

Do Entrepreneurial Ecosystems Matter in Knowledge Sharing Through Startups?

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Abstract: The entrepreneurial ecosystem metaphor has been overused with scarce and often inconsistent definitions in academia. Its impact on management has been studied for decades with growing interest from industry and policymakers. For this reason, research on entrepreneurial ecosystems was mapped to understand better how this domain has evolved as a function of venture geography, innovation adoption and knowledge sharing. A systematic literature review was conducted using Web of Science to collect metadata. First, using Biblioshiny, we conducted a bibliometric analysis and content analysis of the conceptual and social structures of the metadata to reveal the evolution of research from 1984 to 2022, networks, and collaborations. We then provide critical insights on trends, journals, articles, authors, institutions, and countries. The results have been classified into major thematic groups - (i) entrepreneurial ecosystems and innovation efficiency, (ii) Innovation systems, digital affordances, and networks, (iii) Knowledge-based innovation systems, metrics for entrepreneurship, and collaboration in helix, and (iv) digital entrepreneurial ecosystems - emphasising their contributions and presenting a research agenda. Finally, we present implications for future research.

Keywords: Entrepreneurial Ecosystem; Knowledge Sharing; Bibliometric Analysis; Systematic Literature Review.

1. Introduction

The ecosystems epistemology comes from the word *Oikos* and dates back to 700 bc, and since then, there has been an evolution of vocabularies and taxonomies. The territorial approach to entrepreneurial ecosystems relates to other precursor concepts such as industrial districts (Marshall, 1890; Becattini, 1989; Bellandi, 1996), regional and national innovation systems (Asheim and Coenen, 2005) Freeman, 1987; Lundvall, 1992; Nelson, 1992; Cooke, 1992, 2001; Edquist, 1997), learning regions (Morgan, 1997; Cappellin & Wink, 2009; Asheim & Gertler, 2005), clusters (Porter, 1998, 2000; Asheim & Coenen, 2005) and innovative environments (Aydalot, 1986; Ratti, 1989; Camagni, 1991; Camagni & Maillat, 2006).

Interest in entrepreneurial ecosystems (EEs) has been growing over the last 15 years and, as of 2017, has led to a considerable increase in publications in academic journals (Theodoraki, Dana and Caputo, 2022). The concept of ecosystems has become popular in strategy corresponding to "the alignment structure of the multilateral set of partners that need to interact for a focal value proposition to materialise" (Adner, 2017, p.40). EE has become a central topic in entrepreneurship research (Torres and Godinho, no date). However, definitions remain scarce and often inconsistent, with atheoretical, static and broad conceptualisations (Audretsch and Link, 2019). Ecosystems differ in governance form and emerge from multi-polar coordination based on many types of complementarities (Jacobides, Cennamo and Gawer, 2018). It also includes external resources and orchestrated stakeholder communities that focus on identifying, reaching and scaling opportunities (Autio *et al.*, 2014).

Most EE definitions ignore the entrepreneur's role in creating new values (Acs *et al.*, 2017). Previous research presents multifaced approaches concerning entrepreneurial ecosystems. Even taking venture geography as a basis, the existing vague definitions do not respect the boundaries of the respective clusters (Audretsch and Link, 2019). This wide variety of topics raises the need to assess the state of the art of the managerial literature on entrepreneurial ecosystems so that there is an adequate performance evaluation and measurement of their results, which is currently made impossible by the imprecision of their definitions (Acs *et al.*, 2017; Cavallo, Ghezzi and Balocco, 2019; Audretsch, Lehmann and Seitz, 2021; Volkman *et al.*, 2021).

Recently, comprehension of entrepreneurial ecosystems permeated different approaches considering features, dimensions, key elements, and business conditions (Audretsch, Lehmann and Seitz, 2021). Previous research presents interwoven and multi-layered paths. It includes a focus on (i) innovation efficiency analysis (Fischer *et*

al., no date; Guan and Liu, 2005; Guan and Chen, 2009, 2012; Chen and Guan, 2016; Fischer, Queiroz and Vonortas, 2018; Sunny and Shu, 2019; Alves, Fischer and Vonortas, 2021; Zhao *et al.*, 2021; Dionisio, Inacio Junior and Fischer, 2021; Pushkarskaya *et al.*, 2021); (ii) digital affordances and networks (Autio *et al.*, 2014; Autio, Nambisan, Llewellyn D W Thomas, *et al.*, 2018; Autio, Nambisan, Llewellyn D.W. Thomas, *et al.*, 2018; Lamine *et al.*, 2018; Qin, Wright and Gao, 2019); (iii) knowledge-based innovation systems, and collaborations through multiple helices (Carayannis *et al.*, 2018; Carayannis & Campbell, 2021; Heikka & Carayannis, 2019; Inacio Junior *et al.*, 2021; Mikel Zabala-Iturriagoitia *et al.*, 2021; Fritsch *et al.*, 2020; Ivanova *et al.*, 2019; Leydesdorff & Porto-Gomez, 2019; Perret, 2019); e (iv) digital entrepreneurial ecosystems, and technological transitions for sustainability (Grillitsch *et al.*, 2019; Yap and Truffer, 2019; Kashani and Roshani, 2019; Andersen and Markard, 2020; Hipp and Binz, 2020; Kieft, Harmsen and Hekkert, 2020; Koehler, Raven and Walrave, 2020; Musiolik *et al.*, 2020; van Welie, Boon and Truffer, 2020; Heiberg, Truffer and Binz, 2022; van der Loos *et al.*, 2022).

Several systematic and bibliometric literature reviews present research agendas for EEs (Theodoraki and Catanzaro, 2022). However, a holistic framework that addresses diverse methods, theories and approaches, integrating the factors of venture geography, innovation adoption and knowledge sharing, is still needed. This research aims to unravel the domain addressing entrepreneurial ecosystems by providing a framework through a systematic literature review with bibliometric analysis considering high-quality contributions in the management literature. We conducted a systematic literature review in the Web of Science database, followed by performance analysis and comprehensive bibliometric scientific mapping. The most relevant articles, journals, institutions, countries and authors were categorised. Publications and citations were networked considering co-authorship, co-occurrence, and bibliographic coupling.

Content analysis of the metadata revealed collaborative networks and the evolution of research over the last thirty-eight years, resulting in descriptive statistics, social and conceptual frameworks. The state-of-the-art mapping resulted in four distinct thematic clusters with temporal overlaps. A holistic framework is then developed by integrating venture geography, innovation adoption and knowledge sharing into the EE literature. Finally, we offer a qualitative cluster thematic analysis and several emerging directions for future research are highlighted with suggestions for future theory and practice development.

2. Systematic review protocol

A systematic literature review protocol (Liberati *et al.*, 2009) was used to ensure primary research's greatest strength, synthesis, significance, pertinence, and reliability in a specific field (Snyder, 2019). The review focused on studies about entrepreneurial, digital, and innovation ecosystems. Data analysis was carried out using meta-analysis using the Bibliometrix – Biblioshiny (Aria and Cuccurullo, 2017) on R-Studio software. To guarantee the transparency and replicability of this review, the procedure was proposed by (2003).

The articles collection was done in the Web of Science (Pranckutė, 2021), indexing database on March 10th, 2022, with the search research equation for the entire period. The search resulted in 8,606 documents. Applying some selection criteria reduces to 2,312 papers used for bibliometrics and scientometrics analysis. The protocol and the article selection process with all descriptions by stages can be seen in detail in Table 1.

Table 1: Systematic literature review protocol

STEP	INPUT	DESCRIPTION
Search Method & Scope	Database	Web of Science - WoS
	Type of articles	Published in Journals - full Search (Liberati <i>et al.</i> , 2009)
	Scope	Topic (title, abstract & keywords) (Snyder, 2019)
	Research equation	((("entrepreneur*") AND (knowledge*) AND (("digital entrepreneurial ecosystem*") OR ("digital business ecosystem*") OR ("digital platform ecosystem*") OR ("entrepreneurial ecosystem*") OR ("innovation ecosystem*") OR ("innovaton system*"))))
	Research date	March/10/ 2022
Research selection process	process: full WoS search	8,606 all findings: WoS Only (Pranckutė, 2021) https://www.webofscience.com/wos/woscc/summary/83b44d1b-9c8a-4478-8339-c36062062c99-287690a3/relevance/1 no additional records through other sources; no duplicated articles 5,918 articles: full articles Only (Tranfield, Denyer and Smart, 2003)

Records used for descriptive analysis	3,107 articles: manager, business, and economics categories (Bengtsson and Raza-Ullah, 2016)
in	2,959 articles: English only (Ankrah and Al-Tabbaa, 2015)
Bibliometrix	2,312 articles: SSCI - Social Sciences Citation Index (Jones, Coviello and Tang, 2011)

Origin: prepared by the author

3. Bibliometric analysis

The bibliometric method was used to identify patterns in the literature through science mapping and performance analysis with a quantitative perspective (Aria et al., 2020). The open-source R-package Bibliometrix – Biblioshiny (Aria & Cuccurullo, 2017) provided plural tools for bibliometrics and scientometrics. Network extraction offered a descriptive analysis focused on prominent authors, sources, documents, and social and conceptual structures with their upcoming outputs.

3.1 Dataset Results

The Bibliometrix's descriptive analysis of collection metadata describes a summary of collected results. Unless we did not use any time filter, publications refer to 1984 until March/10/2022. 4,260 authors published 2,313 articles - 396 single-authored - in 238 journals with 89,754 citations. These papers represent an average of 4.48 publications per year with a 2.06 collaboration index and 5,267 author's keywords.

Regarding the annual scientific production (1984-2022). We decided to maintain data, despite the false impression of decreasing publications in 2022 due to research conducted in March. The results reveal the field remained hibernating from 1984-to 2000, and researchers have become more involved since 2011 and 2021 reached higher peak frequencies of publications in an upward curve.

3.2 Leading sources

A fundamental part of a bibliometric analysis is identifying the most active sources (Aria et al., 2020), and figures 1 and 2 categorise them. Figure 1 refers to the reference lists of the results, and Figure 2, refers to the citation of journals publishing the results. The most cited and cited source is the Journal Research Policy, with 12,245 articles and has a vast distance from the second place, Journal Technology Forecasting and social change. With an impact factor of 8,110 and a total citation of 32,584 in an upward curve, articles citation median of 5, the journal is 26/226 in the management category belonging to the first quartile of the Ranking Clarivate Journal Citation Reports®.

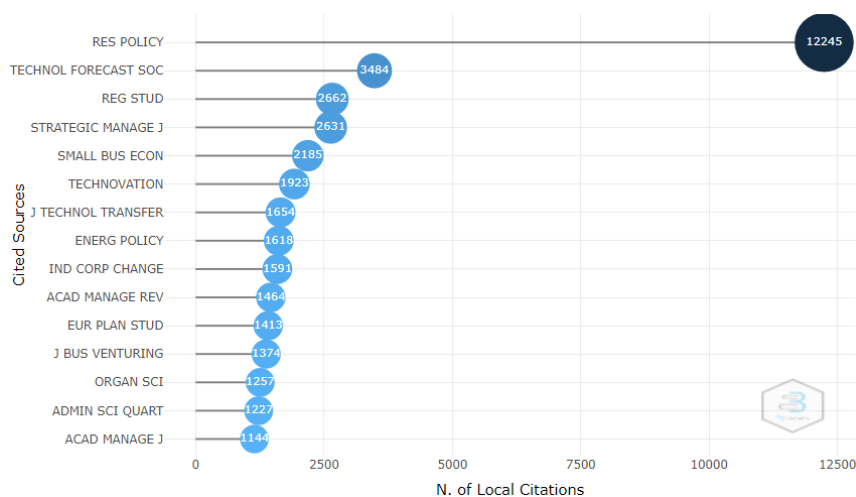


Figure 1: Most Relevant Cited Sources

Origin: Bibliometrix – Biblioshiny, opensource R-Studio

Figure 2 brings the same two Journals of figure 1 at the top of the citing sources ranking with inversion of the order. The Journal Technology Forecasting and Social Change occupies the first place with 267 and is very close to the Journal Research policy with 246 citations. The other sources are even earlier, with 97 or fewer citations. The results point to a wide range of journals divided into three distinct blocks of citation quantities. The first two

Journals exceed 200 citations; the middle block shows between 70 and 100 citations, and the last block is from 30 to 50.

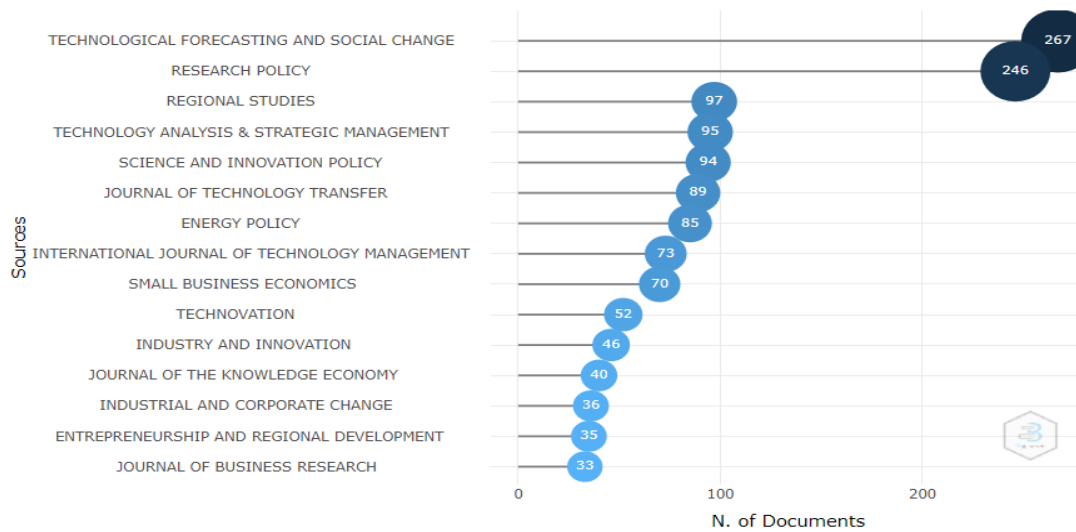


Figure 2: Most Relevant Citing Sources

Origin: Bibliometrix – Biblioshiny, opensource R-Studio

3.3 Most influential authors

In terms of publications, the twenty most relevant authors published 4,260 papers. The most pertinent authors are Truffer, B (22 publications and 577 citations); Hekkert, MP (17 publications and 516 citations); and Markard, J (16 publications and 421 citations). Two other authors who had many citations even with few publications were Jacobsson (534 citations in only nine publications) and Carlsson (438 citations with four publications). The group has an average citation rate of approximately 75 citations per article. Interestingly, the authors of positions 14 (Lindmark, S) and 20 (Uranga, MG) present the highest citation rates per article, respectively, 253 and 218. Also, interestingly, the author of position 8 (Adner, R) presents the lowest and most discrepant rate with only 12 citations per article. A further curiosity is that the two authors with the highest citation per article rates 'produced only one work and stopped publishing. The analysis uses a frequency measure with fractional frequency, which means that it quantifies the individual contribution of each co-author. These results indicate that many researchers seem interested in the topic, but few continue to investigate it.

Considering the output of the Top Authors over time, the most constant author was Truffer, B, who has published since 2008 and already has publications in 2022 starting. His highest publication years were 2013, 2017, and 2018. The most relevant authors in 2021 were Carayannis, EG; Lee, K; Audretsch, DB, and Guerrero, M. Of the authors shown in figure 4, those who have already published in 2022 beginning were Truffer, B; Lee, k; Audretsch, DB; Binz, C, and Alkemade, F.

3.4 Most productive institutions and countries

Utrecht University (Netherlands) is the most productive institute, with 96 articles. It is followed by Lund University (Sweden) with 78 articles and the University of Manchester (England) with 57 articles. The top 3 most productive universities and most of the universities listed are all European. The only American university, George Washington, appears in 6th place with 35 articles. The list also features three universities from emerging countries: Tsinghua of China in 4th place with 38 publications, followed by the Brazilian University Unicamp in 8th place with 29 publications, and Seoul Natl University of Korea in 10th place with 28 journals.

Scientific production by country (the corresponding authors) indicates the top 10. Among them, the countries with the highest production are (i) the United States (USA); (ii) the United Kingdom; and (iii) China; (iv). 5 European Union countries appear on the list, and Australia in 10th place. No Latin country appears anywhere.

On the one hand, the United Kingdom and the United States remain among the most cited countries because they have a high average number of citations. The list repeats itself among the ten most productive. Therefore, a high production may not be reflected in citations.

3.5 Most-cited publications

Table 2 shows the top ten articles ranked by overall and annual citations, considering the most cited publications. All have above 700 total citations and an average of citations per year above 60. The two most recent articles ranked 1st (Markard et al., 2012) and 10th (Smith & Raven, 2012) belong to the same year. Unlike all the other articles that address different perspectives of innovation systems, these deal with sustainable transitions. The oldest article in the top ranking dates back to 1997 (Cooke et al.) and provides an overview of regional innovation systems. The papers in this list were included in the thematic discussion; we address the contributions of the most influential papers, the primary authors, the most cited, and the most recent ones.

Table 2: Most Cited Papers

Reference	TC	ACy
Markard et al., 2012	1324	120,36
Malerba, 2002	1131	53,86
Cooke, 1997	1125	43,27
Hekkert et al., 2017	1121	70,06
Adner & Kapoor, 2010	994	76,46
Furman et al., 2002	978	46,57
Bergek et al., 2008	918	61,20
Acs et al., 2002	837	39,86
Jensen et al., 2007	826	51,63
Smith & Raven, 2012	774	70,36

TC = total citations; ACy = Average Citations per year

Origin: adapted by authors from Bibliometrix – Biblioshiny

3.6 Trend topics

Figure 3 presents the trending topics. We set the following parameters, authors' keywords, timespan 2017-2022 to capture the most recent topics remaining a no polluted picture. We kept the system default to a word minimum frequency of 10 and at least 5 per year. The beginning and end of each line delimit the first and last publication's year. The circles' positions represent the average publication year and its size, the co-occurrence of each keyword.

Furthermore, entrepreneurial ecosystems remain an actual and relevant toping; its circle is more significant than innovation ecosystems and a more frequent keyword. It's worth mentioning new approaches to the same constructs. Sustainable Entrepreneurship and development are the brand new perspective on ecosystems, both entrepreneurial and innovation. Moreover, innovation is being studied from an increasingly technological perspective. Knowledge management keeps being a transversal theme of interest.

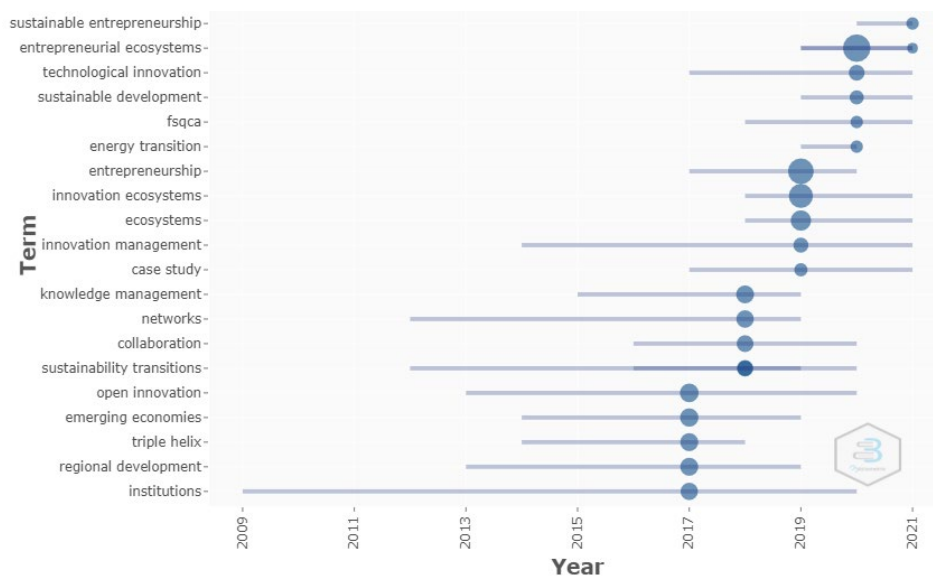


Figure 3: Trending Topics

Origin: Bibliometrix – Biblioshiny, opensource R-Studio

3.7 Social Structure

The software provides three units of collaboration analysis: institutions, authors, and countries. Considering the low average of 1.84 authors per publication and the absence of relevant results on collaborations between authors and institutions, it only presents collaborations between countries. Figure 4 shows a map of this collaboration and its network. The parameters considered were ten minimum edges and five edges size per default.

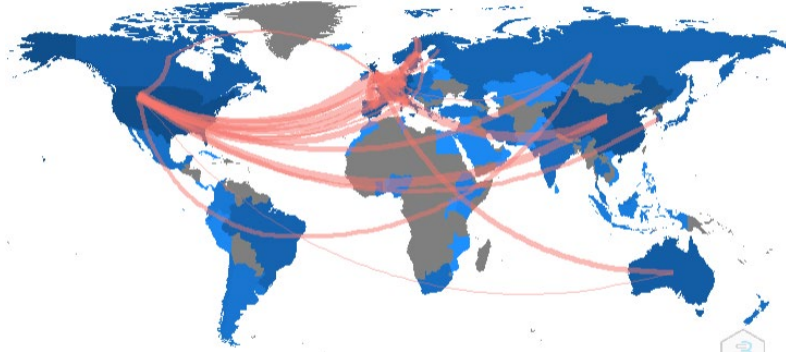


Figure 4: Countries Collaboration Map

Origin: Bibliometrix – Biblioshiny, opensource R-Studio

The USA is the primary collaboration country with the most diverse activities, mainly the United Kingdom, Europe, and China. However, it's worth noting collaborations with Australia and Russia. No relevant collaborations with and from Africa and Latin America were detected per filters applied. Table 3 presents the correspondent author's top ten most relevant countries. Except for Sweden, which shows a similar index of collaborations, other countries have internal collaboration higher than international. The country collaboration rates turned into 0,3 and 0,5.

Table 3: Intra And Inter-Country Collaboration Among Countries

Ranking	Country	Articles	SCP	MCP	CCR
1	UNITED KINGDOM	279	159	120	0,4
2	USA	271	182	89	0,3
3	CHINA	202	129	73	0,4
4	GERMANY	179	121	58	0,3
5	NETHERLANDS	145	85	60	0,4
6	ITALY	121	78	43	0,4
7	SPAIN	97	69	28	0,3
8	SWEDEN	87	44	43	0,5
9	FRANCE	75	41	34	0,5
10	AUSTRALIA	74	46	28	0,4

SCP = single country; **MCP** = multiple countries; **CCR** = country collaboration rate

Origin: adapted by authors from Bibliometrix – Biblioshiny

The collaboration network shows the three clusters among the international collaborations. The only cluster with clear leadership is the red one which the United Kingdom and the USA lead. Other clusters don't manifest a significant leader. It used the default parameters (Aria and Cuccurullo, 2017), e.g., automatic layout, Louvain clustering algorithm, and normalisation by association, removing isolated nodes. As a result, the blue cluster has more density than followed red one, while the green cluster has less centrality and density once they have fewer collaborations. Therefore, the United Kingdom and the United States' central position corresponds to their relevant position as the most significant number of publications with international affiliations. On the other hand, it's impossible to notify an immense power of centrality or density of emergent economies. In the figure, They appear as supporting roles without collaborations between China and Latin America.

3.8 Conceptual Structure

The conceptual framework presented in Figure 5 distinguishes the most important and recent themes by applying the criteria of centrality (relevance of the theme to the field) and density (a measure of its development) (Aria et al., 2020). Default settings were applied on the authors' keywords, minimum clustering frequency - five (per thousand docs), several words - 250, and three labels for each cluster following Cahlik's

(2000) and Aria et al.'s (2020) criteria. The figure behaves like a life cycle of the presented topic to the research field and gives a static picture of the authors' keywords clustered together.

The lower left quadrant shows "nascent, emerging or declining themes, with low centrality and low density, meaning that they are underdeveloped and marginal." Such themes, represented here by the idea of university-industry collaboration and triple helix relationships and university entrepreneurship, may develop in the future by emerging into the next quadrant. The top left quadrant displays the "highly developed and isolated themes, with well-developed internal linkages (high density) but no important external linkages (low centrality), meaning that they are of limited importance to the field" (Aria et al., 2020: 823). Here universities appear to be being studied in isolation, and technological innovation systems are being analysed in conjunction with the idea of sustainable technical transitions. Much of the transitions studies in this quadrant relate to the energy industry and the development of new sustainable energy. They are of marginal importance to the field.

The upper right quadrant has "the driving themes, characterised by high centrality and high density, meaning that they are developed and important to the research field" (Aria et al., 2020: 822). Here, entrepreneurial and innovative ecosystems are associated with open innovation, regional development, and knowledge management. In contrast, the lower right quadrant has "basic and crosscutting themes, worked across a variety of knowledge areas and characterised by high centrality and low density, meaning that these themes are important for a domain and concern general themes that cut across the different research areas of the field" (Aria et al., 2020: 822). Here there are two major clusters with a tendency to intersect. The rose cluster presents the innovation systems associated with its policies, and a relevant number of studies deal with the topic in emerging economies and the European Union. They also use institutions to measure absorptive capacities in national contexts. The blue cluster presents innovation policies in regional contexts, and most research has been conducted in regions of Greater China. Here the focus was on technology transfer, research, and development of new technologies, with the number of patents as the primary measure.

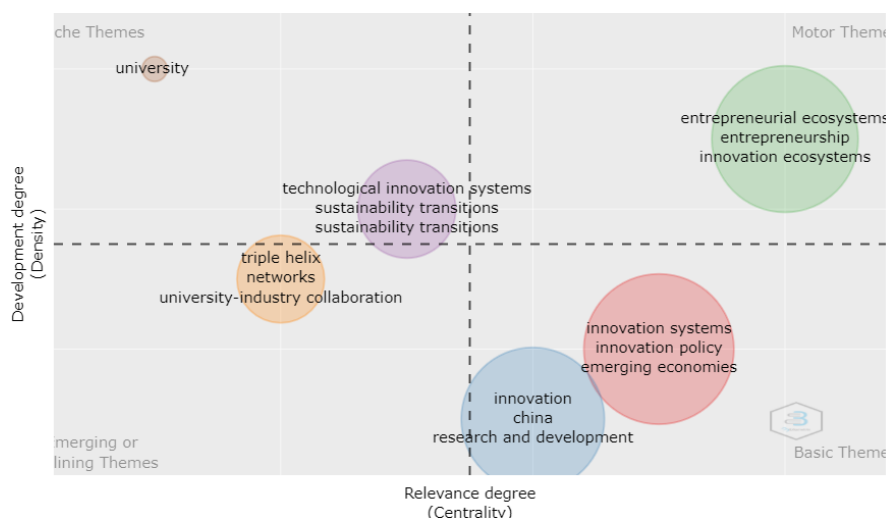


Figure 5: Thematic Map

Origin: Bibliometrix – Biblioshiny, opensource R-Studio

3.9 Overall thematic evolution

The thematic evolution presented in Figure 6 shows that the researched period from 1984 to 2022 was divided by the software into two timespans: i) 1984-2016 (Figure 11), ii) 2017-2022 (Figure 12). This division corroborates the annual scientific production, where we see an increasing increase in publications with a yearly average of more than 150 articles per year. It also shows how the theme was concentrated, evolved, and the turning point in 2016-2017. The terms innovation systems, open innovation, and technological innovation systems were maintained and presented variations with regional approaches. The term technology transfer emerged in the second timespan and merged concepts of innovation associated with biotechnology. The keyword entrepreneurial ecosystems incorporated several keywords associated mainly with innovation and triple helix, which evolved to quadruple and quintuple approaches in the following years.

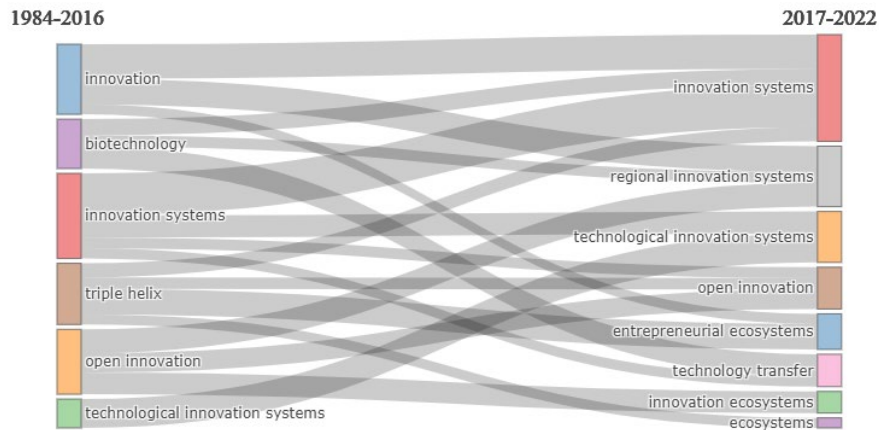


Figure 6: Thematic Evolution Per Author's Keywords

Origin: Bibliometrix – Biblioshiny, opensource R-Studio

3.10 First period (1984-2016)

During the first reference period (1984-2016), innovation systems were driving and crosscutting themes along with the triple helix, while innovation and biotechnology were basic crosscutting themes (Figure 7a). Research on technological innovation systems is a developed and isolated theme. In contrast, open innovation and networks are in the emerging or declining quadrant. It is possible to assume the decline of the network because it is not present in the following reference period and the emergence of open innovation by its permanence and growth in the subsequent period (Figure 7b). It is important to emphasise that the cross-sectional research for this period mainly involved emerging economies, especially China.



Figure 7a. Thematic Map Of Author's Keywords During 1984-2016

Figure 7b. Thematic Map Of Author's Keywords During 2017-2022

Origin: Bibliometrix – Biblioshiny, opensource R-Studio

It is worth highlighting the keywords associations here since they cluster differently in the next period. The orange cluster associates open innovation with research and development. The yellow cluster aggregates biofuels and sustainability transitions to Technological innovation systems. The brown cluster that deals with the triple helix brings the institutions, regional development, and regional systems and policies. The pink cluster brings the innovation systems associated with the concepts of Knowledge management, social capital, absorptive capacity, and governance. The blue cluster integrates crosscutting concepts of innovation, entrepreneurship, and technology with a significant field of study in China. Finally, the purple cluster relates technology transfer, patents, Universities, and Knowledge spillovers to the biotechnology area.

3.11 Second period (2017-2022)

Figure 8 presents the second timespan (2017-2022). The second timespan gives growth in the number of clusters and brings new keywords and new associations for keywords from the past period. A new technology transfer cluster appears in the emerging or declining themes quadrant. This keyword disaggregated from the biotechnology cluster of the previous period, which lost relevance and dropped and now seems to be associated with higher education, academic entrepreneurship, and knowledge spillover. Still, in the same quadrant, the cluster technological innovation system declined in the previous period despite gaining volume associated with renewable energy and economic development with studies conducted in Africa.

In the quadrant of isolated themes, two new clusters appear. The smaller cluster presents studies conducted in Canada, and a larger one brings together regional and global innovation systems, social networks, and COVID-19. Biotechnology is no longer the central theme and is aggregated to the dark blue cluster. The new cluster innovation ecosystems that aggregate the keywords entrepreneurial universities, sustainable development, and university-industry collaboration appear at the intersection of the quadrants. In the quadrant of the driving themes, the ecosystems cluster is associated with social entrepreneurship, demonstrating the theme's potential for growth. The open innovation cluster, which emerged in the previous period, appears extraordinarily relevant and integrated with the triple helix and knowledge management concepts.

Finally, two clusters communicate and intercede in the quadrant of transversal themes. The entrepreneurial ecosystem cluster aggregates the concept of sustainable entrepreneurship. Several studies were with European startups (including the UK). The innovation systems cluster is associated with studies conducted in emerging economies, mainly China, and used as performance measures patents, research and development, policies whose analysis units are institutions. Although the USA represents a high percentage of publications and collaborations, the country did not present itself as a relevant keyword; it appeared only throughout the articles.

In contrast to the visualisation of the whole period, the themes in the right quadrants have several overlaps and more proximity in both periods. Thus, the most cited articles are in the right quadrants. Hence, the most influential papers are the transversal and motor ones.

3.12 Co-occurrence network

The co-occurrence network presents the research in front of the topics addressed. Again, the standard parameters were used and taken as a basis for the Keywords of the authors (Aria & Cuccurullo, 2017) with normalisation by association, node size proportional to its occurrence, and the line size is proportional to the co-occurrence of the items. The colours red, blue and green identify three clusters. Combining thematic and network analysis, it stands out that crosscutting and driving themes are at the centre of the clusters, e.g. innovation, innovation systems, and entrepreneurial ecosystems. All clusters possess centrality. However, the red and blue clusters have more significant co-occurrence, and their links have greater strength. The red cluster is the largest of all. The theme with the most remarkable centrality is innovation systems and relates to interventions and structures for innovation at the macro level. The blue cluster, whose central theme is innovation, deals with its content and application. Finally, the green cluster brings the entrepreneurial ecosystems as a significant and emerging theme and deals with the relationship of entrepreneurship with innovation and its structures.

4. Conclusions

This research is pioneering in providing a comprehensive bibliometric analysis without temporal clipping of entrepreneurial ecosystems with venture geography and conditions, technological innovation adoption and

knowledge sharing in management research. By identifying and categorising authors, articles, journals, countries, institutions, and their collaboration networks, state of the art are better portrayed, providing key themes and trends. Therefore, the findings presented are valuable for researchers to advance in investigating entrepreneurial ecosystems and their knowledge sharing dynamics influenced by the adoption of innovations.

In addition to its contributions, the limitations of a bibliometric analysis must be considered. We suggest using other databases (e.g. Scopus), other bibliometric analysis software (e.g. VOSviewer), adding different topics to the research equation, and an in-depth discussion of the issues identified. While the analysis also excluded grey literature, it did not capture all available research on the intersection between the concepts addressed. Furthermore, the results do not assess the purpose of citation, which means that it is unknown whether quotations were used to agree or disagree with the authors.

The state-of-the-art mapping resulted in four distinct thematic clusters, which had been qualitatively analysed, highlighting several emerging directions for future research. A holistic framework is then developed by integrating venture geography, innovation adoption and knowledge sharing into the EE literature. Finally, this research had identified relevant issues and gaps to be addressed. It is possible to conduct further bibliometric analyses using co-citation and historiographic networks.

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