional business ecosystems in order to identify how the factors of economic development, infrastructure and competitiveness affect the formation and growth of new companies in different regions. In this sense, the work of Lai & Vonortas (2019) stands out, which analyzes how regional business ecosystems have evolved in China and how they have been influenced by political, cultural and economic factors. Focusing on four different regions of the country, they analyzed how cooperation between the different actors of the ecosystem - local governments, universities and companies - has contributed to boosting business development in each region. They also looked at the challenges these ecosystems face, such as a lack of venture capital and global competition, and how they are addressing these challenges. Overall, the findings suggest that regional entrepreneurial ecosystems in China are constantly evolving and key to the country's long-term economic growth.

At the same time, Zhou & Park (2020) examined the regional factors influencing the formation of new enterprises in the car exchange sector in China. Based on a sample of 135 cities they analyzed the factors associated with the formation of new companies. The results suggest that market competition, economic development, transport infrastructure and population density notoriously drive the formation of new companies in the sector.

#### *Startups and the characteristics of entrepreneurs*

A relevant set of studies has focused on the characteristics and work skills of entrepreneurs as determinants of the success of startups. Along these lines, Kaiser & Müller (2015) explored how the heterogeneity of skills in new companies influences their chances of success, and how that heterogeneity evolves over time. Their study was based on a sample of more than 7,000 startups in Germany, where they analyzed the skills of company founders in areas such as technology, management and sales. The results suggest that skill heterogeneity in founding teams has a positive impact on the success of startups in terms of long-term growth and survival. In addition, they found that skill heterogeneity tends to decrease as companies grow and mature, which can be a long-term disadvantage for innovation and continued success.

With a similar approach, applied to South Korean companies, Lee (2018) showed that the human capital of the entrepreneur - measured by his educational level and previous work experience - and some job skills such as the ability to manage the team and human resources management, had a positive impact on the success of the company. They also found that job skills are particularly important in the early stages of the company, while human capital can have a positive impact throughout the company's life cycle. Consequently, Lee suggests that these factors should be carefully considered in the selection and training of founders, as well as in the long-term management of the company.

Subsequently, Marvel, Wolfe & Kuratko (2020) determined that innovation is crucial to the success of startups, and that the founder's human capital and willingness to receive feedback are key aspects in the innovation process. To test their hypothesis, they collected data from 211 founders of tech startups in the United States. The results indicate that the founder's human capital is positively related to product innovation in the company, and that the founder's willingness to receive feedback moderated this relationship. In addition, the authors found that the founder's willingness to receive feedback influences how the founder's human capital relates to product innovation.

For their part, Hashai & Zahra (2021) analyzed how the previous work experience of the founding team can affect the growth of startups. They argue that previous work experience can be an asset or a liability for the growth of the company, depending on how it is used. These authors collected data from 307 startups in the high-tech sector in Israel, and the results showed that the founding team's previous work experience was positively related to the growth of the company's company, but only if the team has a high capacity for learning and adaptation. In addition, they found that the effect of previous work experience on company growth is moderated by the age of the firm, competition in the market, and the availability of external resources.

The relationships between startup success and human capital have also been studied emphasizing venture capital as a source of funding. In this case, Gu, Huang, Mao, & Tian (2020) showed that human capital—especially the level of education and business experience of the founding team—is a key factor for success. Using data from venture-funded companies in the United States, they found that human capital positively influences company performance in terms of valuation and market success. In addition, that the business experience of the founders is particularly important for the success of the company compared to other characteristics of human capital, such as education, and that the impact of human capital on the performance of the company is greater in the early stages of the company.

Regarding market access, Stucki (2016) argues that the general and specific human capital of founders can influence the firm's ability to access and compete in international markets. Using data from start-ups



in Finland, he found that overall human capital - measured by education and previous work experience - has a significant impact on the likelihood that a company will start exporting. In addition, the study found that specific human capital—measured by industry experience and foreign languages—positively influences the company's export quantity and geographic diversification. Stucki clarifies that the impact of specific human capital is greatest in the early stages of the company.

Other aspects that concern the characteristics of entrepreneurs refer to their motivations. For that matter, Cinar & Hienkel (2018) addressed the opportunity/need dichotomy in Chinese entrepreneurship through a comparative analysis of figures from the Global Entrepreneurship Monitor (GEM). These authors noted that although China has experienced rapid growth in entrepreneurial activity in recent decades, there are specific features of Chinese entrepreneurship that have yet to be adequately explored. Their research was based on GEM data records between 2011 and 2015, and the results showed that Chinese entrepreneurs have higher motivation for opportunity and lower motivation for need compared to other countries. In addition, they suggest that Chinese entrepreneurs have comparatively greater confidence in their entrepreneurial skills and a greater perception of opportunities.

#### *Startups and access to financial resources*

Studies associated with business determinants facilitate access to financial resources occupy an important place in the literature. In this regard, Talaia, Pisoni, & Onetti (2016) point out that fundraising is a critical process for the success of innovative startups, and that understanding the factors that influence this process can be useful for startup founders and investors. These authors conducted an online survey of 137 innovative startups in Europe, and used statistical analyses to assess the factors influencing the fundraising process. The results showed that factors influencing fundraising include the quality of the founding team, the quality of the business plan, the quality of the product or service, the presence of venture capitalists and the reputation of the company. Conversely, the size and age of the company did not significantly influence the fundraising process.

Yang & Tu (2019) analyzed how capital affects new product quality in high-tech startups in two different environmental contexts. They state that although capital is an important factor in the success of a startup, its impact on product quality can vary depending on the context in which the company operates. The information was obtained from 97 high-tech startups in Taiwan and the United States, and the results showed that capital has a positive impact on the quality of the new product in both contexts, but the impact is greater in Taiwan than in the United States. Miranda & Maestre (2019) suggest that this is due to cultural differences and the business environment in each country.

Expanding the landscape of this line, Blank (2020) examined the importance of incubator resources for the survival of student startups operating in an academic incubator. The study covered a sample of 107 startups in Spain, and the results suggest that funding and mentoring are critical factors influencing the survival of student startups, as well as access to networks. The findings also indicate that funding and mentoring favor the long-term durability of companies.

Another outstanding study in terms of access to financial resources is that of Nigam, Benetti, & Johan (2020). His research was focused on analyzing which quality signals are most relevant for digital startups to gain access to venture capital funding, and was focused on data from 282 digital startups around the world. The results show that companies with experienced teams and patents obtained more venture capital financing, while market traction was not an important factor. López (2019) Consequently, they suggest that investors should pay attention to these quality signals to identify opportunities.

An essential aspect to consider in terms of financial needs is that these are not static but change during the existence of the company. In this regard, Singh & Bala (2020) analyzed how the financial needs of technology startups in Bangalore, India, change throughout their life cycle and why and how they differ. The study was based on in-depth interviews with 30 companies. The results show that the financial needs of startups change significantly as they move from the idea stage to the growth stage, and that

initial funding is often not sufficient to cover long-term financial needs. In addition, the study highlights that the need for capital and the type of investors change as companies grow and often seek investors with experience in the technology sector.

#### *Startups and organizational management*

Startup management has been studied in different latitudes, levels and units of analysis. Gupta & Bhattacharya (2016) analyzed how knowledge management processes can affect the sustainability of small family businesses in the brass manufacturing sector in Moradabad, India. Using a combination of quantitative and qualitative research methods, they found that effective implementation of knowledge management processes—such as training and skills development, knowledge transfer, and collaboration—can improve a company's ability to innovate and adapt to changes in the marketplace. Bórquez (2020) The authors highlight the importance of business culture in promoting knowledge management, as well as the need for adequate technological infrastructure to support knowledge management processes. They conclude that family businesses can improve their sustainability through the implementation of effective knowledge management processes, which would allow them to innovate, adapt to changes in the market and create a company culture that promotes continuous learning and development.

In Japan, Fukugawa (2018) analyzed how human capital management in business incubators influenced the creation of new companies. The study found that effective human capital management—such as training and mentoring—has a positive impact on the success of startups. The author emphasizes the importance of human capital management in networking and relationships between startups and external resources, such as investors and customers. Likewise, the experience and knowledge of part of the incubator staff in the industrial sector is relevant to the success of the start-up.

Nigam, Mbarek & Boughanmi (2020), for their part, argue that while traditional methods of financing—such as debt and equity financing—may not be sufficient to support these types of companies, intellectual capital (IC) can be a valuable asset that attracts alternative sources of funding, such as venture capital, angel investing, and crowdfunding. The study uses a sample of 237 Spanish startups with innovative business models and finds that QI—specifically human capital and relational capital—positively influences these companies' ability to obtain financing. These results suggest that startups should actively manage their QI to increase their chances of obtaining funding.

In Latin America, specifically in Peru, Álvarez (2020) analyzed how organizational resources affect survival, arguing that organizational resources such as human resource management, strategic planning and innovation, are critical for the survival of startups in the early stages of their life. The study applied in-depth interviews to startup founders and leaders and found that HR management, particularly hiring the right talent and retaining key employees, is essential for survival. In addition, it showed that strategic planning and innovation are also critical factors that affect survival. Thus, companies should focus on the effective management of their organizational resources to increase their chances of survival and long-term success.

#### *Startups and multiple determinants of success*

Some studies cover multiple categories of factors associated with startup success. Some of the most relevant studies of this line have been developed in the European Union. One of them is the research of Skawinska & Romuald (2020), which analyzed the factors that contribute to the success of startups through a comparative study based on a survey of more than 1,000 startups in six EU countries, and focused on factors such as funding, the founding team, innovation and collaboration with other actors in the business ecosystem. The results show that funding is a critical factor for startup success, and that companies that receive venture capital funding tend to experience more success than those that rely on other funding sources. In addition, they highlight the importance of the founding team and the capacity

for innovation for success, and discuss the challenges faced by companies in the EU, such as lack of venture capital and global competition.

For their part, Caliendo, Goethner & Weißenberger (2019) focused on measuring and determining entrepreneurial persistence beyond survival in small companies. They state that while survival is a basic goal for small businesses, long-term entrepreneurial persistence is also important for sustainable business growth and success. In their research they used data from a survey of 1,605 German companies and developed an index of entrepreneurial persistence beyond survival. The results show that long-term entrepreneurial persistence is related to factors such as innovation, internationalization, access to financing and the founder's previous business experience. In addition, they show that the effects of these factors on business persistence vary according to the size of the company and the industrial sector.

Overall, the literature consulted provides valuable insight into the challenges and opportunities faced by entrepreneurs and startups in different regional and sectoral contexts, which can be useful for policymakers and investors seeking to foster business growth and economic development.

## CONCLUSION

Based on the findings, it can be said that there is an important relationship between human capital theory and startup research. Human capital theory holds that investment in the training and skills development of workers can increase the productivity and performance of firms. This concept relates to research on skill heterogeneity in startups, which highlights how founders and startup team members may have different skills and knowledge, and how these skills can affect the startup's ability to innovate and grow.

In addition, human capital theory also relates to the importance of mentoring and learning in developing entrepreneurial skills. Research on the importance of incubator resources suggests that mentoring can be a critical factor for the success and survival of businesses, as it can help entrepreneurs develop specific business skills and knowledge.

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