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Digital entrepreneurship: bibliometric analysis on Scopus and Wos database

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Abstract

This study analyzes the academic literature on entrepreneurship and new technologies through a bibliometric approach. A proprietary database of 3288 works was constructed by combining Web of Science (WoS) and SCOPUS, offering a broader perspective on the field. The results reveal a growing interest in digital entrepreneurship, particularly since 2017, with Technological Forecasting and Social Change emerging as the most impactful journal. Influential works by authors such as S. Nambisan highlight the transformative role of digital technologies in entrepreneurial ecosystems. Thematic analysis identifies digitalization, innovation, and business models as central "motor themes," emphasizing their importance in entrepreneurial research. This study underscores significant research gaps, providing valuable insights for entrepreneurs seeking innovation opportunities and for policymakers designing digital ecosystems to support sustainable ventures. Educational institutions are urged to integrate digital skills and entrepreneurship training to prepare future entrepreneurs. By jointly analyzing WoS and SCOPUS, this work addresses prior methodological limitations, offering a comprehensive contribution to the understanding of digital entrepreneurship. It provides actionable insights for stakeholders in academia, industry, and government, fostering further research and development in this evolving field.

Keywords: Entrepreneurship; new technologies; digitalization; bibliometric analysis.

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Iniciativa empresarial digital: análisis bibliométrico en las bases de datos Scopus y Wos

Resumen

Este estudio analiza la literatura académica sobre iniciativa empresarial y nuevas tecnologías mediante un enfoque bibliométrico. Se construyó una base de datos propia de 3288 trabajos combinando Web of Science (WoS) y SCOPUS, ofreciendo una perspectiva más amplia del campo. Los resultados revelan un creciente interés en el emprendimiento digital, particularmente desde 2017, con Technological Forecasting and Social Change emergiendo como la revista de mayor impacto. Influyentes trabajos de autores como S. Nambisan destacan el papel transformador de las tecnologías digitales en los ecosistemas emprendedores. El análisis temático identifica la digitalización, la innovación y los modelos de negocio como "temas motores" centrales, destacando su importancia en la investigación empresarial. Este estudio pone de relieve importantes lagunas en la investigación y aporta valiosas ideas a los empresarios que buscan oportunidades de innovación y a los responsables políticos que diseñan ecosistemas digitales para apoyar empresas sostenibles. Se insta a las instituciones educativas a integrar las competencias digitales y la formación empresarial para preparar a los futuros emprendedores. Mediante el análisis conjunto de WoS y SCOPUS, este trabajo aborda las limitaciones metodológicas previas, ofreciendo una contribución integral a la comprensión del emprendimiento digital. Proporciona información práctica para las partes interesadas del mundo académico, la industria y la administración pública, fomentando la investigación y el desarrollo en este campo en evolución.

Palabras clave: Emprendimiento; nuevas tecnologías; digitalización; análisis bibliométrico.

1. Introduction

Entrepreneurship is one of the most relevant topics for understanding the economic growth and social development of countries (Llanos-Contreras et al, 2020). In this line, research continues to be interested in deepening its knowledge on how to make enterprises emerge and be sustainable in the long term (Jafari-Sadeghui et al, 2020). In this sense, new technologies (hereinafter, NTs) offer both challenges and opportunities for entrepreneurs (Troise et al, 2022). NTs contribute to the development and changes in new industries (Aydalot and Keeble, 2018). Among NTs are Artificial Intelligence (AI), Machine Learning, Internet of Things (IoT), digital platforms, mobile applications (apps), cloud computing, blockchain, among others (Troise et al, 2022). Digital transformation (DT) favors the creation and dissemination of various types of ventures (Oukil, 2011) as well as their growth (Kraus et al, 2019; Nambisan, 2017). These technologies are having a disruptive impact on entrepreneurship, changing traditional patterns and helping to discover new

frontiers for entrepreneurs (Broomé and Ohlsson, 2018).

For instance, e-commerce startups utilize AI algorithms to recommend products, while healthcare companies use AI to enhance diagnostics and treatments (Kaplan & Haenlein, 2019). Kaplan and Haenlein (2019) emphasize that AI can significantly improve operational efficiency, personalize the customer experience, and develop new products and services. A study by Agrawal et al, (2018) highlights that AI facilitates data-driven decision-making, which can assist entrepreneurs in identifying market opportunities and optimizing their strategies.

In research conducted by Huang and Rust (2018), it was explored how e-commerce startups are employing AI-driven chatbots to enhance customer service. The findings indicate that chatbots not only reduce operational costs but also increase customer satisfaction by providing quick and accurate responses to inquiries (Huang & Rust, 2018).

Big Data analysis enables entrepreneurs to gain valuable insights into their customers, identify market trends, and optimize their marketing strategies. Data analytics platforms aid businesses in making data-based decisions and identifying growth opportunities (Marr, 2016). IoT allows entrepreneurs to connect and monitor devices in real time, enhancing efficiency and reducing costs (Verdouw et al, 2016).

A deep understanding of this phenomenon is crucial for designing effective policies and developing strategies that promote gender equity and economic progress.

However, research on digital entrepreneurship is fragmented.

In this context, bibliometric analysis emerges as a valuable tool to evaluate and map the academic production on this topic, providing a quantitative and qualitative view of existing research (Aria and Cuccurullo, 2017). Bibliometric analysis allows identifying the most outstanding trends and emerging research topics in the field of entrepreneurship and new technologies. This is fundamental to understand the evolution of knowledge in the field and highlight areas that require more attention. The network of collaborations among researchers, institutions, and countries is essential for the progress of research. A bibliometric analysis reveals these connections, facilitating the identification of academic communities and promoting effective collaborations that enhance the quality of research (Pandey et al, 2022). Moreover, identifying the most influential authors and the most impactful journal in the field provides a perspective on the direction that research is taking. This is crucial for validating sources and guiding future research efforts (Pandey et al, 2022).

Bibliometric analysis allows identifying underexplored areas or gaps in the existing literature. By highlighting these gaps, future research can be directed towards issues that have not yet been addressed, enriching the overall knowledge and fostering a more comprehensive understanding of female entrepreneurship (Pandey et al, 2022).

In our knowledge, we only find the work of Zhai et al, (2023) that conducts a study on global trends in publications from 1985 to 2021 on digital entrepreneurship. For this, they rely on a bibliometric analysis of 723 works from the WoS database. In this sense, the Scopus database, which includes a larger number of journals than WoS

(Adriaanse & Rensleigh, 2013), is being overlooked.

To address this gap and obtain a broader overview of research in digital entrepreneurship, this study encompasses publications from two databases: Scopus and WoS. In this sense, this work represents a novelty.

Therefore, the objective of this work is to analyze, through a bibliometric analysis, the academic literature related to entrepreneurship and new technologies. There is still a lack of consensus on what digital entrepreneurship means, although some authors indicate three characteristics (Zhau et al, 2023): (i) They use digital technologies in their business activities, such as marketing, operations, etc. (ii) The core of the business is closely related to digital technologies. (iii) The strategy and business model of the venture are based on digital technologies.

2. Materials and Methods

To address the previously raised questions, the following steps recommended by Aria and Cuccurullo (2017) were followed:

- Study Design: Based on the previous arguments, research questions can be identified. Due to space constraints, this work answers the following questions: What has been the evolution in publications on the topic? What are the reference works? Who are the most cited authors? And which institutions publish the most on this topic?
- Data Collection: This phase involves deciding on the search keywords, filters, and language. Additionally, choosing the source of published works. Most studies on bibliometric analysis in general, and in the field of entrepreneurship in particular, have used the Web of Science (WoS) or SCOPUS (Ahmad et al, 2023; Ramos-Rodríguez et al, 2021).

Both have their advantages and limitations (Pato and Texeira, 2016), but no work to date has used both data sources together for the quantitative review of literature. Therefore, a new database was generated by merging the results from WoS (1033 papers) and SCOPUS (2814 papers). For this, R-studio software was used, and the codes provided by Fernandes (2022) were followed, which also allows the removal of duplicate works (559). Thus, the generated database contains 3288 words. In this context, the present study represents an innovative contribution. The following table 1 details the search terms used in both databases:

Table 1
Methodology

Details	Data Source WOS	Data Source SCOPUS
Search Criteria	Entrepeneur* AND “new technolog* Or Digital	Entrepeneur* AND “new technolog* Or Digital
Applied Search	Topic	Article title, abstract, key words
Data	5,571	8,804
Filter 1: Document Type	Review article, proceeding, paper, open access	Article, Conference paper

Cont... Table 1

Filter 2: Field Study	Business Economics	Business, management and accounting; economics, econometrics and finance
Filter 3. Language	English	English
Search Results	1,033	2,814
Selected document for study	3,288	

- Data Analysis: Subsequently, the Bibliometrix package of R-Studio, an open-access tool that includes bibliometric methods for the quantitative analysis of research (Aria & Cuccurullo, 2017), was used. The results are presented in the next section.

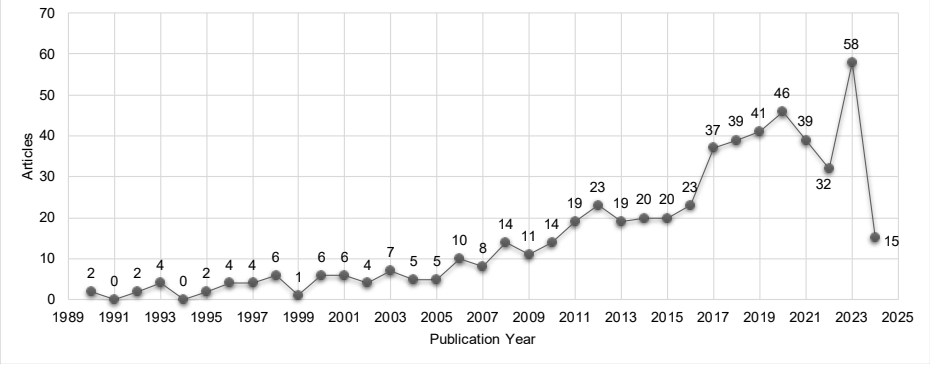
3. Entrepreneurship and new technologies: Results

The combined search resulted in 3288 documents published in 957 different sources from the period 1972-2024. Most of the works were authored by more than one author, with an average ratio of 2.82.

3.1. Literature Evolution

Graphic 1 shows the evolution of the literature on entrepreneurship and new technologies. Although the first publication dates back to 1990, interest in the topic did not awaken until the beginning of the 21st century. Three periods can be distinguished regarding the number of publications per year. In the first period, between 1990 and 2000, the published works did twenty-five articles. From the beginning of the 21st century until 2016, the second period, annual publications did 214.

Graphic 1
Annual scientific production



Finally, the third period (2017-present) is when more annual publications are generated, starting with 37 and ending last year with 58 (the highest number). The curve decreases in 2024 because it only covers the first quarter of publication. Nevertheless, 15 works related to entrepreneurship and

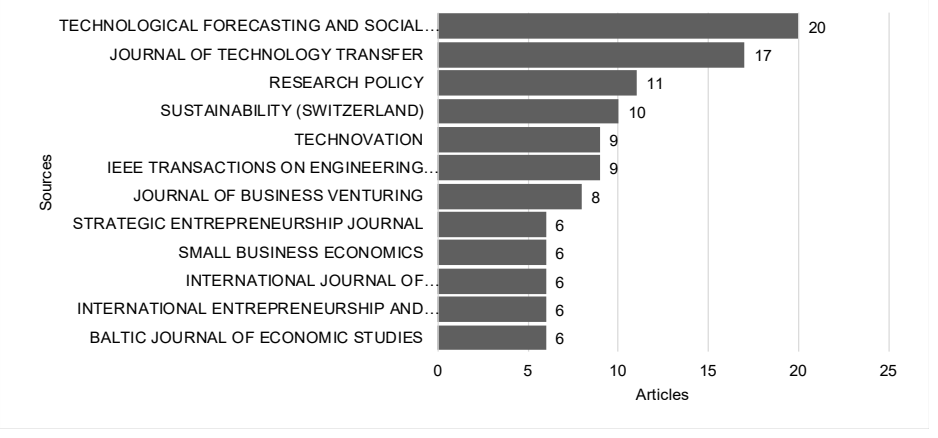
new technologies have been published in this period alone. In summary, there is a growing interest in researching the topic.

3.2. Most Relevant Sources

The top ten most relevant sources or journals by the number of published works are shown in the following Graphic 2.

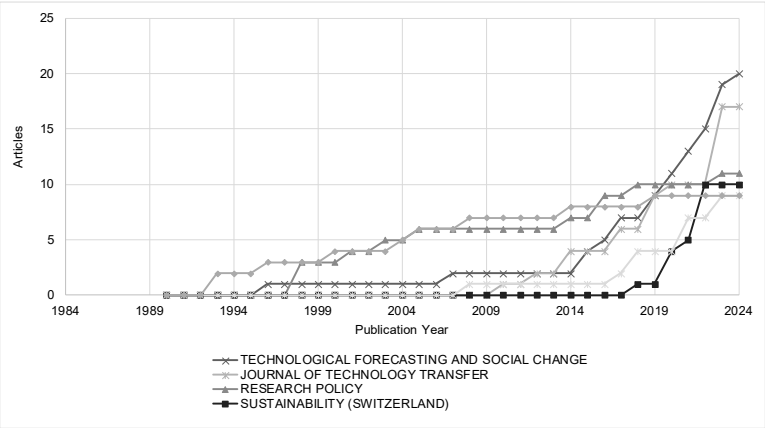
The first journal is "Technological Forecasting and Social Change" with 20 publications (3.7% of the total analyzed works) interested in methodologies and technological prediction studies as planning tools since they interrelate social, environmental, and technological factors. The "Journal of Technology Transfer" has 17 publications and focuses on research related to the human and social dynamics of the entrepreneurial phenomenon, with a view towards small organizations with growth potential. In third place is the "Research Policy" with 11works, a multidisciplinary journal seeking papers examining various contexts and business management topics.

Graphic 2
Most Relevant Sources



It is also interesting to examine the evolution of journal publications. In this context, graphic 3 compares the top five journals with the highest number of publications on the topic in terms of publications per year. It is observed that during the years 1993-1997, the Technovation had the highest number of publications. However, starting in 1998, Research Policy stands out again, followed by the Technological Forecasting and Social Change and Journal of Technology Transfer.

Graphic 3
Publication evolution by journals



The journal "Technological Forecasting and Social Change," besides being the most publishing on entrepreneurship and new technologies, is also the most impactful (see Table 2), followed by the "Journal of Business Research" and "Small Business Economics." Journal impact is measured by the H-index (Hirsh index), representing the number of published articles (H) in a journal, each of which has been cited at least h times in other works.

Table 2
Journal impact

Sources	H_Index
Technological Forecasting and Social change	34
Journal of Business Research	27
Small Business Economics	26
Technovation	25
Journal of Business Venturing	21
Research Policy	21
International Journal of Entrepreneurial Behaviour and Research	20
Journal of Technology Transfer	18
International Entrepreneurship and Management Jornual	15
Journal of Small Business and Enterprise Development	13

3.3. Most Influential Papers

Citations of works or papers reflect their influence among researchers (Baier-Fuentes et al, 2019). The following table shows those that have had more than 400 citations, representing nearly 19% of the 77,952 total citations of all analyzed works (Table 3).

Table 3
Most Influential Works

Authors	Title	DOI	Year	TC(*)
Shane, S.	Prior Knowledge and Discovery of Entrepreneurial Opportunities	10.1287/orsc.11.4.448.14602	2000	2980
Sambamurthy, V. Bharadwa, A. y Grover, V.	Shaping Agility through Digital Options: Reconceptualizing the role of information Technology in Contemporary Firms	10.2307/30036530	2003	2366
Nambisan, S.	Digital Entrepreneurchip: Towar a Digital Technology Perspective of Enterpreneurship	10.1111/etap.12254	2017	1263
Nambisan, S., Lyytinen, K; Majcchrzak, A. y Song, M.	Digital Innovation Management	10.25300/MISQ/2017/41.1.03	2017	1121
Nambisan, S., Wright, M. y Feldman, M.	The digital transformation of innovation and entrepreneurship: Progress, Challenges and key themes	10.1016/j.respol.2019.03.018	2019	1006
Wamer, K.S. Wager, M.	Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal	10.1016/j.lrp.2018.12.001	2019	813
Colombo, M. y Grilli, L.	Founders human capital and the growth of new technology-based firms: A competence-based view	10.1016/j.respol.2005.03.010	2005	780
Autio, E. Nabinsan, S. , Thomas, L. y Wright, T.	Digital addordances, spatial affordances, and the genesis of entrepreneurial ecosystems	10.1002/sej.1266	2017	763
Baltar, F. y Brunet, I.	Social research 2.0: virtual snowball sampling method using Facebook	10.1108/10662241211199960	2012	727
Ling, L.	China´s manufacturing locus in 2025: With a comparison of" Made in China 2025" and "Industry 4.0"	10.1016/j.techfore.2017.05.028	2018	643
Christensen, F. Olesen, M. y Kjaer, J.	The industrial dynamics of Open Innovation – Evidence from the transformation of consumer electronics	10.1016/j.respol.2005.07.002	2005	499
Van de Ven, H.	The development of an infrastructure for entrepreneurship	10.1016/0883-9026(93)90028-4	1993	494
Colombo, M. y Delmastro, M.	How effective are technology incubators? Evidence from Italy	10.1016/s0048-7333(01)00178-0	2002	453
Sussan, F y Acs, Z.	The digital entrepreneurial ecosystem	10.1007/s11187-017-9867-5	2017	452
Elia, G. Margherita, A. y Passiante, G.	Digital enterpreneurship ecosystem: How digital technologies and collective intelligence are reschaping the entrepreneurial process.	10.1016/j.techfore.2019.119791	2020	407

(*) TC: Total of Citations

3.4. Keywords

An interesting analysis regarding works is the keywords included within the works, providing signals of research trends and topics (Okumus et al, 2018). In this line, Diagram 1 presents a word cloud that is very useful for obtaining an overview of the subtopics addressed in research on new technologies and entrepreneurship (Troise et al, 2022). This word cloud was created from the keywords mentioned in the abstracts of the works. It can be seen that research is interested in understanding how new technologies relate to digitalization, innovation, business models, among others.

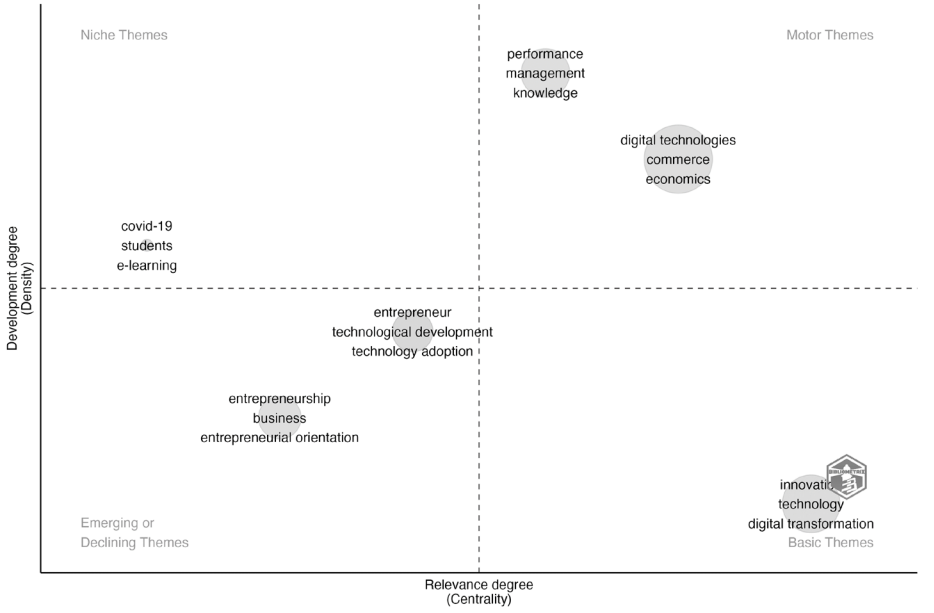
Diagram 1
Keywords Word Cloud

It is also important to analyze research trends (Zupic and Cater, 2015). For this, the conceptual structure of the topic is analyzed through the thematic map, showing four different types of themes based on the co-occurrence of words (Martínez et al, 2015).

3.5. Relevant themes

In Diagram 2, the four diverse types of themes are shown, and the cluster size is proportional to the number of works linked to that theme. The themes in the upper-right quadrant represent the “motor themes” and are those with strong centrality and high density. These themes are well-developed and important to the structure of research on entrepreneurship and new technologies. They play a key role in research. Research on digital technologies, commerce, sustainable development, entrepreneurial ecosystem, and transfer are highlighted among other subtopics. The lower-right quadrant gathers the basic and general themes. They are important for research because they analyze the adoption of new technologies with business competitiveness and innovation.

Diagram 2
Thematic Map



The themes in the upper-left quadrant are very specific and are often considered marginal regarding their importance in the research field (Martín-Navarro et al, 2022). Therefore, they are those that arise in specific moments, such as Covid-19, but do not contribute to the development of the research field. Finally, the lower-left quadrant gathers those themes that are disappearing or becoming emerging themes of interest. In Diagram 2, it can be seen how entrepreneurship related to technologies can be seen as an emerging and highly interesting theme.

3.6. Key Authors and Institutions

Table 4 shows the authors with more than six publications, the year of their publications, the total citations received, and other indicators such as the "h," "g," and "m" indices that measure author productivity. The h-index (Hirsh index) is a measure used to evaluate an author's research productivity and impact. It is calculated by counting the number of articles published by the author that have been cited at least h times. Therefore, it is a way to measure both the quantity and influence of an author's academic output (Hirsch, 2005).

Table 4
Most Productive Authors

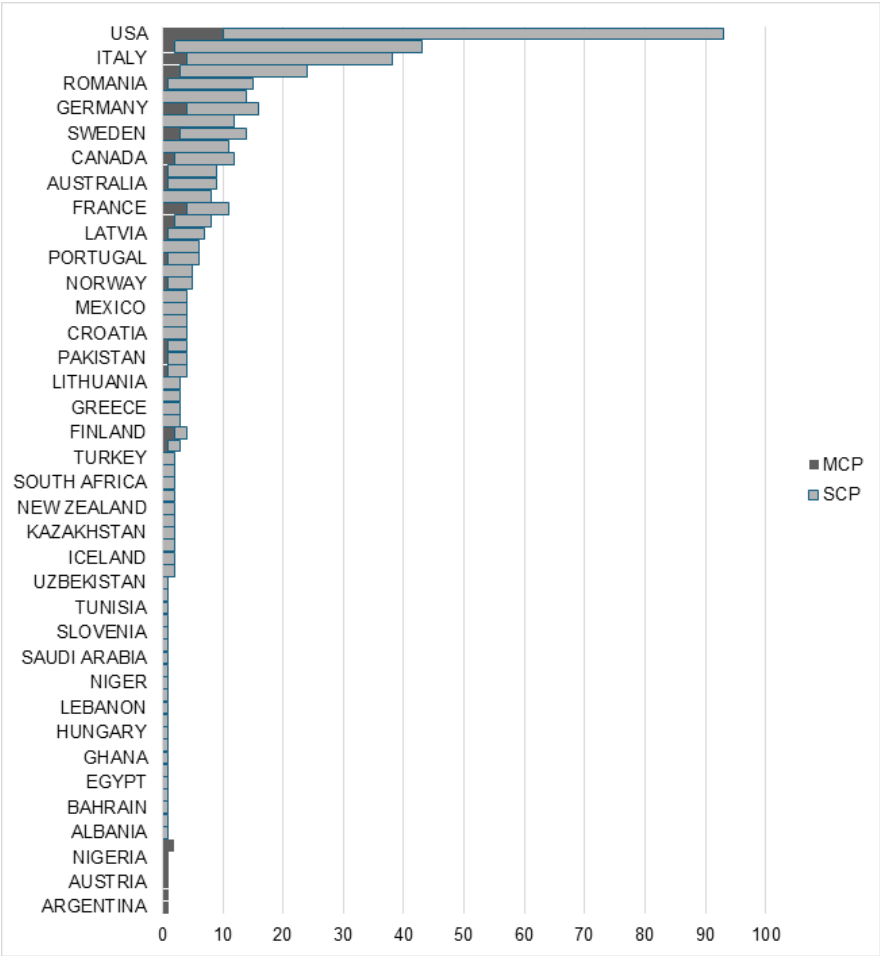
Autor	h_index	g_index	m_index	TC	NP	PY_start
Krauss S	15	21	1,5	1265	21	2015
Cavallo A	8	17	1,333	662	17	2019
Fisch C	8	11	1	632	11	2017
Ghezzi A	8	21	1,333	804	21	2019
Grilli L	8	8	0,381	1137	8	2004
Nambisan S	8	8	0,889	4643	8	2016
Secundo G	8	9	0,727	694	9	2014
Wright M	8	8	0,333	2522	8	2001
Ferreira J	7	12	1,167	557	12	2019
Bouncken R	6	6	1,2	407	6	2020
Guerrero M	6	11	1	207	11	2019
Meoli M	6	7	1	334	7	2019
Ratten V	6	11	1,2	483	11	2020
Rossi M	6	6	0,75	213	6	2017
Vismara S	6	9	1	368	9	2019

Note TC: Total of Citations; NP: Number of jobs; PT_start: year of issue

The g-index is another measure used to evaluate an author's research productivity and impact, calculated by ordering the citations received by all the author's articles in descending order and then identifying the point at which the line representing cumulative citations deviates from the diagonal line representing a uniform distribution of citations. The value of g is the number of articles that have equal or more citations than the point of deviation (Egghe, 2006). Finally, the m-index provides a measure of the author's productivity and relative impact adjusted to their academic career (Guo et al, 2021).

It is also interesting to know the collaboration among researchers from different countries and thus the network work. Graphic 4 shows that the United States of America (USA) is the country most interested in the topic by the highest number of publications in total and that almost all publications are carried out with researchers from the country. The United Kingdom is the one that most investigates in networks with foreign researchers.

Graphic 4
Collaboration with other Countries



Note: MCP multiple country publications / SCP single country publications

Another important aspect of bibliometric analysis is that it informs about the institutions, generally higher education institutions, that most participate in publishing on entrepreneurship and new technologies. Table 5 shows the universities that have published more than 14 works. The Romanian Bucharest University of Economic Studies has published the most on the link between entrepreneurship and new technologies.

Table 5
Most Relevant Institutions

Bucharest Univ Econ Studies	27	Romania
Politecnico Di Milano	26	Italy
Bina Nusantara University	25	Indonesia
University of Turin	20	Italy
Lund University	19	Sweden
University of Bergamo	19	Italy
University of Johannesburg	19	South Africa
University of Birmingham	17	United Kingdom
Renmin University of China	16	China
University of Bologna	16	Italy
University of California	16	USA
University of Tehran	16	Iran
Arizona State University	15	USA
Babson College	15	USA
University of Salento	15	Italy

4. Conclusions

This work has quantitatively analyzed publications on entrepreneurship and new technologies to understand the main patterns and trends. Using a bibliometric analysis, this study shows a growing interest, especially from 2017, in the topic. Although many journals publish on the subject, "Technological Forecasting and Social Change," "International Journal of Entrepreneurial Behavior and Research," and "Journal of Business Research" are the top three with 109, 64, and 60, respectively. It is worth noting that although the latter journal is not solely focused on entrepreneurship topics, it is the second in impact according to the h-index.

Regarding the most influential works, the one titled "Digital Entrepreneurship: Towards a Digital Technology Perspective of Entrepreneurship," published by S. Nambisan in 2017, is highlighted as when interest in the topic begins. The author raises important questions about the intersection of digital technologies and entrepreneurship and proposes how the basis and enrichment of entrepreneurship theories would be from the perspective of digital technology. According to the h-index, this author is one of the most impactful (8) behind S. Krauss with an h-index of 15.

Regarding research topics, the thematic map is an interesting tool for analyzing them as described in the work. Digital technology-related themes are highlighted as motor themes but still need further development.

This work contributes to the academic literature by providing new signals on subtopics related to the entrepreneurial phenomenon. On the other hand, no works have been found that analyze jointly and as a single source of scientific resources the WoS and Scopus databases. This is an advantage since the document analysis is broader, not excluding works included in one of those databases but not in the other. This is a limitation pointed out by other researchers (Ahmad et al, 2023; Frende

Vega & Salgado, 2023; Martín-Navarro et al, 2022; Trabskaria et al, 2023).

The results may be of interest not only to entrepreneurs by providing information on the opportunities for innovation in products, services, business models, and business processes that digitalization can offer them (Nambisan, 2017) but also to policymakers. The digital era has radically transformed how businesses are created, operate, and scale. Understanding how these changes affect the business landscape is crucial for entrepreneurs and companies, as well as creating a digital ecosystem that supports them.

Furthermore, the results hold significant implications for the educational sector. Highlighting the crucial role of educational institutions in preparing future entrepreneurs, it is suggested to integrate courses and training programs focused on digital transformation and entrepreneurial skills. This approach ensures that graduates are well-equipped to navigate the evolving business landscape.

Finally, the results of this research offer relevant information for those who want to delve into an increasingly appreciated topic in the academic world.

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