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Literature Review

Business Incubators and Technology-Based Startups in Emerging Economies: A Bibliometric Analysis

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ABSTRACT

In the context of rapid technological advancement and the global rise of entrepreneurship, business incubators have become essential mechanisms for supporting technology-based startups, particularly in emerging economies. These incubators play a strategic role in bridging resource gaps, fostering innovation, and enhancing the survival and growth of early-stage ventures. Despite their increasing importance, there remains a limited understanding of how incubator performance directly influences startup outcomes. This study addresses that gap through a comprehensive bibliometric analysis of 920 scholarly articles published between 2010 and 2022, sourced from Scopus and Google Scholar. Using VOSviewer, the analysis identifies key research trends, influential publications, and thematic clusters related to incubator performance. The findings reveal a significant increase in research activity over the past decade, with a peak in 2018, and a strong concentration of publications in journals focused on technology transfer and innovation management. Prominent themes include academic entrepreneurship, incubator performance, technology transfer offices, and the role of innovation ecosystems involving academia, industry, and government. These themes highlight the multifaceted nature of incubator success and the importance of cross-sector collaboration. The study also emphasizes the need for integrated evaluation frameworks to enhance incubator effectiveness and guide institutional and policy-level strategies. The novelty of this research lies in its synthesis of bibliometric insights to propose future research directions and methodological improvements for assessing incubator performance. By mapping the intellectual landscape of incubator research, this study contributes to a deeper understanding of how incubators can be optimized to support sustainable startup development and economic growth in emerging markets.

Keywords: business incubators, technology-based startups, emerging economies, bibliometric analysis, innovation ecosystems

INTRODUCTION

The global rise of startup businesses in recent years has been significantly driven by the proliferation of business incubators, which play a vital role in supporting entrepreneurial ventures. Startups are typically designed to identify scalable business models that enable rapid growth [1], often operating in early-stage development and market exploration phases [2]. The United States leads globally with 45,877 digital startups, followed by India with 5,768, while Indonesia ranks sixth with 1,939 startups [3]. Despite this growth, the failure rate among startups remains alarmingly high, ranging from 50% to 95% globally [3], [4], [5], [6]. In Indonesia, the situation is particularly

challenging, with only about 1% of startups achieving success, while the remaining 99% fail [7], [8]. This high failure rate is often attributed to limited business knowledge among new entrepreneurs, poor planning, inadequate management practices, failed technological investments, and insufficient cash flow [4], [9].To address these challenges, business incubators have emerged as essential platforms that provide startups with the resources, mentorship, and strategic guidance needed to succeed [10]. Incubated companies are significantly more likely to survive and grow compared to non-incubated ones, as they benefit from structured support systems [11]. Business incubators offer specialized programs that include coaching, mentoring, and development support tailored to the needs of early-stage entrepreneurs [12], [13], [14], [15]. Their strategic role in nurturing innovative Small and Medium Enterprises (SMEs) is particularly important in enhancing business capacity and competitiveness in dynamic markets [16]. Historically, the economic impact of incubators was first recognized in the 1980s, and their functions have since evolved to meet the changing demands of startups and the broader economy [8]. Studies such as those by Peters et al. [17] have demonstrated the positive effects of incubators on job creation, business development, and graduation rates.

Recent research continues to affirm the effectiveness of incubators, showing that incubated startups are more resilient and better equipped to navigate market challenges [11]. This progression reflects the increasing sophistication of incubator programs, which now integrate innovation, sustainability, and digital transformation to support entrepreneurial growth. As the startup landscape becomes more complex, the role of business incubators will remain central to fostering economic development and enabling the success of new ventures across diverse sectors.

The landscape of business incubation has evolved significantly over time, giving rise to various types of incubators tailored to the changing needs of startups and the broader economy. Initially, incubators were designed to provide general business support, but as innovation and technology became central to economic development, more specialized forms—such as technology incubators—emerged to address sector-specific challenges [18], [19]. These incubators now vary widely in structure and strategy, encompassing academic institutions, non-profit development corporations, for-profit ventures, venture capital firms, and hybrid models [20], [21]. This diversification reflects a broader trend toward strategic specialization, where incubators are increasingly aligned with targeted economic goals such as industry restructuring, revenue generation, and resource optimization [22].

Technology incubators, in particular, have gained prominence for their role in fostering high-tech innovation and supporting the development of technology-based enterprises. Their primary objective is to facilitate innovation by leveraging collaborative networks of expertise and resources [23], [24]. In response to this trend, many higher education institutions have adopted a new mission of promoting economic sustainability and entrepreneurship through the establishment of Technology Business Incubators (TBIs) [25]. These incubators are designed to support university-affiliated startups by providing access to technological infrastructure, business development services, and mentorship during the critical early stages of growth [26].

The integration of TBIs within academic environments has also strengthened the role of universities in commercializing research and fostering academic entrepreneurship. Universities with innovation-oriented ecosystems—such as science parks and incubator facilities—have been shown to significantly enhance technology transfer and the commercialization of academic research [27], [28], [29], [30]. This development marks a new phase in the evolution of incubators, where their function extends beyond business support to include knowledge dissemination, innovation acceleration, and regional economic development. As incubators continue to adapt to the dynamic needs of startups and the innovation economy, their strategic importance in shaping entrepreneurial ecosystems is expected to grow even further.

Performance measurement is a critical aspect of organizational success, serving as a benchmark for assessing the extent to which objectives are achieved [31], [32]. This principle is equally applicable to Technology Business

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Incubators (TBIs) within universities, where regular performance evaluations are essential for determining effectiveness and guiding strategic improvements [33], [34]. Evaluations typically yield both positive and negative outcomes: positive results can be maintained and enhanced, while negative findings prompt corrective actions or the adoption of more efficient work patterns [35], [36], [37]. These assessments not only help align TBI operations with institutional goals but also support continuous improvement in service delivery and resource utilization.

Despite the recognized importance of performance evaluation, there is no universally accepted standard for measuring incubator success. Scholars have proposed various indicators, such as tenant performance, revenue generation, venture capital acquisition, and post-incubation success rates [38, 39]. Other studies emphasize the influence of internal and external factors, including governance structures, support services, networking capabilities, and university linkages [38], [39], [40]. Additionally, knowledge sharing among startups has been identified as a key determinant of incubator performance, highlighting the importance of collaborative learning environments [40].

The historical development of business incubators underscores their evolving role in promoting innovation and economic growth [41]. However, the specific factors influencing the performance of TBIs—particularly within higher education institutions—remain underexplored. As universities increasingly rely on TBIs to drive technology commercialization and regional development, understanding the determinants of their success becomes crucial. This study addresses this gap by conducting a comprehensive a bibliometric analysis to identify and synthesize the key factors affecting TBI performance. Drawing on the Resource-Based View (RBV) and Knowledge-Based View (KBV), this research considers TBIs as entities that derive competitive advantage from their unique resources and knowledge capabilities [9], [36], [45]. The review focuses on studies published between 2010 and 2022, aiming to consolidate existing knowledge, identify research gaps, and provide a foundation for enhancing the strategic management of TBIs.

Over the past two decades, research on business incubator performance has grown substantially, reflecting a heightened interest in their role within entrepreneurial ecosystems. Bibliometric analysis has emerged as a powerful tool in this domain, offering valuable insights into research trends, influential publications, and global collaboration networks. Key themes explored include the effectiveness of incubator programs, their contribution to regional development, and the innovation outcomes of incubated firms. Influential works from leading institutions have shaped the academic discourse, while extensive international collaboration—particularly across North America, Europe, and Asia—has underscored the global relevance of this field. The adoption of advanced bibliometric tools such as VOSviewer, CiteSpace, and Bibliometrix has further enhanced researchers' ability to analyze large datasets and uncover nuanced patterns.

Despite these advancements, notable gaps remain. While performance metrics have been widely studied, there is limited research on the long-term economic and social impacts of incubators, especially at the regional level. Emerging areas of interest include the rise of digital incubators, the influence of public policy on incubator success, and the integration of sustainability practices into incubation models. Bibliometric studies increasingly incorporate case-based approaches, offering deeper contextual insights into the factors influencing incubator performance. Comparative analyses across regions and incubator types reveal significant variability in success factors, highlighting the importance of local context. As the field continues to evolve, integrating bibliometric techniques with complementary research methodologies will be essential for developing a comprehensive understanding of the mechanisms driving incubator effectiveness and their broader economic contributions.

METHODS

A This study employs bibliometric analysis as a suitable method for investigating and analyzing scientific literature related to Business Technology Incubators (IBTs) [46–48]. Bibliometric techniques enable researchers to

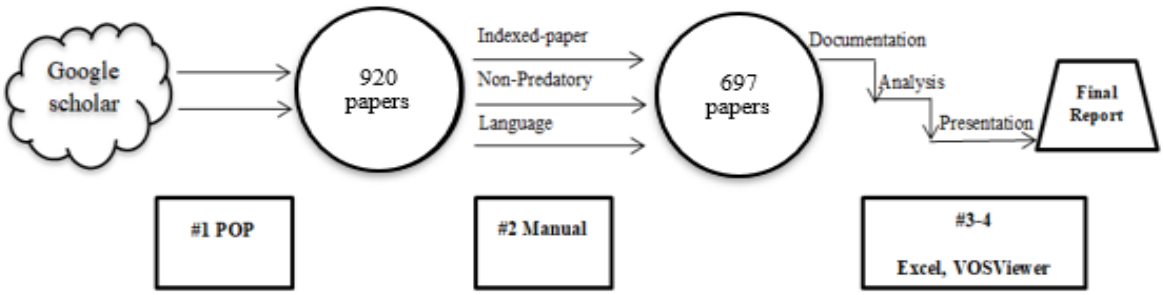

Figure 1. Research Steps Source

systematically examine the content and trends of published articles, particularly those indexed in Google Scholar between 2010 and 2022. The analysis focuses on identifying challenges and developments in IBT research. The bibliometric process in this study consists of four main steps (see Figure 1). The first step involves identifying relevant publications using Google Scholar, which offers search capabilities based on fields of study, author names, and keywords. It includes a wide range of academic sources such as books, theses, journal articles, and publications from universities, institutions, and professional organizations. To facilitate this process, the study utilizes the Publish or Perish (PoP) software, which retrieves and analyzes academic citations. PoP helps filter high-quality articles and presents metadata that supports the identification of relevant references aligned with the research theme.

A combination of keywords—"performance," "business incubator," "knowledge-based view," "resource-based view," and "technology"—was used to capture diverse topics related to IBTs. This search yielded 920 documents, including journal articles, conference proceedings, symposia, books, working papers, theses, and citations. An initial screening was conducted to remove duplicates and exclude papers that did not meet the keyword criteria. This structured approach ensures the relevance and quality of the data used in the bibliometric analysis, laying a strong foundation for exploring the performance and strategic development of IBTs.

The second step involves manually screening the papers retrieved using Publish or Perish (PoP). The first author carefully reviewed the abstract of each document to assess its relevance to the research topic. As a result of this screening, 223 papers were excluded, leaving 697 papers deemed suitable for further analysis. These selected papers were systematically recorded in Microsoft Excel, focusing on key attributes such as the theoretical framework, research methodology, country of origin, and thematic focus. The screening criteria specified that only journal articles were to be included, thereby excluding books, citations, web content, and other non-journal sources. Consequently, from the initial pool of 920 documents, 697 met the inclusion criteria and were retained for analysis.

The third and fourth steps involve data processing and presentation. VOSviewer software was employed to visualize the bibliometric findings. VOSviewer is a powerful tool for constructing and exploring bibliometric maps, allowing researchers to identify and analyze relationships among publications, authors, and keywords [49, 50]. In this study, it was used to build and visualize citation networks and thematic clusters. The results of this analysis were then interpreted to address the research questions, particularly focusing on identifying trends in the literature related to factors influencing the performance of business incubators.

RESULTS AND DISCUSSION

This study presents a comprehensive a bibliometric analysis of 697 journal articles published between 2010 and 2022, aiming to synthesize key findings and identify research gaps in the field of Technology Business Incubators (TBI). The central gap identified is the need to enhance TBI performance through the effective integration of multiple

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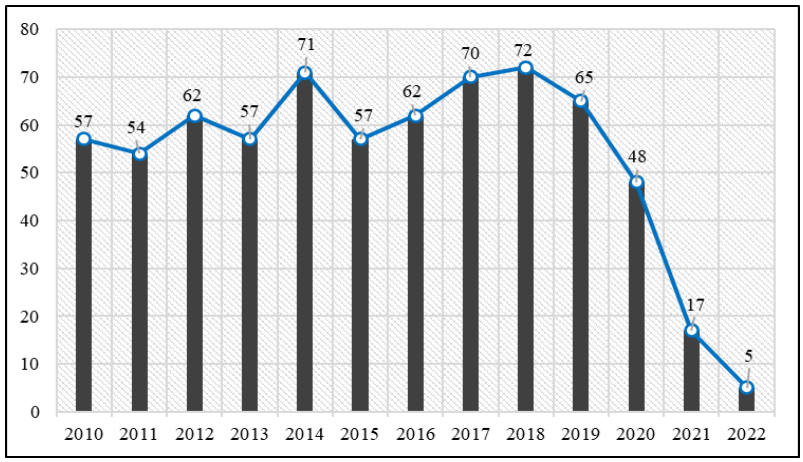

Figure 2. IBT Performance Publication 2010-2022

methods, considering the diverse internal and external factors that influence their success. The novelty of this research lies in its dual role: as an improvisation of existing TBI frameworks and as a foundation for future technological advancements. By analyzing these influencing factors, the study proposes a more resilient and adaptive approach to improving TBI outcomes.

The Profiles Incubator Business Research

The bibliographic analysis, conducted using rigorous selection criteria—including publication year, co-citation patterns, institutional collaboration, keyword relevance, and thematic alignment—reveals a fluctuating yet generally upward trend in TBI research from 2010 to 2018, followed by a decline from 2019 to 2022. This trend is visualized in Figure 2, which shows the annual distribution of selected journals. The downturn, likely influenced by the COVID-19 pandemic, reflects disruptions in research funding, access to facilities, and organizational operations. Despite this, the sustained scholarly interest underscores the field's relevance and potential for innovation.

From the 697 journals reviewed, 248 were selected for detailed analysis and categorized into 77 classifications. The top 15 classifications, accounting for 62% of the selected journals, are led by *Technovation*, *Research Policy*, and *Journal of Business Research*, as shown in Figure 3. These journals predominantly originate from the United

Figure 3. Journal Rating

Table 1. Number of Journals by Country

Country	Total	Country	Total	Country	Total
Australia	1	India	4	Singapore	1
Austria	1	Lithuania	6	South Korea	2
Bosnia Hegovina	1	Malaysia	1	Switzerland	23
Canada	6	Netherlands	90	Thailand	1
Chile	1	Poland	9	United Kingdom	330
Czech Republic	2	Romania	1	United States	195
Germany	22				
					697

Table 2. Number of Journals by Publisher

Publisher	Total	Publisher	Total
Elsevier	197	Wiley Online Library	39
Springer	146	mdpi.com	20
Taylor & Francis	85	researchgate.net	12
emerald.com	83	academic.oup.com	10
journals.sagepub.com	41	papers.ssrn.com	6

Kingdom, the United States, and the Netherlands—highlighting the global distribution and leadership in TBI research. Table 1 further categorizes these publications by country, with the United Kingdom emerging as the most prolific contributor. This aligns with its robust startup ecosystem, where incubators provide critical support through mentorship, funding access, infrastructure, and strategic networking—particularly vital for early-stage, technology-driven ventures.

In terms of publishing platforms, Table 2 highlights the top 10 publishers, with *Elsevier* leading (197 journals), followed by *Springer* (146), *Taylor & Francis* (85), and *Emerald* (83). These publishers play a pivotal role in disseminating TBI research. Additionally, Table 3 identifies 211 core journals, with *The Journal of Technology Transfer* (69 articles), *Technological Forecasting and Social Change* (39), and *Technovation* (37) at the forefront. These journals are instrumental in shaping the discourse around innovation ecosystems and incubator performance. The quartile rankings (Q1–Q4 and proceedings), visualized in Figure 4, provide further insight into the academic impact and quality of these publications.

All journal data were analyzed using VOSviewer to map thematic trends, co-authorship networks, and keyword co-occurrences. The interpretation of these findings reveals that while publication volume has declined in recent years, the field remains vibrant and strategically important. The dominance of high-impact journals and publishers suggests a maturing research landscape with established scholarly hubs. The implications are clear: the identified gap

Table 3. Ranked in The Top 10 Core Journals in TBI Research

Journal	Total		
The Journal of Technology Transfer	69	Research policy	18
Technological Forecasting and Social Change	39	Entrepreneurship & Regional Development	15
Technovation	37	Journal of the Knowledge Economy	14
Journal of Business Research	27	Journal of Knowledge Management	13
Small business economics	19	Sustainability	13

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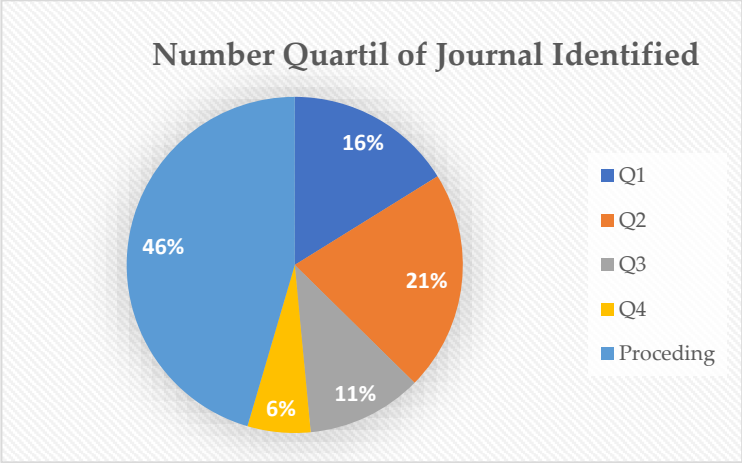

Figure 4. Chart of Number Quartile of Journal Identified

in enhancing TBI performance offers a focused direction for future research, while the bibliometric insights provide a roadmap for academics and policymakers to align with influential themes, collaborative networks, and proven publication channels. This positions the study as both a strategic reference and a practical guide for optimizing incubator ecosystems and supporting sustainable startup development.

Prospects and Challenges Based on Clustering Theme

To analyze and review the related literature, VOSviewer software is employed to visualize keyword and title-based clusters, revealing thematic patterns across the selected papers. The process involves two main steps. First, VOSviewer generates a network visualization in which five primary clusters are identified, each represented by a distinct color—red, blue, yellow, green, and purple—as shown in Figure 5. These clusters group terms that frequently co-occur, indicating thematic proximity. For example, the red cluster may include keywords such as "integrity," which is closely linked to terms like "firm performance," "capability," and "startup," as indicated by connecting lines. These lines represent the strength of co-occurrence relationships between nodes, helping to map the intellectual structure of the field.

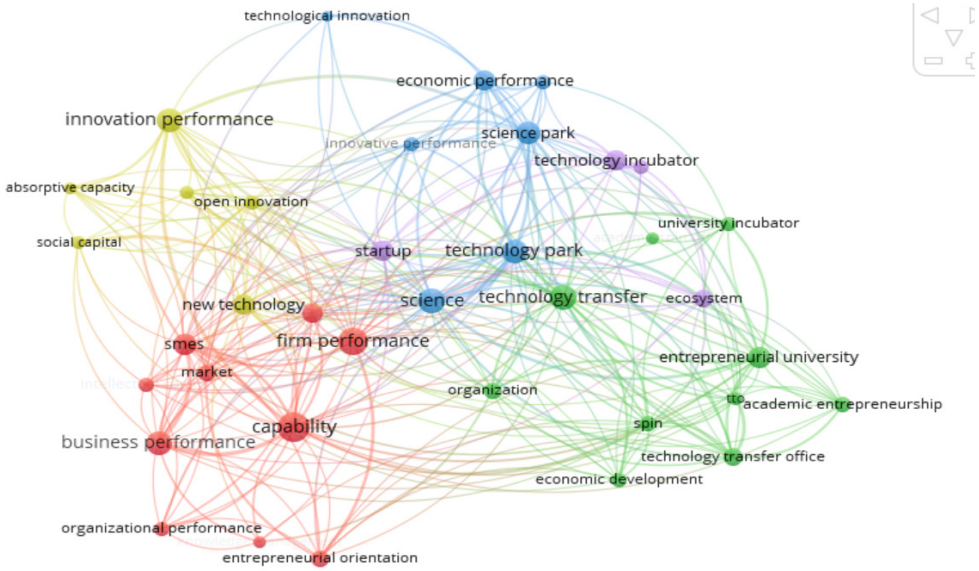

Figure 5. VosViewer Processing Result

Table 4. Mapping Based on Color Clusters on Vosviewer

Cluster 1: OA	Cluster 2: OE	Cluster 3: TP	Cluster 4: IP	Cluster 5: EE
Business performance	Academic entrepreneurship	Economic performance	Absorptive capacity	Ecosystem
Capability	Academic spinoff	Human capital	Entrepreneurial firm	Entrepreneurial ecosystem
Entrepreneurial orientation	Economic development	Innovative performance	Innovation performance	startup
Firm performance	Entrepreneurial university	Science Park	New technology	Technology incubator
Intellectual capital	Technology transfer office	Technological innovation	Open innovation	
Knowledge management	University incubator	Technology Park	Social capital	
Market				
Organizational performance				

OA = Organizational Aspect; UE = Univ. Entrepreneurism; TP = Technology Park; IP = (Innovation Performance; EE = Entrepreneurial Ecosystem

Second, the clusters are examined in detail to interpret the thematic focus of each group. This analysis results in five distinct clusters, summarized in Table 4, which reflect the dominant research themes within the business incubator performance literature. The clustering approach provides valuable insights into how different studies are conceptually related, highlighting commonalities and emerging trends. Overall, this method enhances understanding of the research landscape by identifying key areas of focus and potential gaps in the existing body of knowledge. Each node in the VOSviewer network represents a keyword, with node size reflecting its frequency across the dataset. Larger nodes indicate higher relevance, while links between nodes represent co-occurrence relationships. Figure 6 highlights "capability" as the most prominent keyword, indicating its central role in TBI

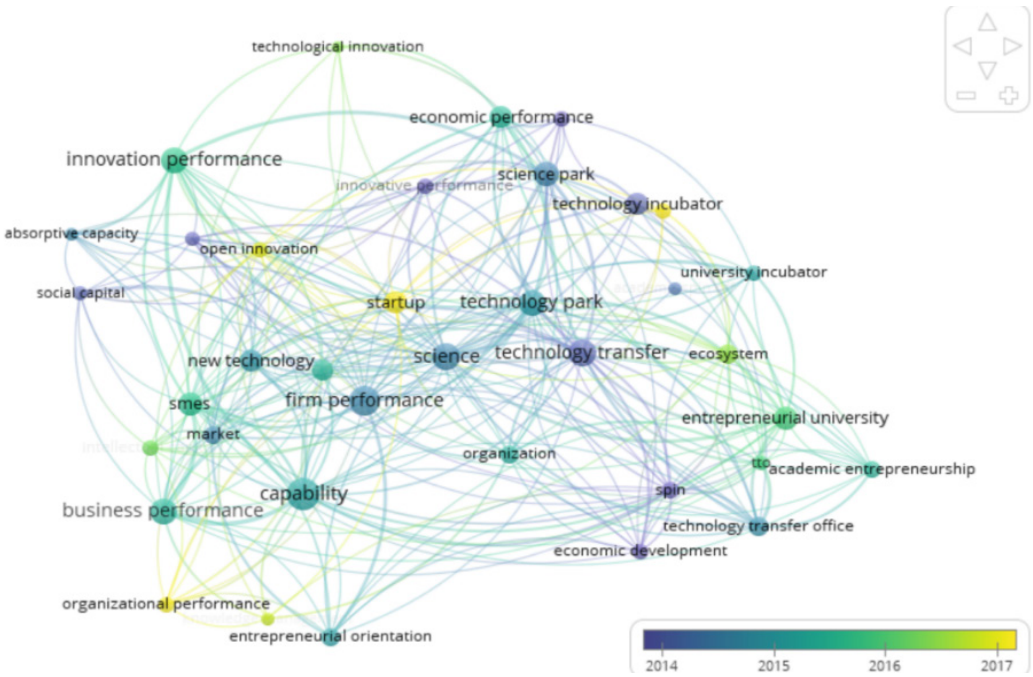

Figure 6. VosViewer Processing Result by Year

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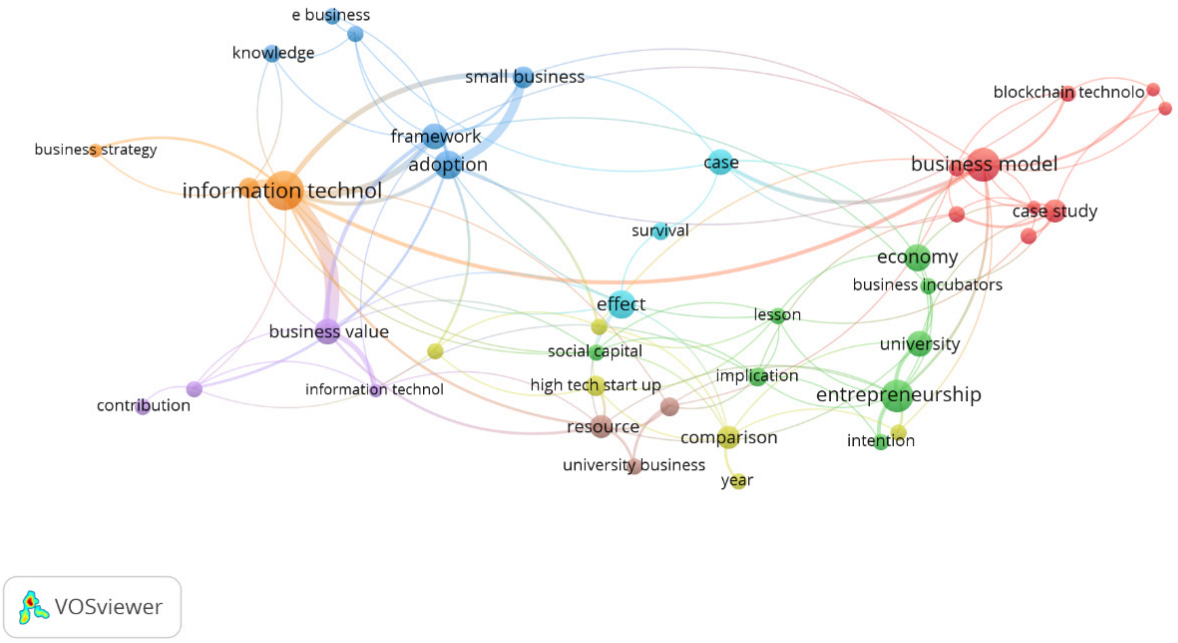

Figure 7. VosViewer Processing Newest

research. Other frequently discussed terms include “academic spinoff,” “performance,” and “technology transfer office.” Notably, keywords such as “open innovation,” “startup,” and “technology incubator” are shown in yellow, clustered toward the most recent years (2017 onward), suggesting their emergence as current research priorities.

Figure 7 presents a keyword co-occurrence network based on articles published between 2014 and 2017. This visualization, also generated using VOSviewer, illustrates the thematic structure and evolution of TBI research. Node size and line thickness visually represent keyword importance and interconnectivity, offering insights into dominant and emerging topics.

The findings from Figures 5, 6, and 7, along with Table 4, reveal that business incubator research is increasingly shaped by technological innovation, academic entrepreneurship, and ecosystem development. In today’s rapidly evolving economic landscape, business models and digital technologies play a pivotal role in driving efficiency and adaptability. Consequently, business incubators must evolve to meet the changing needs of entrepreneurs, integrating knowledge, innovation, and digital tools to enhance their performance. The clustering results in Table 4 provide a clear thematic breakdown, guiding future research and strategic development in the field.

Cluster 1: Organizational Performance

Business incubators play a vital role in enhancing the performance of startups, which directly links to the theme of "Firm Performance" (Cluster 1). International studies have highlighted how incubators can support firm growth and sustainability through access to funding, mentoring, and knowledge management. A study by Fithri et al. [36] found that knowledge management acts as a mediating factor between funding support, government aid, incubator governance, and technological performance, emphasizing that managing organizational knowledge effectively can significantly improve both incubator and firm-level outcomes.

However, there are significant challenges in evaluating and improving incubator performance. Gozali et al. [14] identified critical success factors in university incubators, such as information technology systems, admission criteria, mentorship networks, and regulatory support from both universities and government bodies. Yet, the absence of standardized performance metrics makes it difficult to assess incubator effectiveness comprehensively.

This inconsistency creates barriers to developing evidence-based strategies that support firm performance through incubation services [14].

Furthermore, Al-Mubaraki and Busler [51] observed that while incubators can increase startup survival rates up to 81–90% annually, they still face challenges such as limited resources, the need for customized services, and poor integration with broader innovation ecosystems. These issues hinder the scalability and long-term success of both incubators and the firms they support. Thus, improving firm performance through incubation requires a holistic approach—strengthening managerial capacity, developing extensive support networks, and aligning incubation services with the specific needs of startups [51].

Cluster 2: Academic Entrepreneurship

Academic incubators have emerged as strategic platforms for fostering academic entrepreneurship by bridging the gap between research, innovation, and commercialization. These incubators support faculty members, students, and researchers in transforming their intellectual assets into viable startups through access to mentoring, business services, and innovation networks. The integration of digital technologies (e.g., social, mobile, analytics, and cloud) further enhances the ability of incubators to facilitate collaboration within entrepreneurial ecosystems [52]. Similarly, Correia et al. [53] emphasize the strategic importance of academic entrepreneurship ecosystems in supporting long-term university–industry engagement and promoting economic development through innovation-based ventures.

Despite their growing importance, academic incubators face persistent challenges that can limit their effectiveness. One key challenge is the misalignment between academic career incentives and entrepreneurial objectives. Traditional academic institutions often prioritize publications and teaching over commercialization, leading to a lack of motivation or institutional support for entrepreneurial activities among faculty [54]. Furthermore, researchers often struggle with a lack of funding, limited access to technological infrastructure, and insufficient mentorship—all of which are critical for startup success. Stana et al. [55] found that incubator-supported academic ventures frequently face these structural and operational hurdles, which can significantly slow down or even halt venture development in university settings.

To fully realize the potential of academic incubators, universities must reform their internal policies to promote entrepreneurial culture and reward innovation. As Fithri et al. [36] point out, knowledge management is a key mediating factor in incubator performance and academic firm outcomes. Institutions need to institutionalize entrepreneurship education, align faculty performance indicators with innovation outputs, and create strong university-industry partnerships. This is consistent with recommendations from Nafari et al. [52], who propose the development of international virtual incubators to scale academic entrepreneurship across borders and drive greater social and economic impact. These efforts would enable academic incubators to evolve from isolated support centers into integrated engines of innovation and commercialization.

Cluster 3: Technology Park

Technology parks have become essential environments for nurturing innovation and economic development by offering infrastructure, technological support, and access to academic and industrial collaborations. Business incubators within these parks enhance startup growth by providing mentorship, access to funding, and facilitating networking across stakeholders. The synergy between incubators and technology parks has led to stronger entrepreneurial ecosystems, especially when digital technologies such as social, mobile, analytics, and cloud (SMAC) are leveraged to support communication and innovation processes [52]. These incubators not only support technology transfer but also help bridge the gap between academic research and market applications [14].

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However, several challenges still hinder the optimal performance of incubators located within technology parks. A key issue is the lack of alignment between the academic mission of universities and the commercial focus of incubators. Traditional academic performance metrics often emphasize publications over entrepreneurial success, which limits faculty engagement in business ventures [56]. Furthermore, startups within technology parks frequently face difficulties accessing sufficient funding and technological infrastructure, particularly in developing regions. Surana, Singh, and Sagar [57] highlight that many incubators in emerging economies struggle with sustainability due to limited financial resources and weak policy support. Moreover, university and local government coordination is sometimes inadequate, which can reduce the effectiveness of regional innovation systems [58].

To address these challenges and enhance incubator performance within technology parks, several strategic reforms are necessary. First, universities must create incentive systems that reward entrepreneurial activity, including technology transfer and startup creation. Second, stronger partnerships between universities, municipalities, and private industry are needed to facilitate resource sharing and foster innovation clusters. According to Kulkov et al. [58], such multi-stakeholder collaborations can increase local economic resilience and innovation output. Additionally, adopting digital incubator models and international virtual incubation platforms can improve access to resources, mentorship, and global markets, especially for underserved regions [52]. Ultimately, aligning academic, industrial, and governmental objectives within technology parks can significantly improve the business performance of incubators and foster sustainable innovation.

Cluster 4: Innovation Performance

Business incubators play a pivotal role in enhancing innovation performance by providing startups with essential resources, mentorship, and networking opportunities. These incubators serve as catalysts for innovation by offering a conducive environment for idea generation and technological advancement. For instance, a systematic literature review by Leitão et al. [59] highlights that incubators significantly contribute to the innovation performance of technology-based ventures by facilitating access to knowledge, infrastructure, and financial resources. Moreover, Fithri et al. [36] emphasize the importance of knowledge management within incubators, noting that effective knowledge-sharing practices can lead to improved innovation outcomes for incubated firms.

Despite these advantages, incubators face several challenges that can impede their effectiveness in fostering innovation. One major challenge is the lack of standardized performance metrics to evaluate the success of incubators in promoting innovation. As noted by Hausberg and Korreck [60], the absence of uniform evaluation criteria makes it difficult to assess the true impact of incubators on innovation performance. Additionally, Surana et al. [57] point out that in developing countries, incubators often struggle with limited funding and inadequate policy support, which can hinder their ability to support innovative startups effectively. Furthermore, Yuan et al. [61] identify that the success of incubators in enhancing innovation is contingent upon various factors, including the availability of skilled human capital, technological infrastructure, and access to financial resources.

To address these challenges and enhance the innovation performance of incubated firms, several strategies can be implemented. Firstly, establishing standardized performance metrics can provide a clearer understanding of an incubator's effectiveness in promoting innovation. Secondly, increasing government support and funding for incubators, especially in developing regions, can bolster their capacity to nurture innovative startups. Additionally, fostering collaborations between academia, industry, and government can create a more robust innovation ecosystem. As highlighted by Fithri et al. [36], such collaborations can facilitate knowledge transfer and provide startups with access to a broader network of resources and expertise. By implementing these strategies, incubators can overcome existing challenges and significantly enhance their role in driving innovation performance.

Cluster 5: Entrepreneurial Ecosystem

Business incubators serve as pivotal components within entrepreneurial ecosystems, offering startups essential resources such as mentorship, networking opportunities, and access to capital. These incubators facilitate the translation of innovative ideas into viable business models, thereby driving regional economic growth and innovation. For instance, Yuan et al. [61] highlight that technology business incubators in China significantly contribute to entrepreneurial ecosystems by providing critical support in areas like technology, capital, and infrastructure. Similarly, Surana et al. [57] emphasize the role of science, technology, and innovation-based incubators in India in achieving sustainable development goals through targeted support for startups. Moreover, incubators act as intermediaries, bridging the gap between academia, industry, and government, thus fostering a collaborative environment conducive to entrepreneurship [62].

Despite their contributions, incubators face several challenges that can impede their effectiveness within entrepreneurial ecosystems. One significant challenge is the lack of standardized performance metrics, making it difficult to assess the true impact of incubators on startup success and ecosystem development. Hausberg and Korreck [60] note that this absence of uniform evaluation criteria hinders the ability to measure incubator performance accurately. Additionally, incubators in developing economies often struggle with limited funding and inadequate policy support, which can restrict their capacity to support innovative startups effectively [57]. Furthermore, the dependence of startups on incubators can lead to challenges in achieving long-term sustainability once they graduate from the incubation program [63].

To enhance the performance of incubators within entrepreneurial ecosystems, several strategic measures can be implemented. Establishing standardized performance metrics would enable better assessment and improvement of incubator services. Increasing government support and funding, particularly in developing regions, can bolster the capacity of incubators to nurture innovative startups. Fostering collaborations between academia, industry, and government can create a more robust and supportive entrepreneurial ecosystem. For example, the integration of campuses with industry through incubators has proven effective in facilitating innovation and entrepreneurship among students, as seen in the case of NUS Enterprise in Singapore [64]. By implementing these strategies, incubators can overcome existing challenges and significantly enhance their role in driving entrepreneurial ecosystem development.

CONCLUSION

IBT studies have received attention in the last ten years and are supported by the government's increasing efforts to appeal to the importance of Business Incubators in government and universities. Based on the findings of 920 papers submitted to Vosviewer, the following conclusions can be drawn, leading to further research suggestions. First, based on the results and discussion, it can be interpreted that the growth in the topic area regarding business incubators occurred in 2010-2022, with the highest Google Scholar index occurring in 2018, namely 72 publications. Technology transfer journals published the most publications, with 69 journals. Meanwhile, geographically, the topic of this research is dominated by the United Kingdom. Second, most studies on IBT discuss academic spinoff, performance, and technology transfer offices. This issue is very often discussed on the topic of IBT. The government's desire to produce startups capable of being independent and successful is significant at this time. Third, five research themes have been identified that are also relevant for further research. For example, future research could focus on several topics such as Academic Entrepreneurship, performance, Technology Transfer Office, and ecosystems such as industry, government, and academics related to IBT performance. Future research should also explore the dynamic interactions between these stakeholders within various cultural and institutional contexts beyond the

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current geographic focus, particularly in emerging economies. Additionally, longitudinal studies could provide deeper insights into the sustainability and long-term impacts of business incubators on startup success and regional innovation systems. Investigating the role of digital transformation and emerging technologies in enhancing incubator services is another promising area for future inquiry. Theoretical implications from this study contribute to the understanding of how business incubators function as multi-actor ecosystems that facilitate knowledge transfer and entrepreneurship development. This research extends existing theories on innovation ecosystems by emphasizing the pivotal role of government-university collaborations and the strategic positioning of technology transfer offices. Practical implications highlight the need for policymakers and incubator managers to tailor support mechanisms that align with the evolving needs of startups, particularly emphasizing the enhancement of technology transfer processes and fostering stronger linkages between academia, industry, and government. These insights can guide the design of more effective incubator programs and strategies to boost entrepreneurial performance and regional economic growth.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this paper. All authors have contributed significantly to the work and have approved the final version of the manuscript. No financial, personal, or professional relationships have influenced the content or outcomes of this research.

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