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Startup Financing Patterns and Performance: A Systematic Review of Empirical Research

Abstract

Research background and purpose: This study examines the financing patterns and performance of startups through a systematic review of empirical research. It aims to provide an integrated understanding of how different funding mechanisms such as venture capital, bootstrapping, angel investment, and government support- shape startup survival, growth, and scalability within the entrepreneurial ecosystem.

Design/Methodology/Approach: This study employs a systematic literature analysis using a mixed-method approach. The dataset was selected following PRISMA guidelines, and bibliometric mapping was conducted using VOSviewer based on 610 records from the Web of Science database (1991-2025), supplemented by content analysis to describe the thematic aspects of the current situation of startup performance and financing patterns.

Findings: This study finds that startup performance and financing patterns have improved in developed nations, whereas developing countries still face significant difficulties. Since 2017, startup financing and performance have attracted increasing scholarly attention worldwide, although the distribution of research remains uneven. The USA leads in this regard, followed by Italy and China.

Value added and limitations: The analysis helps in understanding the growth of startups and relevant studies as well as which countries and authors perform most prominently in this area. This provides guidance for other researchers to explore fields that are not covered in depth. A limitation of this study is that it does not provide an in-depth analysis of regional variations.

Keywords: *startups, financing patterns, performance, PRISMA, entrepreneurship*

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Classification: G24, L26, M13, O16, C89

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1. Introduction

Startups play a vital role in creating new jobs, fuelling innovation and accelerating industrialisation in both developed and emerging economies. Their role in the commercialization of new ideas, creation of high-growth companies and strengthening of the entrepreneurial ecosystem is crucial. Countries across the globe have gained prominence as they are home to rapidly growing startup ecosystems. This growth is being fuelled by digitalization, policy measures and an increase in entrepreneurship resources. Maradi (2023) asserts that startups play an important role in economic dynamism and technological progress. The success of a startup ecosystem depends on the reinforcement of institutions, credibility and the mobilisation of resources. Startups have become essential contributors to the e-commerce, education, health care and fintech industries, where startup-driven innovations have created significant impact across sectors, thereby contributing to national growth objectives (Baporikar, 2015; Fatema et al., 2020). This has helped various researchers grasp the significance of startup financing and performance.

Since startups have great potential, they face high uncertainty and encounter various structural, financial and operational challenges throughout their evolution. Current literature suggests that the growth of a startup depends on entrepreneurial capability and market opportunity, but also on institutional support, human capital, regulatory clarity and available financing (Chillakuri et al., 2020; Dwivedi, 2019). The situation is further aggravated by procedural complexities, infrastructure deficits, and uneven distribution of ecosystem maturity across regions. Konga and Kasilingam (2023) state that many startups still face repeated documentation requirements in the funding process as well as difficulties to take bank credit due to the traditional approach of banks and the need for collateral. Likewise, low investment in research and development hampers innovation, and a regional divide presents a difficult challenge for startups in securing growth funding and development opportunities. Startups grapple with talent acquisition and retention, vague and inconsistent tax regulations, a lack of institutionalization and limited exit options which further increase risk and jeopardize long-term viability (Jha, 2018; Abell et al., 2021). Such limitations increase the importance of financing decisions for the startup's survival and growth.

The financing patterns of startups form the backbone of the creation, sustenance, and scaling of new ventures. Unlike well established companies, the startups depend on multiple sources of financing that are required as the firm progresses into various developmental stages. The choice of the financing depends on the nature of the business, maturity, industry characteristics, possibilities for high growth and the stage specific expectations of funding partners. Across different stages, entrepreneurs mostly rely on their own resources, friends and family financing, and informal borrowing during the ideation and bootstrapping phase (Ismail & Medhat, 2019).

Angel investors are the preferred source during the early-stage growth of the venture, and venture capital is highly appropriate once startups attain product-market fit and begin to scale (Bonini & Capizzi, 2019; Raju et al., 2020). Apart from angel investors and venture capital, private equity, corporate backing, follow-on rounds, and strategic buyouts are applicable at the various subsequent stages (Zeng, 2023). Crowdfunding has emerged as an alternative source of financing for consumer-oriented ventures by enabling participation from a broader investor base. Further, many government policy interventions and regulatory reforms have reduced administrative hurdles and improved the startup funding ecosystem as well. (Mittal & Madan, 2020; Muramalla & Al Hazza, 2019). However, the opportunities for funding differ between industries and geographical locations.

Apart from the access to capital, the financing-performance relationship is multidimensional and therefore should be given due consideration. Standard financial metrics, such as profitability, revenue or return on investment, cannot adequately capture the performance of startups. This is evident in the recent literature that focuses on dimensions, such as user base, customer acquisition, brand building, innovation potential and strategic flexibility (Costa et al., 2022; Nguyen et al., 2021). This is especially true since success for a startup is more about scalability, resilience and positioning in the ecosystem than short-term profitability. According to Kemell et al. (2020), if an organization does not use a systematic performance measurement system, the startup might be forced to adopt ad-hoc decision making processes, which will impede adaptability and scaling. Lean startups and agile experiments support resilience and strategic clarity (Blank, 2013; Silva et al., 2020). When financing is available to a startup at an appropriate time and in the required amount, it can improve performance by funding innovation, recruitment, marketing and market expansion efforts (Mittal & Madan, 2020) however, overemphasis on valuation-driven growth and underemphasis on sustainable business models can heighten the risk of failure and adversely affect long-term performance. In this sense, financing and performance are closely related and should be considered together.

There has been a drastic increase in the literature on startup financing and performance, but the existing literature remains fragmented. Scholars have studied related issues such as entrepreneurial finance, venture capital, startup growth, innovation ecosystems, performance measurement, but most studies only explored a specific dimension of the topic, such as barriers to funding, sources of financing, policy support and performance measures. A lack of integrated understanding regarding the evolution of the field, its authors and sources, and prevailing themes leads to limited consolidated evidence on the quantity, intellectual structure, influential works, and emerging research trends in the field. Therefore, we propose a systematic bibliometric and content analysis-based review that could synthesise the existing literature and identify the main trends and leading directions of research into entrepreneurship financing and performance.

In line with the study objectives, the present study is guided by six standardized research questions. It first examines how the literature on startup financing patterns and performance has evolved over time (RQ1), which journals have been the most productive (RQ2), and which authors have been the most prolific contributors (RQ3). It then identifies which documents have been the most influential in the literature (RQ4) and which sources form its intellectual structure (RQ5). Finally, it explores the major research themes, current trends, and emerging topics in the field (RQ6).

2. Methods

Bibliometric analysis was employed as the methodological foundation of this study, because it is a rigorous and widely used approach to analysing the research activities, structure, and thematic changes in a research field. Bibliometric analysis is conducted to determine the publication trends, sources, authors, citation connectivity, and themes from the literature (Robertson et al., 2020). As the literature on financing and performance of startups is spread across different themes and disciplines, bibliometric analysis is an adequate and structured technique to identify the intellectual and conceptual structure of the literature.

Table 1. **Bibliometric techniques employed in the study of financing pattern and performance of startups**

Techniques	Objective	Research Questions	Bibliometric Method	Analysis
Method of Evaluation: Bibliometrics	1. To assess the academic impact and relative influence	RQ1. How has the literature on startup financing patterns and performance evolved over time? RQ2. Which journals are the most productive in publishing research on startup financing patterns and performance? RQ3. Who are the most prolific authors contributing to research on startup financing patterns and performance?	Measures of productivity	Evolution of publications over time- Article distribution across journals- Author-wise distribution of articles
Relational Techniques: VOS-viewer	2.To ascertain the intellectual structure 3.To recognize thematic organization	RQ4. Which documents are the most influential in this field? RQ5. Which sources constitute the intellectual structure of the literature on startup financing patterns and performance?	Impact metrics Co-citation analysis (documents, authors, journals)	Document co-citation analysis- Author co-citation analysis- Journal co-citation analysis
Review Technique: Content Analysis	4. To identify the conceptual structure	RQ6. What are the major research themes, current trends, and emerging topics in the literature on startup financing patterns and performance?	Co-occurrence analysis Co-word analysis	- Thematic mapping through co-word analysis- Content analysis of recurring concepts

Source: own study

VOSviewer was employed to construct and visualize networks, as it is commonly considered the most suitable software to establish bibliometric maps in co-authorship, co-citation, citation, and keyword co-occurrence analysis compared with other tools (Eck & Waltman, 2010; Husaeni & Nandiyanto, 2021). VOSviewer is popular as it can provide a simple, cluster-based, and intuitive visualization of the relationships among authors, journals, documents, and keywords, as well as the thematic and intellectual structure of a research area (Zhu et al., 2024). Compared with the other tools, Bibliometrix is more useful for descriptive bibliometric statistics and R-based analysis, while CiteSpace is more suitable for temporal trends and burst detection. Since the present study aimed to map the intellectual structure of the literature through citation and co-citation relationships rather than time-based evolution, VOSviewer is considered more appropriate.

We extracted the bibliographic records from the Web of Science (WoS) Core Collection. We chose WoS as our only data source because it is a more selective and rigorously curated database that provides cleaner, more standardized and more reliable citation data for bibliometric analysis, whereas Scopus offers broader but more heterogeneous coverage. The WoS excels in providing rigorous coverage of peer-reviewed journals, standardized bibliographic metadata, and reliable citation indexing, all of which facilitate reproducible and reliable bibliometric mapping (Vlase & Lähdesmäki, 2023; Harsono et al., 2024). We supplemented the bibliometric techniques with content analysis to provide a more interpretive analysis of recurring themes, research topics, and emerging trends (Rahman et al., 2023; Allam et al., 2024).

We applied threshold values for the network analyses to retain top items and avoid an overly dense network, to reduce visual complexity and improve the interpretability of the subsequent visual mappings. The level of the threshold was set in accordance with the size of the dataset to retain the most relevant and analytically meaningful items and ensure a less-dense and interpretable network. We applied the same normalization and clustering settings in VOSviewer to ensure comparability among the nodes and facilitate meaningful thematic and intellectual groupings. All parameter settings were chosen to maintain a balance between analytical comprehensiveness and visual interpretability and to ensure a more robust and meaningful bibliometric mapping.

The articles selected as part of the literature search were identified using several keywords, as this is an automated technique and does not carry any researcher biases. Only scientific publications included in the WoS core collection and published in peer-reviewed journals were considered for inclusion after thorough evaluation. Early access articles, book chapters, and other types of documents were not included in the selection process. All that remained were reviews and empirical investigations. In such studies, the search strategy is essential. In order to ensure that relevant works were not missed, we decided to conduct a thorough search that included many synonyms and related

terms. 'TS=('startup') Or TS=('startups') Or TS=('start-up') Or TS=('start-ups') And TS=('Financing Pattern') Or TS=('Funding Pattern') Or TS=('Startup Performance') Or TS=('startup Growth') were the words used in this context. The search string was applied to the "title," "abstract," and "keywords" fields. The time frame for the search was limited to December 1990 through July 25, 2025 (Figure 1). The selected period was considered appropriate because it captures the long-term evolution of research on startup financing and performance, including both foundational studies and recent developments in the field.

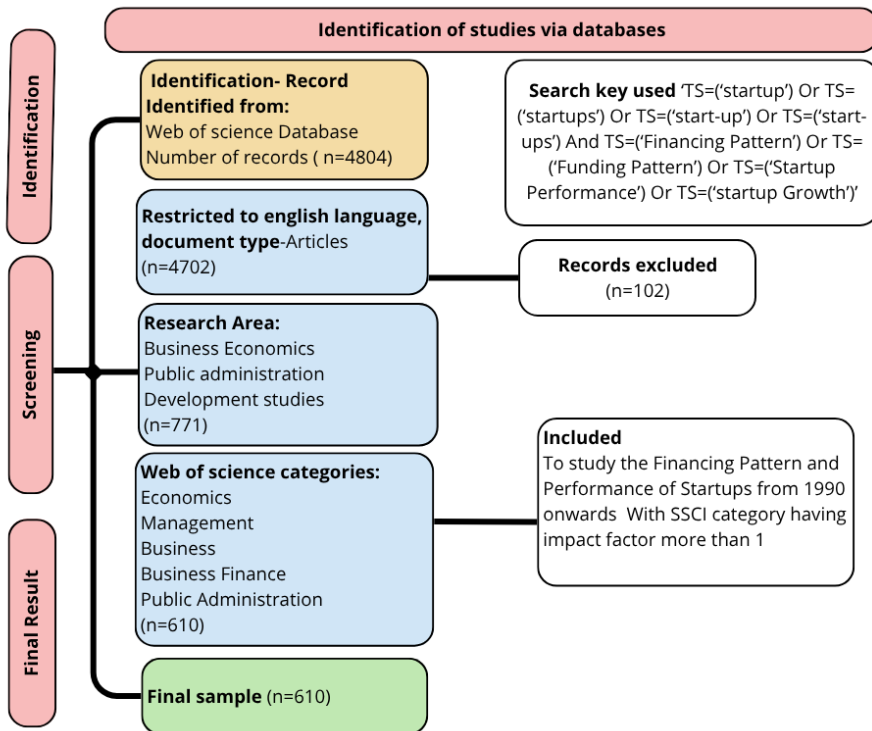


Figure 1. PRISMA framework

Source: own study

The first step resulted in the collection of 4804 articles, which were then re-examined and those that had nothing to do with the subject of the study were eliminated. In order to maintain objectivity, all authors participated in this second screening, which

produced a final sample of 610 papers. Details of the selection process are given in Table 2.

Table 2. **Search protocol followed**

Database	Web of Science (WoS)
Geographical Range	Worldwide Scientific Output
Language	English
Search Parameters	Topic
Criteria for Inclusion	Articles and Review Articles
WoS Categories	Management, Business, Economics, Business Finance
Range of Data	All years to 2025 included (1990–2025)
WoS Index	Social Science Citation Index (SSCI)
Search Date	25th July 2025
Search Terms	(TS=('startup') Or TS=('startups') Or TS=('start-up') Or TS=('start-ups') And TS= ('Financing Pattern') Or TS= ('Funding Pattern') Or TS= ('Startup Performance') Or TS= ('startup Growth'))
Initial Number of Documents	4804
Final Filtration Process	Filtration is made on the Basis of Abstract of Papers
Final Selection	610

Source: own study

In the systematic review, the process began with productivity analysis, followed by the overall number of publications and the distribution of research articles by authors, countries, journals and institutions. In order to evaluate the significance of various studies, the manuscript considered the papers with the greatest number of citations, both absolute and relative. Through the VOSviewer application and a systematic review strategy (Van Eck & Waltman, 2010), we used relational techniques to ascertain how the study area had been developed. This enabled us to create a variety of network linkages based on co-word and co-citation analysis. Figure 2 offers a diagrammatic depiction that explains the study process in detail.

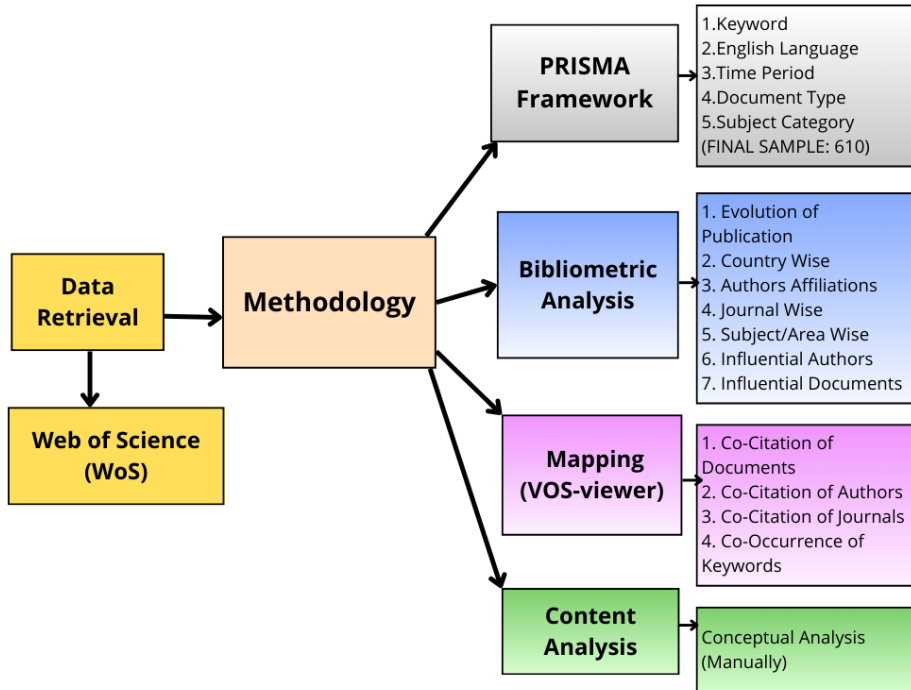


Figure 2. Research procedure

Source: own study

3. Results

To analyse the scholarly literature and uncover patterns in academic communication across different disciplines, Systematic reviews employ quantitative techniques. These techniques (Kumar et al., 2023; Xie et al., 2020) provide valuable insights into the development, impact of scientific information and structure. Passas (2024) systematically analysed the bibliometrics, authorship, citations, publications, and institutional outputs to find the key players, trends and research collaborations. The two important methodological research approaches can be identified within the framework of science. Evaluative bibliometrics measure the academic impact of a journal, authors, and institutes, which helps in the evaluation of research performance and strategic planning (Robertson et al., 2020); whereas, descriptive methods are retrospective cumulative counts of the number of publications or citations

that mark the historical change and growth of research activity through time (Sun et al., 2022). Such analyses aid science policies and the management of research but also open another venue of information retrieval and academic visibility. As global research increases, bibliometric analysis provides a sound data-based foundation for understanding the dynamics of knowledge production and dissemination, thereby providing critical input for evidence-based decisions in and outside academia (Ho & Luong, 2022). A mapping tool is available in the VOSviewer software to visually depict the results of the bibliometric analysis.

3.1. Publication growth analysis

The initial publication on this topic appeared in the year 1990 by (Van de Ven et al., 1990), marking the beginning of scholarly engagement in the field. The line chart depicts the annual distribution of publications from 1990 to 2025, serving as a bibliometric indicator of research trends over time. Between 1990 and 2009, the publication count remained consistently low, with annual outputs rarely surpassing 10 (Table 3), indicating limited academic interest during the early decades. Around 2010 noticeable growth was observed, indicating a rise in research activity and awareness. In 2017 (Figure 3) significant growth was observed, with a strong upward trend in publication numbers. Since 2018, the year-wise publication growth has been consistently increasing from 45 to over 80 through 2024. This upward trend suggests that startup financing and performance have become increasingly important and rapidly expanding areas of academic research in recent years.

Table 3. Article distribution by publication year

Publication years	Number of articles	%Age (N/610) *100	Annual growth rate (in %age)
2025	34	5.574	-58.0
2024	81	13.279	5.2
2023	77	12.623	18.5
2022	65	10.656	-9.7
2021	72	11.803	2.9
2020	70	11.475	52.2
2019	46	7.541	70.4
2018	27	4.426	42.1
2017	19	3.115	111.2

2016	9	1.475	-25.0
2015	12	1.967	71.3
2014	7	1.148	-46.1
2013	13	2.131	62.5
2012	8	1.311	166.5
2011	3	0.492	-62.5
2010	8	1.311	0.0
2009	8	1.311	699.4
2008	1	0.164	-85.7
2007	7	1.148	16.7
2006	6	0.984	100.0
2005	3	0.492	-25.0
2004	4	0.656	-33.3
2003	6	0.984	50.0
2002	4	0.656	300.0
2001	1	0.164	-66.7
2000	3	0.492	-25.0
1999	4	0.656	300.0
1998	1	0.164	0.0
1997	1	0.164	-50.0
1996	2	0.328	100.0
1995	1	0.164	-66.7
1994	3	0.492	50.0
1993	2	0.328	100.0
1992	1	0.164	0.0
1990	1	0.164	-

Source: own study

The mean year on year growth rate from 1990 to 25th July 2025 is approximately 52.3%.

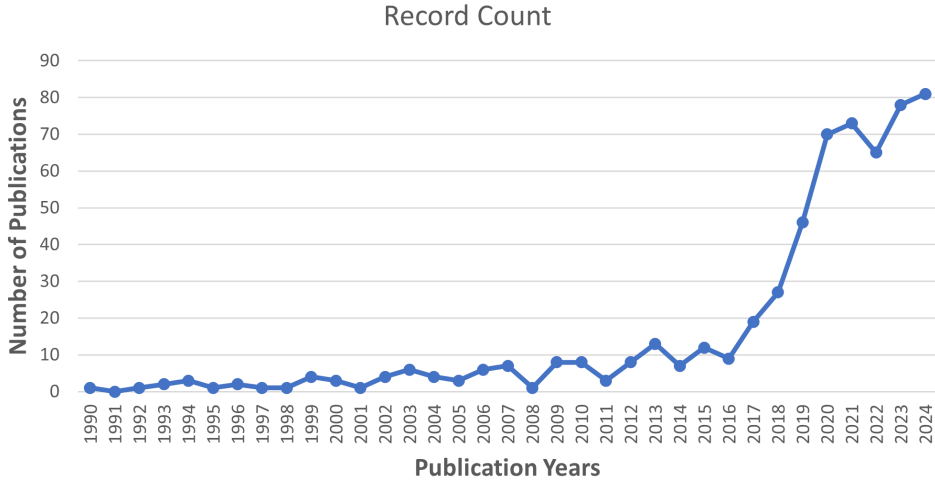


Figure 3. Growth in publications

Source: own study

3.2. Countries with the highest number of articles produced

In a systematic review of articles, the assessment of the role of institutions and countries is important for understanding the foundations of knowledge and origins of academic research in the area of study. In this study, this is achieved by connecting research articles to the authors' country and institutional affiliation. Table 4 represents the top ten most productive countries. The USA accounts for 40% of the total academic articles, showing its leading position in the research area. Then comes Italy (10.82%) and China (10.49%). These countries made a notable contribution; this is followed by Germany (8.52%), England (7.86%) and France (6.88%) with the 6th position. Spain (5.738%), Netherlands (4.754%), South Korea (4.098%) and India (3.77%) round out the top ten, each with a small but noticeable share. These results suggest that research on new venture financing and performance is skewed toward more mature economies with developed entrepreneurial ecosystems, research capabilities and infrastructures, and more extensive venture capital and innovation financing ecosystems. The lower-than-expected contribution from emerging economies suggests that there is much to be done to ensure a more geographically diverse research agenda in the future.

Table 4. Countries with the greatest number of articles published

Countries	Number of articles	%Age (N/610) * 100
USA	244	40
Italy	66	10.82
Peoples R China	64	10.492
Germany	52	8.525
England	48	7.869
France	42	6.885
Spain	35	5.738
Netherlands	29	4.754
South Korea	25	4.098
India	23	3.77

Source: own study

Table 5 presents an institution-wise analysis of publications. The financing patterns and performance of startup research are led by top universities, the leading roles belong to the USA institutions, Indiana University System has ranked the highest with 20 research articles, then Indiana University Bloomington with 19 articles, then Harvard University, Iu Kelley School of Business and University of London from United Kingdom these three universities has 14 research articles, then National Bureau of Economic Research and University of California System has 13 research articles. Finally Copenhagen Business School of Denmark as the only European institution with 10 research articles, is recorded in the top 10. This trend shows the prominence of institutions from developed economies in shaping the research on startup financing and performance.

Table 5. Article distribution based on author affiliation

Institution	Country	Number of articles	%Age (N/610) *100
Indiana University System	US	20	3.279
Indiana University Bloomington	US	19	3.115
Harvard University	US	14	2.295

Iu Kelley School of Business	US	14	2.295
University of London	United Kingdom	14	2.295
National Bureau of Economic Research	US	13	2.131
University of California System	US	13	2.131
Columbia University	US	12	1.967
State University System of Florida	US	12	1.967
Copenhagen Business School	Denmark	10	1.639

Source: own study

3.3. Important journals and research fields with a high volume of articles

Table 6 shows that the distribution indicates that research on startup financing and performance is dispersed across a broad range of journals, but a relatively small group of leading journals plays a dominant role in shaping the core scholarly discourse in this field. There are a total of 200 journals that published 610 articles, which shows a varied but unequal spread. It shows that 119 journals (59.5%) published only one article. 24 journals (12%) published two articles and 56 journals (28.5%) published three or more articles. It is shown in the table that the top ten journals collectively account for 208 articles, demonstrating their dominance in this research area. Small Business Economics is the leading journal with 35 articles (5.738%), followed by the Journal of Business Venturing with 33 research articles (5.41%) and then Research Policy with 23 articles (3.77%). Next are the other journals: Strategic Management Journal with 22 research articles (3.60%) followed by Technological Forecasting and Social Change with 21 articles (3.44%) and the last five journals being International Journal of Entrepreneurial Behavior Research (2.787%), Strategic Entrepreneurship Journal (2.623%), Journal of Business Research (2.459%), IEEE Transactions on Engineering Management and International Entrepreneurship and Management Journal with (2.131%).

Table 6. Article distribution according to the journal

Publication titles	Impact Factor	Number of articles	%Age (N/610) *100
Small Business Economics	4.8	35	5.738
Journal of Business Venturing	8.9	33	5.41

Research Policy	8	23	3.77
Strategic Management Journal	7.2	22	3.607
Technological Forecasting and Social Change	13.3	21	3.443
International Journal of Entrepreneurial Behavior Research	4.7	17	2.787
Strategic Entrepreneurship Journal	6.3	16	2.623
Journal of Business Research	9.8	15	2.459
IEEE Transactions on Engineering Management	5.2	13	2.131
International Entrepreneurship and Management Journal	3.9	13	2.131

Source: own study

Table 7 represents the classification of articles by research area, which reveals that most of the research is associated with management and business, indicating the pivotal role of entrepreneurial activities and organisational processes in shaping financing patterns and performance of startups. A good proportion corresponds to the economics and business finance which demonstrates the market dynamics, financial structure and investment trends. Only a small portion is devoted to development studies and public administration wherein the policies and the governments are identified. This shows that the researchers are mainly focused on the managerial and financial aspects of this research and not much on its policy and development aspects.

Table 7. Articles distribution according to the research field

Research area	Number of articles	%age (N/610) *100
Management	350	57.377
Business	312	51.148
Economics	161	26.393
Business Finance	76	12.459
Development Studies	8	1.311
Public Administration	2	0.328

Source: own study

3.4. Authors' analysis

The author analysis indicates that research in the field of startups is fragmented but is emerging as an active area. The indicators show that out of 610 research articles there are 1441 total authors in this field. 89.3% of authors (1,441) have one publication, followed by 7.7% (111) who have two published articles, then 1.9% (28) who have three or more articles and finally 1.09% (15) who have four or more published articles. Table 8 depicts the prominent authors in this field - Audretsch D.B., Kuratko D.F., and Patel P.C. - are active researchers with significant contributions in Europe and Israel. These indicators show the broad and emerging nature of the field with many occasional contributors and a relatively small number of active authors driving the core academic narrative.

Table 8. **Most active authors startups**

Rank	Name of author	Country	University/Institution	Number of publications
1	Audretsch DB	USA	Indiana University Bloomington	9
2	Kuratko DF	USA	Indiana University	7
3	Patel PC	USA	Ball State University	7
4	Avnimelech G	Israel	Ono Academic College	5
5	Cavallo A	Italy	Politecnico di Milano	5
6	Conti A	Spain	IE University	5
7	Ghezzi A	Italy	Politecnico di Milano	5
8	Guzman J	Canada	University of British Columbia	5
9	Koning R	USA	Harvard Business School	5
10	Wolfe MT	USA	University of North Texas	5

Source: own study

3.5. Most cited articles

This review presents the top 10 highly cited papers in the area of Financing patterns and performance of startups and outlines the intellectual foundations and research development in this area (Tabel 9). The most seminal work (Baum et al., 2000) in the Strategic Management Journal has 1,644 citations, indicating that the key drivers of

entrepreneurial growth are learning within organisations and strategic alliances. This is followed by (Rao, 1994) with 856 citations, which highlights institutional and legitimacy perspectives, and (Baum and Silverman, 2004) with 808 citations, further strengthening the role of strategy and networks in venture success. (Zucker et al., 2002) and (Davila et al., 2003) are pioneering works discussing knowledge transfer and financial control systems, respectively. (Ghezzi & Cavallo, 2020) and (Kanze et al., 2018) have explored in their research work gender dynamics and entrepreneurship. Together, these studies show that the field is shaped by strategic, institutional, financial, and emerging social dimensions.

Table 9. **Top 10 most cited articles in Financing Pattern and Performance of Startups**

Rank	Title	Authors	Country (1st Author)	Journal	Impact Factor	TC	(C/Y)	Publication Year
1	Don't go it alone: Alliance network composition and startups' performance in Canadian biotechnology	Baum, J.A.C.; Calabrese, T.; Silverman, B.S.	Canada	Strategic Management Journal	1.5	1644	63.23	2000
2	The social construction of reputation: Certification contests, legitimation, and the survival of organizations in the American automobile industry: 1895–1912	Rao, H.	USA	Strategic Management Journal	1.5	856	26.75	1994
3	Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology startups	Baum, J.A.C.; Silverman, B.S.	Canada	Journal of Business Venturing	1.51	808	36.73	2004
4	Commercializing knowledge: University science, knowledge capture, and firm performance in biotechnology	Zucker, L.G.; Darby, M.R.; Armstrong, J.S.	USA	Management Science	1.08	602	25.08	2002
5	Venture capital financing and the growth of startup firms	Davila, A.; Foster, G.; Gupta, M.	Switzerland	Journal of Business Venturing	1.51	438	19.04	2003

6	Gender differences in business performance: evidence from the Characteristics of Business Owners survey	Fairlie, R.W.; Robb, A.M.	USA	Small Business Economics	1.37	413	24.29	2009
7	Agile business model innovation in digital entrepreneurship: Lean startup approaches	Ghezzi, A.; Cavallo, A.	Italy	Journal of Business Research	2.08	351	58.5	2020
8	Agile business model innovation in digital entrepreneurship: Lean startup approaches	Kanze, D.; Huang, L.; Conley, M.A.; Higgins, E.T.	United Kingdom	Academy of Management Journal	2.43	338	42.25	2018
9	Methods for studying innovation development in the Minnesota Innovation Research Program	Van de Ven, Andrew H.; Poole, Marshall Scott	Australia	Organization Science	1.21	293	8.14	1990
10	Firm Exports And Multinational Activity Under Credit Constraints	Manova, K.; Wei, S-J.; Zhang, Z.	England	Review of Economics and Statistics	2.43	265	24.09	2015

Abbreviations: TC = Total citations; C/Y = Citations per year.

Source: own study

3.6. Visual analysis of citations and sources

Co-citation analysis uses a systematic review of literature to determine the key contributions and their interrelationships with other research in that area. This study of Financing patterns and performance of startups reveals the knowledge structure that shapes the domain. To demonstrate the conceptual connections, Co-citation is used, whereby two documents are cited together in a single work.

3.6.1. Citation network of documents on financing pattern and performance of startups

To examine the knowledge structure of research on startup financing patterns and performance, VOSviewer was used to generate the citation network visualization. From 610 research articles and 46,086 cited references, the type of analysis was set to Citation and the unit of analysis to Documents. A minimum citation threshold of 20 citations per document was applied. This cut-off was selected to retain influential and substantively visible studies while excluding low-cited peripheral documents that may introduce

noise into the network. Among these, 234 core articles were identified; of these, 124 documents formed an interconnected citation network. The network was generated using association strength normalization, which was retained as it standardizes link strength and improves comparability among documents of different citation volumes. Default layout and clustering settings were used for reproducibility (Attraction = 2, Repulsion = 0; Resolution = 1.00; Minimum cluster size = 1; Merge small clusters enabled). This indicates a vibrant scholarly discourse with a fair amount of inter-referencing between seminal works. Within the visual mapping layout, Baum (2000) emerges as the primary central node, structurally distinguished by its 13 interconnecting links to subsequent literature. The density of the citation network is further anchored by Rao (1994) and Baum (2004), with the latter establishing 16 distinct linkages that confirm its foundational role in shaping the field's intellectual map. Other notable contributions include (Zucker, 2002; Davila, 2003; Fairlie, 2009; Ghezzi, 2020; Camuffo, 2020), which reflect both foundational and emerging perspectives. Overall, the citation network shows that the field is strongly shaped by a small group of influential studies, while the clusters indicate a gradual evolution from strategic and legitimacy perspectives toward entrepreneurial finance, innovation, and new venture dynamics.

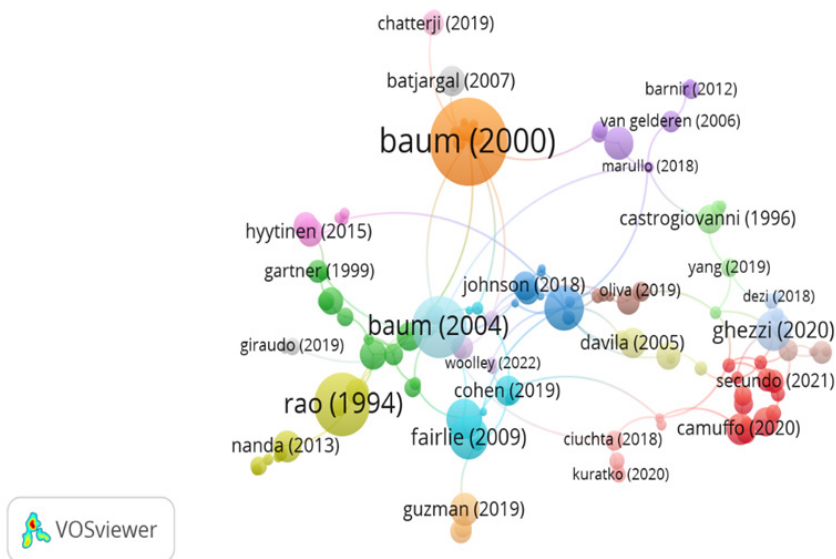


Figure 4. Citation of a network of documents

Source: own study

3.6.2. Co-citation network of authors with expertise in financing pattern and performance of startups

In the systematic review of 610 articles, author co-citation analysis was conducted utilizing the full counting method, identifying a total of 18,385 cited scholars. An author threshold value of 50 citations was established pragmatically to isolate core contributors; this specific cutoff filters out secondary data clutter and minor peripheral entries while ensuring structurally vital figures remain distinct and legible. To ensure rigorous mapping, the network applied an association strength normalization method to balance variations in citation frequencies across different nodes. The visualization was compiled using default software clustering parameters (resolution of 1.00, minimum cluster size of 1, small clusters merged), yielding a final network structure composed of 48 items, 1,102 links, and a total link strength of 19,276. Figure 5 presents three major interconnected clusters. Shane, located in the middle of the network, seems to be a highly-influential scholar that is well-connected, indicating his substantial contributions to entrepreneurship research. Authors such as Davidsson and Cardon in the blue cluster focus on individual-level startup dynamics and early-stage venture creation, whereas, authors such as Hsu, Colombo and Lerner in the red cluster focus on financial ecosystems, institutional supports, accelerators, incubators and venture capital.

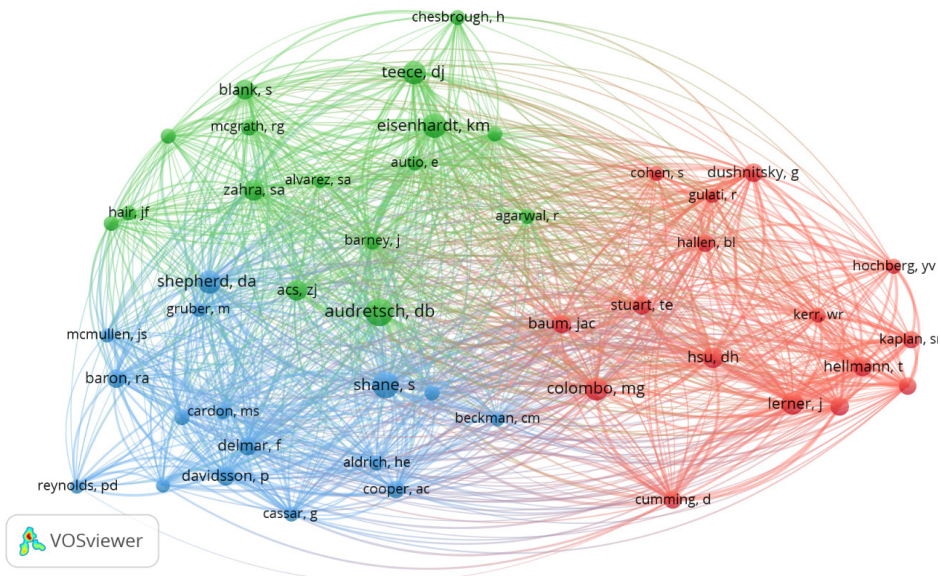


Figure 5. Co-citation network of authors

Source: own study

The green cluster, consisting of Eisenhardt, Audretsch, and Teece, reveals a strategic and an innovation perspective. In general, the co-citation network reveals that the field is based on an overlapping dimension of scholarship that integrates that of entrepreneurship, finance ecosystems, and strategic management perspectives.

3.6.3. Journal co-citation network with a focus on financing pattern and performance of startups

Journal co-citation analysis shows how the field is organized thematically (see Fig. 6) using cited sources as the unit of evaluation via the full counting method. Out of 9,672 total identified sources across the 610 sample papers, a baseline restriction of 447 citations per source was utilized to capture dominant academic journals.

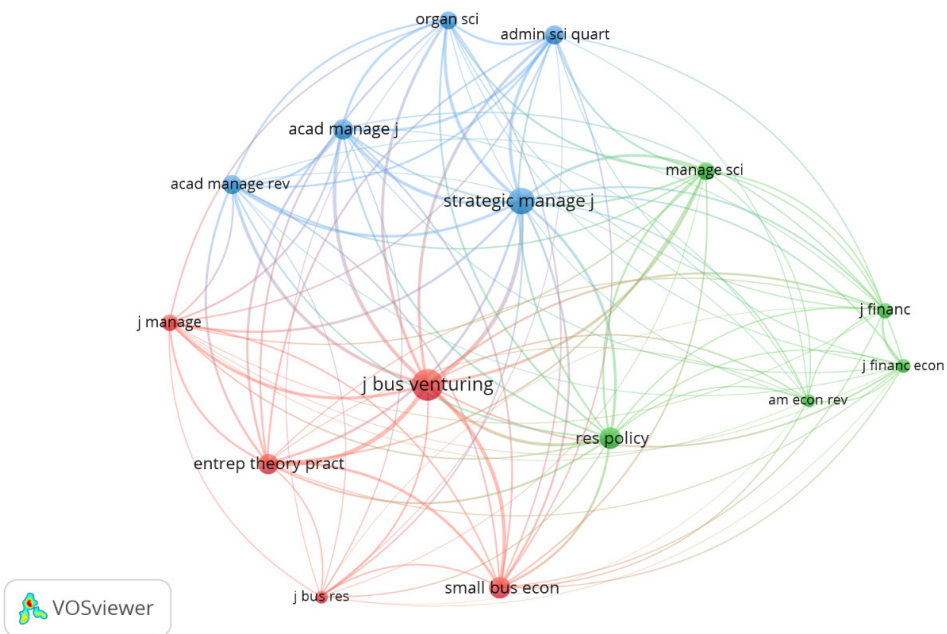


Figure 6. **Journal co-citation network**

Source: own study

This specific constraint guarantees data scannability by naturally filtering out secondary publications without omitting historically central platforms. Under these network parameters, 15 primary journals met the benchmark and were retained for visual mapping, where the physical size of each node correlates directly to its cumulative citation volume. Co-citation links show the thematic similarity between the journals. The red cluster includes the entrepreneurship, startup growth and small business performance-oriented journals that cover empirical and theoretical aspects of the overall startup growth and entrepreneurial finance environment; the blue cluster reveals a more organisational and strategic perspective; the green cluster includes the finance and economics journals that discuss the financial models and the economic impact of entrepreneurship and entrepreneurs. The journal co-citation network overall indicates that the field is organised around three closely related domains: entrepreneurship, strategic management and finance/economics, thus underscoring the relevance of the field's multidisciplinary nature.

3.6.4. Keyword co-occurrence analysis

Keyword co-occurrence analysis was used to identify the major research trends and dominant themes in the literature on startup financing and performance. Evaluated via the full counting method with all keywords selected as the unit of analysis, the 610 sample documents initially produced a total index of 2,880 entries. Applying a baseline requirement of 40 occurrences condensed the extensive index down to 15 key terms, effectively removing peripheral linguistic noise and overlapping phrases to optimize semantic coherence. The resulting model was subsequently structured using standard default association strength normalization rules. The most striking and representative keyword are performance, entrepreneurship, innovation, startups, growth and investment. Three major clusters were identified by the analysis. The green cluster represents startups, performance, innovation, entrepreneurship, and knowledge. The blue cluster represents strategy, management, and technology, while the red cluster focuses on venture capital, firm growth, and investment. Overall, the keyword co-occurrence pattern indicates that the literature is centred on three major themes-entrepreneurial performance and innovation, strategic and technological management, and venture capital-driven growth-highlighting the multidimensional nature of the field.

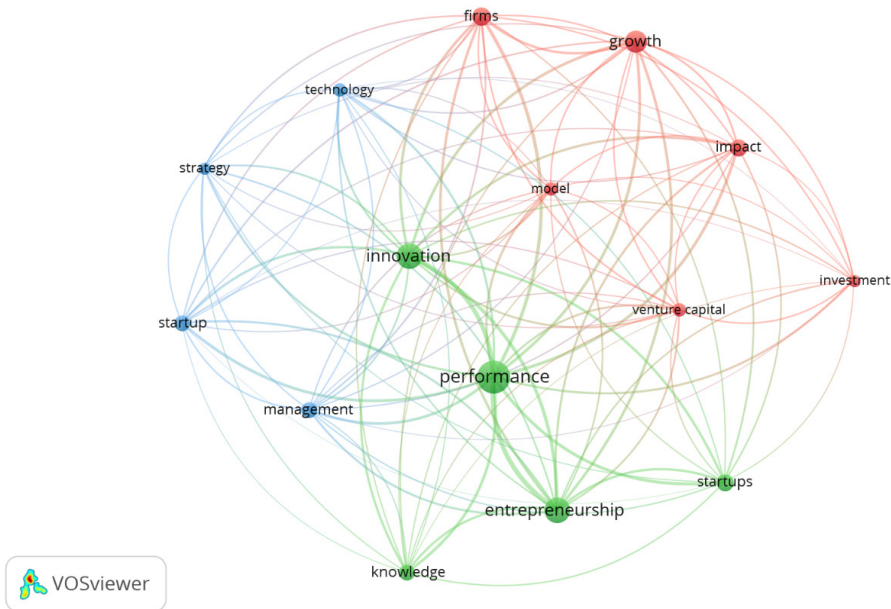


Figure 7. **Keyword co-occurrence network**

Source: own study

4. Content analysis

Content analysis is a systematic study of text in which, through careful reading, common words, themes and ideas are determined. Through this process researchers are able to find the topics that are most frequently discussed in the research and to identify the common patterns and ideas in it. It reveals the structural development of the intellectual foundation by tracing transformations in the research area and combining thematic clusters together. Unlike citation analysis, which merely counts how many times a paper has been cited, content analysis also provides knowledge about how ideas are discussed, compared and explained in different studies. With a specific focus on this study, this can be helpful for better understanding how the funding mechanisms, government policies and strategy all interact to influence startup development. The integration of bibliometric mapping with qualitative content analysis enables a more comprehensive understanding of the key challenges and opportunities that influence startup development and growth (White & Marsh, 2006; Esmaeili et al., 2025).

This analysis has identified five main areas: policies and programs for start-ups: problems and challenges, funding models and outcomes, techniques and methods, and a geographical analysis (Table 10).

Government policies and schemes play an important role in the construction of an entrepreneurial environment. Government initiatives support startups through funding assistance, incubation programs, tax benefits, and regulatory relaxations aimed at fostering entrepreneurial growth. Initiatives such government programs helps to promote startups to create more trust and encourage innovation and attract foreign investors (Mittal & Madan, 2020; Jain, 2019). We found many global initiatives such as Singapore's Startup SG and Yozma program in Israel, which suggest that government support programs are crucial models for startups worldwide. Content analysis in this study suggests that major innovation hubs and metropolitan centres across different countries are receiving significant benefits from such support, but startups in rural and peripheral areas continue to face challenges (Singh and Subrahmanya, 2022). This implies that the policy support has a positive impact on the development of startups, but it has been unevenly distributed across regions. The result may indicate that more inclusive policy implementation could help more non-metropolitan and resource-constrained startups to benefit from institutional support.

Table 10. Content Analysis of Startup Financing and Performance

No.	Dimension	Key Insights	Supporting References
1	Policies and Programs of Startups	1. Startup India initiative (2016) by government, that supports the startups by offering funding support, incubation help, tax benefits and easier rules for the startups. 2. Such initiatives attract the foreign capital and promote innovation but mostly the benefits are concentrated in big cities like -Bengaluru, Delhi, Mumbai. 3. Mostly the support is given towards the Tech startups whereas social enterprises are under supported.	Dominic & Joseph (2023); Mittal & Madan (2020); Singh & Subrahmanya (2020); Jain (2019)
2	Issues & Challenges	1. There is consistent funding gaps in the initial stage of startups as investors are not confident because of risk perception, under-developed debt market and lack of collateral. 2. Information asymmetry that reduces the trust between investor and entrepreneurs. 3. Managerial skill shortages, fear of failure and complexity in rules makes startups more exposed . 4. During the COVID-19, it reveals the challenges with supply chain and cash flows.	Banudevi & Shiva (2019); Raju et al. (2020); Singh & Wasdani (2016); Rajamani et al. (2022); Gonzalo & Kantis (2021)

3	Financing Patterns & Performance	1. In the initial stage of startups, they still rely on personal saving, informal loans, and family money 2. whereas reforms and foreign investments have grown the venture capital and private equity 3. Government Funding, crowdfunding and angel investors have further improved the choices available for startup financing. 4. Startups that have diversified funding sources that show the higher resilience and scalability 5. Tech startups are highly in need of Research and development intensive financing across lifecycle.	Dominic & Joseph (2023); Konga & Kasilingam (2023); Ashraf et al. (2022); Mittal & Madan (2020); Singh & Subrahmanya (2020)
4	Methodologies in Literature	1. Most of the studies uses quantitative methods like regression, survival analysis, and panel data. 2. Mostly the research use the databases like GEM, Crunchbase, and Pitch Book are used. 3. It is seen that Qualitative case studies and ethnographies presents the context- specific realities. 4. Current bibliometric studies use co-citation, citation, and thematic mapping to see how research knowledge has developed over time. 5. Research studies represent a shift from venture capital toward FinTech, crowdfunding, and digital platforms.	Rajamani et al. (2022); Joshi (2018); Cumming et al. (2022); Chhabra et al. (2023); Sharma et al. (2023)
5	Geographical Analysis	1. Studies shows that developed countries like US and EU lead the literature because of mature Venture capital environment. 2. Developing countries India, China increasingly studied but regional disparities persist. 3. Indian hubs like -Bengaluru, Delhi-NCR, Mumbai attract most capital; Tier-2/3 cities understudied. 4. Proximity to VC firms, clusters, and universities strongly influences funding outcomes. 5. Africa, Latin America, and Southeast Asia remain insufficiently represented.	Ahluwalia & Kasicieh (2024); Nigam et al. (2020); Maradi (2023); Buteau (2021)

Source: own study

Although policymakers are promoting entrepreneurs and startup founders, the startups also face many challenges. The main problem is that during the early stage of startups, they face problems when investors lack confidence in early-stage startups and regard them as high risk, and debt markets are weak (Banudevi & Shiva, 2019; Singh & Subrahmanya, 2022). Other challenges include a shortage of skilled people, tight regulations that increase the cost of production and a lack of management skills (Rajamani et al., 2022). It is widely noted that cultural barriers such as a fear of failure —, prevent people from taking risks and starting new businesses (Singh and Wasdani, 2016). Gonzalo and Kantis (2021) assessed that the COVID-19 pandemic exposed the vulnerabilities of many startups, a large number of which failed due to cash shortages

and supply chain disruptions. The importance of this theme is that startup success is determined by much more than funding; it is also strongly influenced by the complexity of regulatory and institutional environments, managerial skills, and ecosystem capacity. The fact that these themes are emerging repeatedly suggests that more research should be conducted beyond the supply of capital, to examine how a complex set of factors interact to affect startup survival and growth.

Funding is a critical factor in startup development. In the early stage of startups, they still depend on their own savings, informal loans, and family resources, while reforms and the global capital markets have expanded the channels for venture capital and private equity financing (Dominic & Joseph 2023). (Konga & Kasilingam 2023) showed that the options for the startups' financing were improved by the Government Funding, crowdfunding and angel investors. The startups with diversified sources of funding are more scalable and resilient; in contrast, depending on informal finance hinders long-term growth (Mittal & Madan 2020). This pattern points to the importance of the quality and variety of funding sources in influencing the resilience, growth, and long-term sustainability of your startup. It also suggests that stronger access to formal and diversified funding mechanisms may be essential for improving startup sustainability, particularly in emerging entrepreneurial ecosystems.

Research employs different methodologies. Quantitative analysis uses tools such as panel data, regression and survival analysis to examine how funding affects startups (Rajamani et al., 2022). Qualitative research provides the nuance by fleshing out the real life experience of entrepreneurs (Joshi, 2018). Research has evolved from The classic venture capital to FinTech through crowdfunding via various mixed-method and bibliometric approaches which utilized tools such as (co)citation analysis and keyword mapping (Cumming et al., 2023; Sharma et al., 2024). The range of methodologies speaks to the increasing maturity of this discipline and the evolution from basic descriptive research to more analytical and multi-faceted work on the financing and performance of startups.

From the content analysis, it is shown that most research is still the focus of developed countries such as Europe and the US (Nigam et al., 2020). Emerging economies such as China, Brazil, South Korea, and other fast-growing countries have attracted increasing academic interest because of their demographic and economic potential (Maradi, 2023). A number of countries' startups are concentrated in major cities near incubators and investors; regions and smaller cities are relatively less attended to (Ahluwalia & Kassicieh, 2024). According to Buteau (2021), small cities are on the rise but are less studied. The geographical distribution implies that the current literature remains focused on the well-established startup hubs and leaves smaller cities and new ecosystems under-researched. This highlights an important opportunity for future research to generate a more inclusive and context-sensitive understanding of startup financing and performance.

5. Discussion

The current study uses the PRISMA, VOSviewer visualization, bibliometric techniques and content analysis to provide a detailed overview of financing patterns and performance of startups. The findings of the study show that the startups initially use bootstrapping and angel funding, after which they transition to venture capital and private equity as they scale matching the financial growth cycle theories (Konga & Kasilingam, 2023). On the other hand, the evidence reveals that due to limited capital and weak debt markets, it is challenging for startups to access formal funding (Singh & Subrahmanya, 2022). Because of these structural limitations, entrepreneurs depend heavily on the staged venture capital or informal funding where cash disbursement only depends on milestone achievement. (Panda & Gopalaswamy, 2020). The study shows that a founder's experience, industry and skills affect funding. Technology-driven startups, especially those driven by IT and digital services, receive the most venture capital because investors view them as fast-growing and globally competitive (Prokopenko et al., 2025). The content analysis indicates that startup financing patterns contribute to the expansion of venture capital and private equity activities. However, funding disparities remain evident, as traditional and social startups often receive comparatively lower investment support. Early-stage funding limitations continue to restrict innovation, particularly in smaller and non-metropolitan regions across both developed and developing economies (Singh & Subrahmanya, 2022). In addition, macroeconomic and demographic factors, including a growing entrepreneurial culture, a large young population, and increasing employment challenges, position startups as important drivers of self-employment and economic growth (Banudevi & Shiva, 2019). Existing literature also continues to argue whether domestic or foreign venture capital has a stronger impact on startup performance, and cross-country comparative studies indicate that each type should be analysed separately to assess its unique effects. In general, this study adds to the literature through providing a holistic review of high-level startup-level financing and performance literatures using a bibliometric analysis, science mapping and content analysis. It extends prior research by combining publication trends, intellectual structure, and thematic patterns within a single framework, while also highlighting the distinct financing realities and performance challenges of the startup ecosystem.

6. Conclusions

The present study demonstrates that research on startup financing patterns and performance has evolved into a well-established and interconnected field of inquiry. The findings indicate that startup financing is no longer viewed merely as a sequence of isolated funding events, but rather as a dynamic and continuous process influenced

by institutional support, financing accessibility, innovation capability, strategic management practices, and geographic context. The study further highlights that startup sustainability and long-term performance are increasingly associated with diversified financing mechanisms, supportive policy environments, and effective organizational capabilities. The bibliometric and thematic analyses reveal three major dimensions shaping the literature: the concentration of entrepreneurial financing and research activity within major startup ecosystems, the growing emphasis on multidimensional performance indicators beyond traditional financial measures, and the emergence of evolving financing mechanisms supported by digital and innovation-driven platforms. These findings emphasize the importance of strengthening decentralized entrepreneurial ecosystems and improving access to early-stage financing and institutional support mechanisms. The study contributes to the existing literature by systematically integrating fragmented research streams and mapping the intellectual and conceptual structure of startup financing and performance research. However, the study is limited to publications indexed in the Web of Science database and selected document categories. Future research may incorporate additional databases, longitudinal approaches, comparative regional analyses, and mixed-method investigations to provide deeper insights into startup financing behaviour and performance dynamics.

The findings of this study have several implications for researchers, policymakers, and regulators interested in strengthening the startup ecosystem. For researchers, this study provides a systematic overview of startup financing and performance, identifying relevant themes, methods, and gaps. The analysis indicates underexplored areas such as financing challenges in smaller and non-metropolitan cities across diverse national contexts, the role of debt markets, and increasingly ESG-oriented financing. These insights can guide future research agendas toward comparative, interdisciplinary, and context-specific studies that go beyond venture capital dominance and examine alternative financing mechanisms. For policymakers, the results emphasize that financing patterns are critical determinants of startup performance and sustainability. While government support programs and public funding initiatives have widened access to capital, the benefits remain concentrated in metropolitan hubs and technology-driven ventures. This indicates a strong demand for finance that meets the early-stage gaps, extends to social and non-tech firms and promotes balanced regional development. Reducing information asymmetry between entrepreneurs and investors and facilitating trust-building could also be a potential area of policy interventions. Furthermore, the ever more important role played by angel investments and venture capital implies that for regulators, accountability, efficient allocation of resources, and improving financial literacy of the high potential industries such as technology, sustainability and healthcare is imperative in boosting investor confidence in making investments in entrepreneurs.

The examination of the current conceptual framework led us to identify a number of study areas that require more investigation. The following highlights a few areas for a future research agenda:

- a. The existing literature pays considerable attention to venture capital and angel investments, but there is limited empirical work exploring the role of alternative financing mechanisms such as crowdfunding, revenue-based financing, and FinTech-enabled lending in shaping startup growth. Future research could examine how these emerging instruments influence performance outcomes, particularly in resource-constrained contexts.
- b. The current study relied exclusively on WoS data for bibliometric mapping. Future research should broaden the scope by integrating multiple databases such as Scopus, EBSCO, Science Direct, and JSTOR to capture a more comprehensive intellectual landscape and minimize database-specific biases.
- c. While much of the current scholarship examines financing trends in developed economies or major metropolitan ecosystems, comparative studies across developed and emerging economies, or between large metropolitan hubs and smaller cities, remain sparse. Such cross-sectional analyses could yield critical insights into structural disparities and localized financing challenges.
- d. The findings also show a bias toward technology-driven startups, with relatively little attention given to non-tech or social enterprises. Future research could focus on how financing constraints differ across sectors and whether existing funding models are adequate for addressing the needs of diverse entrepreneurial ventures.
- e. Finally, future studies should adopt longitudinal and mixed-method designs to assess the long-term impact of financing structures on survival, scalability, and innovation capacity. Incorporating qualitative insights from entrepreneurs, investors, and policymakers alongside quantitative datasets would enrich the understanding of the financing–performance nexus.

Authors' contribution

S.N.: article conception, theoretical content of the article, research methods applied, conducting the research. **S.K M.:** conducting the research, data collection, analysis and interpretation of results, draft manuscript preparation.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors did not use Generative AI and AI-assisted technologies in the writing process.

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