

# The Ecosystem Of Start-Ups: A Bibliometric Overview

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## **Abstract**

*The start-up ecosystem is an innovation garden in a world where new enterprises proliferate like spring flowers. This paper provides an immersive exploration of the garden, elucidating the support systems that facilitate the expansion of these enterprises. Consider an imagined treehouse wherein visionary entrepreneurs generate concepts, financial backers spruce up these concepts with capital, and incubators simulate greenhouse conditions, thereby fostering optimal development. Additionally, the paper addresses the challenging endeavour of quantifying potential. It is like attempting to quantify the brightness of a star that has not yet formed. This study uses bibliometric analysis to map the current research on start-ups, similar to how a mapmaker would draw a new land. It shows who the top experts are in this field, what they have been talking about, and where the map is still blank. This is more than just a list of facts; it is a map for people who want to discover the world of start-ups in the future.*

**Key Words:** *Start-up, Ecosystem of Start-ups, Valuation of Start-ups, Bibliometric Analysis*

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## **I. Introduction**

The previous two decades have seen an unprecedented boom in entrepreneurial activity, propelled by technological advances, shifting market dynamics, and expanding customer tastes. This proliferation of start-ups has piqued the interest of researchers, policymakers, and investors, resulting in an increasing corpus of literature oriented to elucidating the complexities of the start-up ecosystem. In recent years, bibliometric analysis has become an effective technique for assessing and mapping the intellectual landscape of diverse academic topics (Aksnes et al., 2012). Conducting a bibliometric analysis of the start-up ecosystem literature might offer useful insights into the trends, influences, and knowledge gaps within this dynamic and quickly expanding subject.

The start-up ecosystem comprises interrelated elements essential for the growth and sustainability of new ventures, such as entrepreneurs driving innovation, various investors providing necessary funding (Blank, 2014), incubators and accelerators offering mentorship and resources (Cohen & Hochberg, 2014), co-working spaces fostering collaboration (Gajda & Radojevich-Kelley, 2016), university research assisting in technology transfer (Fini et al., 2017), and benevolent government policies and regulations (Kerr & Nanda, 2009). It is distinguished by its cross-disciplinary makeup, which includes elements of innovation, entrepreneurship, technology, economics, and management [Stam, E. (2015)]. Given its complexity, this ecosystem's multiple aspects and the interactions between its numerous parts require an in-depth understanding. The value creation process inside the ecosystem is largely dependent on the valuation of start-ups, which is one important aspect. In this context, valuation is the process of estimating the value of a start-up by taking into account its innovative potential, market opportunity, intellectual property, and growth prospects (Van Eck et al., 2010).

The valuation of start-ups is essential since it affects several kinds of stakeholders, including founders, investors, workers, and the larger economy. A proper valuation facilitates start-ups to acquire capital on fair terms, allowing them to expand their businesses and bring their unique ideas to existence. In addition, valuation functions as a tool for coordinating partners' interests and minimising conflicts that might arise as a start-up grows (Amit et al., 2012). On the other side, inaccurate valuations may result in insufficient funding options, distorted resource allocation, and ultimately, a start-up's ability to develop sustainably.

The process of valuing start-ups is difficult despite their significance, and these challenges are sometimes caused by the risk and uncertainty present in early-stage businesses (Amis et al., 2001). This complexity has sparked a wealth of research into numerous valuation strategies, ranging from conventional methods like discounted cash flow analysis to modern methods like real options analysis and comparable-based valuation (Da Rin et al., 2017). The need for specialised valuation models created to meet the particular issues encountered by start-ups was driven by the changing nature of the start-up sector and its distinctive characteristics.

A systematic and objective technique to analyse the enormous numbers of startup-related research is to use bibliometric analysis. Which is a quantitative technique that looks at publishing patterns, citation linkages, and theme trends within a particular field (Van Eck et al., 2010). In the field of social sciences, bibliometric

analysis has emerged as an important tool for evaluating the significance of scholarly output as well as discovering patterns of collaboration and information transfer. Additionally, the review examines ethical issues addressed by bibliometric research, such as self-citation and manipulation of citation metrics (Brown et al., 2022).

Bibliometric analysis has a lot of promise in the social sciences. This paper focuses on how it can help us understand how multidisciplinary research works and how ideas spread across boundaries. Researchers can better understand the thematic clustering and prominent works driving the discourse regarding the ecosystem of start-ups and their valuation by analysing scholarly output in terms of publications, authors, journals, keywords, and citations.

This paper conducts a bibliographic analysis with the aim of emphasising the theoretical basis of the literature regarding the start-up ecosystem. employing bibliographic methodologies aims to draw attention to the most well-known study areas, prominent authors, significant publications, and notable journals that have helped to shape the area of start-up research. Furthermore, analysing citations focused on identifying foundational publications that have served as bases for the growth of startup-related research, notably in the realms of ecosystem and valuation. The findings of this study not only offer a concise overview of the issue's current status and highlight prospective avenues for future research and collaboration.

## II. Research Methodology & Design

The methodology used for the bibliometric analysis of the ecosystem of start-ups in this study appears to use a systematic search and selection procedure on the Scopus platform to find appropriate information on the subject area. Table 1 summarises the filtering procedure and the number of documents accepted and rejected at each step.

**Table 1: Search criteria and article selection**

Filtering criteria	Reject	Accept
Search Criteria		
Search engine: Scopus		
Search Date: July 23, 2023		31476
Search term: (Start-up*)		
Year Selection (2003 to 2023)	7181	24295
Subject Area: "Business, management and accounting", "Economics, econometrics and finance"	19800	4495
Document Type: Article	1742	2753
Language Filter: English only	90	2663
Source Type: Journal only	147	2516
Publication stage: Only finally published documents included	143	2373
Article Selection		
Screening of erroneous records: Include documents with valid author information and valid year	43	2330

Following this, all 2330 selected documents were exported in CSV format with the selection of all bibliography options, then were analyzed with the help of Vos-viewer software in order to determine the publishing patterns, notable authors and journals, influential articles, co-occurring keywords, and the bibliographic coupling of different countries.

## III. Data Analysis

### Research Trends and Scientific Productivity

The number of publications over time is shown in Fig. 1, which shows how study activity related to start-ups fluctuated or increased. From 2003 to 2022, an upward trend could mean more people are interested in and willing to spend on start-up research. It is because the sector is very dynamic and important for driving innovation and economic growth. Fig. 2 states the patterns of how works in the start-up ecosystem area have been cited over the past few years. If the number of citations keeps going up, it could mean that the study is becoming more well-known and influential in the academic world. It shows how important and valuable the findings are in the field. Fig. 3 probably shows how papers in the start-up ecosystem are spread out across different subject areas. Start-up study covers various fields, such as innovation, entrepreneurship, technology, economics, and management, as shown by the wide range of topics covered.

Fig. 1: Publication Trends of Article in the Start-up Ecosystem Area

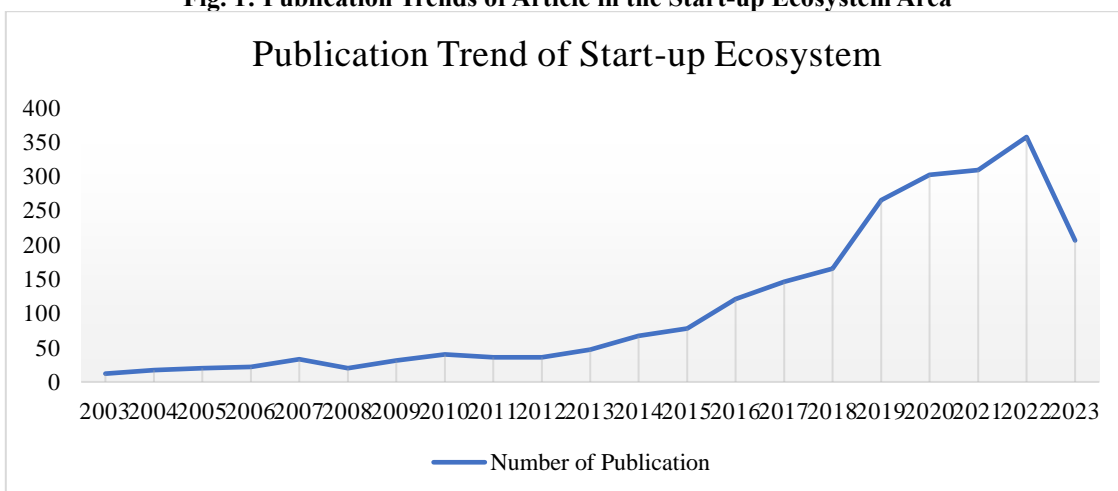


Fig. 2: Year-wise citation trends of Articles in the Start-up Ecosystem Area

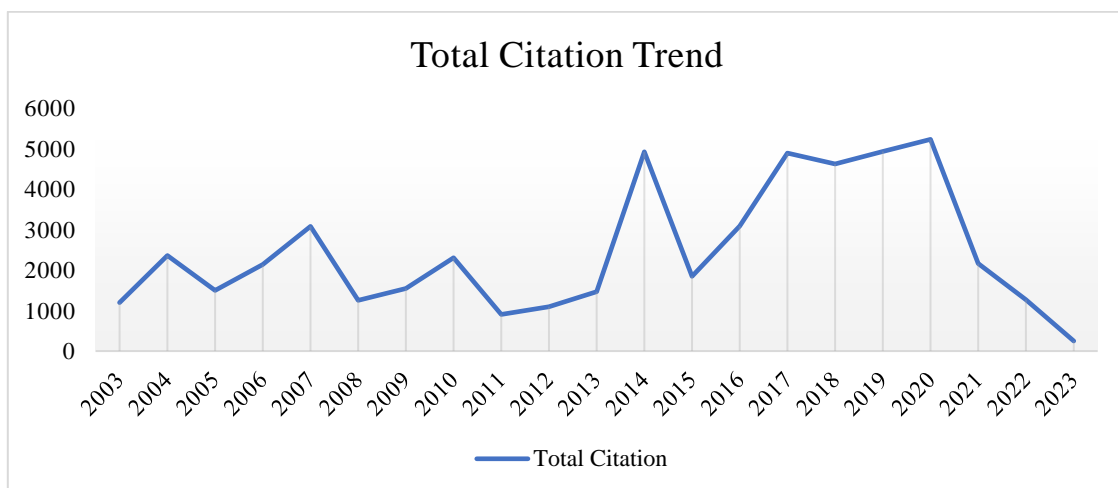
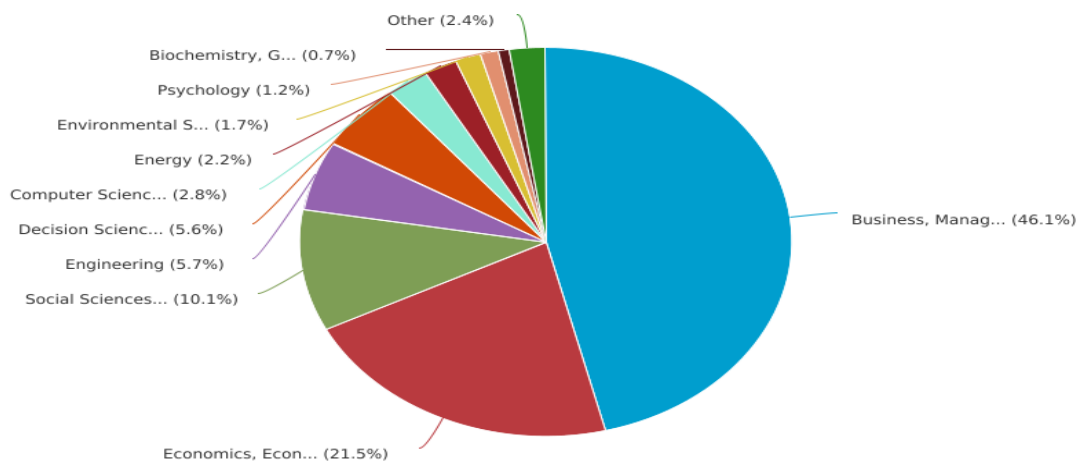


Fig. 3: Distribution of documents by subject area



**Most Influential Journals**

**Table 2: Top Journals in the Start-up Ecosystem Area**

SR. NO.	SOURCE	DOCUMENTS	CITATIONS
i	"Journal of Business Venturing"	40	6087
ii	"Small Business Economics"	58	3560
iii	"Research Policy"	41	2804
iv	"Business Horizons"	27	1835
v	"Journal of Business Research"	30	1746
vi	"Technological Forecasting and Social Change"	38	1401
vii	"Journal of Technology Transfer"	19	1234
viii	"Journal of Cleaner Production"	35	1177
ix	"Journal of Service Research"	1	1058
x	"California Management Review"	21	999
xi	"Journal of Business Venturing Insights"	26	951
xii	"Strategic Management Journal"	28	807
xiii	"Journal of Financial Economics"	15	752
xiv	"Journal of Small Business Management"	16	686
xv	"International Journal of Entrepreneurial Behaviour and Research"	33	678

Table 2 consists of the ranking of the best 15 journals out of 734 for start-ups based on the number of papers they have published and the number of citations those papers have earned, with 257 meet thresholds. The function applied for seeking this information from the selection of Sources option in the Citation head by using Vos-viewer has a minimum of one document and 20 citations. For instance, the "Journal of Business Venturing" is at the top of the list, having published forty papers and receiving a total of 6087 citations, making it the most significant journal in our study. Next, with 58 documents and 3560 citations, is "Small Business Economics". According to their productivity (number of documents) and the influence of their work (number of citations), the academic journals listed in this table are the most significant in the subject of start-ups. This might be helpful for researchers seeking credible publications to submit their work to or for others looking for reliable articles on the subject.

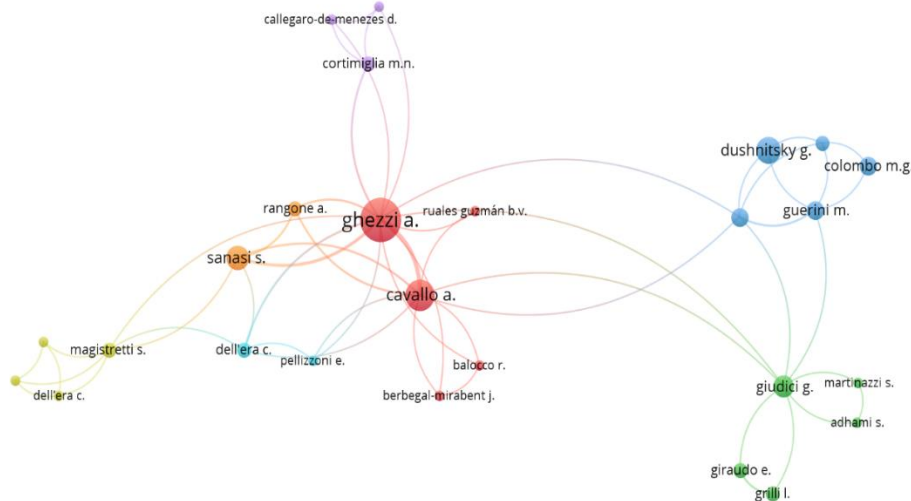
**Table 3: Most prominent authors in the Start-up Ecosystem Area**

SR. NO.	AUTHOR	DOCUMENTS	CITATIONS
i	Hmieleski k.m.	7	1078
ii	Bitner m.j.	1	1058
iii	Brown s.w.	1	1058
iv	Burkhard k.a.	1	1058
v	Demirkan h.	1	1058
vi	Goul m.	1	1058
vii	Ostrom a.l.	1	1058
viii	Rabinovich e.	1	1058
ix	Smith-daniels v.	1	1058
x	Audretsch d.b.	6	966
xi	Ghezzi a.	16	914
xii	Siegel d.s.	4	902
xiii	Silverman b.s.	1	830
xiv	Robb a.m.	3	798
xv	Ensley m.d.	3	720

Based on the number of documents they have written and the number of citations those documents have gotten, Table 3 seems to rank the top 15 most well-known authors in the field of start-ups. It was retrieved using the Authors option under the Co-Authorship heading in Vos-viewer with a minimum of one document and 20 citations. The final count had 5119 writers overall, of whom 1274 met the required number.

For instance, the author "Hmieleski k.m." is the most prominent author in this study based on the stated criteria, as evidenced by the fact that they are placed at the top with seven papers and a total of 1078 citations. All of the other writers on the list have produced works that have received several citations, demonstrating their prominence and impact in the start-up community. For example, "Bitner m.j." has produced one document with a high number of citations (1058), indicating that this particular piece of work has considerably influenced the area.

**Fig. 4: Mapping of Most prominent authors in the Start-up Ecosystem Area, with collaboration with others**



**Table 4: Most Influential Articles in the Start-up Ecosystem Area**

Sr. No.	Document	Citations	Title
i	Mollick e. (2014)	2201	"The dynamics of crowdfunding: an exploratory study"
ii	Ostrom a.l. (2010)	1058	"Moving forward and making a difference: research priorities for the science of service"
iii	Baum j.a.c. (2004)	830	"Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology start-ups"
iv	Lee i. (2018)	520	"Fintech: ecosystem, business models, investment decisions, and challenges"
v	Kuckertz a. (2020)	519	"Start-ups in times of crisis – a rapid response to the covid-19 pandemic"
vi	Bosma n. (2004)	517	"The value of human and social capital investments for the business performance of start-ups"
vii	Carr j.c. (2007)	484	"Prior family business exposure as intergenerational influence and entrepreneurial intent: a theory of planned behavior approach"
viii	Ensley m.d. (2006)	474	"The importance of vertical and shared leadership within new venture top management teams: implications for the performance of start-ups"
ix	Davila a. (2003)	470	"Venture capital financing and the growth of start-up firms"
x	Acs z.j. (2007)	432	"Entrepreneurship, economic growth and public policy"
xi	Fairlie r.w. (2009)	426	"Gender differences in business performance: evidence from the characteristics of business owners survey"
xii	Audretsch d.b. (2014)	405	"From the entrepreneurial university to the university for the entrepreneurial society"
xiii	Markman g.d. (2005)	397	"Entrepreneurship and university-based technology transfer"
xiv	Kellermanns f.w. (2008)	394	"An exploratory study of family member characteristics and involvement: effects on entrepreneurial behavior in the family firm"
xv	Link a.n. (2007)	390	"An empirical analysis of the propensity of academics to engage in informal university technology transfer"

Based on how many times each item has been cited, Table 4 looks to be a ranking of the top 15 articles in this area with the most impact. The list's entries each include the title of the article, its year of publication (in parenthesis next to the author's name), and the number of citations it has received. For instance, "The dynamics of crowdfunding: An exploratory study" by Mollick E. (2014), which has 2201 citations, is the most referenced

article in this analysis. Because these papers have received so many citations, it is likely that they have made a substantial contribution to the area of start-ups.

**Table 5: Co-occurrence Author Keywords in the Start-up Ecosystem Area**

SR. NO.	KEYWORD	OCCURRENCES	TOTAL LINK STRENGTH
i	Entrepreneurship	408	427
ii	Start-ups	284	303
iii	Start-up	210	200
iv	Innovation	173	224
v	Venture Capital	122	130
vi	Crowdfunding	57	80
vii	Lean Start-up	53	54
viii	Open Innovation	43	61
ix	Start-Up	40	35
x	Fintech	39	39
xi	Human Capital	38	48
xii	Entrepreneurial Finance	36	53
xiii	Business Model	35	56
xiv	Technology	33	62
xv	Start-Ups	31	25
xvi	Strategy	30	43
xvii	Gender	28	35
xviii	Business Model Innovation	25	32
xix	Case Study	25	41
xx	Entrepreneurial Ecosystems	25	17
xxi	Sustainability	25	30
xxii	New Ventures	24	32
xxiii	Social Entrepreneurship	24	15
xxiv	Entrepreneurship Education	22	16
xxv	Entrepreneur	21	20
xxvi	Performance	21	28
xxvii	Technology Transfer	21	14
xxviii	Covid-19	19	23
xxix	Digital Transformation	19	24
xxx	Ecosystem	19	33

The selection of a specific and more precise keyword is a difficult task. For this, Table 5 attempts to demonstrate the co-occurrence of author keywords in the start-ups category. In this context, co-occurrence refers to how frequently two or more terms occur together in the same publications. The table comprises 30 keywords, their frequency (Occurrences), and the overall link strength for each item. The overall link strength often gives a number that shows how strong the relationship is between the term and other keywords. A higher number means that the relationship is better. With 408 occurrences and a total link strength of 427, the term "Entrepreneurship" is the most prevalent in this study. Based on the most-used keywords, this table might help you determine the most important themes and topics in the start-up business. The connection strength suggests which subjects are frequently addressed in relation to one another.

Fig. 5: Mapping of Co-occurrence of Authors' Keywords in the Start-up Ecosystem Area

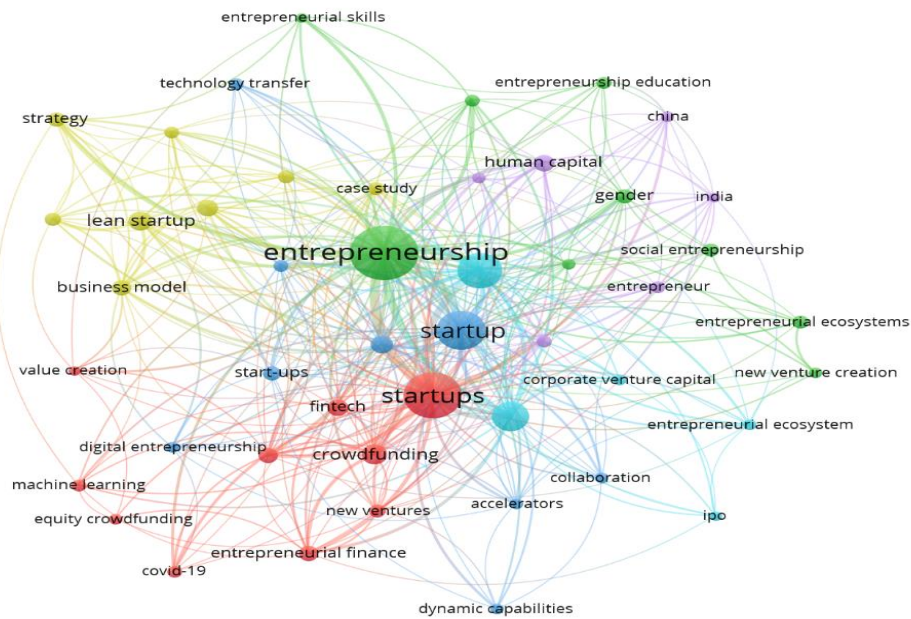


Fig. 6: Mapping Overlay Presentation of Co-occurrence of Authors' Keywords in the Start-up Ecosystem area

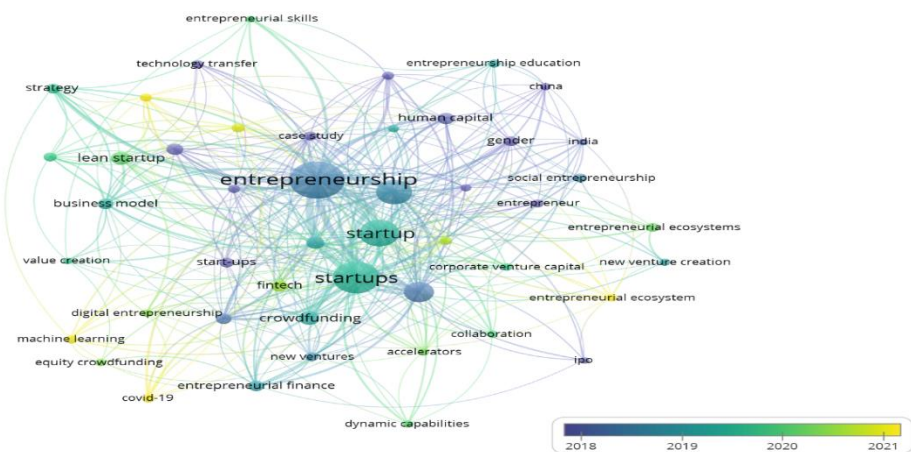


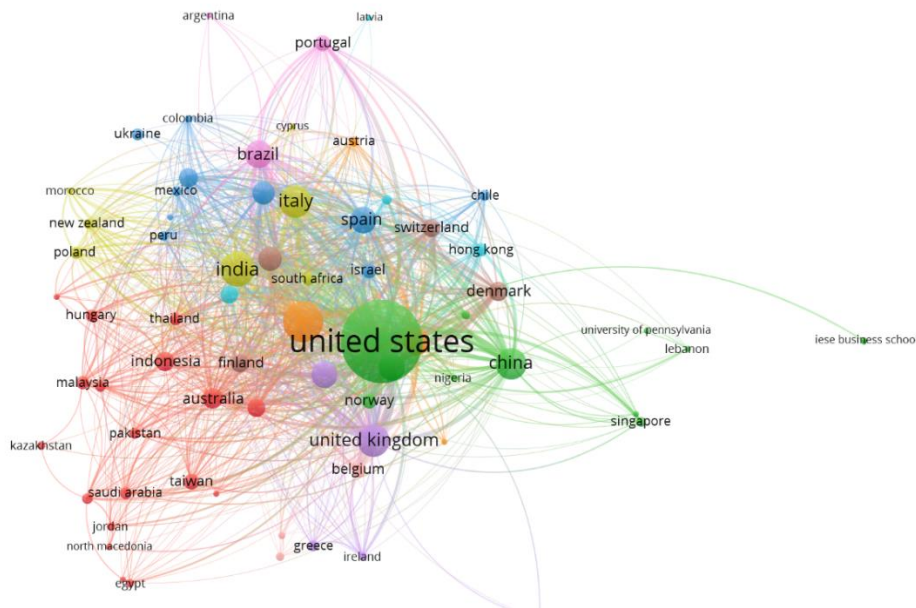
Table 6: Bibliographic Coupling of Countries in the Start-up Ecosystem Area

Sr. No.	Country	Documents	Citations	Total link strength
i	United States	809	28816	69798
ii	Germany	199	6075	27335
iii	United Kingdom	129	3481	20160
iv	Canada	86	3180	10058
v	Italy	125	3031	22488
vi	Netherlands	63	2515	9860
vii	France	86	2353	17109
viii	China	119	1790	14444
ix	Spain	82	1679	11247
x	Sweden	69	1425	13886
xi	Switzerland	42	1400	9021
xii	South Korea	83	1223	6896
xiii	Australia	54	1061	8148
xiv	Denmark	45	955	9458
xv	Brazil	93	928	12622
xvi	Finland	41	844	7961
xvii	Israel	28	753	3205
xviii	India	145	714	9832
xix	Belgium	28	703	4022

xx	Hungary	17	528	1516
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The bibliographic coupling of the countries in the start-up sector is shown in Table 6 and fig. 7. When two works cite the same third work in their bibliographies, this is known as bibliographic coupling. This setting uses it to illustrate the link between various countries based on the results of their research on start-ups. Each column in the table indicates a country, the number of papers or articles that the country produced (papers), the total number of citations those documents received (Citations), and the link strength of all of those publications combined. A greater number denotes a stronger relationship between the country's work and other documents, and the link strength usually quantifies the strength of that relationship. In this research, the United States, for instance, is the most linked nation with 809 papers, 28816 citations, and a total link strength of 69798. India is placed in 18<sup>th</sup> rank with a total of 145 published documents, 714 citations and 9832 link strength with different countries. According to the research output and its influence, this table may be useful for determining which countries are the most active or important in the field of start-ups.

**Fig. 7: Mapping of Bibliographic Coupling of Countries in the Start-up Ecosystem Area**



#### IV. Conclusion

While the study "The Ecosystem of Start-Ups: A Bibliometric Overview" provides valuable insights into the start-up landscape, several unexplored avenues exist for future research. Notably, the temporal dynamics of the start-up ecosystem require further investigation through longitudinal analysis. Such an approach could uncover evolving trends, emerging fields, and shifts in collaborative patterns among start-ups. Additionally, while the study acknowledges geographical variations in start-up activities, a more detailed examination of regional clusters and their formation drivers would offer insights into successful start-up hubs and their contributions to innovation and economic growth.

Furthermore, while the study emphasizes the significance of collaborative networks among start-ups, academia, industry, and government entities, there is potential for deeper exploration of the evolving dynamics within these networks. Investigating the ways in which knowledge transfer and innovation diffusion occur through these networks using network analysis methodologies could provide a better comprehension of their impact on the overall ecosystem.

Addressing these research gaps would help to understand the start-up ecosystem better and give practical information for stakeholders involved in supporting innovation and entrepreneurship.

Lastly, although the study touches on the impact of government policies and support programs, there is room for a more comprehensive assessment of their effectiveness in fostering the growth and sustainability of start-ups. A focused examination of how regulatory frameworks, funding incentives, and other policy-related factors influence the trajectory of start-up ventures could yield insights into the role of policy in shaping the entrepreneurial landscape.



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