Educational Administration: Theory and Practice
2024, 30(5), 5287-5296
ISSN: 2148-2403
https://kuey.net/

Research Article

Technology Business Incubator Performance: A Bibliometric Study

Nurrina Abdul Rahim[1], Logaiswari Indiran[2*], Anbalagan Krishnan[3], Azlin Abd Jamil[4], Franco Gandolfi[5]

[1]Faculty of Management, Universiti Teknologi Malaysia, Malaysia, nurinaabdulrahim@gmail.com
[2*]Faculty of Management, Universiti Teknologi Malaysia, Malaysia, logaiswari@utm.my
[3] School of Business and Administration, Wawasan Open University, Malaysia, anbalagank@wou.edu.my
[4]Department of Deputy Vice Chancellor (Research and Innovation), Universiti Teknologi Malaysia, Malaysia, azlinjamil@utm.my
[5]McDonough School of Business, Georgetown University, Washington DC, USA; California Institute of Advanced Management (CIAM), Los Angeles, USA, francogandolfi@hotmail.com

Citation: Logaiswari Indiran, et al (2024), Technology Business Incubator Performance: A Bibliometric Study, *Educational Administration: Theory And Practice*, 30(5), 5287-5296, Doi: 10.53555/kuey.v30i5.3774

ARTICLE INFO

ABSTRACT

While globalization offers various opportunities, the business world is becoming more competitive. Many new businesses struggle in their early years due to a lack of management skills, marketing support, and financial access. To address these challenges, technology business incubators have emerged. Their aim is to promote technology transfer, encourage growth through innovation, help with small business development, and boost local economic growth. These incubators also serve as a measure for fostering an innovation-based economy. This study focuses on tracing the development of business incubator management research found in international scientific journals indexed in Scopus. Using a descriptive quantitative approach and data from the Scopus database spanning from 1984 to 2021, the study analyzes the evolution of this field through bibliometric analysis. The findings reveal that from 1985 to 2021, Scopus indexed 1,642 articles with 3,610 distinct keywords on incubator business research, with 2019 being the year with the most articles published (162). The most common research topics are business, management, and accounting, and the United States leads in publishing research papers on business incubators.

Keywords: Technology Business Incubator, Innovation, Incubatees, Performance

1.0 INTRODUCTION

The origin of Business Incubators (BIs) can be traced back to the late 1950s in the United States, although it gained global attention and popularity around 1980 (Al-Mubaraki & Shrodl, 2011). This study specifically focuses on Technology Business Incubators (TBIs), a specialized type of business incubation supporting startup companies by integrating cutting-edge technology into their operations. TBIs play a vital role in promoting innovation through collaborations between industries and universities, utilizing their competencies and resources (Binsawad, Sohaib, & Hawryszkiewycz, 2019). In addition to providing advanced technology, TBIs offer comprehensive support, including technical assistance, consulting services, office space, employee support, networking opportunities, management support, information technology assistance, and various other resources. This holistic approach aims to create an environment conducive to the growth and success of incubated startups.

According to the National Business Incubator Association (NBIA) in Ohio, the concept of business incubation is succinctly defined as a comprehensive support process expediting the successful development of startups and fledgling companies. This is achieved by providing entrepreneurs with a diverse range of targeted resources and services, often coordinated through a well-connected network. A key objective of business incubators is to cultivate thriving enterprises that not only become financially viable but also capable of operating independently. An integral part of the incubator's definition is the provision of tailored management guidance, technical assistance, and consulting services specifically designed to address the unique challenges faced by young, growing companies (NBIA, 2009a). In essence, business incubators act as catalysts for the growth and success of startups by offering a comprehensive suite of support services, covering financial guidance, technical expertise, and strategic consulting. Through their network and tailored

resources, incubators play a crucial role in nurturing fledgling companies to become self-sustaining entities, significantly contributing to the entrepreneurial ecosystem.

In recent times, there has been a rise in the number of startups aiming to expand their operations. However, many of these startups encounter challenges due to a lack of support and collaboration with universities and established companies. Without these partnerships, startups often struggle to find assistance and new ideas. The success of these startups heavily relies on the performance of a technology business incubator (TBI), which is influenced by several key factors. These factors include management support, information technology support, networking opportunities, and knowledge-sharing processes among employees. Successful TBIs must provide strong management support to offer guidance and strategic direction to the startups they nurture. Information technology support is also vital, ensuring startups have access to cutting-edge technology to improve their operations. Networking opportunities within the incubator ecosystem promote collaboration and idea exchange among startups, contributing to their collective growth. Additionally, an effective knowledge-sharing process among employees further boosts the innovative capacity of the startups within the incubator.

Figure 1 displays a visualization presenting a comprehensive global overview of research articles on business incubators, indexed in VOSviewer. This map functions as a valuable tool for grasping the landscape of research contributions in this field, emphasizing countries that have significantly advanced business incubation practices. The data for this visualization originates from Scopus, a reputable scholarly database, and has been processed using the VOSviewer software to create a detailed representation of the global research network. The map illustrates the concentration of research activities across various countries, offering insights into the geographical distribution of scholarly contributions on business incubators. Essentially, this geographic representation serves as a visual guide, highlighting nations leading in research and innovation within the realm of business incubation, showcasing their notable contributions and active engagement in shaping the discourse surrounding business incubators.

Figure 1 presents a bibliometric visualization of the global research landscape on business incubators, as indexed in the VOSviewer software. This map provides a macroscopic view of the contributions from various countries to the field of business incubation. Each node, representing a country, is sized proportionally to the volume of research output or the centrality of the country's role in this specific area. The connecting lines between the nodes illustrate the collaborative relationships and the flow of knowledge between countries. The United States and the United Kingdom stand out as prominent nodes, indicating that these nations are pivotal to the development and research of business incubation practices. Their size and the density of connections suggest that they not only contribute significantly to the volume of literature on the subject but also play a key role in fostering international collaborative research efforts. Countries such as Spain, Australia, India, and China also display substantial connectivity, reflecting their active participation and influence in the study of business incubators. These connections might represent research partnerships, co-authorship of scholarly articles, and the exchange of practices and findings that are critical to the advancement of business incubation.

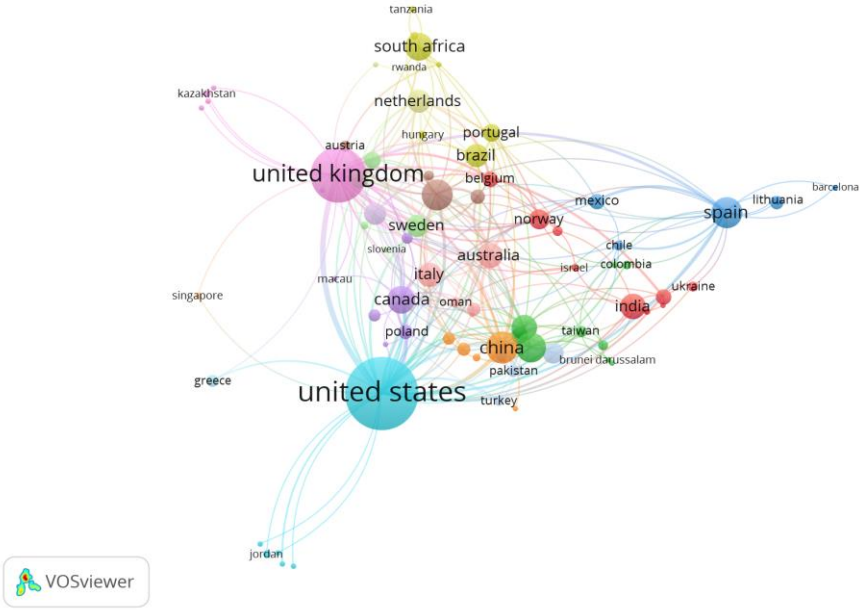

Figure 1: Countries map VOSviewer

Link:
https://app.vosviewer.com/?json=https%3A%2F%2Fdrive.google.com%2Fuc%3Fid%3D1nV2eEiX10qd51zObxfqa3xCTxS4EWhHj

This visualization not only emphasizes the global nature of research in business incubation but also underscores the significance of international collaboration and knowledge dissemination. The collaborative exchange of ideas and insights between researchers, academics, and practitioners from different regions is instrumental in advancing the collective understanding and effectiveness of business incubation practices on a global scale. The map presented in Figure 1 serves as a dynamic snapshot of the international research landscape, reflecting the interconnectedness of scholars and institutions working towards the common goal of enhancing business incubation strategies worldwide.

2.0 LITERATURE REVIEW

This section will explore the existing body of scholarly work, providing an analysis of key factors such as technology business incubation, management support, information technology assistance, networking, and knowledge exchange. Additionally, the theoretical foundations pertinent to this field will be delineated within this review. Various theoretical perspectives are introduced to underpin the elements that affect the efficacy of technology business incubators. For a business incubator to thrive, it is essential to possess the requisite factors that aid in business expansion and ensure financial stability. A hallmark of a successful business incubator is the ability to maintain a consistent flow of projects, alongside a continuous generation of innovative ideas for the incubated companies.

2.1 Technology Business Incubator

The term "business incubator" serves as an umbrella term that encompasses a variety of different models of business incubation. The primary objective of a business incubator is to encourage the expansion and success of small and medium-sized businesses (SMEs). According to the United Kingdom Business Incubator (UKBI, 2010), the incubation programme is a strategic initiative that has been tailored to provide essential facilities and support to small and medium-sized enterprises (SMEs). These businesses would not have been able to navigate the crucial stages of their development without the assistance of this support system. Within the context of incubators, a specialised class known as Technology Business Incubators (TBIs) has emerged as an organisation that is committed to fostering Technopreneurs in the process of developing and commercialising technology-driven products and services. This specialisation not only helps to reduce the costs associated with successful product launches, but it also helps to strengthen incubatees while they are in their most vulnerable stages (Rathore & Agrawal, 2021). According to Bers et al. (2009), technology business incubators have a much broader impact than simply cutting costs; they also play a crucial part in the process of encouraging ground-breaking innovation. Technology Business Incubators, which are recognised as entrepreneurial entities (Rice and Matthews, 1995), function as bridges by actively engaging in the sourcing and micromanagement of innovation processes within emerging and potentially weak but promising intermediary organisations. According to Hackett and Dilts (2004), this function is essential for providing start-up companies with resources during various stages of development while also maintaining a strategic control over the costs that are associated with the possibility of failure.

A Technology Business Incubator (TBI) is a pivotal institution aimed at enhancing the technological development phase for startups and established companies within the business incubation ecosystem (Binsawad, Sohaib, & Igor, 2019). The effectiveness of a TBI is assessed by its capacity to cultivate and invigorate businesses to meet targeted economic objectives such as sectoral restructuring and income generation, while optimizing resource utilization. Performance metrics include the durability of projects and essential factors like knowledge and connectivity. Additionally, TBI success is broadly characterized by the rise of innovation and knowledge management, essential for fostering new enterprises that contribute to the prosperity of local economies (Binsawad, Hawryszkiewycz, & Kang, 2016). Indicators of TBI performance encompass the expansion and endurance of programs, the thriving and scaling of companies within the incubator, and alignment with the strategic goals of affiliated universities. The broader impact of TBIs on the community is evident through increased sales, revenue, tax contributions, spending, and employment opportunities for graduates.

Al-Mubaraki and Schrödl (2011) propose a broadened perspective on business incubation as a supportive mechanism designed to expedite the growth of startups and nascent companies. This is achieved by providing entrepreneurs with an array of specialized resources and services, curated by the management of incubators and accessible through their extensive network. The central aspiration of a business incubator is to rear firms that are both financially stable and self-sufficient. Key to this mission is the delivery of strategic management guidance, technical support, and consulting, all catered to the needs of emerging companies. Furthermore, Kiran and Bose (2020) assert that TBIs are increasingly vital as policy tools that bolster entrepreneurial expansion and evolution. They define a business incubator as an entity dedicated to designing, nurturing, and sustaining new ventures, demanding diverse inputs such as skilled labor, workspace, capital, and technology. TBIs are instrumental in championing innovative progress and play a vital role in the economic enhancement and social coherence of a region (Guan Jian, 2021). They are essentially engaged in supporting and fostering technology startups by supplying essential resources, mentorship, and networking possibilities to aid in their market success and growth.

As documented by SME Corp in 2012, Malaysia's entrepreneurial sphere boasts a total of 103 incubators, enhancing the nation's business startup environment. Sukhur and Bakar (2018) describe an incubator as a facility that provides its resident startups, termed "incubatees", with a suite of diverse supportive services. According to the Malaysian Standards (2018), the country recognizes three main categories of business incubators catering to technology startups: those dedicated to technology, non-technology-focused incubators, and virtual incubators. This typology underscores the multifaceted ways in which Malaysian incubators contribute to the nurturing and advancement of startups, emphasizing the necessity to customize support services to meet the distinct needs of different business sectors.

3.0 BIBLIOMETRIC

Bibliometric analysis constitutes a quantitative scrutiny of written works, aiming to discern distinct patterns within scholarly research, as exemplified by Jean-Pierre (1999), who applied this methodology to examine material characteristics and perform an intellectual content analysis across varied datasets. Cobo et al. (2011) describe bibliometrics as encompassing various quantitative techniques to systematically review academic writings and monitor their evolution. This approach is instrumental in assessing scholarly endeavors across different nations, academic institutions, research entities, collaborative networks, and journals. Recognized for its capacity to evaluate the quality and productivity of academic research, bibliometrics offers a quantifiable benchmark for appraising the scholarly contributions of researchers (Moed et al., 1995). Within the field of bibliometrics, performance analysis and scientific mapping emerge as two core techniques for investigating research topics (Noyons et al., 1999; Van, 2005). The present study seeks to employ these techniques to discern emergent patterns within the corpus of published research papers.

Rosyafah (2021) indicates that bibliometric investigations utilize mathematical and statistical methods to track literature trends and probe the developmental trajectory of scholarship concerning authorship, publication frequency, and citation patterns. The fundamental objective of bibliometric inquiry is to graphically represent the progression of a scientific field. This research entails a descriptive quantitative analysis of the yearly proliferation of published articles, incorporating two distinct forms of incubation. The analysis also encompasses the geographic origin of the research, thematic areas, author-selected keywords, and the nexus of keywords among co-authors. The dataset utilized for this analysis was procured from the Scopus bibliographic database.

4.0 SCOPUS

Studies on business incubators are disseminated through a multitude of platforms, which include peer-reviewed journals, book sections, conference proceedings, synopses of conferences, and journal articles. Despite this variety, the primary emphasis of research remains on scholarly articles. These articles are sourced from Scopus, a comprehensive citation and abstract database curated by experts in respective fields. As of 2021, Scopus' website (www.scopus.com) lists the inclusion of over 1,626 active scientific journals, encompassing 506 conference papers and review articles. It also contains 141 book chapter publications and in excess of 50 additional papers. Scopus regularly updates its listings on a daily basis, accounting for any new data entries or deletions that occur with the publication or retraction of various scholarly works. Several scholars, including Rosyafah (2021), recognize Scopus as a repository managed by Elsevier, which stands as the most extensive data center housing a comprehensive array of scientific literature that spans numerous decades (Saleh & Sumarni, 2016). Scopus meticulously catalogues research articles covering a wide range of subjects and countries. It creates indices of scientific literature that deliver accurate details regarding the metadata of each academic document, including publication dates, abstracts, and citations (Aksnes & Sivertsen, 2019; Rosyafah, 2021). Scopus is not only instrumental in indexing but also aids researchers in conducting more efficient searches, analyses, and visual representations of scholarly investigations (Tupan et al., 2018).

5.0 VOSviewer

VOSviewer, an abbreviation for "Visualization of Similarities Viewer," as delineated by Tupan et al. (2018), is a software application developed to produce and navigate maps derived from data and illumination, streamlining the process of displaying and examining these maps. The tool is equipped with a range of functionalities such as the ability to construct maps from network data. Users can employ pre-existing networks within the software or opt to generate their custom networks, as described by Rosyafah (2021). VOSviewer offers three distinct forms of visual representations: network, overlay, and density visualizations. Although primarily conceived for the analysis of bibliometric networks (Eck & Waltman, 2020), VOSviewer's versatility allows for its application in creating, visualizing, and navigating maps based on a variety of network data types. VOSviewer is commonly used for crafting visual network maps that hinge on keywords, specifically the co-occurrences of these keywords, or co-word analysis, as well as maps founded on

authorship, such as co-authorship networks. A co-word network emerges when two keywords frequently appear together within a single publication, often found within an abstract or a compilation of keywords. On the other hand, a co-authorship network is established through the interconnection of scholars, research institutions, or nations, linked by the collective number of publications co-authored (Eck & Waltman, 2014). The methodology for generating a co-word and co-authorship map via VOSviewer encompasses a four-step process: initially, data is extracted from the Scopus database; next, the collected data is inputted into VOSviewer; subsequently, network maps are constructed based on this data; and finally, the maps are visualized using the graphical capabilities of VOSviewer (Ranjbar-Sahraei & Negenborn, 2017).

6.0 RESEARCH METHODOLOGY

6.1 Research design

Utilizing a bibliometric methodology, this research adopts a quantitative descriptive technique. The unit of analysis within this research is the scientific paper. Information was collated from scholarly articles on business incubators indexed within the Scopus database and analyzed using VOSviewer. The selection criteria for Scopus are deliberately chosen, reflecting the platform's esteemed quality and international recognition by academic and research institutions.

6.2 Population and Sample

The study's population comprises all scientific articles related to business incubators and technology business incubators published in journals, books, international conferences, and other publication mediums indexed by Scopus. A search conducted on September 5, 2021, within the Scopus database revealed a total of 2,363 documents. A subset of this population, consisting of research articles on business incubators published between 1984 and 2021, yielded a sample of 1,622 articles.

6.3 Data Collections Techniques

For the acquisition of information and data, this study utilized secondary data available within the Scopus database. To access the complete range of features and services provided by Scopus, one must first log in to the Scopus website, www.scopus.com, via the University Technology Malaysia (UTM) software portal or by subscribing to an account (which is a paid service). Subsequently, navigate to the advanced search feature and input the search string, such as 'TITLE – ABS (“business incubator”)'. Refine the search to only include "articles" as the document type and further narrow the results by excluding publications from the years "1961" and "1956". Following this, export the search results into a "CSV" file format. The exported data is then processed using Microsoft Excel and VOSviewer for analysis.

7.0 RESULT AND DISCUSSION

Number of Business Incubator Research Publications Per Year

The research team conducted searches in the Scopus database using the keywords “business incubator” and “business incubat*”, and limited the document type to “article”. The search yielded 1,462 papers published between the years “2001” and “2021”. In bibliometric studies, such graphs are used to identify trends and patterns in academic research, such as growth in interest, shifts in research focus, or the response to industry and economic changes. The year 2019 standing out as the peak suggesting a significant surge in research activity related to business incubators. This could be attributed to a variety of factors including increased funding for entrepreneurship, policy changes, technological advancements, or heightened academic interest in the role of business incubators in economic development. The sharp rise to the peak in 2019 followed by a decline could indicate a culmination of research interest or a shift in the field's dynamics. The decline after 2019 might suggest a saturation point in the research, a change in research priorities, or even external factors such as global economic trends or the impact of the COVID-19 pandemic on academic research and publication processes.

Data from the Scopus database indicates a slight decline in publications to 115 documents in 2021. In contrast, the year 2001 saw minimal activity with only 18 documents published. Between 2005 and 2006, the number of publications remained relatively stable at around 30 documents. There was a notable increase to approximately 45 documents in 2007, followed by a minor decrease in 2008, and stabilization through to 2009. A sharp increase occurred in 2011 with the publication of 60 documents, followed by a slight downward trend until 2013. From 2013 to 2019, the number of published articles on business incubator research indexed in the Scopus database generally showed a positive growth trend.

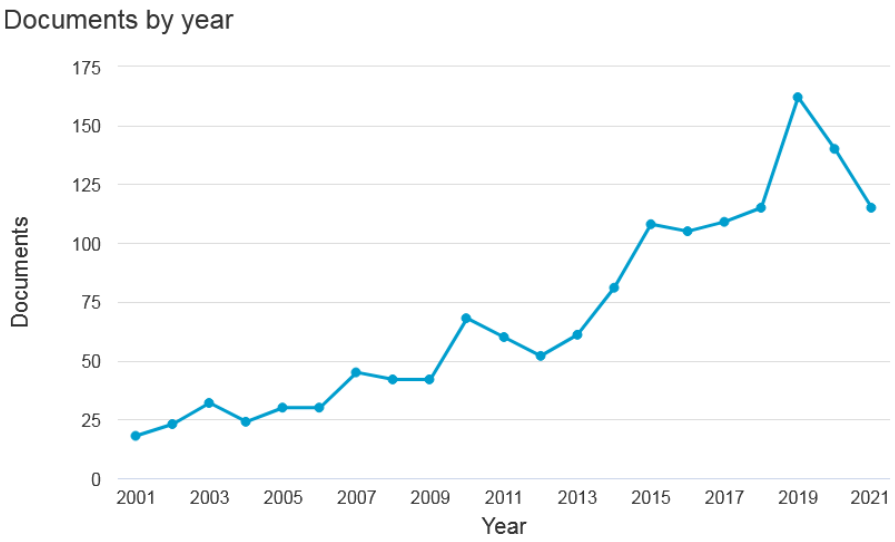

Figure 2: Documents Published by Year
Source: Data processing on Scopus, 2021

Business Incubator Research Subjects

Figure 3, as described, presents a pie chart that illustrates the distribution of research on the subject of business incubators indexed in Scopus from 2001 to 2021. Scopus is a reputable abstract and citation database of peer-reviewed literature, and this chart helps in understanding the interdisciplinary nature of research incubator businesses by showing which academic disciplines have contributed to the field during the specified period. In a bibliometric analysis article, this pie chart would be discussed to highlight the multi-disciplinary interest in business incubators and to show how various fields contribute to the body of knowledge on this topic. The largest sector of the pie chart, Business and Management, with 34.9%, indicates that this discipline has the most substantial influence on the research of business incubators. This is not surprising given that business incubators directly relate to business growth and management strategies.

The second most prominent field is Social Sciences with 18.7%, which suggests that aspects such as social impact, policy, and organizational behavior are also significant in the study of business incubators. Economics and Econometrics, with 16.9%, further indicates that economic factors, financial models, and market impact are critical areas of exploration in incubator-related research. Meanwhile, smaller contributions from fields like Engineering, Computer Science, and Environmental Science suggest that technical, technological, and sustainability aspects are also relevant to business incubator research. Even disciplines with smaller percentages, such as Arts and Humanities, Mathematics, and Energy, demonstrate that research incubators have a broad and varied impact, affecting many areas of study. The "Other" category, accounting for 6.8%, indicates that there are additional disciplines not listed individually that have contributed to the topic, possibly interdisciplinary studies, or emerging fields.

In the bibliometric article, this study would likely delve into the reasons behind the distribution of disciplines, discuss the evolution of research emphasis over the years, and examine the implications of these findings for future research directions. The finding analyzes the interconnectivity between disciplines and how they collectively contribute to the understanding of business incubators. This pie chart serves as a visual representation of the diversity and depth of research in the area, emphasizing the multifaceted nature of business incubators.

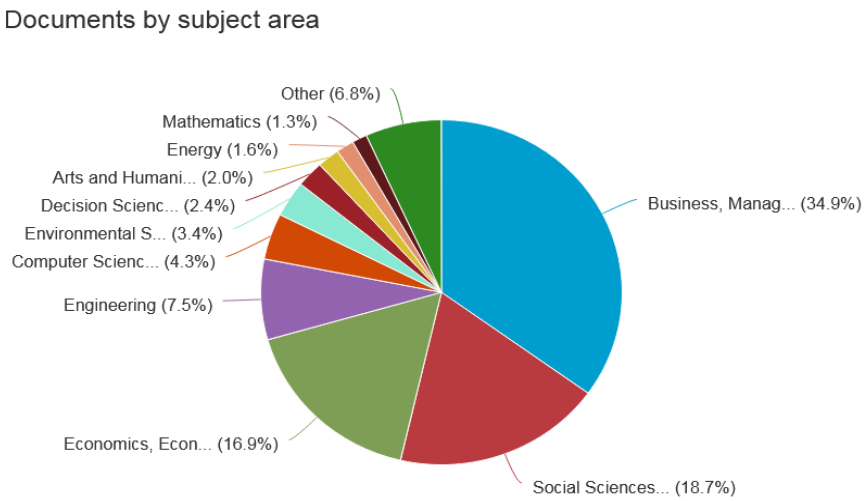

Figure 3: Research Subject Area
Source: Data processing on Scopus, 2021

Business Incubator Documents by Country or Territory.

In Figure 4, we observe a horizontal bar chart that compares document counts related to the subject of research incubator businesses for up to 15 countries or territories, covering the period from 2001 to 2021. This comparison is instrumental for a bibliometric analysis article as it provides insights into the geographical distribution of research activity in the field of business incubators. The chart indicates that the United States leads in the number of documents produced, with a count surpassing 300, suggesting a strong research interest and possibly a robust infrastructure for business incubators within the country. The United Kingdom holds the second position with nearly 200 documents, reinforcing its role as a significant contributor to the research in this domain.

China follows closely behind the United Kingdom, which may reflect its growing research capabilities and increasing focus on entrepreneurial support systems. Countries like Spain, Indonesia, and Germany also show considerable contributions, albeit to a lesser extent than the leading three. Further down the list, South Africa, Canada, India, and Malaysia show participation in this research area, but with fewer documents, indicating that while there is interest, it is not as pronounced as in the leading countries.

For a bibliometric analysis article, the information presented in Figure 4 would be crucial in discussing global research trends in the area of business incubators. The article would analyze factors that could have influenced these patterns, such as economic development, government policies supporting entrepreneurship, availability of funding for research, and the presence of academic and research institutions specializing in business incubation. Moreover, the chart could serve as a basis for discussing international collaborations, the flow of knowledge between countries, and the potential for future research initiatives. The article might also explore how the socio-economic and cultural contexts within these countries or territories influence the focus and outcomes of business incubator research. In summary, the bar chart provides a clear visual representation of where research on business incubators is most active and highlights the disparities in research output across different countries, which is a valuable perspective in the field of bibliometric analysis.

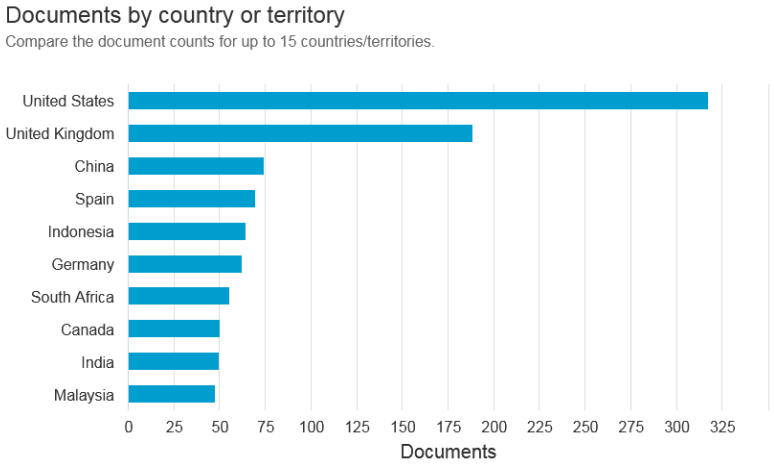

Figure 4: Top Publisher Country
Source: Data processing on Scopus, 2021

Business Incubator Research Network Map by Author Keywords

Figure 5 appears to be a visualization of a keyword co-occurrence network based on 1,624 articles about business incubator research, published from 1984 until 2021. This visualization was likely generated using VOSviewer, a tool for constructing and viewing bibliometric networks. The network shows the relationships between keywords found in the published papers, with a total of 3,610 different keywords identified. In a bibliometric analysis article, this visualization would be integral in demonstrating the thematic structure and the evolution of research within the field of business incubators. The figure shows that "entrepreneurship" is the most frequently used keyword, mentioned 307 times, indicating it is a central theme in the literature. This prominence reflects the intrinsic link between business incubators and the fostering of entrepreneurial activities.

The keywords "business incubators" and "start-ups" are also highlighted as commonly used terms, underscoring the focus of the research on new business ventures and the supportive role of incubators in their development. The layout of the network reveals clusters of keywords that are more frequently associated with each other, suggesting that there are sub-themes or specific areas of interest within the broader field. The size of the nodes (circles representing keywords) and the thickness of the lines (indicating the strength of the association between keywords) in the network provide a visual representation of the importance and interconnectivity of topics. Larger nodes for keywords such as "innovation," "small and medium enterprises," "performance," and "economic growth" suggest these are also key themes within the research on business incubators.

Additionally, the visualization highlights the inter-disciplinary nature of business incubator research, with connections to fields such as technology, education, and economics. This reflects the complex ecosystem within which business incubators operate, encompassing elements like technology transfer, academic entrepreneurship, and venture capital. For the bibliometric analysis article, the authors would likely discuss the centrality of entrepreneurship in business incubator studies and how related concepts like innovation and start-up performance contribute to our understanding of successful incubation practices. They might also explore how these themes have developed over time and what new trends are emerging, based on the keyword analysis. In summary, Figure 5 provides a rich map of the intellectual landscape of business incubator research, revealing how various concepts are interwoven and which areas have garnered the most attention over the years. This type of analysis helps researchers identify gaps in the literature, emerging trends, and potential areas for further investigation.

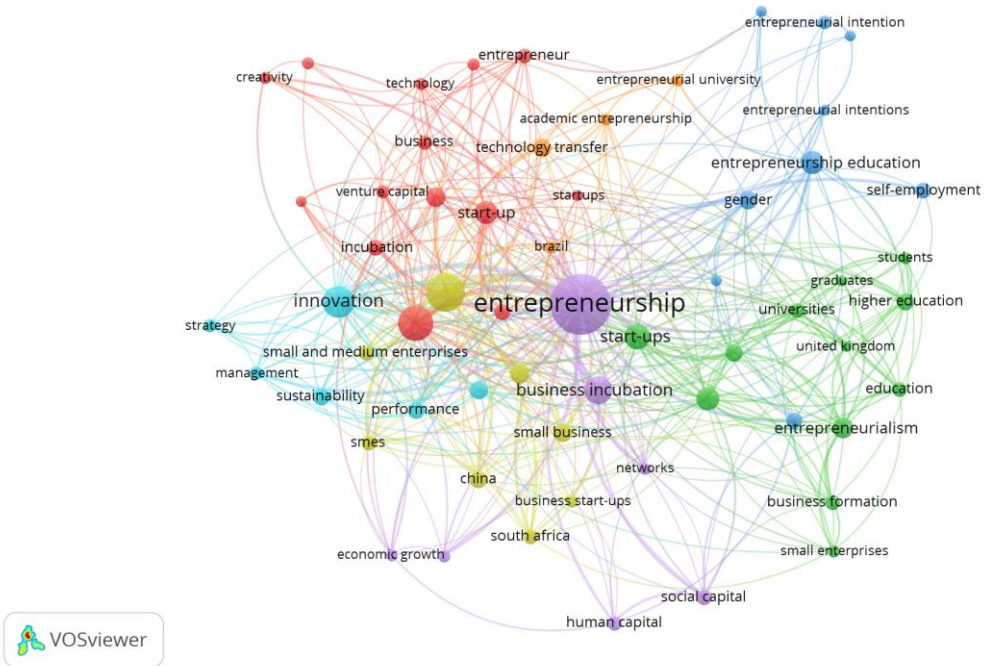

Figure 5: Map Network Author Keywords

Link:
https://app.vosviewer.com/?json=https%3A%2F%2Fdrive.google.com%2Fuc%3Fid%3D1100YYjftHHIAdRK2crrnoov7QoyKO7Qf

8.0 CONCLUSION

This study provides a comprehensive analysis of TBI performance research, utilizing data from the Scopus database spanning from 1984 to 2021. The study reveals a growing body of literature, with a peak in publications in 2019, indicating heightened academic and practical interest in TBIs. The United States leads

in research output, followed by the United Kingdom and China, showcasing the global interest and varying contributions to the field. The interdisciplinary nature of TBI research is evident, with the majority of work stemming from business and management, but also significant input from social sciences, economics, and other fields. The study's findings underscore the centrality of entrepreneurship within TBI research and highlight the importance of TBIs in fostering innovation, supporting startups, and contributing to economic growth. The use of VOSviewer has allowed for the visualization of the research network, demonstrating the interconnectedness of countries and the prominence of international collaboration.

Future recommendations for researchers are the following:

i. Investigate the impact of recent global events, such as the COVID-19 pandemic, on the operation and effectiveness of TBIs, as the decline in publications post-2019 may suggest shifts in research focus or external influences on the field.
ii. Explore the role of TBIs in emerging economies and developing countries, where the potential for economic growth through innovation and entrepreneurship could be significant.
iii. Conduct comparative studies between countries with high and low TBI research outputs to understand the factors contributing to successful incubation practices and the transferability of these practices across different socio-economic contexts.
iv. Examine the role of policy and government support in the success of TBIs, as this could provide valuable insights for policymakers and practitioners aiming to enhance the effectiveness of incubators.
v. Expand the scope of interdisciplinary research to include more contributions from fields such as environmental science, sustainability, and technology, to address the evolving challenges faced by startups in a rapidly changing business landscape.
vi. Utilize qualitative research methods to complement the bibliometric analysis, providing a deeper understanding of the experiences and challenges faced by incubatees and incubator managers.
vii. Focus on the long-term outcomes and performance metrics of businesses that have graduated from TBIs to assess the sustained impact of incubation services on business success and economic development.

By addressing these recommendations, future research can build upon the findings of this study to enhance the understanding of TBIs and their critical role in the global entrepreneurial ecosystem. In conclusion, this document provides a comprehensive overview of the research landscape on TBIs, emphasizing the importance of these institutions in the entrepreneurial ecosystem and the value of bibliometric analysis in understanding the development of this research field.

REFERENCES

1. Aksnes, D. W., & Sivertsen, G. (2019). A Criteria-based Assessment of the Coverage of Scopus and Web of Science. *Journal of Data and Information Science, 4*(1), 1-21. doi:10.2478/jdis-2019-0001.
2. Al-Mubaraki, H., & Schrodl, H. (2011). Measuring the Effectiveness of Business Incubators: A Four Dimensions Approach from A Gulf Cooperation Council Perspective. *Journal of Enterprising Culture, 19*(4), 435-452.
3. Alpenidze, O., Pauceanu, A. M., & Sanyal, S. (2019). Key Success Factors for Business Incubators in Europe: An Empirical Study. *Academy of Entrepreneurship Journal, 25*(1).
4. Barney, J. B., Ketchen, D. J., & Wright, M. (2011) The Future of Resource-based Theory: Revitalization or Decline? *Journal of Management*, *37*(5), 1299-1315.
5. Barney, J.B. (1991), Firm resources and sustained competitive advantage, *Journal of Management*, *17*, 99-120.
6. Bers, J. A., Dismukes, J. P., Miller, L. K., & Dubrovensky, A. (2009). Accelerated radical innovation: Theory and application. *Technological Forecasting and Social Change*, *76*(1), 165-177.
7. Binsawad, M., Hawryszkiewycz, I., & Kang, K. (2016). The Influence of the Knowledge-Sharing Process on Technology Business Incubator Performance in Saudi Arabia.
8. Binsawad, M., Sohaib, O., & Hawryszkiewycz, I. (2019). Factors Impacting Technology Business Incubator Performance. *International Journal of Innovation Management, 23*(01), 1-30.
9. Cobo MJ, L´opez-Herrera AG, Herrera-Viedma E, Herrera F (2011) An approach for detecting, quantifying, and visualizing the evolution of a research field: a practical application to the fuzzy sets theory field. J Informet 5(1):146–166. https://doi.org/10.1016/j.joi.2010.10.002.
10. Eck, N. J. Van, & Waltman, L. (2014). Measuring Scholarly Impact. In Y. Ding et al. (eds.) (Ed.), *Measuring Scholarly Impact* (pp. 285–320). Switzerland: Springer International Publishing. https://doi.org/10.1007/978-3-319-10377-8.
11. Eck, N. J. Van, & Waltman, L. (2020). *VOSviewer Manual*. Leiden: Univeristeit Leiden. Retrieved from http://www.vosviewer.com/documentation/Manual_V OSviewer_1.6.1.pdf.
12. Goh, M., Prakash, S. & Yeo, R. (2007), Resource-based approach to IT shared services in a manufacturing firm, *Industrial Management & Data Systems*, *107*(2), 251-70.
13. Hackett, S. M., & Dilts, D. M. (2004). A Real Options-driven Theory of Business Incubation. T*he Journal of Technology Transfer*, *29*(1), 41–54. doi:10.1023/B:JOTT.0000011180.19370.36.

14. Hamida, M. (2020). *Understanding The Startup Studio Incubation Model.* (Master Degree), University of Gothenburg, Institution of Innovation and Entrepreneurship.
15. Hsu, I.C. (2008) Knowledge Sharing Practices as a Facilitating Factor for Improving Organizational Performance through Human Capital: A Preliminary Test, Expert Systems with Applications, 35, pp.1316-1326.
16. Jean-Pierre , V. M. H. (1999). Historical Bibliometrics: Its Purpose and Significance to the History of Disciplines. *Libraries & Culture, 34*(4).
17. Kiran, R., & Bose, S. C. (2020). Stimulating Business Incubation Performance: Role of Networking, University Linkage and Facilities. *Technology Analysis & Strategic Management*. doi:doi.org/10.1080/09537325.2020.1772967
18. Liang, T.P., You, J.J., & Liu, C.C. (2010), A resource-based perspective on information technology and firm performance: a meta analysis, *Industrial Management & Data Systems*, *110*(8), 1138-58.
19. Lin, H.-F. (2007). Knowledge Sharing and Firm Innovation Capability: An Empirical Study. *International Journal of Manpower, 28*(3/4), 315-332.
20. Mbewana, P. N. (2006). *The Key Success Factors for Business Incubation in South Africe: The Godisa Case Study*. (M Sc (Technology Management)), University of Pretoria.
21. Moed HF, Bruin RE, Leeuwen TN (1995) New bibliometric tools for the assessment of national research performance: Database description, overview of indicators and first applications. Sciento-metrics 33(3):381-422. https://doi.org/10.1007/BF02017338.
22. Noyons, ECM, Moed, HF, & Luwel, M (1999) Combining mapping and citation analysis for evaluative bibliometric purposes: A bibliometric study. J Am Soc Inf Sci *50*(2), 115–131.
23. Ranjbar-Sahraei, B., & Negenborn, R. R. (2017). *Research Positioning & Trend Identification*. TU Delft. AIDA Project. Retrieved from http://aida.tudelft.nl/wp-content/uploads/2017/05/aida_booklet_V1.1.pdf.
24. Rathore, R. S., & Agrawal, R. (2021). Performance indicators for technology business incubators in Indian higher educational institutes. *Management Research Review*, *44*(11), 1499-1520
25. Rice, M., & Mathews, J. (1995). Growing New Ventures, Creating New Jobs. Westport, CT.
26. Rosyafah, S. (2021). A Bibliometric Study of International Impact of Business Incubators. *International Journal of Science, Engineering and Management (IJSEM), 6*(2), 11.
27. Saleh, A. R., & Sumarni, E. (2016). Studi Bibliometrik pada Jurnal Standardisasi Pasca Terakreditasi (2011 – 2015). *Visi Pustaka*, 18 (Desember), 231-240.
28. Saunders, M., Lewis, P., & Thornhill, A. (2016). Research Methods for Business Students (7th ed.). Pearson Education Limited.
29. Solesvik, M.Z. & Westhead, P. (2010). Partner selection for strategic alliances: case study insights from the maritime industry, *Industrial Management & Data Systems*, *110*(6), 841-860.
30. Somsuk, Nisakorn, Wonglimpiyarat, Jarunee, & Laosirihongthong, Tritos, (2012). Technology business incubators and industrial development: resource-based view, *Industrial Management & Data Systems*, *112*(2), 245-267.
31. Sukhur, S. S., & Bakar, S. A. (2018). Factors Contributing to the Incubation Performance of Malaysian Technology Incubators. *Economic and Management Review, 13*, 33-43.
32. Tupan, Rahayu, R. N., Rachmawati, R., & Rahayu, E. S. R. (2018). Analysis of bibliometric Development Research Division Science Instrumentation. *Journal of Documentation and Information, 39*(2), 135-149.
33. van Raan AFJ (2005) Measuring science. In: Moed HF, Gl ¨anzel W, Schmoch U (eds) Handbook of quantitative science and technology research, chap. measuring. Springer, Netherlands, pp 19-50.
34. Wu, W., Wang, H., & Wu, Y. J. (2020). Internal and External Networks, and Incubatees' Performance in Dynamic environments: Entrepreneurial Learning's Mediating Effect. *The Journal of Technology Transfer*, 1-27. doi:10.1007/s10961-020-09790-w.