

## INCUBATOR IN ENTREPRENEURSHIP AND INNOVATION: A BIBLIOMETRIC ANALYSIS

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ARTICLE INFO		ABSTRACT
Received:	16/4/2025	<i>Business incubator</i> (or “Incubator”) is a comprehensive support model designed to facilitate the growth of startups and newly established enterprises by providing a range of services including shared resources, training, financial support, equipment, and infrastructure. These resources aimed at helping businesses develop and succeed. This study explores global research trends on business incubators through a bibliometric analysis of 144 publications from 2015 to 2024 indexed in the Web of Science. Using CiteSpace software, the study identifies leading countries, key research domains, and emerging thematic clusters. The results reveal a growing interest in incubator research, with the United States emerging as a central hub and management, and business as dominant disciplines. Key themes in the research include entrepreneurial ecosystems, innovation, and university-based incubators. The study’s findings provide valuable insights for researchers and policymakers, helping to shape better incubator strategies and support innovation-driven entrepreneurship. Strengthening these strategies will enable incubators to provide more effective support for startups, fostering entrepreneurship and innovation on a global scale.
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## VƯỜN ƯƠM TRONG KHỞI NGHIỆP VÀ ĐỔI MỚI SÁNG TẠO: PHÂN TÍCH TRẮC LƯỢNG THƯ MỤC

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THÔNG TIN BÀI BÁO		TÓM TẮT
Ngày nhận bài:	16/4/2025	Vườn ươm doanh nghiệp (incubator) là một mô hình hỗ trợ doanh nghiệp toàn diện được thiết kế nhằm tạo điều kiện thuận lợi cho các doanh nghiệp khởi sự và mới được thành lập phát triển thông qua cung cấp các dịch vụ dùng chung, đào tạo, hỗ trợ tài chính, trang thiết bị và nhà xưởng. Tất cả các nguồn lực này với mục đích giúp các doanh nghiệp phát triển và thành công. Nghiên cứu này đi sâu tìm hiểu các xu hướng nghiên cứu toàn cầu về vườn ươm doanh nghiệp thông qua việc phân tích các tài liệu xuất bản của 144 công trình được công bố từ năm 2015 đến 2024 và được sắp xếp trong cơ sở dữ liệu Web of Science. Sử dụng phần mềm CiteSpace, nghiên cứu xác định các quốc gia dẫn đầu, các lĩnh vực nghiên cứu chính và các cụm chủ đề mới nổi. Kết quả cho thấy sự quan tâm ngày càng tăng đối với nghiên cứu về vườn ươm, với Hoa Kỳ nổi lên như là một trung tâm và quản lý, và kinh doanh là các ngành thống trị. Các chủ đề chính trong nghiên cứu bao gồm hệ sinh thái khởi nghiệp, đổi mới và vườn ươm đại học. Những phát hiện của nghiên cứu cung cấp những hiểu biết có giá trị cho các nhà nghiên cứu và nhà hoạch định chính sách, giúp định hình các chiến lược ươm tạo tốt hơn và hỗ trợ tinh thần khởi nghiệp đổi mới sáng tạo. Việc tăng cường các chiến lược này sẽ cho phép các vườn ươm cung cấp hỗ trợ hiệu quả hơn cho các công ty khởi nghiệp, thúc đẩy tinh thần khởi nghiệp và đổi mới sáng tạo trên quy mô toàn cầu.
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## 1. Introduction

In the contemporary global economy, entrepreneurship and innovation have emerged as critical engines of economic growth, structural transformation, and competitive advantage [1]. Startups, in particular, are often viewed as catalysts of innovation, job creation, and technological advancement [2], [3]. However, despite their potential, startups face substantial barriers to entry and survival including limited access to capital, fragile organizational structures, underdeveloped networks, and a high level of uncertainty in market validation and scalability [4]-[6]. These challenges are especially acute in the early stages of firm formation, where foundational decisions can determine long-term viability [1]. Within this landscape, business incubators have emerged as institutional mechanisms designed to support nascent enterprises in overcoming the structural and strategic challenges that often hinder their survival and long-term success. As noted by S. Mian et al. [7], incubators go far beyond offering physical workspaces and technical resources; they serve as integrative platforms that cultivate entrepreneurial networks, reduce entry barriers, and facilitate access to financial, human, and social capital [8]. K. Deyanova et al. [9] further emphasized that incubators serve as a bridge between idea and execution, offering structured environments that promote experimentation, risk mitigation, and iterative innovation. The strategic function of incubators is closely linked to their ability to create conducive environments for knowledge exchange, business development, and innovation diffusion. A. Grandi and R. Grimaldi [10], [11] highlighted how incubators act as both facilitators and filters guiding startups through critical early-stage decisions while enhancing their ability to integrate into broader innovation ecosystems. These ecosystems often include universities, government agencies, investors, and private sector actors, positioning incubators at the intersection of policy, innovation, and enterprise growth.

Multiple incubator models have evolved over time, each reflecting variations in service offerings, resource intensity, and strategic orientation. Among the most prevalent models are:

- **Traditional incubators**, which provide startups with physical office space, mentorship, administrative support, and access to professional networks [12]. These incubators typically engage with startups throughout their development lifecycle from conceptualization to market readiness and are often affiliated with academic institutions, economic development agencies, or municipal governments.

- **Accelerators**, which adopt a more time-compressed and investment-oriented model [13]. Typically structured as short-term, cohort-based programs, accelerators focus on scaling high-potential ventures rapidly, offering seed funding, intensive mentorship, and investor exposure. As Cohen's notes, accelerators are designed to expedite market entry and capital acquisition within a predefined period, distinguishing them from the more gradual approach of traditional incubators.

- **Coworking spaces**, which provide flexible, shared working environments for entrepreneurs and small teams [14]. While offering fewer structured services than traditional incubators or accelerators, coworking spaces encourage cross-pollination of ideas, informal collaboration, and community engagement. They often serve as entry points for entrepreneurs before transitioning into more resource-intensive support systems.

Understanding the structural diversity and functional mechanisms of incubator models is essential for stakeholders seeking to enhance entrepreneurial ecosystems. These models vary significantly depending on factors such as sectoral orientation, regional innovation capacity, and access to financial and human capital. As such, evaluating the links between incubation practices and entrepreneurial performance including survival rates, innovation capacity, and growth trajectories remains a central research challenge.

While existing studies have explored various aspects of incubators, there is still a lack of comprehensive bibliometric synthesis that captures global trends, thematic development, and collaborative networks within this domain. To address this gap, the present study conducts a

longitudinal bibliometric analysis of 144 publications from 2015 to 2024 indexed in the Web of Science (WoS). The objective is to provide a macroscopic overview of the research landscape surrounding business incubators within the context of entrepreneurship and innovation. Specifically, the study seeks to:

- Examine how research on incubators has evolved over the past decade in relation to startup and innovation ecosystems [15];
- Identify the most research-active countries and assess patterns of international collaboration [16];
- Detect the most frequently occurring keywords to reveal dominant themes and emerging trends [17];
- Analyze the structural and thematic relationships across publications and geographical regions [18].

By addressing these research questions, this paper contributes to a more nuanced understanding of the strategic role of incubators in economic development and innovation policy. The insights derived are expected to inform future academic research, guide policymakers, and support incubator managers in refining their models to better serve entrepreneurial growth and resilience in an increasingly complex economic landscape.

## 2. Data and Methods

This study employs a bibliometric analysis approach to explore the research landscape surrounding business incubators in the context of entrepreneurship and innovation. Bibliometric methods enable researchers to quantitatively assess publication patterns, author networks, country collaborations, and thematic trends in a given research field over time. To ensure the validity and comprehensiveness of the dataset, we utilized the WoS Core Collection, one of the most widely recognized and reputable academic databases, as the primary data source.

### 2.1. Data collection

The dataset for this study was retrieved from the Web of Science (WoS) Core Collection using a targeted topic-based search strategy. The query was formulated as follows:

TS = (“business incubator” OR “startup incubator” OR “technology incubator”) AND TS = (“entrepreneurship” OR “innovation ecosystem”)

The search was limited to publications published between January 1, 2015 and March 31, 2024, and only included documents categorized as journal articles or conference proceedings, written in English. To ensure quality and consistency, we excluded duplicate records and retracted publications using both WoS built-in filters and manual review.

Importantly, no restrictions were applied to specific WoS subject categories during the search process to maintain a comprehensive dataset across disciplines. Disciplinary distribution was subsequently analyzed and presented in Table 1 to highlight the concentration and diversity of incubator-related research domains.

After cleaning, the final dataset comprised 144 unique publications, including 112 journal articles and 32 conference papers. This corpus serves as the foundation for all subsequent bibliometric analyses in this study.

### 2.2. Analytical tools and methods

To analyze the collected data, we utilized CiteSpace (version 6.1.R6, 64 bit) a powerful bibliometric visualization software widely used for mapping scientific knowledge and detecting emerging trends [19], [20]. CiteSpace enables the construction of co-authorship networks, co-citation networks, keyword co-occurrence maps, and cluster visualizations, thereby uncovering structural patterns and intellectual turning points in the literature.

The bibliometric analysis was conducted in several stages:

- *Descriptive statistics*: Basic quantitative indicators were generated, including publication volume by year, most prolific countries, citation counts, and H-index values.

- *Keyword co-occurrence analysis*: Keywords were analyzed to identify prevailing research topics and emerging areas of interest. Keyword networks were generated to detect thematic clusters.
- *Co-authorship and country collaboration analysis*: Networks of collaborating countries and institutions were mapped to highlight the geographic distribution and interconnectivity of research efforts.
- *Co-citation analysis*: Citation relationships between highly cited articles were examined to identify foundational works and influential research streams within the field.

CiteSpace enables the construction of co-authorship networks, co-citation networks, keyword co-occurrence maps, and cluster visualizations, thereby uncovering structural patterns and intellectual turning points in the literature

To enhance the reproducibility of our analysis, the CiteSpace software was configured using the following parameters:

- *Time slicing*: The time range was set from 2015 to 2024, with a 1-year per slice interval to track annual changes and thematic evolution.
- *Node types*: Depending on the analysis focus, node types included keywords, countries, institutions, authors, and cited references.
- *Selection criteria*: For each slice, the top 50 nodes were selected based on the g-index, with the scale factor set at  $k = 25$ . This setting balances network comprehensiveness with interpretability.
- *Pruning methods*: The networks were refined using Pathfinder and Pruning sliced networks, techniques that reduce visual clutter and preserve the most significant structural connections.
- *Visualization techniques*: Results were visualized using cluster view and timeline view, enabling the identification of major thematic clusters and their evolution over time.

These configurations were chosen to ensure both depth and clarity in mapping the intellectual structure of incubator-related research, while maintaining methodological transparency for replication.

### 2.3. Rationale for methodology

Bibliometric analysis was selected due to its suitability for systematically capturing the evolution and dynamics of research fields over time [21], [22]. Compared to traditional literature reviews, bibliometric methods offer objectivity and replicability, allowing researchers to process large datasets and identify patterns that may not be apparent through qualitative analysis alone.

The combination of CiteSpace and WoS ensures the reliability of results, given the database's high-quality indexing and the software's advanced capabilities in temporal, structural, and thematic mapping. The chosen methodology is well-aligned with the study's objectives: to provide a comprehensive overview of incubator-related research, identify influential contributors and emerging trends, and assess the development of international scholarly collaboration.

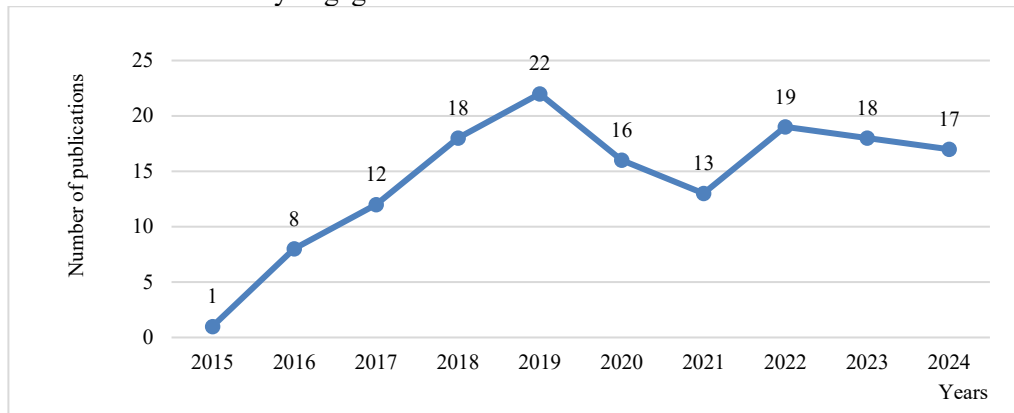
## 3. Results and Discussion

The bibliometric analysis reveals a rich and multidimensional landscape of scholarly research on business incubators within the broader context of entrepreneurship and innovation. Through a detailed examination of publication trends, country contributions, collaborative networks, disciplinary domains, and thematic structures, this section provides a comprehensive interpretation of the evolving intellectual structure of the field. A list of the ten most highly cited publications in our dataset is provided in Appendix A, offering a snapshot of the most influential contributions to incubator-related research.

### 3.1. Temporal evolution of research output

The longitudinal analysis of publication output from 2015 to 2024 (see Figure 1) demonstrates a clear growth trajectory, indicative of increasing academic attention to the role of incubators in supporting startups and fostering innovation ecosystems. The number of publications rose from a

single article in 2015 to a peak of 22 in 2019, marking the period between 2015 and 2019 as a phase of intensified scholarly engagement.

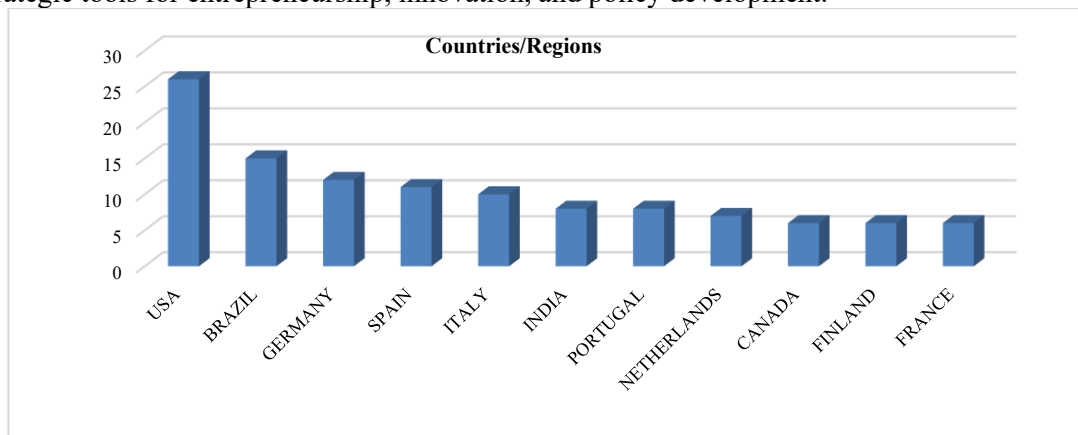


**Figure 1.** Annual distribution of publications on business incubators (2015–2024)

This growth coincides with global trends in innovation policy as shown in Figure 1, where incubators have gained recognition as pivotal tools for regional economic development and entrepreneurial capacity building. The subsequent decline in 2019–2021, from 22 to 13 publications, likely reflects the short-term disruption caused by the COVID-19 pandemic, which temporarily shifted academic focus and constrained entrepreneurial activities globally. Nevertheless, the research output recovered quickly in 2022 and remained relatively stable through 2024, indicating resilience and sustained interest in the topic. This temporal pattern suggests that incubator research is not merely trend-driven but has established itself as a sustained and maturing area of scholarly inquiry.

### 3.2. Country contributions and global research landscape

The analysis of country-level contributions in Figure 2 confirms the United States as the undisputed leader in incubator-related research, with more than 25 publications. This pattern reflects the maturity of the U.S. innovation system. It also shows the widespread use of incubator models across universities, governments, and the private sector, across universities, government programs (e.g., SBIR, TechStars), and the private sector. Other active contributors such as Brazil, Germany, and India demonstrate the global expansion of incubator research across diverse economic contexts. This distribution emphasizes the international relevance of incubators as strategic tools for entrepreneurship, innovation, and policy development.



**Figure 2.** Top 10 countries by number of publications on business incubators (2015–2024)



**Figure 3.** *International co-authorship network in incubator research (2015–2024)*

Brazil, Germany, Spain, and Italy also exhibit substantial research activity, underscoring the relevance of incubators in diverse economic contexts from emerging markets grappling with job creation challenges (e.g., Brazil, India) to developed economies investing in high-tech entrepreneurship (e.g., Germany, Netherlands, Finland). The co-authorship network visualization (Figure 3) further illustrates the interconnectedness of this scholarly community. The USA functions as the central hub of international collaboration, with robust academic linkages to countries such as Germany, Brazil, France, India, and Finland. These connections indicate the existence of global knowledge flows and shared policy learning, particularly on best practices in incubation design, governance, and evaluation.

Notably, countries with relatively fewer publications such as Canada and Finland exhibit high centrality in the collaboration network, suggesting that their influence lies more in strategic partnership roles rather than publication volume alone. These collaborative patterns reveal a globally dispersed research landscape. At the same time, they demonstrate structural integration through international partnerships, driven by mutual interests in entrepreneurship development, regional competitiveness, and institutional support for innovation [23].

### 3.3. *Disciplinary breadth and research domains*

Table 1 reveals a dominant concentration in the fields of Management (65 publications) and Business (52 publications). Together, these domains account for approximately 81% of all publications and are also responsible for the highest citation impact (H-index of 20 and 16, respectively). This demonstrates the intellectual consolidation of incubator research within strategic management, organizational theory, and innovation studies.

**Table 1.** *Distribution of publications by WoS categories with citation metrics (2015–2024)*

No	Field of research WoS Categories	Total number of publications	Total citations (without self-citations)	H-index
1	Management	65	1074	20
2	Business	52	804	16
3	Engineering Industrial	6	515	11
4	Operations Research Management Science	11	282	5
5	Economics	10	71	3

In contrast, the Industrial Engineering domain despite contributing only 6 publications recorded a disproportionately high citation count (515 citations) and H-index (11). This suggests a focused yet impactful engagement, likely dealing with incubation process optimization, performance measurement, and technological infrastructure.

The presence of Operations Research & Management Science and Economics further reinforces the field's methodological pluralism, accommodating both qualitative frameworks (e.g., ecosystem theory, institutional analysis) and quantitative models (e.g., efficiency analysis, econometrics). Other emerging domains, including Environmental Studies, Computer Science, and Education, reflect growing interest in sustainability-driven incubator models, digital incubation platforms, and the role of incubators in entrepreneurial education.

This interdisciplinary nature indicates that incubator research is increasingly responsive to complex, cross-sectoral challenges and aligned with broader societal transitions such as green innovation, digital transformation, and human capital development.

### 3.4. Thematic Clusters and Keyword Dynamics

The keyword co-occurrence analysis (not shown visually but referenced in the dataset) identifies entrepreneurial ecosystems, innovation ecosystem, startup climate, and business incubation as core thematic nodes. These recurring keywords reveal the conceptual framing of incubators not as isolated entities, but as embedded components within systemic environments that enable knowledge exchange, resource mobilization, and institutional interaction as shown in Figure 4.

Other salient keywords such as technology startups, open innovation, business model innovation, and university incubators suggest an evolving interest in high-growth and knowledge-intensive entrepreneurship, as well as the role of academic institutions in incubation.

Terms like knowledge management, organizational patterns, and strong ties underscore the importance of relational and cognitive dimensions in successful incubation. These findings resonate with literature highlighting that incubators are more than just service providers; they are architects of social capital and learning platforms that shape firm trajectories and innovation capacity.

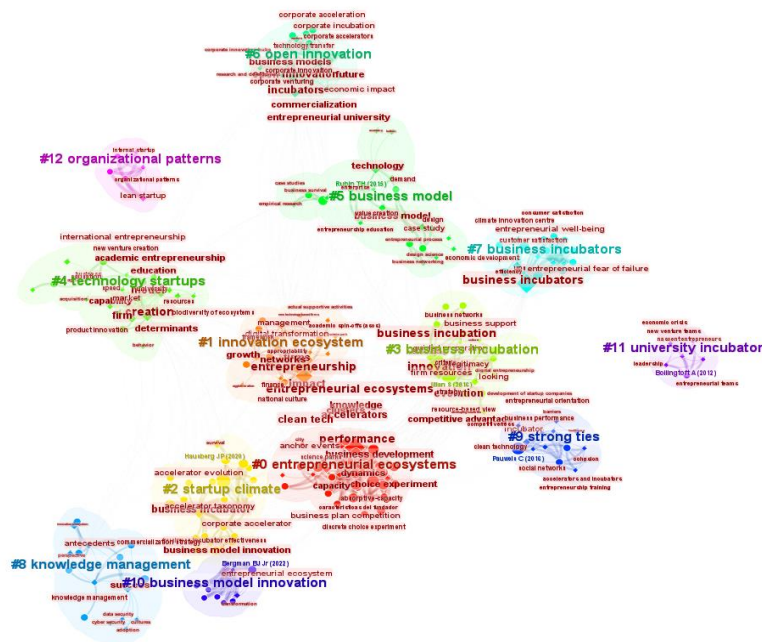


Figure 4. Keyword co-occurrence network of incubator research (2015–2024)

### 3.5. Implications and strategic reflections

The results of this study yield several important implications for both academic inquiry and policy-making:

For scholars, the maturity of incubator research in management and business opens space for more comparative and evaluative studies, especially in emerging contexts and under-researched

regions. Further integration with sustainability, digitalization, and inclusivity agendas can enhance theoretical richness and policy relevance.

For policymakers, understanding the global distribution and collaboration patterns helps in benchmarking incubation models and adapting them to local innovation systems. Evidence-based policy design should draw on the success factors identified in leading countries while remaining responsive to contextual constraints.

For practitioners and incubator managers, the keyword analysis highlights the critical role of ecosystem thinking, network formation, and strategic resource orchestration. Incubators that align themselves with broader entrepreneurial ecosystems and continuously adapt to evolving startup needs are more likely to deliver long-term impact.

#### 4. Conclusions

The bibliometric findings reveal a dynamic and growing body of research on incubators, with increasing global engagement and cross-disciplinary exploration. The dominance of management and business domains, coupled with emerging interests in engineering, sustainability, and education, highlights the complex and evolving nature of incubation as both a practical intervention and a subject of scholarly inquiry. Furthermore, the prominence of keywords such as “entrepreneurial ecosystems,” “business model innovation,” and “university incubators” reflects a strategic shift toward understanding incubation within broader innovation systems. This systems-based perspective reinforces the idea that incubators are not stand-alone entities but integral nodes in the architecture of regional and national economic development.

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## APPENDIX

## Appendix A. Top 10 Most Cited Publications on Business Incubators (2015–2024)

No.	Title	References	Source/ Journal	Year	Citations*
1	Technology Business Incubation: An overview of the state of knowledge	[7]	Technovation	2016	243
2	Hatching start-ups for sustainable growth: A bibliometric review on business incubators	[9]	Review of Managerial Science	2022	187
3	The design of startup accelerators	[13]	Research Policy	2019	158
4	Business incubators and new venture creation: an assessment of incubating models	[11]	Technovation	2005	132†
5	Technology business incubation mechanisms and sustainable regional development	[8]	The Journal of Technology Transfer	2018	119
6	Startups and open innovation: a review of the literature	[3]	European Journal of Innovation Management	2017	104
7	Co-working spaces, collaborative practices and entrepreneurship	[14]	Collaboration in the Digital Age (Springer)	2018	91
8	Research cooperation between universities and local firms: Comparing ecosystems in China and USA	[16]	Journal of the Knowledge Economy	2025	74
9	Identifying Factors Affecting Startups Survival: A Systematic Literature Review	[4]	Journal of Organisational Studies & Innovation	2024	63
10	HRM as a catalyst for innovation in start-ups	[2]	Employee Relations: The International Journal	2021	58

Note: \*Citation counts were retrieved from the Web of Science Core Collection as of April 2024.

†Included for historical context and foundational impact, although published before 2015.