

A Bibliometric Analysis of Student Entrepreneurship and Start-up Research (1986-2024)

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Abstract

Entrepreneurship and start-up development are crucial for economic growth, heightens the number of publications by academics, policymakers and educators. In recent years, the student entrepreneurship and start-up business (SEBS) research is gathering increasing attention. However, there is a need of making the comprehensive overview on the topic. This study conducts a bibliometric analysis of 1,324 Scopus-indexed academic publications on "student entrepreneurship" and "start-up" as of July 2024, spanning 38 years. Using VOSviewer, this research explores publication trends, document types, languages, keywords, and contributions by key scholars, countries, and institutions. Findings indicate a notable rise in studies on student entrepreneurship in recent years, reflecting its growing significance in academia. Core research themes, frequent keywords, and author impact analysis reveal emerging directions and influential contributors in this field. This analysis highlights the global scope and evolving trends within SEBS research, underlining the field's dynamic growth and relevance. This bibliometric analysis indicates areas for further exploration and highlights key gaps in the literature. Identifies industry leaders and co-author networks, and shows directions for future collaboration. This research can provide a comprehensive and multidisciplinary approach to improve research on entrepreneurship and start-up development.

Keywords: *Entrepreneurship, Start-up, Student, Bibliometric analysis.*

Introduction

Student entrepreneurship is a process of transforming accumulated knowledge or innovation created within the academic institution into a tangible value through entrepreneurial activities such as creating a start-up company, contributes to job-creation, industry development and overall economic growth in the long run. The importance of student-led start-ups is not only the economic gain, but also the unique learning and growth opportunity (Igwe et al., 2021). More

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specifically, testing academic knowledge in the real market environment, acquiring skills required for the digital transition, and developing specialists who meet labor market needs with an entrepreneurial mindset and drive (Galvão et al., 2020). Student-led start-ups can play an important role in innovation and economic growth, leading education and industry policymakers, stakeholders, and researchers to focus more on student entrepreneurship and start-ups ups (Global Entrepreneurship Monitor (GEM), 2018), (Ahmad & Hoffman, 2008).

In Mongolia, the Law on Innovation was enacted in 2011, laid the legal foundation for start-up development. Since, several initiatives by universities, academies and government grants projects contributed in the development and growth of start-up businesses (Mandukhai B & Oyuntsetseg L, 2019). It should be noted that the business incubation services started in early 2000s and formal support for those who are aiming to start their own enterprises, started in 2007 under the project by the Ministry of Labor and Social Welfare. The value of Mongolian startup ecosystem was estimated to be USD123.5 million as of 2022 (APO, 2024). Research in the area of the Student Entrepreneurship and Start-up Business (SESB) has grown significantly, with focus areas evolving over time. In the early 2000s, initially, studies concentrated on students' entrepreneurial attitudes, behaviors, aspirations, and innovative mindsets then gradually expanded to assessing the effectiveness of entrepreneurship education and specific programs. From the 2010s onward, focus shifted toward building innovation infrastructure, including incubator centers, accelerator programs, and mentorship opportunities. Recently, attention has turned to creating supportive student entrepreneurship ecosystems. Overall, student entrepreneurship and start-up research examine the formation of student-led ventures, their sustainability, and the transition of university startups into viable businesses. Due to the differences in existing market environment and the contextual diversity of the countries, students' experience and reactions may vary. Therefore, student entrepreneurship, start-ups, entrepreneurial ecosystem development are context-dependent, situated at the intersection of higher education and business creation. It is important to understand and comprehensively see the development of research in this area to provide information for the effective development of education policy for the Mongolian context.

Literature review

In general, according to the researches, student entrepreneurship can be defined as all students involved in actively running any entrepreneurial activities, acting upon identified opportunities and developed ideas, and transforming them into value for others (Holienka et al., 2017). Student entrepreneurship and startups are fostered through various educational opportunities, including incubator centers, mentorship programs, startup funding, networking, and other university resources (Bergmann et al., 2016; Sendouwa et al., 2019; Walter et al., 2013; Wright et al., 2017a). Higher education institutions play a pivotal role in this development by cultivating a supportive environment for creativity and innovation. For example, organizing entrepreneurship competitions, host seminars (Sendouwa et al., 2019), (Morris et al., 2017); establishing labs, and create incubation centers to support startups by students across diverse fields (Wright et al., 2017b); helping students understand how to mitigate risks, solve challenges, establish networks, and promote interdisciplinary collaboration through accelerator programs (Sendouwa et al., 2019). Participating in these entrepreneurial activities equips students with essential skills such as leadership, problem-solving, and teamwork, helping them build valuable relationships, gain practical experience, and enhance career prospects, whether as founders or employees. Additionally, students develop a mindset for viewing problems from fresh perspectives and reaching innovative solutions (Abushakra et al., 2019). As such, research on student

entrepreneurship addresses a wide range of social and economic issues related to innovation, entrepreneurship education, and the development of startup ecosystems (Fig. 1).

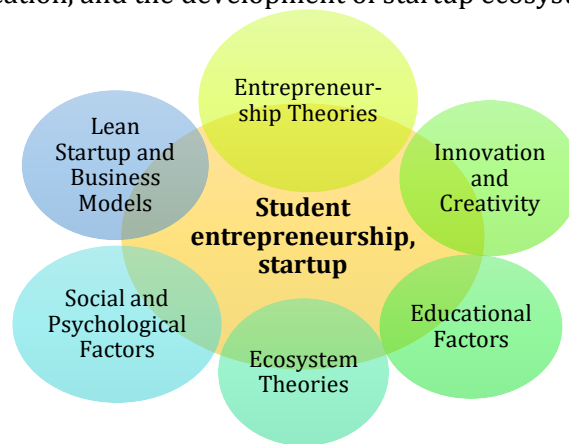


Figure 1. Theoretical Framework

Research on student entrepreneurship addresses a wide range of social and economic issues related to innovation, entrepreneurship education, and the development of startup ecosystems. Research by Vesper & Gartner (1997) and Shane & Venkataraman (2000) provided a theoretical foundation for how students transition from academic environments to entrepreneurship. These works highlighted the important role universities play in promoting entrepreneurship through formal programs, incubators, and mentoring opportunities. Much of the early research focused mainly on entrepreneurial intentions. In the early 2000s, research focus shifted to the factors influencing student entrepreneurship, examined the infrastructures that support the growth of entrepreneurs and highlighted the importance of the entrepreneurial ecosystem within higher education (Siegel et al., 2007). These studies highlight that universities are key players in regional innovation systems, providing students with critical resources, networks, and funding opportunities. The research during this time examines the success factors of student entrepreneurship and highlights the role of mentors, access to venture capital, and entrepreneurship education in the development of startups.

The recent research trend expanded on the above foundation and introduced a more nuanced approach to understanding the dynamics of student entrepreneurship. Researchers such as Roberts & Eesley (2011) and Fayolle & Gailly (2015) have explored the intersection between academic and entrepreneurial activities, focusing on how students use academic knowledge to create innovative business models. Also, the role of digital technology and globalization is emerging as a central research topic. Kuratko et al. (2015) explored how digital platforms provide student entrepreneurs with access to global markets and resources, resulting in the acceleration of the growth of startups and chances of capitalizing on international business opportunities. Further studies have explored various dimensions of entrepreneurship, including the historical evolution and future trajectory of entrepreneurship theory (García-Lillo et al., 2023), the impact of entrepreneurship education (Muhammad Afraz et al., 2020), Joseph Schumpeter's contribution to entrepreneurship and innovation (Ferreira et al., 2017). Other areas of research are entrepreneurial orientation (Akhtar et al., 2017), startup success factors (Le et al., 2022), and the relationship between entrepreneurship and crisis (Xu et al., 2021). While, a bibliometric analysis was conducted on general entrepreneurship and regional development (Dan & Goia, 2018), key contributors in startup success (Lee et al., 2001; Shane & Stuart, 2002), entrepreneurial universities (Etzkowitz, 2003) and factors influencing college student entrepreneurial activity (Jansen et al., 2015; Bu et al., 2023). In addition, fields such as the study of entrepreneurial

thinking and behavior (Cui & Bell, 2022), as well as the evaluation of the quality of innovation and entrepreneurship education (Zhou & Zhou, 2022) continue to attract researchers. Despite the growing body of research on student entrepreneurship, significant gaps remain. The literature has focused mainly on external factors such as university support and regional ecosystems, but less attention has been paid to the psychological factors of student entrepreneurship such as resilience, risk tolerance, and adaptability. Moreover, most studies focus on student entrepreneurship in developed countries, with relatively little research on how to create student-led businesses in resource-poor or emerging market contexts, often emphasizing short-term measures of success and ignoring long-term sustainability.

Among the works that contributed to the bibliometric analysis methodology, the research of Mukherjee et al. (2022) and Donthu et al. (2021) stand out for giving instructions and recommendations; Máté et al. (2024) and Sapiyi et al. (2024) for outlining the methodological structure for their analysis implementation; Lim et al. (2024) for describing the use of tools such as Bibliometrix and VOS viewer for bibliometric analysis. The bibliometric analysis of Student Entrepreneurship and Start-up Business (SESB) has been conducted across three key areas. Firstly, the expansion of research on Student SESB can be evaluated through several metrics. These include the annual publication count, which reflects the number of SESB-related studies published each year, and the classification of document types and sources, such as journal articles and conference papers. Additionally, the languages of publication highlight the global dissemination and reach of SESB research. Secondly, significant research areas within SESB are explored through the examination of core research directions, offering insights into primary themes and focal points. A keyword frequency analysis further identifies prevalent and emerging topics, while title analysis systematically reviews research titles to detect central themes and trends in SESB studies. Lastly, the leading researchers and institutions contributing to SESB studies are identified by examining top-contributing countries, higher education institutions, and key authors. Author and citation analyses provide detailed insights into individual contributions and the citation impact of their work in advancing SESB scholarship.

Methodology

Data Source

To ensure reliability and feasibility of conducting bibliometric analysis, the researchers chose Scopus database, as Baas et al. (2020) suggested for its enriched metadata records that provide comprehensive author and organization profile information, that enables extensive and selective content searches. In this study analyzed academic database of 46,704 journals, of the literature on SESB published between 1986 and 2024.

Data collection

To provide transparency and clarity around the data collection process, the flow diagram was created based on the researches of Liberati (2009), and Sapiyi et al. (2024) (Figure 1). To capture relevant documents from the vast database, employed filtering methods and a string search strategy. The search query was created based on the paper title, as follows:

Title (“entrepreneurship” OR “start-up” OR “startup” OR “start-ups”) AND (“student” OR “youth” OR “university”). After removing duplicates, this query initially yielded 1,325 documents. The final dataset comprised 1,324 documents spanning from 1986 to 2024 (Fig. 2). However, due to the reliance on the title-based search, some important article, where key terms appeared in abstracts or keywords may have been excluded. Another limitation of this query is exclusion of non-English language articles.

Analysis and visualization

The research procedure was developed from the researches by Öztürk et al. (2024), Ninkov et al. (2022) and Sapiyi et al. (2024) to fulfill the research aim of revealing the main trends, influential authors, and main research topics, and to study how they have evolved (Figure 2). The dataset was exported in CSV format, containing standard bibliometric information such as year of publication, document type, language of publication, subject area, source title, keywords, abstract, country of origin, jurisdiction, citation count, and author name. Microsoft Excel was used for descriptive statistics and trend analysis, while VOSviewer was employed for network analysis and visualization of bibliometric networks (Fig. 3).

Bibliometric indicators

In the analysis of the articles, key research questions outlined in the previous section were addressed through various elements, including year of publication, document category, source type, country, organization, document language, number of citations, abstract, author, keywords, and title. Throughout the study, several bibliometric indicators were calculated, such as the number of cited publications (NCP), percentage distribution, total citations (TC), average citations per publication (C/P), average citations per cited publication (C/CP), g-index, and h-index. Additionally, Scopus-derived metrics such as CiteScore, SCImago Journal Rank (SJR), and Source Normalized Impact per Paper (SNIP) were integrated into the analysis. The most frequently cited articles were highlighted within the citation analysis to identify influential works in the field.

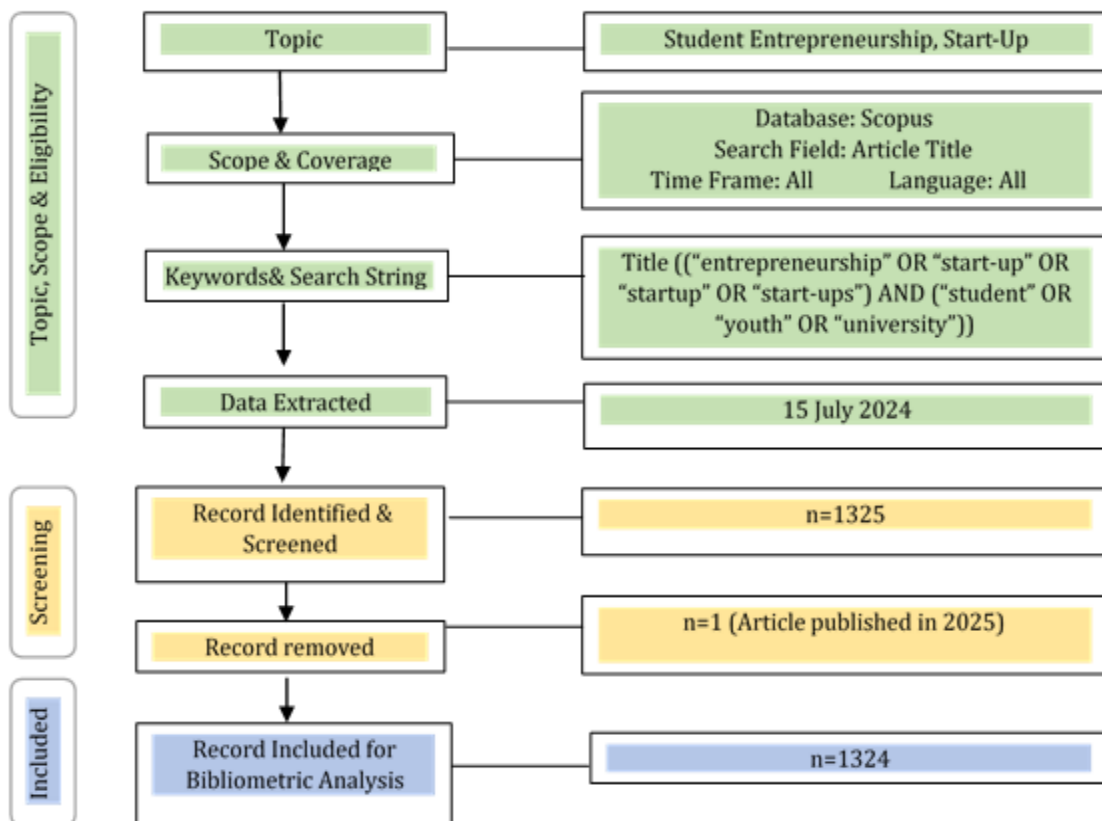


Figure 2: Data collection flow diagram

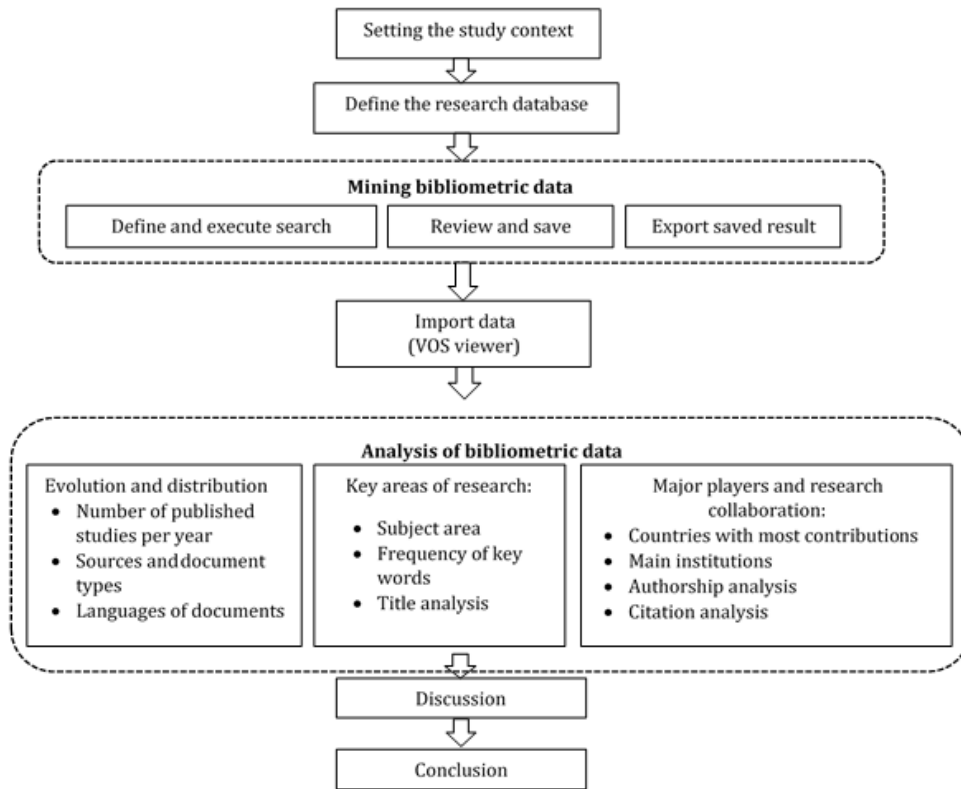


Figure 3: The bibliometric analysis procedure

Results and findings

SESB research trends

As seen in Table 1, there has been a notable increase in SESB research over the past decade. For example, 103 articles were published in 2017, and the number of publications peaked in 2022 with 123 articles. This upward trend in the volume of published articles is visually represented in Figure 4.

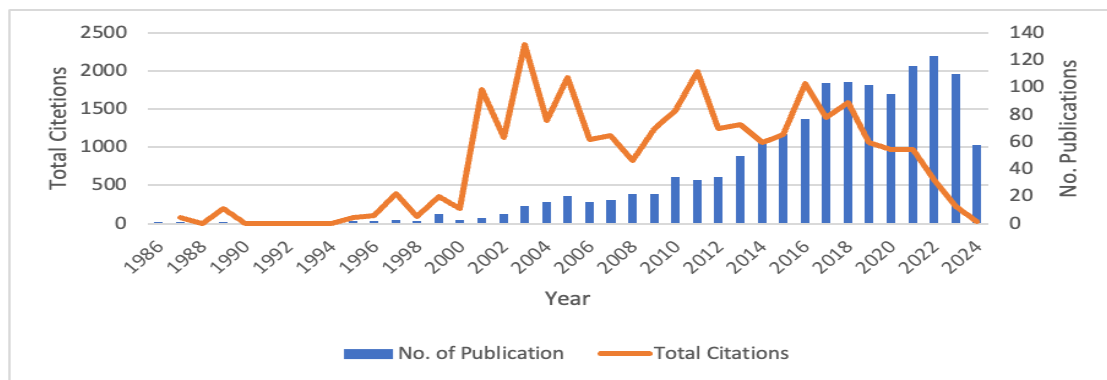


Figure 4: Publication and Citation trend in SESB research

Table 1. Year of Publication

Year	TP	%	NCP	TC	C/P	C/CP
2024	58	4.38	16	28	0.48	1.75
2023	110	8.31	47	226	2.05	4.81
2022	123	9.29	77	577	4.69	7.49
2021	116	8.76	92	975	8.41	10.60
2020	95	7.18	73	974	10.25	13.34
2019	102	7.70	80	1065	10.44	13.31
2018	104	7.85	94	1590	15.29	16.91
2017	103	7.78	85	1390	13.50	16.35
2016	77	5.82	65	1835	23.83	28.23
2015	66	4.98	51	1163	17.62	22.80
2014	61	4.61	47	1066	17.48	22.68
2013	50	3.78	41	1301	26.02	31.73
2012	34	2.57	26	1252	36.82	48.15
2011	32	2.42	25	1997	62.41	79.88
2010	34	2.57	28	1479	43.50	52.82
2009	22	1.66	17	1250	56.82	73.53
2008	22	1.66	20	827	37.59	41.35
2007	17	1.28	17	1158	68.12	68.12
2006	16	1.21	13	1108	69.25	85.23
2005	20	1.51	16	1920	96.00	120.00
2004	16	1.21	16	1354	84.63	84.63
2003	13	0.98	13	2346	180.46	180.46
2002	7	0.53	6	1134	162.00	189.00
2001	4	0.30	4	1762	440.50	440.50
2000	3	0.23	3	201	67.00	67.00
1999	7	0.53	7	354	50.57	50.57
1998	2	0.15	2	91	45.50	45.50
1997	3	0.23	3	389	129.67	129.67
1996	2	0.15	2	104	52.00	52.00
1995	2	0.15	2	83	41.50	41.50
1994	0	0.00	0	0	-	-
1993	0	0.00	0	0	-	-
1992	0	0.00	0	0	-	-
1991	0	0.00	0	0	-	-
1990	0	0.00	0	0	-	-
1989	1	0.08	1	196	196.00	196.00
1988	0	0.00	0	0	-	-
1987	1	0.08	1	78	78.00	78.00
1986	1	0.08	1	11	11.00	11.00
Total	1324			31284		

SESB research sources. Table 2 demonstrates that the most frequently utilized sources were academic journals, comprising 69.8% of the total sources, followed by conference proceedings at 15.33%, while trade journals represented the smallest share at 0.3%. Table 3 illustrates the distribution of document types across 11 categories. Research articles constituted the majority with 877 documents (66.24%), followed by conference papers, which accounted for 233 documents (17.6%).

Table 2: Sources for entrepreneurship, start-up business research

Nº	Source Type	Total Publications (TP)	Percentage (%)
1	Journal	916	69.18
2	Conference Proceeding	203	15.33
3	Book	114	8.61
4	Book series	87	6.57
5	Trade journal	4	0.30
	Total	1324	100

Table 3: Document type

No	Document Type	Total Publications (TP)	Percentage (%)
1	Article	877	66.24
2	Conference paper	233	17.60
3	Book chapter	116	8.76
4	Book	47	3.55
5	Review	27	2.04
6	Conference review	10	0.76
7	Note	6	0.45
8	Erratum	3	0.23
9	Short Survey	2	0.15
10	Data paper	2	0.15
11	Retracted	1	0.08
Total		1324	100.00

Bibliometric indicators

The findings presented in Table 4 highlight the most frequently utilized sources in the study of student entrepreneurship and start-up business. A total of 20 sources, each with more than 8 articles, were analyzed. The *Emerald Emerging Markets Case Studies*, published by Emerald Publishing, led with 76 articles, followed by *Industry and Higher Education*, published by SAGE, with 34 articles. Other notable sources include the *Journal of Technology Transfer*, which published 28 high-impact articles, *Small Business Economics* with 18 articles, *Journal of Entrepreneurial Behavior and Research* with 17, and the *International Journal of Management Education*, which published 12 articles. Additionally, Elsevier's *Technovation* journal, which has the highest CiteScore, contributed 9 articles in this research area.

Table 4: Source title

Source Title	TP	Publisher	Cite Score	SJR 2023	SNIP 2023	NCP	TC	C/P	C/CP	h	g
Emerald Emerging Markets Case Studies	76	Emerald Publishing	0.3	0.142	0.124	25	46	0.61	1.84	21	27
Industry and Higher Education	34	SAGE	4.2	0.526	1.113	33	402	11.82	12.18	10	18
Journal of Technology Transfer	28	Springer Nature	10.2	1.495	2.288	28	2036	72.71	72.71	23	28
Education and Training	28	Emerald Publishing Academic	7.2	0.761	1.485	27	1237	44.18	45.81	17	28
Proceedings of The European Conference on Innovation and Entrepreneurship ECIE	26	Conferences and Publishing International Limited	N/A	0.132	N/A	11	39	1.50	3.55	3	5
ASEE Annual Conference and Exposition Conference Proceedings	26	American Society for Engineering Education	N/A	0.219	N/A	20	131	5.04	6.55	7	11
International Studies in Entrepreneurship	19	Springer	N/A	N/A	N/A	14	27	1.42	1.93	2	3
Small Business Economics	18	Springer	10.3	1.500	3.100	17	1099	61.06	64.65	13	19
International Journal of Entrepreneurial Behaviour and Research	17	Emerald Publishing	10.2	1.353	1.847	17	774	45.53	45.53	12	17
Journal of The International Academy for Case Studies	16	Allied Business Academies	N/A	N/A	N/A	3	6	0.38	2.00	2	3

Notes: TP=total number of publications; SJR=SCImago Journal Rank, SNIP=Source Normalized Impact per Paper; TC=total citations; NCP=number of cited publications; C/P=average citations per publication; C/CP= average citations per cited publication; h=h-index, g=g-index; N/A=not applicable.

Table 5 presents the distribution of languages in which the published works were written. Of the 1,324 articles analyzed, 97.66% were published in English, making it the predominant language for research in this field. Spanish follows as the second most common language, though it accounts for only 0.83% of the publications.

Table 5: Languages used for research publications

Nº	Language	Total Publications (TP)	Percentage (%)
1	English	1293	97.66
2	Spanish	11	0.83
3	French	8	0.60
4	Russian	6	0.45
5	Portuguese	1	0.08
6	German	2	0.15
7	Korean	1	0.08
8	Italian	1	0.08
9	Chinese	1	0.08
	Total	1324	100

The research results of the key aspects

In this study, three key aspects are highlighted:

1. **Subject Area Distribution:** As detailed in Table 6, the distribution of subject areas indicates that the majority of published articles are concentrated in Business, Management, and Accounting (33.4%), Social Sciences (20.22%), and Economics, Econometrics, and Finance (16.95%). Together, these fields constitute 70.57% of the total published literature. Additionally, there are over 100 articles in the fields of Engineering (9.14%) and Computer Science (4.94%), while publications in other disciplines total 395, representing 15.36% of the overall research output.

Table 6: Subject Area

Nº	Subject area	Total Publications (TP)	Percentage (%)
1	Business, management and law	859	33.28
2	Social Sciences, Information and Journalism	685	26.54
3	Education	309	11.97
4	Engineering, manufacturing and construction	285	11.04
5	Information and communication technology	127	4.92
6	Natural sciences, mathematics and statistics	119	4.61
7	Decision Sciences*	88	3.41
8	Health and social security	37	1.43
9	Arts and Humanities	30	1.16
10	Agriculture, forestry, forestry, veterinary medicine	20	0.77
11	Multidisciplinary*	13	0.50
12	Service	9	0.35

*Notes: The subject area of Scopus database is combined based on the scientific categories issued by UNESCO. *-The field is not in the category of UNESCO, but it is in the Scopus database.*

Keyword Frequency: Using VOSviewer for bibliometric analysis, 50 terms and 4 clusters were mapped to visualize keyword relationships. The network's representation conveys connections through the diameter of colored circles, the size of the words, and the thickness of the connecting lines. Keywords sharing the same color are frequently grouped together. In this study, the most frequently occurring keywords include "entrepreneurship," "entrepreneurship education," "students," "technology transfer," "higher education," "entrepreneurial intention," "start-up companies," "business," and "ecosystem" (Fig. 5).

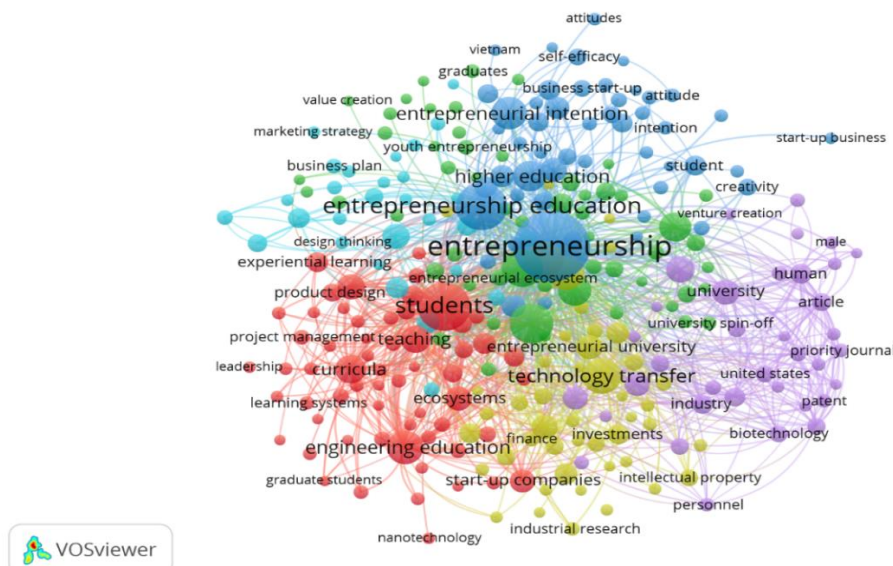
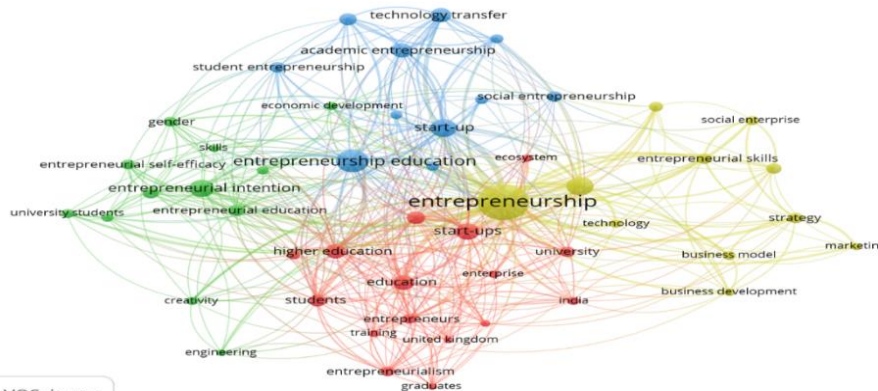


Figure 5: Network visualization map of author keywords with at least 10 occurrences.

Table 7. Keywords in public sector innovation research and their frequency

Nº	Keyword	Number of documents	Percentage (%)
1	Entrepreneurship	434	23.6
2	Students	176	9.6
3	Entrepreneurship education	163	8.9
4	Start-up/ups	152	8.3
5	Innovation	109	5.9
6	Education	98	5.3
7	Technology transfer	86	4.7
8	Engineering education	72	3.9
9	Higher education	60	3.3
10	Academic entrepreneurship	58	3.2
11	Entrepreneur	53	2.9
12	Curricula	50	2.7
13	Teaching	43	2.3
14	Universities	42	2.3
15	Education Computing	36	2.0
16	University	35	1.9
17	Ecosystems	34	1.8
18	Start-up companies	31	1.7

3. Title Analysis: In this analysis, a word appearing once in a title is given equal weight to a noun appearing multiple times in a document. The analysis reveals that the term "entrepreneurship" was the most frequently used and served as the central node in the network. The correlation of word occurrences is depicted by the size of the nodes, while the thickness of the connecting lines indicates the strength of the relationships between words. Terms such as "entrepreneurship," "entrepreneurship education," "start-up/ups," "entrepreneurship skills," "students," and "higher education" frequently co-occurred. VOSviewer identified four clusters comprising 50 terms throughout the study. The figure provides an analysis of document titles with at least 10 occurrences (Fig. 6).



4.  **Figure 6.** VOSviewer visualization of a term co-occurrence network based on title fields

The research contributors and major players

In this section, we examine the scientific collaborators and primary contributors to research on SEBS. This includes an analysis of the leading countries in the field, key research institutions, author contributions, and citation metrics. Next figure illustrates the top 20 countries conducting research in the domain of student entrepreneurship and start-ups. The data highlights significant contributions from the USA (20.2%), the United Kingdom (11.1%), Germany (8.5%), and India (7.9%), which are the foremost contributors to research advancements in this field (Fig. 7).

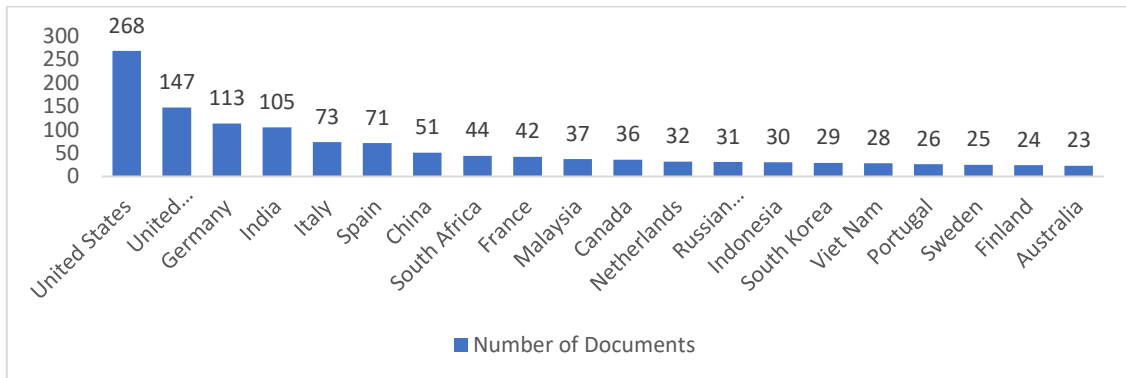


Figure 7: Top countries in Entrepreneurship, start-up research

Major Institutions: Figure 7 shows the institutions with the highest number of published research articles on student entrepreneurship and start-ups. Notably, the National Economics University Hanoi (n=13), University of Beira Interior (n=12), and Friedrich Schiller University Jena (n=12) have produced the most publications out of a total of 1,324 documents. The table demonstrates that institutions from Asia, Europe, and America are actively researching and contributing to this field (Fig. 8).

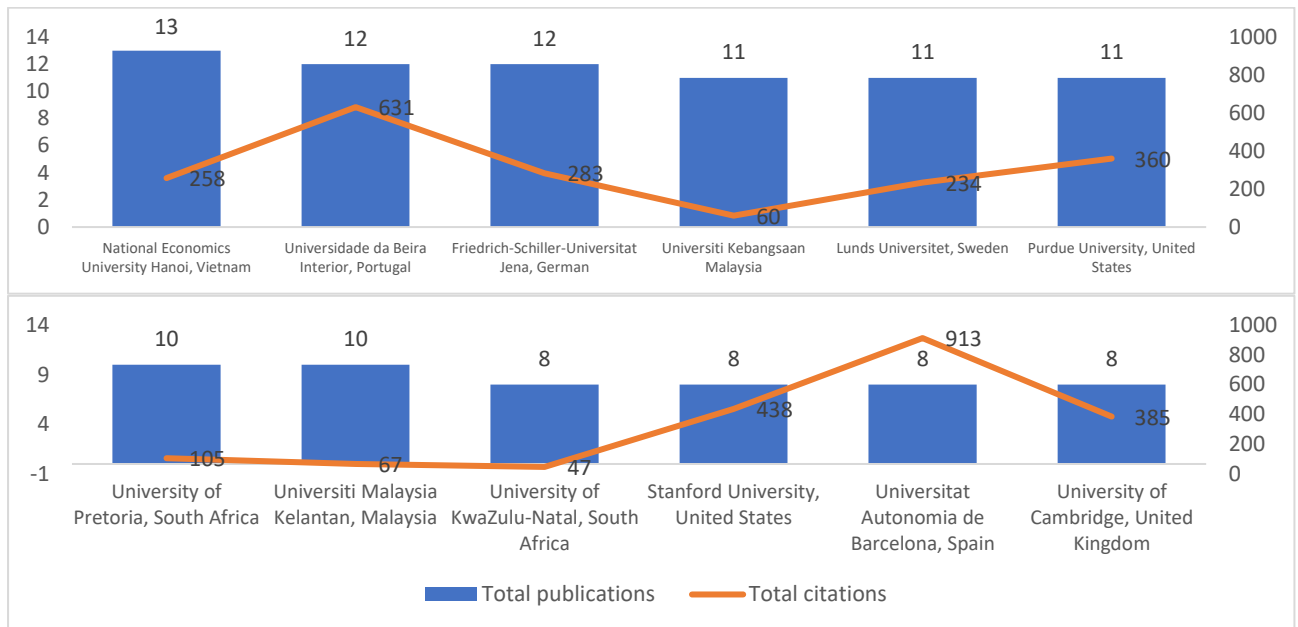
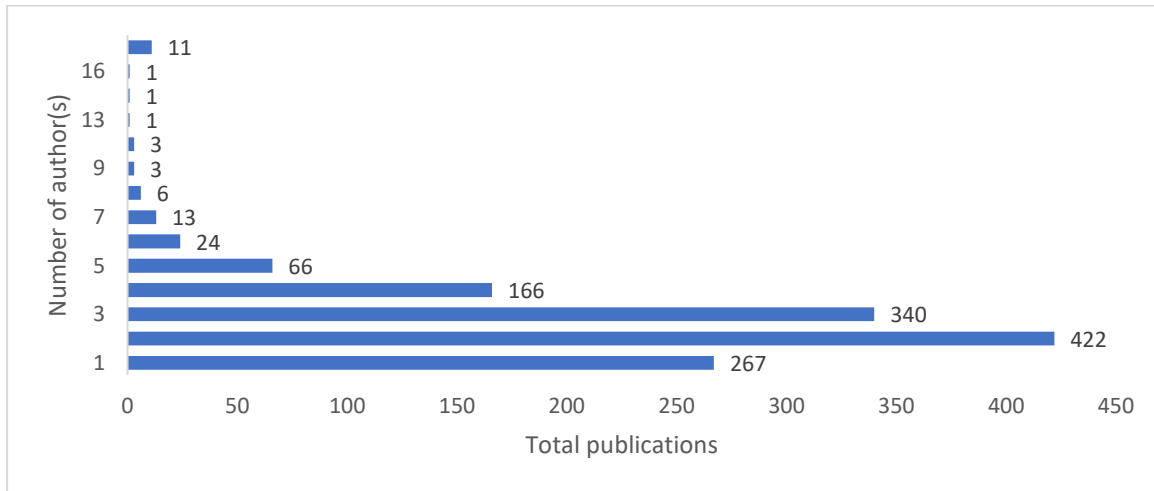


Figure 7: Most influential institutions with minimum of eight publications

Leading universities in the development of innovation, entrepreneurship, and start-ups, such as Harvard University (711 citations), MIT (86 citations), Stanford University (438 citations), and the University of Cambridge (385 citations), have published between six to eight articles, showcasing their significant contributions and foundational work in this area. For example, MIT has proposed a three-stage model for universities to foster entrepreneurship, outlining a structured approach to developing entrepreneurial ecosystems within academic institutions. In contrast, Harvard University has contributed significantly to the literature with publications focusing on topics such as entrepreneurship education, reflections on two decades of university-start-up development, and the concept of entrepreneurship clusters. These contributions highlight different strategies and insights from leading institutions in advancing entrepreneurship through academic frameworks and community-building efforts. China is now one of the leading countries in the world for research publications, including those in business, economics, and technology fields that focus on these areas. Much of this research is concentrated on topics such as technology commercialization, start-up ecosystems, venture capital, entrepreneurial education, innovation management, and the role of government policies in fostering entrepreneurship. Leading Chinese universities such as **Tsinghua University, Peking University, Shanghai Jiao Tong University, Fudan University, and Zhejiang University** are among the most prolific in terms of research output related to innovation and entrepreneurship. These institutions frequently publish in high-impact journals both domestically and internationally. Among the 1,324 articles identified within the searched titles, 51 articles have been published in recent years, collectively accumulating 550 citations (Fig. 7).

Authorship Analysis: Among the surveyed articles, 422 (31.87%) are co-authored by two authors, making this the most common authorship pattern. The second most frequent pattern is documents authored by three individuals, totaling 340 (25.68%). Additionally, there are 267 (20.17%) single-author articles. The remaining documents are multi-authored, with a maximum of 15 and 16 co-authors identified in one paper each (Fig. 8).



*Conference review document. No author is listed.

Figure 8: Number of author(s) per document

The researchers listed in the table have been the most prolific contributors to research on student entrepreneurship and start-ups. Duong and Cong Doanh from the National Economics University of Vietnam, and Raposo and Mário from University of Beira Interior in Portugal, each have 8 publications, making them the leading contributors. Following them are Shirokova, Galina V. from the Higher School of Economics in the Russian Federation, and Ferreira, João J. from University of Beira Interior, Portugal, each with 7 publications. Figure 7 provides a network representation based on the authors' countries, highlighting those with at least 5 publications. It is evident from the figure that researchers from the USA have been the most active, frequently collaborating with researchers from other countries (Table 8).

Table 8. Most Productive Authors

Author Name	Affiliation	Country	TP	%	NCP	TC	C/P	C/CP	h	g
Duong, Cong Doanh	National University of Economics	Viet Nam	8	0.604	7	110	13.8	15.7	5	8
Raposo, Mário	University of Beira Interior	Portugal	8	0.604	8	590	73.8	73.8	8	8
Shirokova, Galina V.	Higher School of Economics	Russian Federation	7	0.529	7	741	105.9	105.9	7	7
Ferreira, João J.	University of Beira Interior School of Economics and management-Lunds University	Portugal	7	0.529	7	542	77.4	77.4	7	7
Politis, Diamanto	University of Malaysia Kelantan	Sweden	6	0.453	6	156	26.0	26.0	4	6
Othman, Nor Hafiza Othman, Norasmah	Faculty of Business and Law	Malaysia	6	0.453	6	47	7.8	7.8	4	6
Nabi, Ghulam R.	University of Foggia	United Kingdom	6	0.453	6	445	74.2	74.2	6	6
Muscio, Alessandro	School of Management, Swansea	Italy	6	0.453	5	60	10.0	12.0	2	6
Jones, Paul		United Kingdom	6	0.453	6	219	36.5	36.5	5	6

Notes: TP=total number of publications; TC=total citations; NCP=number of cited publications; C/P=average citations per publication; C/CP= average citations per cited publication; h=h-index, g=g-index.

Citation analysis

In the next table presents the citation metrics for the collected documents from the Scopus database. Over 38-year period (1986–2024), 1,324 papers generated a total of 31,336 citations, averaging 1,251 citations per year since 1999. The number of articles published on the topic of SEBS has been steadily rising in recent years. Between 2000 and 2012, the average number of citations per article was notably higher, indicating that key foundational works were published during this period (Table 9). Additionally, Table 10 provides a summary of the 30 most cited documents and Figure 9 shows the highly cited authors.

Table 9: Citation metrics

Metrics	Data
Total papers	1324
Total citations	31336
Total number of year	38
Number of year (1999>)	13
-Citations	68
-Citations per year	5.2
Number of year (1999<)	25
Total citations	31268
Citation per year	1250.72
Citation per paper	23.67
h-index	82
g-index	153

Table 10: Top 10 Highly cited articles

Nº	Cited times	Cites Per Year	Authors	Title	Year
1	1329	57.78	Lee C.; Lee K.; Pennings J.M.	Internal capabilities, external networks, and performance: A study on technology-based ventures	2001
2	970	46.19	Etzkowitz H.	Research groups as 'quasi-firms': The invention of the entrepreneurial university	2003
3	923	41.95	Shane S.; Stuart T.	Organizational endowments and the performance of university start-ups	2002
4	894	42.57	Di Gregorio D.; Shane S.	Why do some universities generate more start-ups than others?	2003
5	594	45.69	Grimaldi R.; Kenney M.; Siegel D.S.; Wright M.	30 years after Bayh-Dole: Reassessing academic entrepreneurship	2011
6	590	31.05	Marlow S.; Patton D.	All credit to men? entrepreneurship, finance, and gender	2005
7	578	41.29	Delgado M.; Porter M.E.; Stern S.	Clusters and entrepreneurship	2010
8	480	36.92	Liñán F.; Urbano D.; Guerrero M.	Regional variations in entrepreneurial cognitions: Start-up intentions of university students in Spain	2011
9	462	24.32	Powers J.B.; McDougall P.P.	University start-up formation and technology licensing with firms that go public: A resource-based view of academic entrepreneurship	2005
10	427	23.72	Rasmussen E.A.; Sørheim R.	Action-based entrepreneurship education	2006

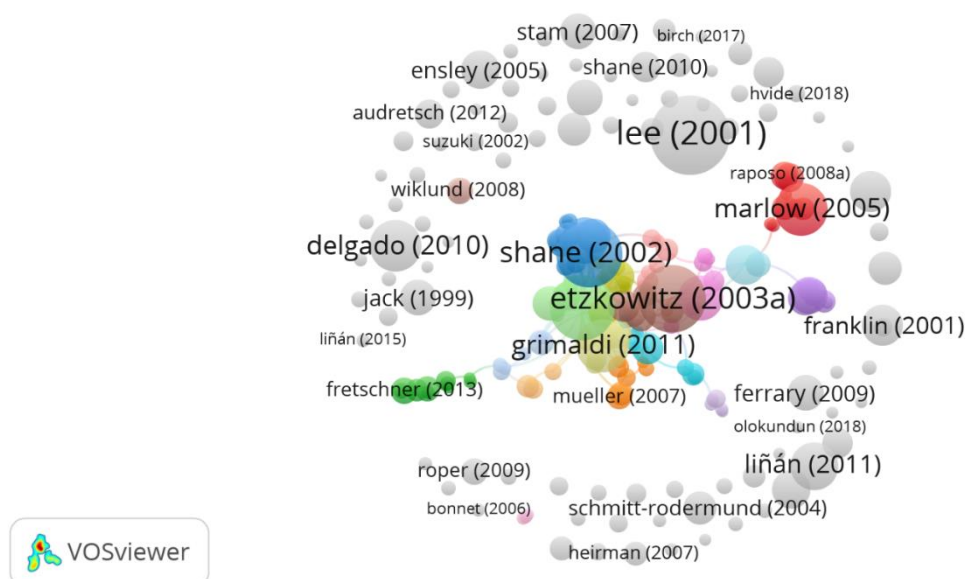


Figure 9. Top highly cited articles by Authors

Conclusion

We hope, this comprehensive bibliometric analysis of student entrepreneurship and start-up research from 1986 to 2024, based on 1,324 documents, provides valuable insights into the evolution and current state of this field. Our study reveals significant growth in this research area, with an average of 100 publications per year in the last 20 years (2004 to 2024), compared to fewer than 10 annually in the 1990s. This trend reflects the increasing recognition of the importance of fostering entrepreneurial skills among students. The global nature of this research field is evident, with contributions from a number of countries. However, there is a clear dominance of publications from the United States accounting for one-fifth of all publications. Within the top 20 contributing countries, 10 were from Europe, 7 from Asia, 2 from North America, and 1 from Africa. This suggests opportunities for more balanced global participation in this research area. Another observed trend in this context is the increase in participation from developing countries. In the last decade, China showed a notable increase in a number of publications on the topic of student entrepreneurship and start-ups, indicating the rapid expansion of research in this area. Institutionally, National Economics University Hanoi ($n=13$), University of Beira Interior ($n=12$), and Friedrich Schiller University Jena ($n=12$) lead in research output. By total cited numbers, Autonomous University of Barcelona (913 citations), Harvard University (711 citations), and University of Beira Interior (631 citations) are topping the list. In terms of leading institutions in thematic research on fostering innovation, entrepreneurship, and startup ecosystems, the study revealed that Harvard University (711 citations), Stanford (438 citations), and Cambridge (385 citations) are at the forefront. This concentration highlights the role of certain institutions in driving the field forward. In terms of publications, Emerald Emerging Markets Case Studies, Industry and Higher Education, Journal of Technology Transfer, Education and Training have the most articles regarding SEBS. The majority of the documents were published as articles in the journals (66.24%), or as conference papers (17.6%) due to the convenience of sharing ideas, conclusions, and recommendations for future research in these formats. Additionally, most of the sampled articles were published in English (97.66%), reflecting its dominance as the primary language for academic dissemination. Typically, each article is co-authored by 2-3 researchers, in rare cases the collaborative efforts involve as many as 15-16 contributors. Among the most published authors in the field are Duong C.D., Raposo M., Shirokova G.V., Ferreira J.J., Politis D., Muscio A., Jones P., Etzkowitz H., Marlow S., Grimaldi R., Franklin S.J.,

Rasmussen E.A., Schmitt-Rodermund E., and Franke N. These scholars are also among the most influential, leading in terms of citation impact from their published works.

The analysis of research directions, keywords, and titles has provided valuable insights into the focus areas of SESB research. Of the 1,324 sampled articles, 859 were published in the fields of business, management, and law; 685 in social sciences, information, and journalism; and 309 in education. The most frequently recurring keywords were entrepreneurship (434), students (176), entrepreneurship education (163), start-up(s) (152), innovation (109), education (98), and technology transfer (86). Title analysis further revealed a strong emphasis on themes such as entrepreneurship, entrepreneurship education, entrepreneurial intention, start-up(s), academic entrepreneurship, and entrepreneurship skills. These findings highlight the dominant research themes and emerging trends within the field. However, it's important to acknowledge the limitations of this study. Our analysis focuses on title-based, in-English keyword searches of 1,324 documents, which may have excluded some relevant publications. In conclusion, as entrepreneurship development continues to play a crucial role in the global economy, this bibliometric analysis offers valuable insights into the current state of SESB research. It highlights the need for sustained scholarly focus on this evolving field, particularly in areas such as the psychological factors influencing student entrepreneurship and the long-term outcomes of student-led start-ups in developing countries. Furthermore, the analysis underscores the importance of promoting language diversification in academic publishing to broaden the accessibility and impact of research.

Applications

This study has several implications for educators, researchers, and policy makers. By identifying key trends, authors, and important research topics, they provide the basis for creating educational programs that better equip students with the skills they need. Educational institutions can also use these results to update their curricula and prepare students to meet current and future market needs. Based on the information obtained from this research, it is possible to implement more effective policy solutions aimed at supporting student entrepreneurship and developing start-ups. For example, observing changes in entrepreneurial ecosystem research can help create support infrastructure, funding opportunities, and mentorship programs that match the challenges student entrepreneurs face. This bibliometric analysis indicates areas for further exploration and highlights key gaps in the literature. Identifies industry leaders and co-author networks, and shows directions for future collaboration. This research can provide a comprehensive and multidisciplinary approach to improve research on entrepreneurship and start-up development.

Limitations and future research directions

While the bibliometric analysis of SEBS provides valuable insights, several limitations should be addressed in future research. Firstly, the scope of the data collection is highly dependent on a single source of Scopus database, and the search query is written in English. Studies published on other platforms or published in non-English languages may not be included. In the future, the scope should be expanded by including data from Web of Science, Google Scholar, or regional or other academic platform databases. Secondly, this research provides a general overview of scholarly activities, focusing primarily on quantitative indicators such as publication volume, citation count, and co-authorship networks, but does not reflect qualitative aspects of research such as methodological rigor, theoretical contributions, and implications. Future research should consider combining bibliometric analysis with a qualitative review of key studies to better understand how different research approaches, methodologies, and contexts shape the field of

student entrepreneurship. Thirdly, the analysis period excludes emerging trends and articles published in the latter half of 2024. As the business environment is rapidly evolving, new developments, especially digital entrepreneurship, social entrepreneurship, and the impact of technology on the startup ecosystem, appear to be future research areas. Also, this analysis does not examine the different cultural, economic, and political factors that may influence the development of student entrepreneurship in different regions. Future research could delve deeper into these contextual factors and how the local environment shapes entrepreneurial outcomes. Finally, while this study primarily identifies trends and key contributors, it does not explore cross-sectoral linkages between technology, education, and business. Further research could explore the intersection of these disciplines and explore how interdisciplinary collaboration can support innovation in entrepreneurship education and startup development.

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