Entrepreneurial Ecosystem: From periphery to roots- Science Mapping and Network Analysis

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Abstract-

Purpose

The purpose of this paper is to identify the main authors, journals, countries, and institutions researching Entrepreneurial Ecosystem (EE). The paper aims to uncover information related to the field, particularly co-authorship, citation, co-citation, term co-occurrence and bibliographic coupling of the documents. The study also attempted to uncover research topics and clusters of themes in the domain of the entrepreneurial ecosystem.

Design/Methodology/Approach

The methodology is based on bibliometric techniques using VOS Viewer software and dimensions AI database. The study has been conducted on 1707 articles from 2015 to 2025.

Findings

Findings highlight the top authors, journals, institutions, and countries in the field of EE. Also, the paper has contributed towards the classification of underlying themes and gaps that have been highlighted.

Originality/Value

The paper has attempted to analyse the progress of studies on EE through the bibliometric analysis technique. This is particularly helpful for new researchers to understand the state of affairs in the field of EE and provide direction for future research agendas.

Key Words: - Entrepreneurial ecosystem, Bibliometric Analysis, Bibliometric Research, Visualisation, VOS Viewer, Citation Analysis, Bibliographic Coupling, Co-authorship.

1. INTRODUCTION

In the modern economy, many authors define entrepreneurship as the process of creating new added value by investing time and effort and assuming financial, social, and psychic risks and uncertainties for monetary and personal satisfaction (Shah, 2015; Schindehutt et al, 2008), whereas other researchers focus on the characteristics and functions of the entrepreneurial process. Drucker (1985) and Kuratko (2009) emphasise the importance of innovation, risk-

taking, and proactiveness for entrepreneurship and entrepreneurs. The entrepreneurship literature has been mostly preoccupied with the characteristics and behaviours of individuals or firms (Shane and Venkataraman 2000; Shane 2003). Some authors (Felicio et al., 2012; Beugelsdijk & Noorderhaven, 2005; Smallbone & Welter, 2001) focus on the traits of entrepreneurship and entrepreneurs. Fritsch (2016) proposes the following features as main characteristics of an entrepreneur as creative, idea generator, risk bearer, proactive, self-actualisation, etc.

Most of the initial literature on entrepreneurship was focused on the entrepreneur and the firm. Individual characteristics of an entrepreneur were considered the starting point of entrepreneurship. Right from Say, Cantillon, Drucker, Schumpeter, Baumol, Mises, Kirzner, and many others, even though various definitions were given by them and still to date we do not have a common definition of entrepreneur, one common element present was a focus on the individual. However, no individual can work and grow in an isolated environment. Even the brightest of individuals need various kinds of resources, networks, technology, and knowledge to create and sustain. The entrepreneurship literature has been mostly preoccupied with the characteristics and behaviour of individuals or firms (Shane and Venkataraman 2000; Shane 2003).

Many scholars writing on Entrepreneurial Ecosystem (EE) criticise the lack of a holistic approach to entrepreneurship that focuses on interrelated aspects of entrepreneurship. This is not to say that the link between networks and entrepreneurship has not been investigated. On the contrary, there is a rich literature starting in the late 1980s that explored the role of different networks for new start-up activity, and ethnic entrepreneurship more in particular (O'Donnell et al. 2001; Hoang and Antoncic 2003; Thornton and Flynn 2003). For instance, Birley (1986) investigated formal and informal networks, and Dubini and Aldrich (1991) made a distinction between personal networks and extended networks. However, there is widespread agreement expressed in papers that the systemic nature of entrepreneurial activity is still underdeveloped (Gustafsson and Autio 2011; Szerb et al. 2012; Qian et al.2013; Acs et al. 2014).

Entrepreneurial Ecosystem (EE) scholars have pointed out the need to understand entrepreneurship in broader contexts such as their regional, temporal, and social settings (Van de Ven 1993; Spilling 1996; Zahra and Wright 2011; Autio et al. 2014; Zahra et al. 2014). Entrepreneurship is a complex activity with a heterogeneous nature and definitional

ambiguity. It plays an important role in the economic growth of a region and hence is given a special place in policymaking. Research should be focused on concretising the foundation of the domain. Individuals, firms, industry sectors and regions are all interrelated in an entrepreneurial ecosystem; hence approach to understand entrepreneurial activity should be multilevel. Entrepreneurial ecosystems play an important part in a region's entrepreneurial activities, and their success and failure depend much on their ecosystem.

Cohen (2006) was the first to use the concept of entrepreneurial ecosystems and defined it as "… an interconnected group of actors in a local geographic community committed to sustainable development through the support and facilitation of new sustainable ventures". Nevertheless, the ideas behind a systemic view on entrepreneurship are much older (Dubini 1989; Van de Ven 1993). The EE concept has attracted a lot of attention in a relatively short period, especially in policy circles (Isenberg 2010, 2011; Spigel 2015; Mack and Qian 2016). According to Mason and Brown (2014), the ecological approach of the EE framework has links to 'economic gardening' as a metaphor for local economic development, in which specific environments promote not only high rates of new business start-ups but also high-growth firms.

Auerswald (2015) compares EE to dynamically stable networks of interconnected organisms and inorganic resources that constitute their distinct domain of analysis. Due to the sheer importance of entrepreneurship in the development of a nation's economy, much emphasis is given in national policy making, but entrepreneurial activities do not take place at a constant rate and homogeneous spread. It takes place at the regional level over a period. The social, cultural, political, governmental, institutional and knowledge system of a place determines the chromosome of that place's entrepreneurial ecosystem. For example, we believe that it is no coincidence that the world's first modern new venture accelerator, the Y Combinator, started its operations in Silicon Valley in 2005, only one year after the moniker: 'Web 2.0' was coined – also in Silicon Valley in a Web developer conference (Constantinides and Fountain, 2008; John, 2012).

Therefore, to understand entrepreneurship, we must first understand the process of entrepreneurial success; hence, it becomes imperative that we must give full attention to the phenomenon (environment) in which it thrives. Also, when we are mentioning the concept of entrepreneurial success, we aim to address it as a collective phenomenon and not as an example of isolated success. In such a case, the place becomes an essential element apart

from other elements. Entrepreneurial success occurs when entrepreneurial activities can be sustained for a long time. Also, to emphasise again, it should not be a stand-alone case. A successful venture (start-up) promotes a whole new supply chain, but this cannot be achieved in isolation. A well-suited entrepreneurial ecosystem is the basic requirement; otherwise, there would have been cases of entrepreneurial success as a collective phenomenon in every corner of the world. So, we propose to analyse and understand the work done by earlier authors in the field of entrepreneurial ecosystem by bibliometric analysis.

2. METHODOLOGY AND TOOLS

We have followed bibliometric analysis, a research method that uses quantitative and statistical analyses to describe patterns of publications about a particular field of study and analyses cooperation between different research profiles (Shanmugam, 2010). This methodology is commonly used in business and management areas (Cuccurullo et al., 2016; Della Corte et al., 2019; García-Lillo et al., 2016; Ramos-Rodríguez and Ruíz-Navarro, 2004), as it allows us to explore the cutting edge of the topic. Also, it is a systematic, straightforward, and reproducible process, as well as it avoids subjectivity (Della Corte et al., 2019). According to Vanti (2002), the goals of bibliometrics consist of identifying-

(1) The trends and growth of knowledge in a field.
(2) The core journals of a discipline
(3) Measure the coverage of secondary journals
(4) The users of a discipline
(5) Predict publication trends
(6) Study the dispersion and obsolescence of scientific literature
(7) Predict the productivity of individual authors, organisations, and countries
(8) Measure the degree and patterns of collaboration among authors
(9) Analyse citation and co-citation processes
(10) Determine the performance of information retrieval systems
(11) Evaluate the statistical aspects of language, words, and phrases
(12) Assess the circulation and use of documents in a documentation centre and finally
(13) Measure the growth of certain areas and the emergence of new themes.

Compared with other literature review methods, bibliometric studies are potentially more rigorous, less biased and present an aggregate view of the scientific literature in a particular field, while complementing meta-analyses and systematic literature reviews (Zupic & Čater, 2015). They have been successfully applied in organisation and management studies in general (Nerur et al., 2008; Ramos-Rodriguez & Ruiz-Navarro,2004) and in entrepreneurship

and international business in particular (Chabowskiet al., 2013; Dabić et al., 2019; Jiang et al., 2020; Lampe et al., 2019; Schildt et al., 2006).

Bibliometric analyses of citations and co-citations are based on purely quantitative approaches and are supported by the premise that citations are a valid and reliable indicator of scientific interaction between researchers and research institutions (Garfield, 1979; Kraus et al., 2012). Thus, they can be used to determine the relevance and impact of any author, publication, or journal and the structure of the field of study addressed (Small, 1978).

The analysis based on the VOS (Visualisation of Similarities) corresponds to a bibliometric mapping and clustering technique in which the distance between two items reflects the strength of the relation between them, with the shortest distance representing the strongest relationship and vice versa. The key difference between citation and co-citation analysis is that the former aims to identify the relevance of different authors or journals based on the number of times they are cited (Voeth et al., 2006), whereas the latter aims to provide information on the internal structure of the field of research based on the relationship between authors and publications, quantifying proximity based on the similarity of the content of the publications analysed (Kraus et al., 2012) and the number of times they are cited together (Van Eck and Waltman, 2010).

Bibliometric analysis in this paper has been conducted with the help of VOS Viewer software. It has been a useful tool for creating, visualising, and exploring bibliometric maps of science (Van Eck and Waltman, 2010). For instance, mapping entire areas of research in full fields of study, such as marketing (González-Valiente, 2014), strategic management (Maia et al., 2015), and even in other sciences, such as clinical medicine (Alfonzo et al., 2014; Xing et al., 2018). One of its strengths is that it can map field structures at different levels of analysis such as journals (Van Leeuwen and Wouters,2017; Merigó et al., 2016; Kolle, 2016; Cancino et al., 2017), geographical spaces, countries or continents (Lu and Wolfram, 2010), and even more detailed subjects or subfields like new product development (Andrade-Valbuena and Merigo, 2018), green supply chain management (Mishra et al., 2017), technology road mapping (Zhang et al., 2013), fuzzy research (Blanco-Mesa et al., 2016) among others. We are using the Dimensions database as a reliable source of information, which provides a suite of research applications and time-saving solutions that connect the dots across the research ecosystem for rapid insight. They host the largest

collection of interconnected global research data, including over 70% of publications with full-text editing (Dimensions AI website).

3. RESEARCH PROCESS

The research process is divided into 6 steps: Formulation of research questions and research objectives, Identification, Screening, Selection, Analysis, and Interpretation. We have followed the Identification, Screening, Selection (ISS) framework.

3.1. FORMULATION OF RESEARCH QUESTIONS AND OBJECTIVES

Keeping in line with the aim of the paper, we identified the following are the research questions-

RQ 1: What are the most relevant authors, journals, documents, institutions, and countries in the field of entrepreneurial ecosystem?

RQ 2: What are the main terms and emerging topics in the field?

Based on the above research questions, the following objectives were defined: -

O 1: To find out influential authors, journals, countries, and institutions in the field of entrepreneurial ecosystem and affiliations among themselves.

O 2: To classify and identify the main content of research through citations and terms.

O 3: To identify the main conceptual and thematic evolution.

3.2. IDENTIFICATION

For identification of the most relevant publications for the bibliometric study, we followed 3 steps-

1. Identification of the database
2. Formation of search query/terms
3. Limiting the timeframe

We have used keywords in the search engine database because of reliability, reproducibility, and verifiability. The database has indexed highly prestigious journals in such diverse areas, identifying the citations of documents, references used and analysis of scientific production with the calculation of bibliometric indices (Ceretta et al., 2016). It has the world's largest collection of linked research data. It has an inbuilt application of VOS Viewer to help with visualisation.

The main search was used with the search string “entrepreneurial success and its ecosystem”. The total numbers of publications found were 164,624. The publication year was taken from 2015 to 2025, which reduced the number of publications to 131,576. For researchers there was no exclusion criterion.

3.3. SCREENING OF PUBLISHED DOCUMENTS

To keep our search relevant, screening criteria were selected. Research categories were limited to relevant fields related to the search query. For the field of research, research categories were chosen as commerce, management, tourism, and services; strategy, management, and organisational behaviour; business systems in context; marketing; banking, finance, and investment; and economics. A total of 50,367 publications were found. Publication type was chosen as articles, which reduced the results to 30,799. Source titles were selected as Journal of business research (669), Journal of open innovation: Technology, market, and complexity (336), Cogent business and management (251), Small business economics (361), International entrepreneurship and management journal (269), International journal of academic research in business and social science (180), Business strategy and the environment (265), International journal of entrepreneurial behaviour and research (330), coming to a total of 2661.

3.4. SELECTION CRITERION

To maintain the quality of research papers, articles, etc, were selected from top-quality and relevant journals only. Journal’s ranking was limited to 2023, Norwegian Register Level 1, UGC Journal list Group 2, DOAJ, VABB-SHW, ERIH PLUS, ELSIVER, SCIENCE DIRECT, EMERALS DATABSE, SAGE, etc. To maintain transparency, all open-access articles were selected, boiling down the result to 1707, which makes this study an extensive one.

3.5. ANALYSIS

Entrepreneurial ecosystems have been a fast-evolving field. In recent years, entrepreneurial ecosystems (EEs) have become the latest conceptual ‘fad’ (Martin, 2015).

(a) To understand the growth and development of research, especially in recent times, to reveal any shift of focus and trend.
(b) To know the recent influential authors and institutions in the field of EE.

(c) To cover areas /topics of research being covered or not in recent times, to identify gaps so that future research directions can be set accordingly.

Since bibliometric analysis is an objective method based on quantitative data, it is reliable for conclusions.

3.6. INTERPRETATION AND CONCLUSION

The data obtained was analysed and interpreted through visualisation with the help of VOS Viewer. Research question 1 was addressed by citation analysis, top 10 most impactful documents, authors, institutions, and top 5 most impactful journals were discovered. Research question 2 was addressed by co-citation and co-authorship analysis

4. BIBLIOMETRIC ANALYSIS AND ITS RESULTS

The search focused on the Dimensions AI database, conducted on 05/04/2025, for a period between 2016 to 2025 on the entrepreneurial ecosystem. The number of publications taken into consideration was 1707. A rerun of the similar search will show a slightly increased number of publications due to continuous change and addition of the latest publications. The data showed a continuous increase in the publication of articles since 2016.

Research question 1 was addressed by citation analysis, which helped in discovering the top 10 most impactful articles, authors, institutions, and the top 5 most impactful journals. Also, by conducting a co-author analysis network of relationships between authors, institutions and countries was revealed. For research question 2, co-citation analysis and bibliographic coupling of documents were done to reveal similarities and networks in citations of papers. Co-occurrence analysis of terms was performed to describe the subject clusters in the domain of the entrepreneurial ecosystem for the period between 2016 to 2025.

4.1. CITATION ANALYSIS

An essential part of the references is to point out prior publications and authors' contribution. Citation analysis is an area of bibliometric analysis which deals with the study of similarity or relationships. Citations are indication by which one may guess the authors' contribution without any confrontation. Any set of documents containing reference lists can provide the raw material for citation analysis, and citation counts based on precise and objective of the research document. Co-citation analysis and bibliographic coupling are the prevalent method to identify close relationship of research finding and conclusion and bibliographic coupling gives evidence if document has been taken from similar documents (Smith L.C. 1981).

4.1.1. CITATION ANALYSIS OF DOCUMENTS

A citation analysis shows the impact of a piece of work, and it identifies seminal work done in the specific domain and explains the structure and evolution of a field. For citation analysis of documents, the unit of analysis was taken as 'document', and the minimum number of citations of a document was taken to be 20, as this is often taken as a threshold. Out of 1706 documents, 587 met the threshold. Among 587 items, 170 clusters were identified with 734 links. 429 items were found to be connected. Among the set of connected items, 28 clusters were found. The top 10 documents are listed in the table given below. Upon analysis of 28 clusters of connected items, important keywords were released. Keywords from the top ten clusters are given below.

Table 1. **TOP 10 CITED DOCUMENTS**

S.N.	Title of research paper	Author/Year	No. of citations	Name of Journal
1.	Tourism and covid-19: impact & implications for advancing & resetting industry & research.	Sigala, Marianna (2000)	1697	Journal of Business Research
2.	Effects of COVID-19 on business & research.	Donthu, Naveen (2000)	1603	Journal of Business Research
3.	Investigating the emerging COVID-19 research trends in the field of business and management: a bibliometric analysis approach.	Verma, Surabhi (2020)	812	Journal of Business Research
4.	The lineages of entrepreneurial ecosystem approach	Acs, Zoltan (2017)	727	Small Business Economies
5.	Entrepreneurial Ecosystem Elements	Stam, Erik (2019)	698	Small Business Economies
6.	Digital Service business models in eco-systems: a theory of the firm	Kohtamaki, Marko (2019)	693	Journal of business Research
7.	Looking inside the spiky bits: a critical review and conceptualisation of entrepreneurial ecosystem	Brown, Ross (2017)	592	Small Business Economies
8.	How entrepreneurial SMEs compete through digital platforms: the role of digital platform compatibility, network capability and ambidexterity	Cenamor, Javier (2019)	592	Journal of Business Research
9.	New players in entrepreneurial finance and why they are there	Block, Joern (2017)	528	Small Business Economies

10.	Antecedents, consequences, and challenges of small and medium sized enterprise digitisation	Eller, Fokko (2020)	512	Journal of Business Research

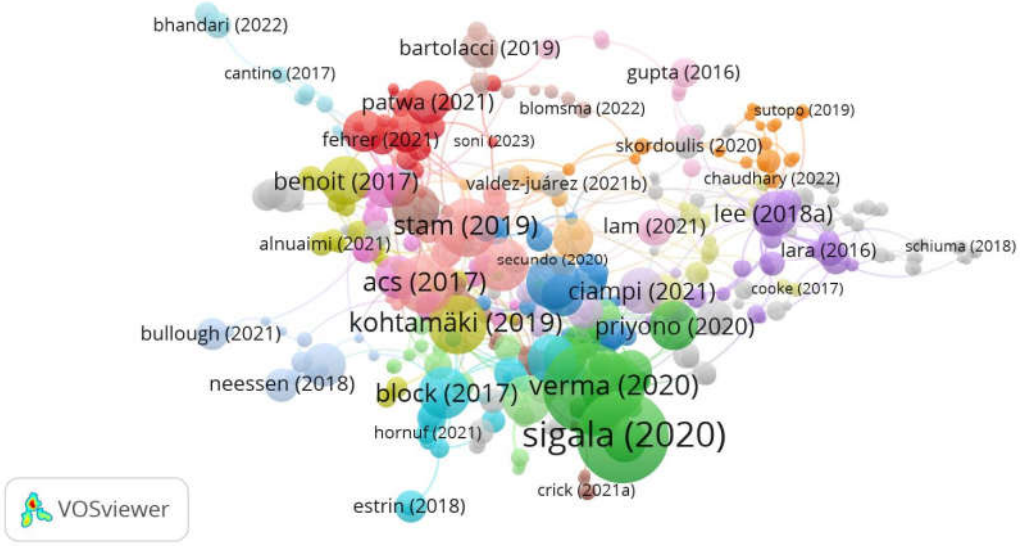
Table 2. **IMPORTANT AND FREQUENT KEYWORDS IN HIGHLY CITED DOCUMENTS**

Cluster	Important keywords	Frequent keywords
1.	Sustainability, circular business model, entrepreneurial culture, circular economy, natural resource-based view, strategy, dynamic capabilities, economic innovation, small and medium-sized enterprises.	Circular business model, circular economy
2.	COVID-19 crisis, sustainability, digital transformation.	COVID-19 crisis, sustainability
3.	Entrepreneurship, technology, SMEs, digital platforms, digital transformation, start-up, innovations, opportunities, dynamic capabilities, digital affordances, digital entrepreneurship.	Digital platforms, digital transformation, digital affordances, digital entrepreneurship
4.	Innovation capability, ecosystems, sustainability, technology.	Innovation capability
5.	Open innovation, strategy, smart cities, fintech	Open innovation, smart cities
6.	Fintech, entrepreneurial ecosystem, venture capital, finance, private equity, crowdfunding, initial coin offering.	Fintech
7.	Open innovation, technology transfer	Open innovation, technology transfer
8.	Social entrepreneurship	-
9.	Universities, knowledge, knowledge management	-
10.	Entrepreneurial ecosystem	-

Upon observation and analysis of the top 10 clusters, patterns and structures around the following themes were revealed in the documents-

- Circular Economy
- COVID-19 crisis and sustainability
- Leveraging digital technologies
- Innovation
- Open innovation and smart cities
- Financial network
- Technology
- Social entrepreneurship
- Universities as a resource
- Entrepreneurial ecosystem

As we can observe, how ecosystem is intricately connected to entrepreneurial activities. Any significant activity or change going on in the environment is reflected in the entrepreneurial activities of that place, which clearly comes out with the example of COVID-19.



Graphical Presentation-1

4.1.2. CITATION ANALYSIS OF AUTHORS

Citation analysis assesses authors' impact by measuring citation frequency. We have taken 2 as the minimum number of documents and 20 as the minimum number of citations for an author. Out of 4941 authors, 418 met the threshold. We have taken the complete set of items in the network for visualisation. Upon analysis top 10 most impactful authors were found to be as follows-

Graphic Presentation-2

Table 3. **TOP 10 CITED AUTHORS**

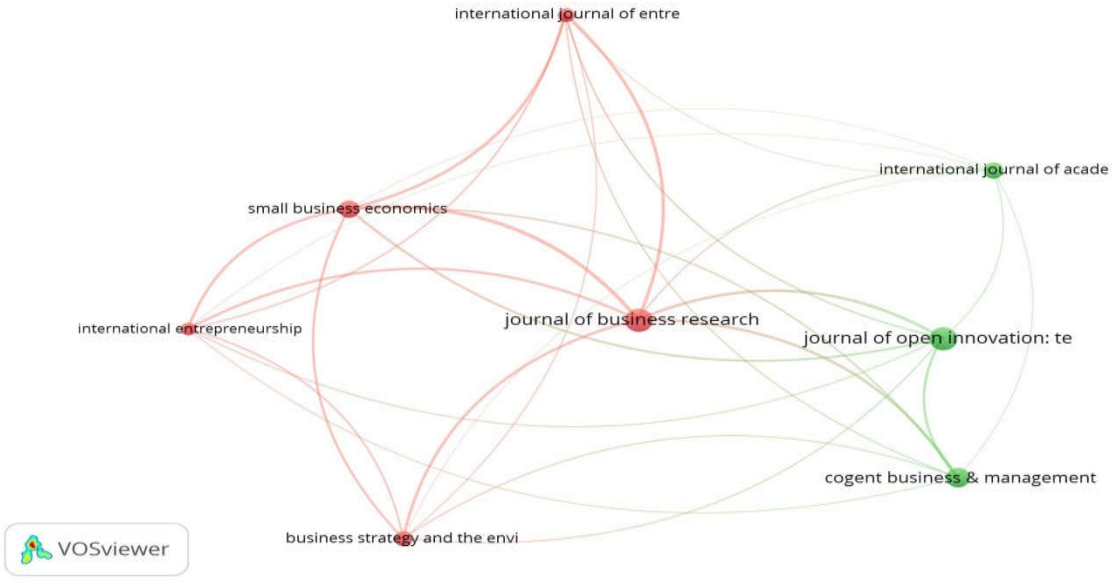
S.N.	NAME OF AUTHOR	NUMBER OF DOCUMENTS	CITATIONS
1.	Anders Gustafson	2	2415
2.	Vinit Parida	13	1821
3.	Naveen Donthu	2	1657
4.	Erik Stam	4	1429
5.	Justin Paul	7	1255
6.	David B. Audretsch	17	1234
7.	Joakim Wincent	8	1055
8.	Lars Hornuf	4	955
9.	Maksim Belitski	11	948
10.	Sascha Kraus	10	938

4.1.3. CITATION ANALYSIS OF SOURCE

The impact factor of a journal is calculated based on the number of citations to the articles published in the previous two years. The number of documents is taken as 5 (default setting), with a minimum number of citations taken as 100.

Table 4. **TOP 5 IMPACTFUL JOURNALS**

S.N.	JOURNAL NAME	CITATION
1.	Journal of Business Research	25647
2.	Small Business Economy	10893
3.	Journal of Open Innovation: Technology, Market and Complexity	8835
4.	Business Strategy and The Environment	4794
5.	International Journal of Entrepreneurial Behaviour & Research	2960



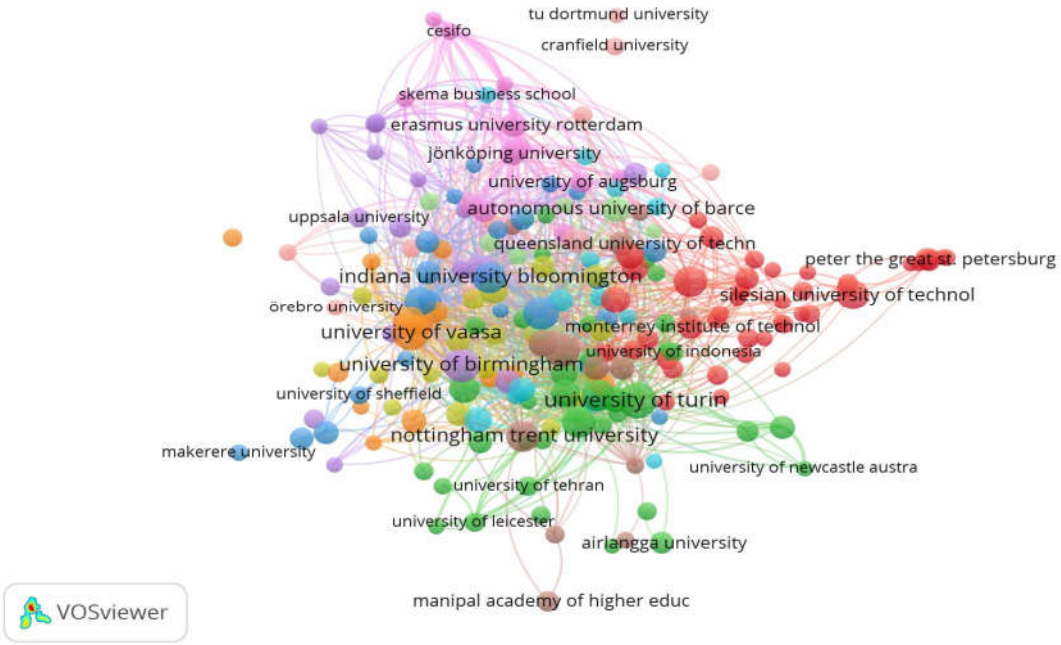
Graphic Presentation-3

4.1.4. CITATION ANALYSIS OF INSTITUTIONS

The analysis is done to assess the research output and impact of an institution. The minimum number of documents for an institution is taken to be 5, and the minimum number of citations is taken to be 20. 209 out of 1810 met the threshold. The top 10 most impactful institutions are as follows-

Table 5. **TOP 10 IMPACTFUL INSTITUTIONS**

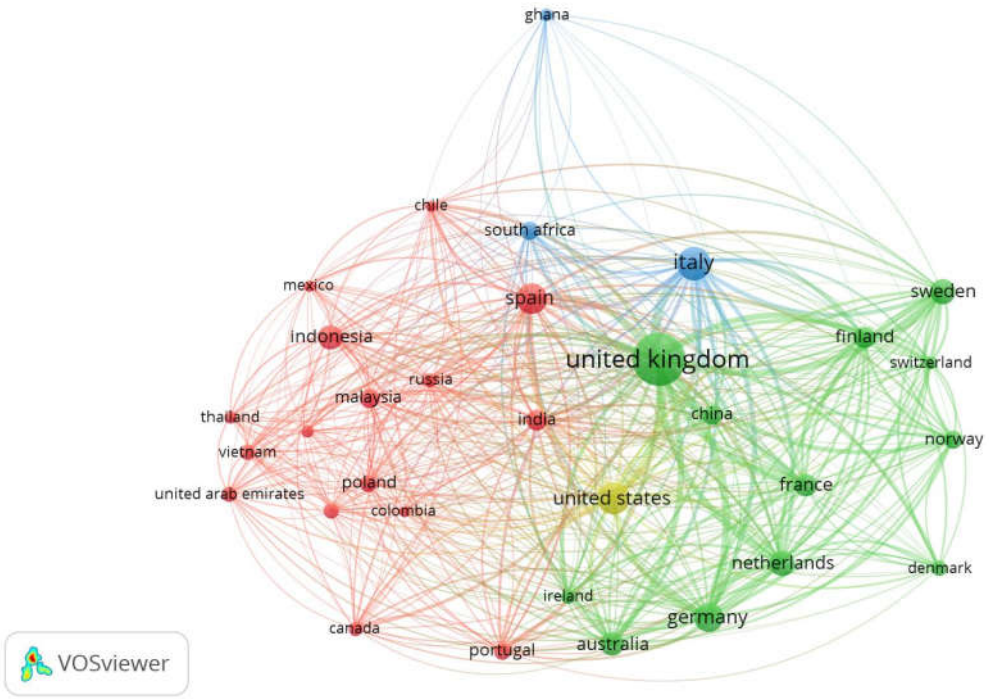
NAME OF INSTITUTION	CITATIONS
1) Bi Norwegian Business School	2514
2) University of Vaasa	2310
3) Utrecht University	2138
4) Lulea University of Technology	1965
5) Aston University	1850
6) University of Gallen	1829
7) University of Reading	1820
8) Loughborough University	1659
9) University of Turin	1578
10) Erasmus University Rotterdam	1554



Graphic Presentation-4

4.1.5. CITATION ANALYSIS OF COUNTRIES

A citation analysis of countries was performed to understand the contribution of countries in the domain of entrepreneurial ecosystem research. It gives us an idea about the current state of research in countries and their respective entrepreneurial activities. The effect of the culture of a particular country on the state of entrepreneurship can be understood, and inferences can be made about culture, entrepreneurial ecosystem, and entrepreneurial activities. Also, the importance given to entrepreneurship in policy making can be assessed. A list of the top 10 countries is given, which demonstrates an active state of research in the field of entrepreneurial ecosystem in these countries.



Graphic Presentation-5

The minimum number of documents was taken to be 20 and the minimum number of citations was set to be 100. Out of 100 countries, 32 met the threshold.

Table 6. **TOP 10 IMPACTFUL COUNTRIES**

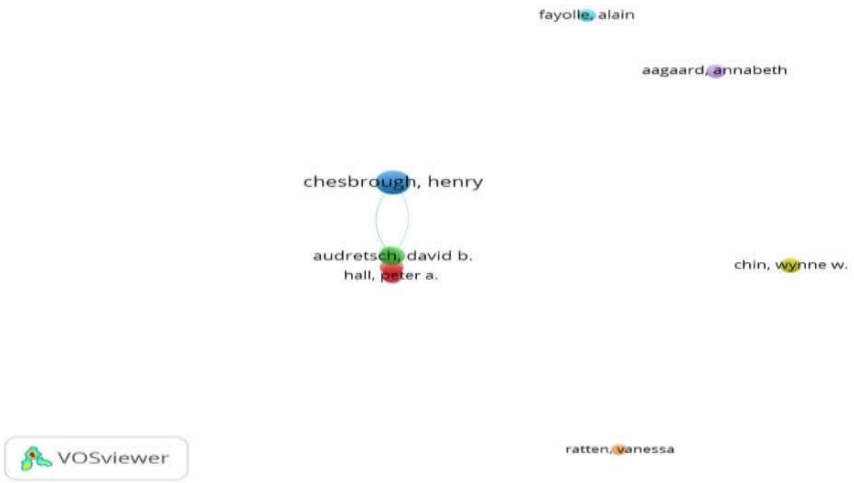
S.N.	COUNTRY	DOCUMENTS	CITATIONS
1.	United Kingdom	402	21613
2.	The United States	150	10026
3.	Italy	165	8637
4.	Germany	126	7200
5.	Australia	81	6698
6.	France	76	5294

7.	Norway	50	4580
8.	Sweden	96	4446
9.	Finland	71	4230
10.	Switzerland	24	2493

4.2. CO-CITATION ANALYSIS

The frequency with which two documents are cited together by other documents is known as co-citation analysis. Its purpose is to identify clusters of research and understand the relationships between different research areas. The focus is on co-occurrences of citations in the citing document. In this analysis, a threshold of 3 or more is often used. So, we have taken the minimum number of citations of a cited reference to be 3. The unit of analysis is a cited reference. In the map, a node represents an author, and a link between two nodes indicates that those authors were co-cited in at least one publication. The thickness of the link represents the frequency of co-citation. A strong link suggests a high level of intellectual similarity and indicates that the work of these authors is often cited together. Authors located at the edge of the network with few or no links might be pioneers and working with specialised topics.

A total of 7 clusters were found within the given threshold. Authors within a particular cluster are more intellectually related to each other. Authors belonging to the same clusters are close to each other as they are frequently cited together.



Graphic Presentation- 6

Table 7. CLUSTER 1- Main theme- Entrepreneurship in the Economy

S.No.	AUTHORS	AREA OF INTEREST	FAMOUS WORK	DOCUMENT TYPE
1.	Bush, candida g.	Entrepreneurship	Teaching Entrepreneurship: A Practice Based Approach	Book
2.	Feld, brad	Entrepreneurship	Start-up Boards	Book
3.	Hall, peter a.	European Studies, capitalism, Socio-economic inequality, populism	Governing The Economy	Book
4.	Soskice, david	Political Science, Macro-Economics	Southern Germany's innovation clusters: regional growth coalitions in the knowledge economy	Report and working papers
5.	Welter, friedrike	Entrepreneurship	Social innovation and social digitisation	Article

Table 8. CLUSTER 2- Main Theme- Social Science of Entrepreneurship

S.No.	AUTHORS	AREA OF INTEREST	FAMOUS WORK	DOCUMENT TYPE
1.	Acs, zoltan j.	Economics, Innovation	High Impact Firms: gazelles Revisited	Advocacy Report
2.	Audretsch, david b.	Economic policy, Finance, Globalisation	Handbook of Technology Transfer	Book
3.	Brannback, malin	Social Science, Business, Economy	Handbook of Research Methods and Applications in Entrepreneurship and Small Business	Book
4.	Carsrud, alan l.	SME, Psychology	Research in Entrepreneurship: an introduction to the research challenges for the 21st century	Book Chapter

Table 9. CLUSTER 3- Main Theme- Open Innovation

S.No.	AUTHORS	AREA OF INTEREST	FAMOUS WORK	DOCUMENT TYPE
1.	Chesbrough, henry	Open innovation	Coined the term open innovation	-
2.	Vanheverbeke, wim	Digital innovation, innovation management	Managing Open Innovation in SMEs	Book
3.	West, joel	Open innovation	Open Innovation: Researching a New Paradigm	Research Article

Table 10. CLUSTER 4- Main Theme- Data Management

S.No.	AUTHORS	AREA OF INTEREST	FAMOUS WORK	DOCUMENT TYPE
1.	Chin, wynne w.	Financial Mgt., Accountancy, Decision & Information Science	Information Technology Acceptance: Construct Development and Empirical Validation	Article
2.	Hensler, jorg	Composite Based SEM	Composite Based SEM: Analyzing latent and emerging variables	Book
3.	Vinzi, Vincenzo esposito	Statistical data analysis, Econometrics	Handbook of Partial Least Squares	Book

Table 11. CLUSTER 5- Main Theme- Sustainable Development Goals (SDG)

S.No.	AUTHORS	AREA OF INTEREST	FAMOUS WORK	DOCUMENT TYPE
1.	Aagard, annabeth	Sustainable IT, ESG	Framing entrepreneurial ideas for sustainability: How do purpose-driven start-ups include the SDGs in their pitches?	Article

Table 12. CLUSTER 6- Main Theme- Entrepreneurship Education

S.No.	AUTHORS	AREA OF INTEREST	FAMOUS WORK	DOCUMENT TYPE
1.	Aagard, annabeth	Sustainable IT, ESG	Framing entrepreneurial ideas for sustainability: How do purpose-driven start-ups include the SDGs in their pitches?	Article

Table 13. CLUSTER 7- main Theme- Family Business & Entrepreneurship

S.No.	AUTHORS	AREA OF INTEREST	FAMOUS WORK	DOCUMENT TYPE
	Ratten, vanessa	Entrepreneurial business planning, corporate venturing, family business	Types of intelligence in family business: Artificial, Social and Emotional	Editorial

4.3. CO-AUTHORSHIP ANALYSIS

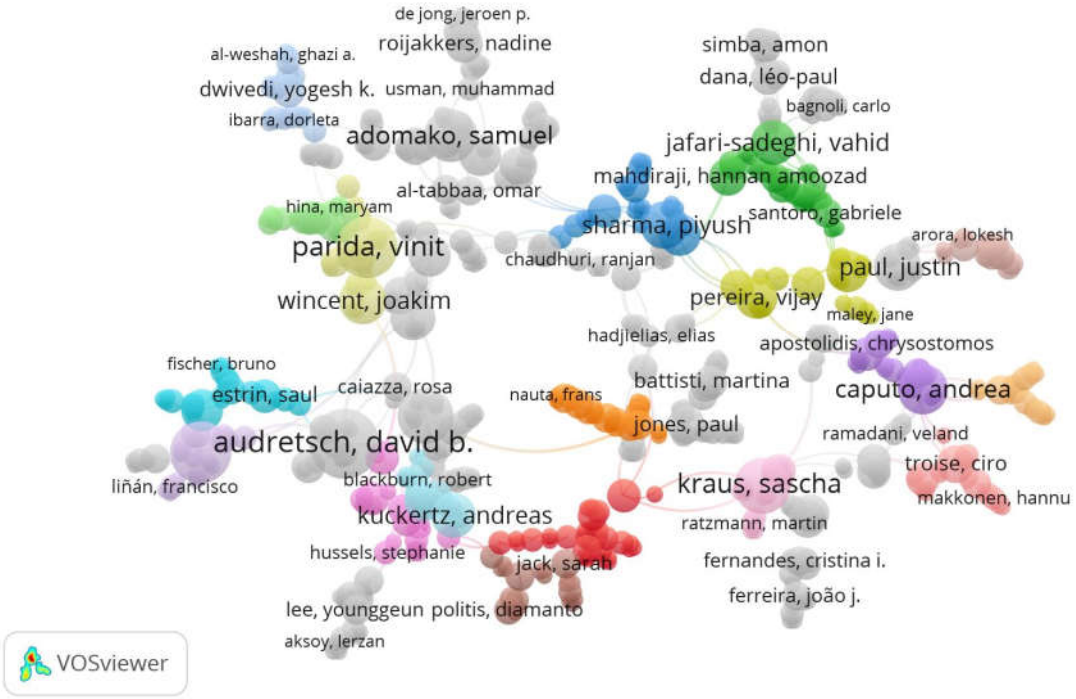
Co-authorship analysis examines the collaboration pattern of collaboration based on the number of documents in which authors have worked together. Co-authorship data can be used to create networks where authors are nodes and connections represent co-authored papers. Our goal is to identify influential authors in the field of entrepreneurial ecosystems and to identify broader research trends and collaboration patterns. For this purpose, two different sets of thresholds were selected.

To identify important sub-disciplines of the field, a minimum number of papers was taken to be equal to 1, and the minimum number of citations of an author was taken to be 10. Out of 5214 authors, 2695 meet the threshold. Out of these, only 724 are connected. For this set of 724 connected items, 43 clusters were found.

The largest cluster consists of 41 authors. Clusters show groups of authors based on their collaborative pattern. We can identify research team dynamics, areas of expertise. Authors in a cluster are grouped based on their frequent collaboration and who work on similar research topics. This way, we can identify sub-disciplines in a particular domain. Also, areas with strong/weak collaboration can be identified.

The following are the important sub-disciplines with strong collaboration in the domain-

Family Entrepreneurship; Digitisation; Open Innovation; Innovation Management; International Entrepreneurship; Strategy; Transition Economies; Entrepreneurial Learning; Finance; SMEs; Knowledge Management.

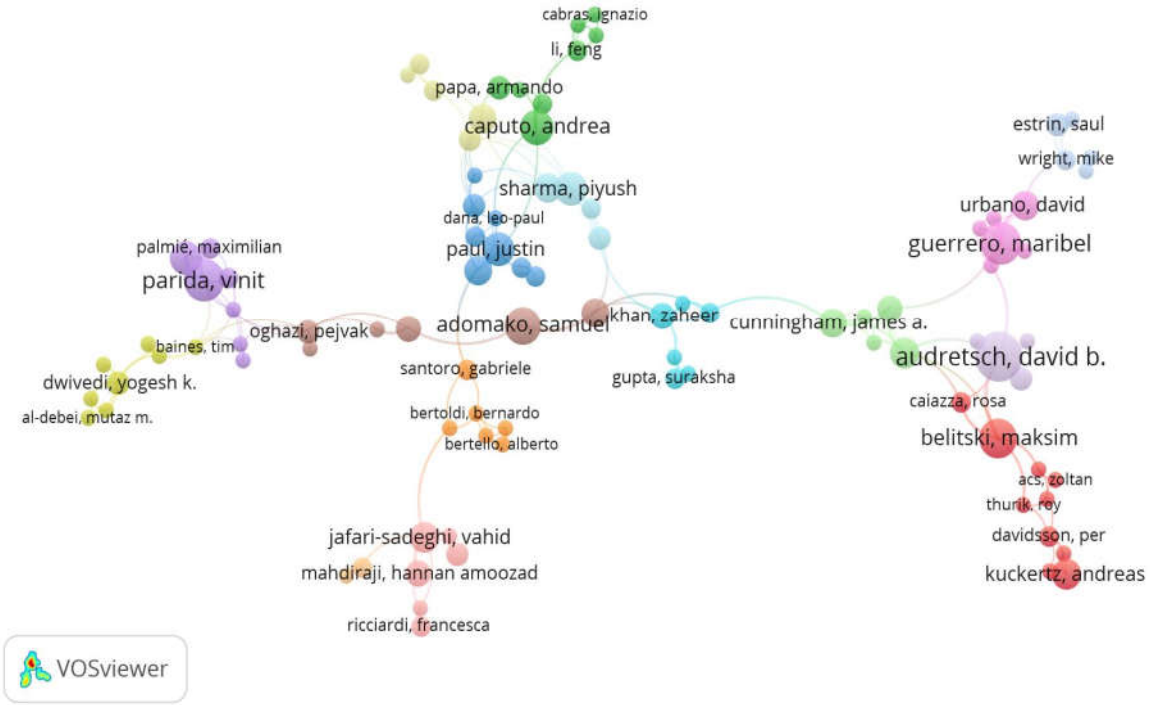


Graphic Presentation-7

To identify influential authors within a field, a higher threshold is used. So, we have taken the minimum number of papers to be equal to 2 and the minimum number of citations to be equal to 100. Based on the location of authors in the cluster, total link strength, and their connection to other authors in different clusters following authors were found to be influential in the domain of entrepreneurial ecosystem-

Table 14. **TOP 7 INFLUENTIAL AUTHORS IN THE DOMAIN OF EE**

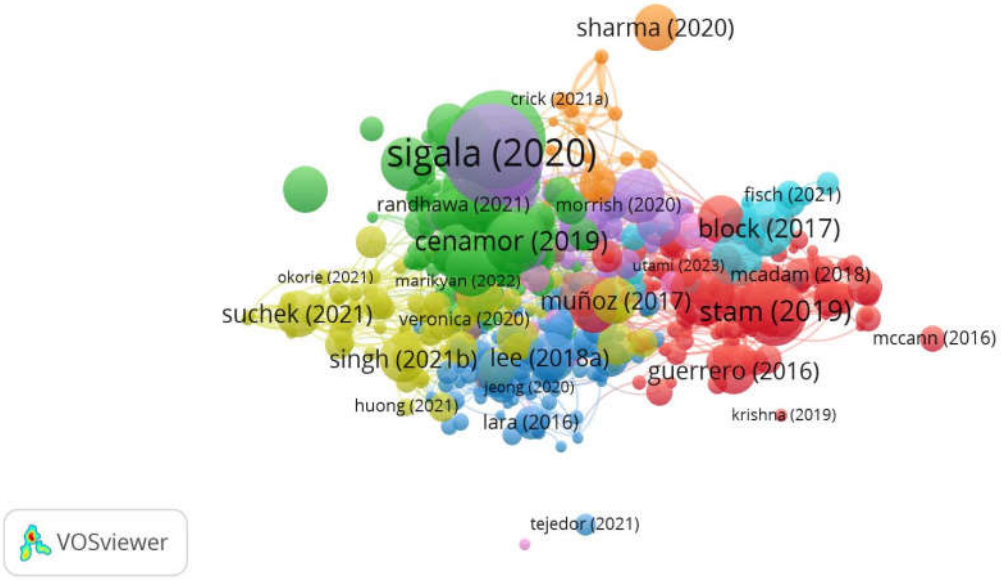
S.No.	AUTHORS	NO. OF DOCUMENTS	NO. OF CITATIONS	TOTAL LINK STRENGTH
1.	David B. Audretsch	17	1304	10
2.	Vinit Parida	13	1932	8
3.	Maksim Belitski	11	992	7
4.	Vahid Jafari Sadeghi	7	726	7
5.	Asish Malik	6	293	6
6.	Eric E. Lehmann	7	497	6
7.	Joakim Wincent	8	1123	5



Graphic Presentation-8

4.4. BIBLIOGRAPHIC COUPLING OF DOCUMENTS

Bibliographic coupling is used to find conceptual similarities in citing a document. Two documents are bibliographically coupled if they cite one or more common documents in their bibliographies. Because they draw on similar sources, they are conceptually related. Taking citations as weights, Sigala (2020), Donthu (2020), Acs (2017), Ross Brown (2017), Erik Stam (2019), Dabic (2020), Munoz (2017), Ciampi (2021), Belitski (2021a), Eller (2020a), Block (2017) are some of the highly cited authors.



Graphic Presentation-9

4.5. TERM CO-OCCURANCE ANALYSIS

When two or more terms frequently co-occur, there is a potential semantic or contextual relationship between them. By identifying groups of terms frequently appearing together, emerging themes and topics can be uncovered. The method of counting is taken as binary, as it simplifies the network representation by recording the presence or absence of two terms. The minimum number of occurrences of a term is taken to be 20. Of the 28799 terms, 436 meet the threshold. For each of the 436 items, a relevance score was calculated. Based on this score, the most relevant terms were selected. The default choice is to select the 60% most relevant terms. Method: association strength, weights = occurrences. Number of terms to be selected = 262. A total of 5 clusters were found.

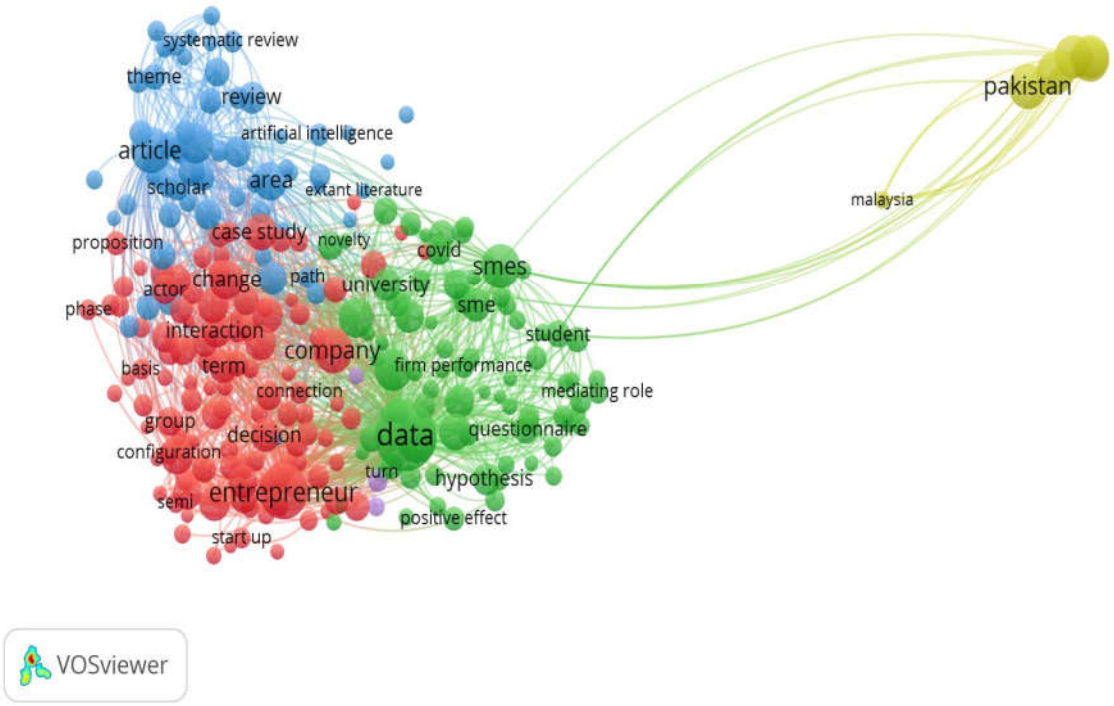
The main theme of cluster 1 emerged to be entrepreneurship, the entrepreneurial process, change, and elements accompanying it.

The main theme of cluster 2 emerged to be education, performance, capability, and skill development.

The main theme of cluster 3 emerged to be entrepreneurial research.

The main theme of cluster 4 is journal publication.

The main theme of cluster 5 is women entrepreneurship.



Graphic Presentation-10

5. INTERPRETATION AND CONCLUSION

This paper has demonstrated how the widespread availability and usefulness of bibliometric databases and tools, which make it easier to collect and analyse vast amounts of scientific data for any research field, have contributed to the bibliometric methodology's remarkable rise in popularity in recent years (Ozturk et al.2024). We have applied bibliometric methods because of their rigour and relative objectiveness (Zupic & Čater, 2015). After analysing the data, it was found that the most influential authors belong to the USA, Europe, or the Nordic countries. Our study's findings also highlight the clear authority of these influential scholars representing the domain's significant generative mechanisms, also known as *invisible colleges* (Crane, 1969; Vogel, 2012). Also, these are the authors who have frequently cited each other. The same pattern again emerges in co-authorship analysis. Notably, these scholars have not only published articles and been cited widely but have also opened new avenues of research in the domain and have triggered the emergence of perspectives, with their contributions being pivotal to the thematic clusters (Velt et al.). Hence, it is evident that research on entrepreneurship and the entrepreneurial ecosystem is highly regarded in these

countries and their institutions. The list of the top 10 most impactful institutions corroborates this.

Also, analysis has uncovered many sub-domains in the field of entrepreneurial ecosystem, and the focus is more on different elements of the field rather than comprehensive studies. To comprehend and develop the domain theoretically, we need a more nuanced approach with a focus on the phenomenon. Studying the domain in its entirety would help us formulate more fruitful and successful policy documents, which would promote the entrepreneurial activities of a region. Such compartmentalization would only lead to over-contextualization of the domain and create a hindrance towards comprehension and application.

The main limitation of this study is its limited timeframe. Additionally, we have searched only one database, i.e., Dimensions ai. Some gaps have been identified that can be filled in the future are-

1. How EEs have evolved and contributed toward successful entrepreneurship in various regions of the world.
2. To identify potential barriers and challenges in the creation of fruitful EE so that effective policy making can be adopted.
3. How EEs' different elements, such as technology, network, etc., can be employed to enhance their effectiveness.

A robust university-level system is also needed to promote research in those parts of the world that lag in the entrepreneurial research domain. A more holistic approach is needed to develop theory and apply it so that good policy documents can be tailored according to specific regional needs.

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