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Article

The Role of Intrapreneurs in Driving Entrepreneurial Transformation in Universities: A Bibliographic Analysis Between 1990 and 2024

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Abstract: Prior research has demonstrated the value of an entrepreneurial mindset in business. The so-called third mission is also becoming an increasingly important aspect of university operations. This involves leveraging knowledge generated at the university level to create close links with society and the economy. The role of intrapreneurs has been examined in the corporate, for-profit sector. However, these agents of change also play a significant role in the advancement of entrepreneurial universities. The present research investigates the role of intrapreneurs in entrepreneurial universities through a bibliographic analysis using RStudio biblioshiny on the Scopus and Web of Science databases. It is evident that the literature on this subject has gained interest in recent years, yet the number of documents remains limited, with a small number of authors publishing them. The development of keywords is also notable, including the emergence of sustainability, which is linked to intrapreneurs and the entrepreneurial universities. Although this study has its limitations, it can show how and where authors should publish, what the basic and the emerging topics are, what the most important keywords are and how these are connected and how countries cooperate in searching for solutions in this globally recognized research area.

Keywords: bibliographic analysis; biblioshiny; intrapreneurship; entrepreneurial university; sustainability; innovation; education

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1. Introduction

Innovation is frequently identified as a key driver of economic growth (Solow 1956; Bilbao-Osorio and Rodríguez-Pose 2004; Guerrero et al. 2011; Urbano et al. 2020). In the evolving landscape of higher education, universities are increasingly recognized as more than just centres of education and research. They are also seen as fertile grounds for innovation and entrepreneurship (Huang et al. 2021). This is underscored by the fact that universities play a pivotal role in the triple and quadruple helix models.

The entrepreneurial university concept involves integrating traditional educational (first mission) and research frameworks (second mission) with a third mission: contributing to society by leveraging knowledge and research results to address societal and economic challenges. This approach is supported by various studies (Etzkowitz 1983; Gulbrandsen and Slipersæter 2007; Sam and van der Sijde 2014; Pinheiro et al. 2015).

Kirby (2006) stated that universities are not the most entrepreneurial organizations as they face the traditional boundaries of huge organizations, such as the following:

- The impersonal nature of relationships.

- The hierarchical structure and the multi-level approval.
- The need for control and consequent compliance with rules and procedures.
- The conservatism of the corporate culture.
- The need for time dimension and immediate results.
- The lack of entrepreneurial talent.
- The inappropriate compensation methods.

Perhaps the most important barrier is that the majority of university staff have never had to engage in entrepreneurial activity and many believe that entrepreneurship leads to a displacement of core university values such as intellectual integrity, critical thinking or a commitment to learning and understanding (Pickus and Reuben 2010).

Entrepreneurial universities foster an environment that encourages faculty, staff and students to think outside the box and promote a culture where ideas can be turned into impactful ventures. In this context, intrapreneurs play a crucial role. They are the unsung heroes who bridge the gap between academia and industry in the triple, or quadruple helix concept, combining academic pursuits with entrepreneurial endeavours to transform universities into innovation hubs.

A key aspect of the transition to an entrepreneurial university is the involvement of intrapreneurs, individuals who demonstrate entrepreneurial behaviour within the conventional university environment (Flores et al. 2024).

Although a significant amount of information on entrepreneurs can be found in the literature, it is more challenging to identify and trace the contributions of intrapreneurs, particularly in academic research. The term 'intrapreneur' was first introduced by Pinchot (1984), who defined them as "those who take hands-on responsibility for creating innovation of any kind within the organization". Initially, the role of intrapreneurs was identified primarily in the for-profit sector of companies and SMEs (Hisrich 1990; Carrier 1996).

Intrapreneurs are mostly referred to as individuals with a unique combination of skills and a mindset that enable them to identify opportunities, take calculated risks and drive innovative initiatives within the larger organizational structure. They are creative, proactive and drive innovation from within their organizations. They leverage the resources and networks available to them to develop new ventures and initiatives (Hay et al. 2002; Wadhwani et al. 2017; Blanka 2019; van Wetten et al. 2020).

They are mostly the drivers of change at companies and the differentiation from entrepreneurs usually includes their desire for more limited risks.

The literature on intrapreneurship in the context of entrepreneurial universities highlights several key themes.

First, intrapreneurs act as catalysts for change, using their entrepreneurial spirit to rejuvenate the university and foster a more innovative culture (Yashin-Shaw and Morrison-Beedy 2022). By harnessing the entrepreneurial mindset of smaller organizations, intrapreneurs can help large, established universities maintain a competitive edge and adapt to rapidly changing market demands (Rule and Irwin 1988; Klofsten et al. 2024).

Second, intrapreneurs play a critical role in developing new products, services and technologies, as well as improving existing processes and offerings (Morais et al. 2021). Their willingness to experiment, learn from setbacks and adjust their assumptions based on new information allows them to drive impactful innovation within the university environment (Flores et al. 2024).

Finally, the success of intrapreneurship in entrepreneurial universities often depends on the institutional support and enabling environment provided by the university leadership (Galván-Vela et al. 2021). Intrapreneurs require a certain level of autonomy, resources and organizational support to effectively implement their initiatives and overcome bureaucratic hurdles (Alam et al. 2023; Dovey and Rembach 2015).

Ultimately, the literature suggests that the presence and support of intrapreneurs is integral to the transformation of universities into more entrepreneurial and innovative institutions capable of responding to the evolving needs of the market and driving economic

progress (Guerrero et al. 2021). Their role in achieving a sustainable culture also has to be mentioned (Aparicio et al. 2020).

This bibliographic analysis aims to explore how the role of intrapreneurs has evolved within entrepreneurial universities.

This is a new contribution to what has already been published because, to our knowledge, there has been no synthesis of the literature on the substantive role of intrapreneurs in entrepreneurial universities. We started with a description of the publication trends, the main journals, the main organizations, countries and their networks. We then carried out a computerized bibliometric analysis to identify how studies on intrapreneurs at entrepreneurial universities have evolved and what the most unique findings in this field are. The following research questions were to be answered:

- RQ1: How has the literature on intrapreneurship in entrepreneurial universities developed over time? (Section 3.1).
- RQ2: What is the impact of the scientific work based on the citations? (Section 3.2).
- RQ3: Who are the most productive and the most cited authors who have published content on the topic? (Section 3.3).
- RQ4: Which are the most influential papers and why? (Section 3.4).
- RQ5: Which countries took part in the work and what collaborations were formed? (Section 3.5).
- RQ6: Which scientific journals have generated the most knowledge about intrapreneurs in entrepreneurial universities? Which academic journals can be potential publication places for future articles? (Section 3.6).
- RQ7: How can we cluster the most important topics? (Section 3.7).
- RQ8: What have been the dominant themes and topics in the field of intrapreneurs at entrepreneurial universities? (Section 3.8).
- RQ9: What collaborations have the authors formed? (Section 3.9).
- RQ10: What are the limitations of this paper, and what topics related to intrapreneurs at entrepreneurial universities should/will be further investigated? (Section 5).

The present study analyzes the definition and scope of intrapreneurship in university environments, reviews the existing body of literature on the subject, and identifies gaps that warrant further investigation. Through this comprehensive examination, the major aim is to provide a nuanced understanding of how intrapreneurs contribute to the entrepreneurial mission of universities, ultimately enhancing their role as engines of innovation and economic development.

Section 2 introduces the methodology used, while Section 3 presents the results. Section 4 summarizes the conclusions of the research.

2. Materials and Methods

The bibliometric review is a tool that has been used since the 1950s (Fano 1956). Its objective is to explore and analyze large volumes of scientific data by the use of statistical tools and visualization techniques.

The number of publications using this methodology in business, economics, and social sciences is growing (Donthu et al. 2021). However, to the best of our knowledge, no bibliometric study has addressed the topic of intrapreneurs in entrepreneurial universities.

To conduct this literature review, we used a systematic approach to identify, analyze, and synthesize the existing body of research on intrapreneurs in entrepreneurial universities. Figure 1 shows the main steps of the bibliographic analysis:

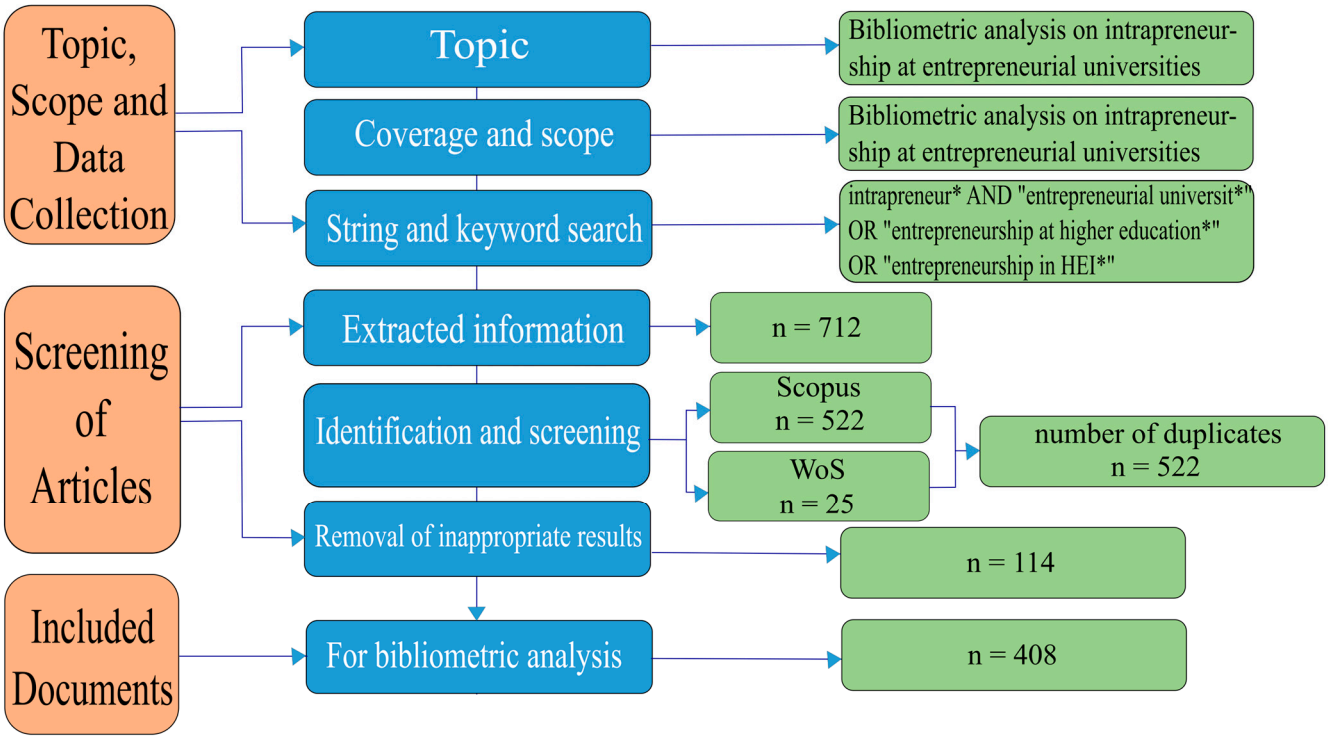

Figure 1. The main stages of the applied methodology. Search criteria and results.

Bibliometric reviews are based on scientific databases like Scopus or the Web of Science (WoS). These databases have their limitations in research as they are not accessible to everyone and do not cover the grey literature (conference proceedings and books), but they are still the most extensively used by the research community (Wilder and Walters 2021). Although during this research we tried to include the Dimensions (Singh et al. 2021) database, unfortunately, the huge volume of missing data would have made comparisons impossible.

Google Scholar provides a platform for unpublished and grey literature; therefore, its use could distort the results.

Finally, after thorough consideration of all the advantages and disadvantages, we decided to use the two most popular ones—Scopus and WoS—as this way, the highest range of high-quality, peer-reviewed publications could be analyzed, and the results can contribute to the existing literature.

We formulated a set of search terms relevant to our topic, including "intrapreneur*" AND "entrepreneurial universit*" with some synonyms, and in the article screening phase, the search was refined to include only peer-reviewed articles published in English in the fields of business, management and accounting, social sciences and economics, econometrics and finance (522 + 25). Data from both databases were downloaded on the same day (29 August 2024) to assure comparability. The initial search results from the two databases were merged and filtered to exclude irrelevant studies, duplicates and publications outside the scope of our review. The final dataset comprised a representative collection of studies focusing on intrapreneurship in the context of entrepreneurial universities.

The search terms were quite similar in the two databases to ensure that the most relevant and comparable publications were found (Table 1). In Scopus, the final term was formulated as (ALL (intrapreneur*) AND ALL ("entrepreneurial universit*" OR "academic entrepreneur*" OR "entrepreneurship in higher education*" OR "entrepreneurship in HEI*")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "SOCI") OR LIMIT-TO (SUBJAREA, "ECON")).

Table 1. Steps of the keyword search in the two databases.

Search Terms	Scopus	WoS
intrapreneur*	9506	1067
"entrepreneurial universit*" OR "academic entrepreneur*" OR "entrepreneurship in higher education" OR "entrepreneurship in HEI"	712	26
English	705	24
Limited to Business, Management and Accounting, Social Sciences and Economics, Econometrics and Finance	658	24
	Journal 522 Book 99 Book series 25 Conference proceeding 12	Article 21 Book Chapters 3 Early Access 2 Proceeding Paper 2 Review Article 1

Source: authors' own construction.

It is worth mentioning that while entrepreneurship is an excessively researched topic (over 140,000 hits on Scopus for "entrepreneur*"), less than 10% of the results are for the term "intrapreneur*". The research aims to find the role of intrapreneurs at entrepreneurial universities, which is why we used the selected keywords.

In the WoS database, the original search for the word "intrapreneur*" was refined by searching within all fields using "Refine results for "intrapreneur*" (All Fields) and "Entrepreneurial Universit*" Or "Academic Entrepreneur*" Or "Entrepreneurship In Higher Education" Or "Entrepreneurship In HEI" (searched in all fields).

After removing inappropriate results, the search yielded 408 documents for analysis. To visualize and interpret the complex bibliographic relationships and textual data in the dataset, we used biblioshiny, a software tool designed for the construction and visualization of bibliometric networks in R Studio (Aria and Cuccurullo 2017). Biblioshiny facilitated the creation of easy-to-interpret illustrations, such as co-authorship networks, keyword co-occurrence maps and citation networks. These visualizations helped us to identify major research themes, influential authors and patterns of collaboration in the field.

The findings gained from the preliminary and in-depth analyses were synthesized to understand the current state of research on intrapreneurs working at entrepreneurial universities. We examined key trends and significant contributions and identified gaps in the literature. This synthesis formed the basis for the discussion and conclusions presented in the following sections. By integrating bibliometric analysis with visualization techniques, this methodology provides a comprehensive overview of the existing research landscape. The combination of quantitative data from Scopus and the WoS and qualitative insights from biblioshiny ensures a balanced and thorough examination of the topic, providing a clear understanding of the role and impact of intrapreneurs within entrepreneurial universities.

3. Discussion and Results

3.1. Development of the Scientific Literature (RQ1)

At first, a general review of the scientific literature was carried out in order to be able to describe the development of the topic over time.

3.1.1. Main Information

Our findings reveal that while entrepreneurship and entrepreneurial universities have been the subject of extensive study since the late 20th century, there has been considerably less research conducted on intrapreneurship. Moreover, the majority of these studies concentrate on firms and companies. To the best of the authors' knowledge, this is the first paper to attempt to define the role of intrapreneurs in entrepreneurial universities within the existing literature.

A search from the Scopus database returned 9506 records for the term "intrapreneur", while the WoS database yielded 1067 documents. After applying the search term of "entrepreneurial universit*" OR "academic entrepreneur*" OR "entrepreneurship in higher education" OR "entrepreneurship in HEI", the number of documents was reduced to 712 in Scopus and 26 in the WoS.

When the authors further limited the search to English-language journals in the relevant scientific fields (business, management and accounting, social sciences and economics, economics and finance), the process yielded a smaller number of articles (25 from the WoS and 522 from Scopus). Duplicates were removed through a double-check process, using RefWorks and RStudio. The analysis of the remaining results then began, excluding irrelevant studies and two studies for which abstracts could not be found in the available databases from further analysis. The main information about the 408 documents finally analyzed is included in Table 2.

Table 2. Main information about the data analyzed.

Description	Results
Timespan	1990:2024
Sources (Journals, Books, etc.)	201
Documents	408
Annual Growth Rate %	13.21
Document Average Age	4.34
Average citations per doc	27.21
Document contents	
Keywords Plus (ID)	624
Author's Keywords (DE)	1275
Authors	
Authors	1025
Authors of single-authored docs	53
Authors collaboration	
Single-authored docs	55
Co-Authors per doc	2.91
International co-authorships %	2.70

Source: authors' own construction.

3.1.2. Annual Scientific Production

The final documents were selected from a period covering 1990 to 2024, representing over 30 years of research work. It should be noted that the average age of the documents is only 4.34 years, indicating that the topic is relatively new. An analysis of early publications indicates that between 1990 and 2008, a total of 15 articles were published. In the subsequent six-year period (2009–2014), the number of articles published doubled, reaching 31. The period of the greatest growth in the field began in 2015, with 13 publications. It is also noteworthy that the United Nations proclaimed the Sustainable Development Goals (United Nations 2015) in 2015. The growth rate is clearly illustrated by the line on the graph in

Figure 2. Given that 88.73% of the documents were published within the last 10 years, this research includes the period of 2015 to 2024 unless otherwise indicated.

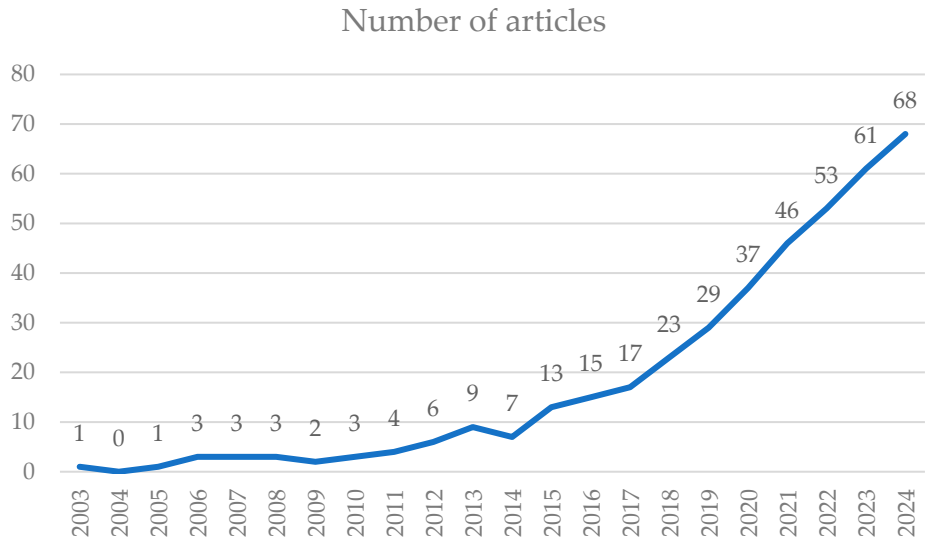

Figure 2. The annual scientific production. Source: authors' own construction.

Figure 2 clearly demonstrates that scientific interest remained low and stable until 2015. After that date, however, there was an exponential and continuous growth in interest. Prior to 2014, the annual number of scientific papers in this field remained below ten. Following the publication of 15 documents in 2016, the number increased to 37 in 2020, 61 in 2023, and has continued to grow, reaching 68 this year.

The pattern of scientific publications can be divided into three distinct stages, as illustrated in Table 3.

Table 3. Stages of research.

Period	Number of Publications	Stage Description
1990–2008	15	pioneers
2009–2014	31	rising interest
2015–2024	362	start of blooming

Source: authors' own construction.

The initial phase spanned from 1990 to 2008 and involved a series of fragmented research initiatives. The first paper was a case study initiated by Ralston (1990), who was interested in exploring the work of the academic entrepreneur. This paper represents a pivotal moment in the evolution of the entrepreneurial university concept. It emerges from a period spanning nearly a decade, during which the concept first emerged (Etzkowitz 1983) and Clark (1998) set up his model. This model identified integrated entrepreneurial culture as one of the five common elements of an entrepreneurial university. The period is defined by the emergence of the educational aspect of entrepreneurship (Heinonen et al. 2007), and the most cited document was published (Pittaway and Cope 2007). Additionally, 2006 marks the year that the first pioneer (Kirby 2006) addressed intrapreneurship in the modern sense through the case study of the University of Surrey.

The second phase began in 2009, following the economic crisis. In addition to the educational aspect, the focus has been on technology and knowledge transfer (Bicknell et al. 2010; Guerrero and Urbano 2012), as well as the need for common definitions (Cantaragiu 2012) and a model (Woollard 2010; Kirby et al. 2011; Nayyar and Naqvi 2013). Social enterprises (Kacperczyk 2013) have also emerged as a key area of interest.

Since 2015, intrapreneurship at entrepreneurial universities has emerged as a popular research area. However, despite the ongoing research, there is still a lack of consensus on common definitions. Entrepreneurship remains a popular topic in higher education, but the most interesting development is the growing focus on sustainability in this period. In fact, 14.9% of the papers contain references to sustainability, and some scholars (Muñoz and Cohen 2017; Ndubuka and Rey-Marmonier 2019; Terán-Yépez et al. 2020) link the term to innovation capabilities (Nair and Bhattacharyya 2022) or to the Business Model Canvas (Pepin et al. 2024).

3.2. The Impact of the Scientific Work (RQ2)

The number of citations provides insight into the impact of the scientific work. Accordingly, this section employs a comprehensive dataset of 408 documents (Table 4). Global citations are defined as the total number of citations gathered from external databases, including Scopus and Web of Science, as well as any other external sources not included in the dataset. On the other hand, local citation counts reflect the number of times a particular publication has been cited within the specific 408-document collection.

Table 4. Global citation structure.

Number of Global Citations	Number of Papers	% of Paper
Over 200	7	1.7%
Between 100 and 200	17	4.2%
Between 50 and 100	33	8.1%
Less than 50	295	72.3%
0 citations	56	13.7%
Total	408	100%

Source: authors' own construction.

It can be stated that the majority of the papers (295, representing 72.3% of the total) have been cited less than 50 times. Only 13.97% of the scientific work has been cited more than 50 times, or 5.88% more than 100 times.

3.3. Most Productive Authors and Their Networks (RQ3)

In Table 5, we have identified the ten most productive and the ten most cited authors from the total database. Guerrero and Urbano have the highest number of publications in the field (19 vs. 13). While the order changes when considering citations, Guerrero's 1485 citations is only slightly behind Urbano's 1550 citations. They collaborated on 11 publications. It is evident that collaboration plays a pivotal role in this field, as evidenced by the interconnected networks of highly cited authors. Pittaway, for instance, had only two papers, one with Cope and one with Fayolle. Notably, three of Fayolle's five works were published in collaboration with Guerrero, and this trend also applies to Mian. Klofsten, on the other hand, had four publications, some of which were in partnership with Guerrero (three articles), Urbano (two articles) and Pittaway (one article).

It is notable that two of the ten most published authors are affiliated with the Australian University of Kuwait (Bani-Mustafa et al. 2021; Abidi et al. 2022; Abidi et al. 2023), collectively publishing three articles. This example demonstrates that this research area is still in its infancy, offering newcomers a promising opportunity for growth and development.

The most influential authors have published 68 articles out of the 408 (three or more papers per author) on the subject of intrapreneurship at entrepreneurial universities (Figure 3). Guerrero is the most productive author, followed by Urbano, with whom they frequently collaborate. Notwithstanding the fact that Audretsch, Abidi and Bani-Mustafa have only three papers each, they are among the most prominent figures in the field of entrepreneurial universities.

Table 5. Top 10 most published and most cited authors.

Author	Institutions	Number of Published Articles	Author	Institution	Number of Citations
Guerrero, M.	Arizona State University	19	Urbano, D.	Universitat Autonóma Barcelona	1550
Urbano, D.	Universitat Autonóma Barcelona	13	Guerrero, M.	Arizona State University	1485
Ferreira, J.	Universidade de Beira interior & NECE	8	Pittaway, L.	Ohio University of Copeland	1094
Fayolle, A.	IDRAC Business School	5	Cope, J.	University of Stratchlyde	1043
Lopes, J.	Miguel Torga Institute of Higher Education	5	Fayolle, A.	IDRAC Business School	532
Menter, M.	Friedrich Schiller University Jena	5	Klofsten, M.	Linköping University	471
Klofsten, M.	Linköping University	4	Kirby, D.A.	British University in Egypt	420
Abidi, O.	Australian University of Kuwait	3	Atienza-Sahuquillo, C.	Universidad de Castilla la Mancha	329
Audretsch, D.	Indiana University	3	Barba-Sánchez, V.	Universidad de Castilla la Mancha	329
Bani-Mustafa, A.	Australian University of Kuwait	3	Mian, S.	State University of New York at Oswego	288

Source: authors' own construction.

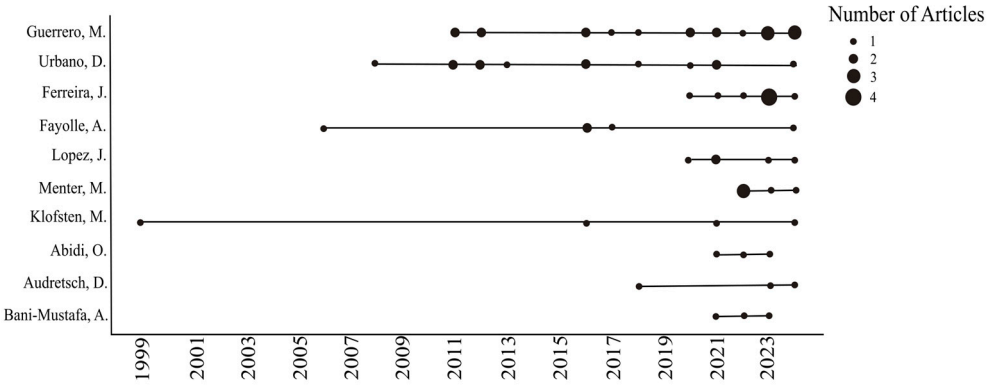

Figure 3. The most influential authors' production over time (1999–2023). Source: authors' own construction.

The involvement of three researchers in the preparation of a paper indicates a collaborative effort. Figure 3 clearly demonstrates the collaboration between Guerrero and Urbano, as evidenced by the fact that their most cited papers are the result of their joint effort. Professor Kirby is the only author among the 25 listed who has not published in the last five years. Klofsten is the most senior researcher, having been engaged in this field since 1999. However, it should be noted that he has only four articles in this field, published in 1999, 2016, 2021, and 2024. Eight of the twenty-five authors have only published since 2020, while eleven have only published since 2019. Only 21 authors have a total citation count of 200 or more.

3.4. Most Influential Papers (RQ4)

As we reviewed the ten most cited papers, it was not unexpected that an older document would be the most cited (Pittaway and Cope 2007). The next most cited paper,

with fewer than half as many citations, is by Maribel Guerrero, a leading expert on entrepreneurial universities. Pittaway maintains his primary position, even when the number of citations per year is taken into account.

It is notable that the three most recently published papers, from 2016 to 2018, occupy the next three positions on the list. This reflects a growing interest in this area. The most recent paper, shown in Table 6, was published in 2021 and addresses the topic of sustainable entrepreneurship. This suggests that this will likely become a more prominent area of interest in this field in the future. The *Journal of Technology Transfer* has seen a significant increase in its position, largely due to the contributions of highly influential authors such as Kirby, Guerrero and Urbano.

Table 6. Most influential (cited) papers in the field of intrapreneurs at entrepreneurial universities.

Rank	Author(s)	Title	Year	Journal	Total Citations
1	Pittaway, L., & Cope, J.	Entrepreneurship Education: A Systematic Review of the Evidence	2007	International Small Business Journal	1043
2	Guerrero, M., & Urbano, D.	The development of an entrepreneurial university.	2012	Journal of Technology Transfer	468
3	Barba-Sánchez, V., & Atienza-Sahuquillo, C.	Entrepreneurial intention among engineering students: The role of entrepreneurship education	2018	European Research on Management and Business Economics	329
4	Muñoz, P., & Cohen, B.	Sustainable Entrepreneurship Research: Taking Stock and looking ahead	2017	Business Strategy and The Environment	287
5	Guerrero, M., Urbano, D., Fayolle, A., Klofsten, M., & Mian, S.	Entrepreneurial universities: emerging models in the new social and economic landscape	2016	Small Business Economics	287
6	Kirby, A.D.	Creating Entrepreneurial Universities in the UK: Applying Entrepreneurship Theory to Practice	2006	Journal of Technology Transfer	273
7	Shepherd, D.A., Wennberg, K., Suddaby, R., & Wiklund, J.	What Are We Explaining? A Review and Agenda on Initiating, Engaging, Performing, and Contextualizing Entrepreneurship	2018	Journal of Management	201
8	Terán-Yépez, E., Marín-Carrillo, G.M., Casado-Belmonte, M.P., & Capobianco-Uriarte, M.M.	Sustainable entrepreneurship: Review of its evolution and new trends	2020	Journal of Cleaner Production	197
9	Ratten, V., & Usmanij, P.	Entrepreneurship education: Time for a change in research direction?	2021	The International Journal of Management Education	193
10	Guerrero, M., Urbano, D. & Fayolle, A.	Entrepreneurial activity and regional competitiveness: evidence from European entrepreneurial universities.	2016	Journal of Technology Transfer	184

Source: authors' own construction.

3.5. Collaborations Between Countries (RQ5)

It is worth noting that the United States does not lead this research field (Figure 4). It appears that intrapreneurship at entrepreneurial universities is a more significant focus in

Europe. Spain and the UK have the highest number of publications, with 39 articles each, and have also established two collaborations. In comparison, the US has 26 publications and one collaboration. This order remains essentially unchanged when the citations are analyzed (UK: 2508, SPAIN: 2384, USA: 819).

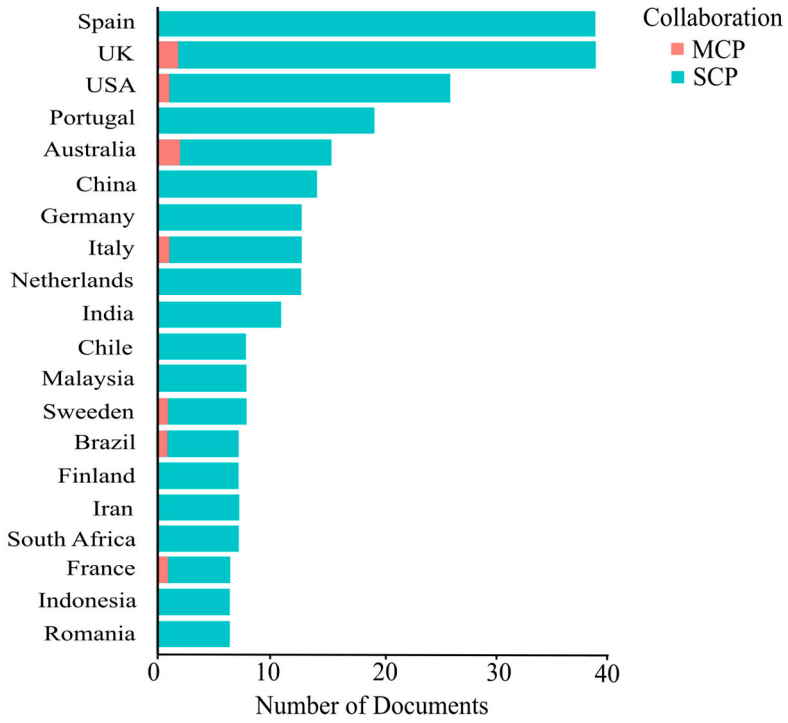

Figure 4. Single country productions and multiple country publications. Source: authors' own construction. Note: MCPs: multiple country publications, SCPs: single country publications.

The level of interest is global, with all continents represented in the top 20. Europe is the clear leader in this field, with 246 papers published, 38.75% of which are from Spain and the UK. Asia produced 80 papers, while North America produced 46, and Australian researchers are also engaged in this field (15 publications with two collaborations). Russia's sole publication was not included in the analysis to avoid distorting the numbers for Asia and Europe.

It is also an interesting fact that in this field, single country publication (SCP) is typical (97.8% of all the relevant documents). With respect to multiple country publication (MSC), it can be seen that UK and Australia had the most collaborations, with two collaborations, respectively.

3.6. Most Influential Journals (RQ6)

The analysis of the top 10 journals based on relevancy (number of articles) and the number of total citations revealed that 32.84% of the papers (134 publications) were published in the top decile of the journals (Table 7). It is to be expected that there will be a high degree of overlap between the number of articles published on a given topic and the total number of citations, although the relative ranks may differ. To illustrate, the *International Journal of Management and Education* published the greatest number of papers (21 articles), yet it is ranked fourth with 616 total citations.

The *Journal of Technology Transfer* is at the forefront of the field, with 1376 citations (more than twice that of the second highest) for its 17 published papers, placing it third in terms of the number of articles. The *Journal of Cleaner Production* also deserves a mention, given the impressive number of citations it has received (437 citations). Despite having published only five articles, it has secured a position on the list.

Table 7. Top 10 journals concerning relevancy and citation.

Sources	Number of Published Articles	Sources	Number of Article Citations
International Journal of Management and Education	21	*Journal of Technology Transfer*	1376
Technovation	19	*International Entrepreneurship and Management Journal*	616
Journal of Technology Transfer	17	*Small Business Economics*	481
Education and Training	16	*Education and Training*	457
Sustainability	15	*Journal of Cleaner Production*	437
Industry and Higher Education	12	*Technovation*	389
International Entrepreneurship and Management Journal	12	*International Journal of Management and Education*	387
Small Business Economics	8	*Sustainability*	223
International Journal of Entrepreneurial Behaviour and Research	7	*International Journal of Entrepreneurial Behaviour and Research*	196
Journal of the Knowledge Economy	7	*Industry and Higher Education*	170

Source: authors' own construction.

3.7. Cluster Analysis of Keywords (RQ7)

Figure 5 is a network visualization that illustrates the co-occurrence of keywords (Keyword Plus) related to intrapreneurs at entrepreneurial universities with a specific focus on themes such as innovation, academic entrepreneurship and intrapreneurship. The colours are used to differentiate between clusters, and the nodes represent key research topics. Larger nodes indicate a higher frequency or relevance, while the links between nodes reflect the strength of their relationships (co-occurrence) in the literature.

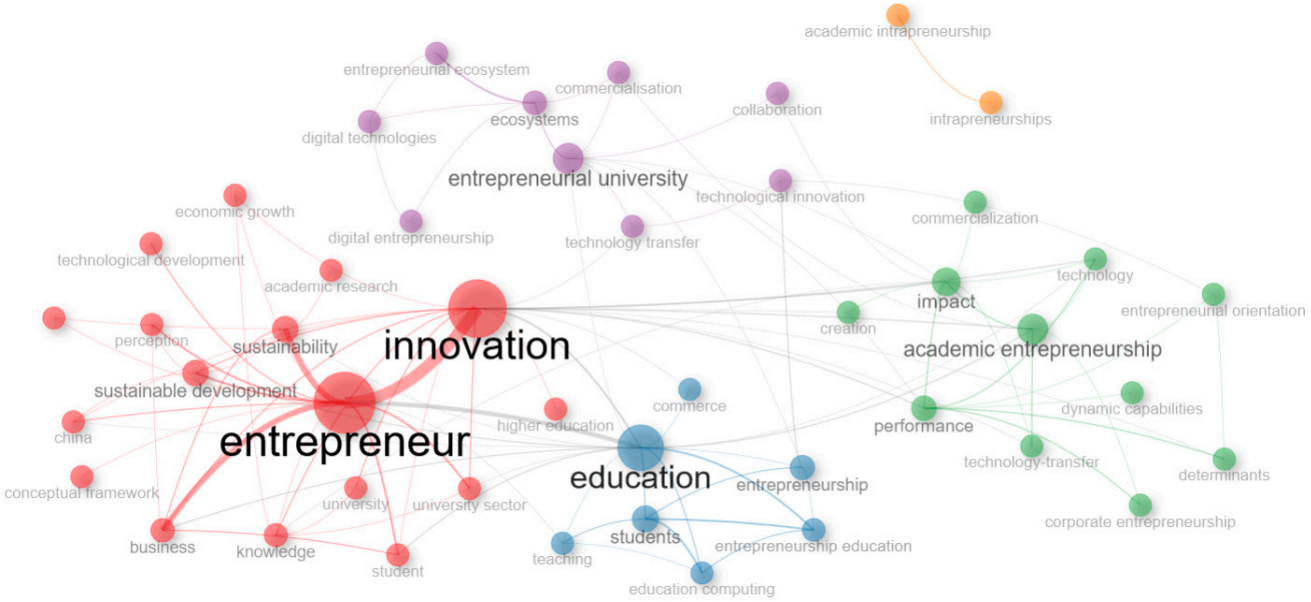

Figure 5. Co-occurrence network by Louvain method for community detection. Source: authors' own construction.

The red cluster (Cluster 1) contains two of the three most relevant terms (entrepreneur and innovation), both of which are central to the studied topic.

These concepts are linked to the main term of Cluster 2 (education), indicating that the intersection of innovation and education is a pivotal aspect of intrapreneurship and related discussions at entrepreneurial universities.

The importance of sustainability and sustainable development is also reflected in Cluster 1, which highlights the growing relevance of these concepts in the context of entre- and intrapreneurship (Rotondo et al. 2023). These terms are situated closer to the centre and are larger than economic growth, as evidenced by recent research that has rated sustainability higher than economic growth. Following Audretsch's (2018) discovery of the links between entrepreneurship and economic growth (2018), the first papers using the keyword "sustainability" were published (Karlusch et al. 2018; Muñoz and Cohen 2017; Qian et al. 2018). The latter soon became a more central topic, although it has yet to gain the attention of the most influential authors.

There are notable overlaps between Cluster 3 (green, led by academic entrepreneurship) and Cluster 4 (purple, led by entrepreneurial university) with regard to technology transfer and commercialization. These terms are primarily from phase 3 of the analyzed publications, indicating that a significant proportion of the research on entrepreneurial universities and academic entrepreneurship places a strong emphasis on these concepts. This is likely due to their crucial role in commercializing academic research and fostering innovation. The entrepreneurial university node is underscored by the ecosystem and digital entrepreneurship, while academic entrepreneurship is closely connected to impact, performance and creation.

The terms "academic entrepreneurship" and "entrepreneurial university" are often used interchangeably, but the figure illustrates the differences in approach, highlighting the confusion around the theoretical approaches and terminologies used. To date, only one publication (Klofsten et al. 2024) has acknowledged the closed relationship between the two terms, even in the context of keyword usage.

The node for intrapreneurship is less integrated into the network and has fewer links compared to the core themes. Its weaker connection to academic intrapreneurship indicates that this area, while pertinent, is not as integrated into the overreaching entrepreneurship discourse at universities. The current research indicates that intrapreneurship in the context of entrepreneurial universities is an emerging topic that has yet to be fully explored. This presents an opportunity for future research.

At the time of this research, based on the keywords, there is only one country visible in this field, namely China (Zhao et al. 2022; Li et al. 2023; Li and Long 2024). Europe, however, is the leader of this topic in the scientific world, mainly because of Guerrero and Urbano (Guerrero et al. 2016).

In conclusion, the visualization demonstrates that intrapreneurship is a less integrated or emerging theme in the broader discourse of entrepreneurial universities, with much of the focus remaining on more central themes such as innovation, entrepreneurship education and sustainability. This may indicate a need for future research or an opportunity for future investigation into the role of intrapreneurs within these institutions.

3.8. Dominant Themes and Topics (RQ8)

To analyze the dominant themes and topics of intrapreneurs at entrepreneurial universities, three different tools of biblioshiny were used.

In the overview of the thematic evolution, we used the three-field plots in two different ways:

- How the keywords used by the authors changed during the three periods determined in Table 3;
- How the journals, the most influential authors and the keywords are connected.

Trend topics are used to represent the most important keywords and the period when they were used.

A thematic map was used to place the 500 most frequently used keywords in a four-quadrant figure according to their development degree (density) and relevance (centrality).

It helped us decide the basic, motor, and niche topics and gave hints about emerging or declining topics, too.

3.8.1. Thematic Evolution

Figure 6 illustrates the evolution of the keywords utilized throughout the three phases. In phase 1 (1990–2008), the keywords were limited to academic entrepreneurship, entrepreneurialism and entrepreneurship. In phase 2 (2009–2014), intrapreneurship emerged and gained significant traction for phase 3 (2015–2024). Furthermore, it is evident that there is a clear connection between this concept and the concept of entrepreneurial universities.

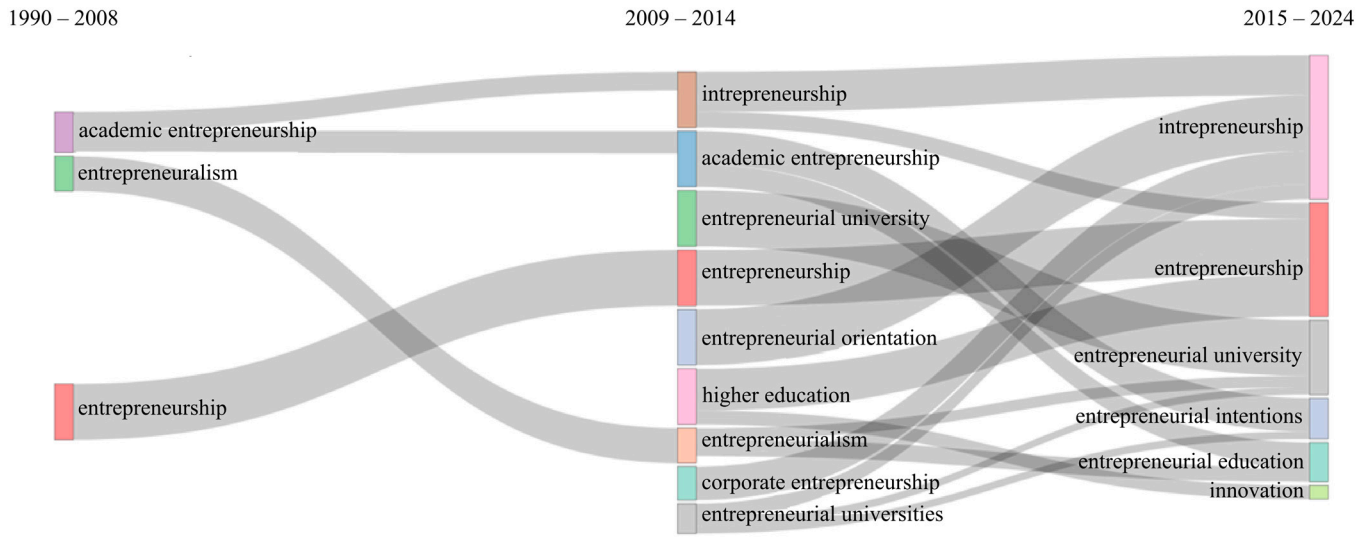

Figure 6. Thematic evolution of the research in three phases. Source: authors' own construction.

A key question was whether certain terms, such as "academic entrepreneurship", "entrepreneurial university" and "entrepreneurship education", could be considered synonyms. However, after careful consideration, it was determined that their subtle nuances made it necessary to examine them separately. Figure 6 demonstrates that following the expansion of keywords in phase 2, a refinement occurred in phase 3, with intrapreneurship and innovation becoming key factors in the development of the topics.

Figure 7 presents the journals in which the most influential authors publish their work and the keywords they utilize.

The concentration of the journals is demonstrated by the fact that only three of these journals published the work of more than eight of the most influential authors. The present study indicates that this is due to the successful partnership between Guerrero and Urbano. There is a significant discrepancy in the number of keywords utilized by the authors. Nearly all of them have included at least four of the most prevalent keywords, which indicates that influential authors tend to work with the most frequently used keywords.

The word 'entrepreneurship' has the most mentions, while the original search term of this research, 'entrepreneurial university', is only the second most frequent. 'Higher education' and 'academic entrepreneurship' are close, while 'entrepreneurship education' is less connected to our research terms.

It is important that 'innovation' is the fourth most frequently used keyword, representing the leverage of the marketization of the results.

'Intrapreneurship' appears underexplored compared to broader topics like 'innovation' or any form of a keyword connected to higher education, suggesting a research gap or emerging area that could be developed further.

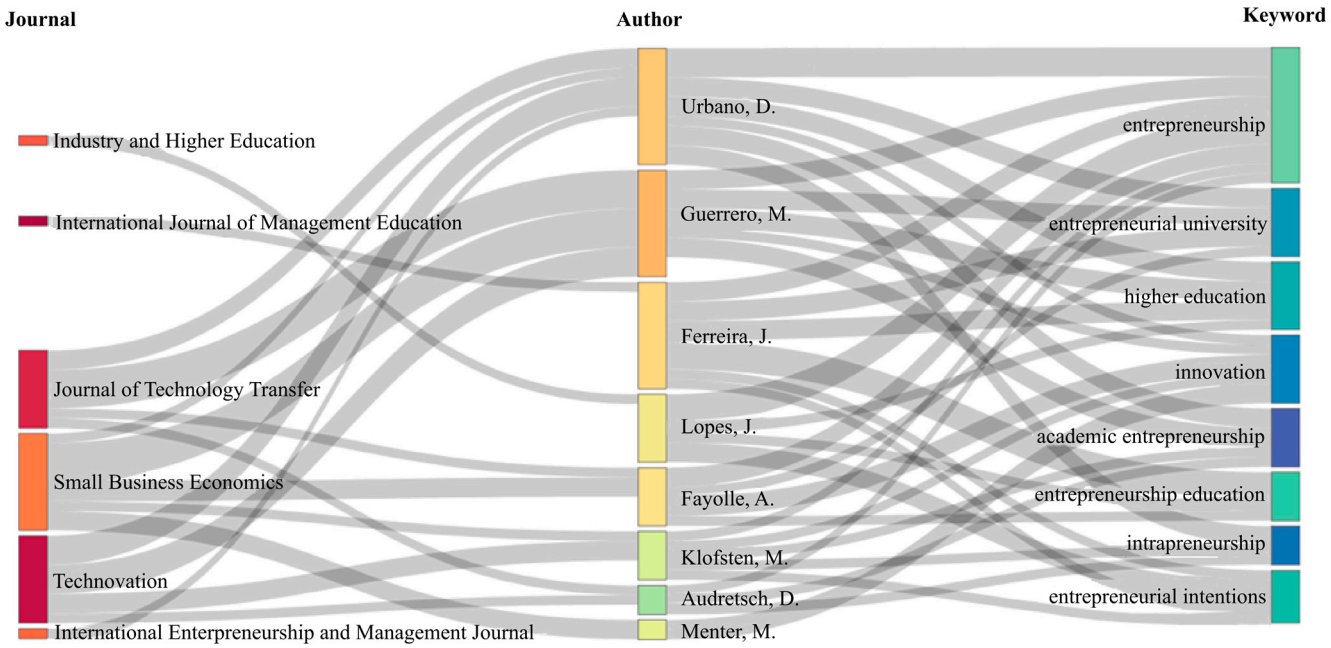

Figure 7. Three-field plot. Source: authors' own construction.

3.8.2. Trend Topics

The focus of current trends has shifted significantly over the past two decades. Figure 8 depicts the most prevalent keywords and the period during which they were utilized.

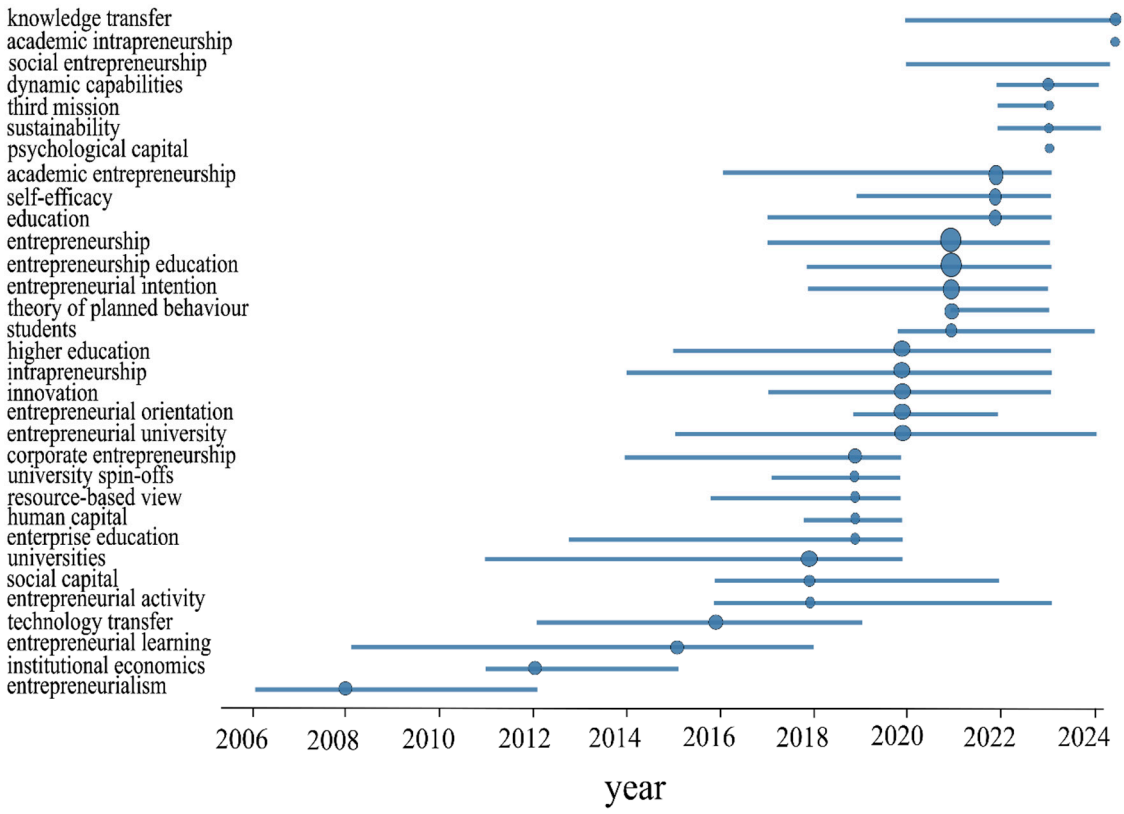

Figure 8. Trending keywords and topics over the studied period. Source: authors' own construction.

The size of the node is indicative of the frequency of use. It is noteworthy that academic intrapreneurship has secured a position among the top 32 keywords, despite its

relatively recent emergence. This demonstrates the emergence of the topic in the scientific literature. It is notable that some other topics, such as university spin-offs (in 2020) or the earlier important term of entrepreneurialism (in 2012), appear to have been overlooked in previous research. Conversely, other topics have undergone a transformation, including entrepreneurial learning becoming entrepreneurship education (in 2018) and technology transfer becoming knowledge transfer (in 2020).

3.8.3. Thematic Map

The thematic map presents a visual representation of the classification of topics based on the authors' keywords, organized into four quadrants (Figure 9) according to their development degree (density) and relevance (centrality). The 500 most frequently used keywords were selected, with a maximum of five labels per cluster if the frequency of use by the authors is equal to or greater than ten. The Louvain algorithm, an efficient hierarchical clustering algorithm based on graph theory (Zhang et al. 2021), was used.

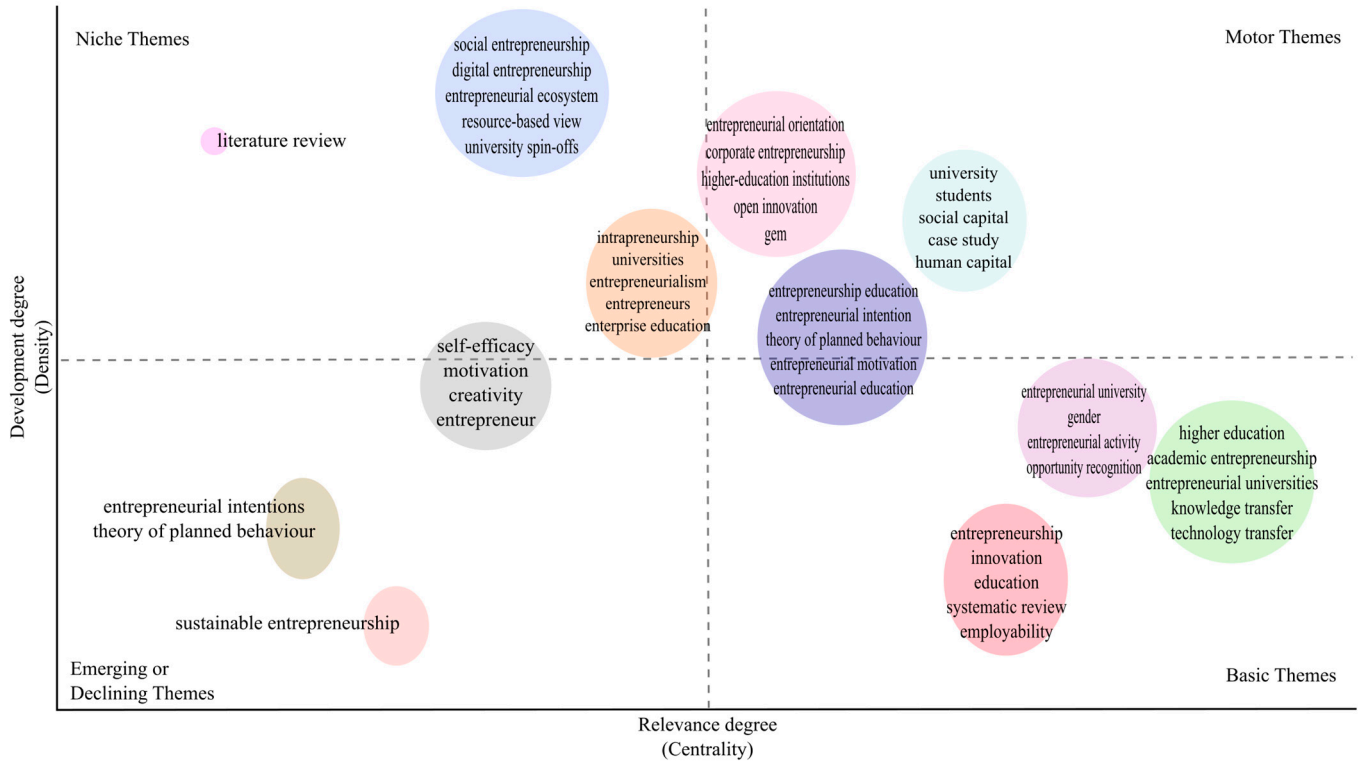

Figure 9. Thematic map of the most frequently used keywords. Source: authors' own construction.

The upper-right quadrant, which focuses on motor themes, includes well-developed and highly relevant topics such as entrepreneurial orientation, corporate entrepreneurship, and entrepreneurship education. This highlights their centrality and importance within the field. It can be said that these topics are crucial for advancing knowledge in the field of entrepreneurial universities.

The lower-right quadrant (basic themes) contains fundamental but underdeveloped areas like entrepreneurial universities, knowledge transfer and technology transfer, indicating that these are essential yet less densely researched topics, suggesting significant opportunities for further exploration and research growth.

The upper-left quadrant (niche themes) includes specialized areas such as social entrepreneurship, digital entrepreneurship and university spin-offs. These areas are highly developed but less central to the broader field. This suggests that there is a specialized interest in these areas that might offer specific or applied insights.

While intrapreneurship is a prominent theme, the lower-left quadrant (emerging or declining themes) illustrates less developed and peripheral themes. These include sustainable entrepreneurship, an emerging area, and entrepreneurial intentions and the theory of planned behaviour, which are in decline.

This structure offers valuable insight into the maturity and significance of different research themes related to intrapreneurship in entrepreneurial universities, while also identifying potential areas for future investigation.

3.9. Collaborations Network

A review of the 50 most influential authors using the Kamada–Kawai method (Kamada and Kawai 1988) indicates that Guerrero is the central figure and her primary and most frequent collaborator is Urbano. Additionally, both authors have collaborated with other researchers on an occasional basis, including Fayolle, Gajon, Heaton and Klofsten, who have published joint papers (Figure 10).

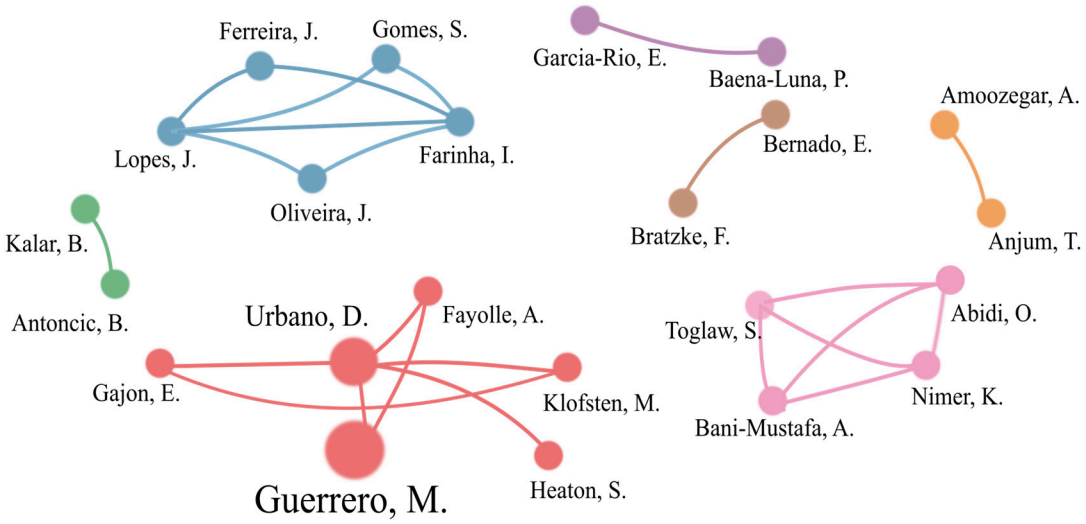

Figure 10. Collaborations network. Source: authors' own construction.

It is evident that there are three larger clusters and four additional pairs of authors who are engaged in research on this topic, with no apparent connections between these groups. The collaboration network analysis suggests that future researchers should either join prominent figures in the field or collaborate with other authors to form a cluster.

4. Conclusions

A review of the literature on intrapreneurs at entrepreneurial universities revealed that although publications have been present since 1990, this is an emerging topic, with research starting with the development of entrepreneurial universities but gaining significant attention in 2015 with the introduction of the Sustainable Development Goals (SDGs) by the United Nations. This may be attributed to the fact that organizations, including universities, comprise individuals whose personalities and aspirations shape the organizational environment. This topic has been primarily researched in the corporate environment (Rutherford and Holt 2007; Kearney et al. 2010; Guerrero et al. 2016).

Overall, 72.30% of the papers were cited less than 50 times and only 5.88% achieved more than 100 citations.

Even the 10 most productive authors have a low number of published articles (19-3) due to the relative novelty and the niche character of the topic.

We have concluded that the role of intrapreneurs at entrepreneurial universities is a topic of global interest, although it is interesting that instead of the US, Europe leads in the number of publications (Spain (39) and the UK (39(2)), whose number of publications is raised by the two leading authors, Guerrero and Urbano.

The collaborations of the authors have led to the concentration of journals too, as only three of the journals have published the work of eight or more of the most influential authors.

In the context of universities, the scientific literature on entrepreneurship and intrapreneurship tends to focus on students and their education. However, it is evident that the intrapreneurial characteristics of academics and staff play a crucial role in fostering an entrepreneurial university environment. The current research has identified avenues for further investigation, including the growing importance of sustainability over economic growth and the potential influence of limited scientific interest on the conclusions drawn in academic papers.

The trending topics changed from time to time. While the term 'entrepreneurial university' appeared in 2015 and 'intrapreneurship' appeared in 2014 in the analyzed literature, both are among the most substantial key topics. The role of 'entrepreneurial education' is unavoidable in the context of entrepreneurial universities. Interestingly, the term university spin-offs disappeared, but the word 'startup' has not yet become a trend, although startups are the baseline of innovation ecosystems.

The analysis of the topics represented that among the basic topics of education, innovation, technology, and knowledge transfer, the topic of sustainable entrepreneurship is emerging. In our opinion, due to climate change, sustainability will gain space in the future. The motor themes are mainly connected to education (university students, entrepreneurship education), while surprisingly the entrepreneurial ecosystem was listed among the niche topics.

We should notice that as the status of the different universities is diverse, the terms used in the literature in a period can be totally different. For example, if a university is at the beginning of its development into an entrepreneurial university, educational aspects are more at the forefront, while for more developed ones, knowledge and then technology transfer are more attractive terms.

The keywords formed clusters, with weak links among them. The figures identified similarities (commercialization, knowledge and technology transfer) and differences between the terms entrepreneurial university and academic entrepreneurship. The latter is more connected to impact and performance, while the most commonly used term, entrepreneurial university, is based on digitalization. The biggest cluster contains the terms sustainability and sustainable development, indicating the indispensability of it in the vision of the future.

5. Limitations and Topics for Further Research

Among the limitations of this paper, it should be mentioned that although we used two databases (Scopus and WoS), impactful papers could have been excluded. We tried to include the Dimensions database, but unfortunately, some important data were missing, making the comparison impossible. Non-English language publications were excluded as most of the literature is in English.

The use of bibliometric methods is another limitation and had an effect on the analysis (e.g., the figures), and moreover, we have to acknowledge that the number of citations does not necessarily indicate the quality of the papers and instead mainly indicates if the publication is recent (as many are in this field). Some of the authors can have more affiliations or can change affiliations over time, which means that the validity of the analysis is limited in time.

Although we tried to identify future topics of the research field like intrapreneurship in the context of entrepreneurial universities, the analysis is based on the trends of past and present publications. This could be refined by using the grey literature (like policy papers and reports) in the analysis.

In the research, interdisciplinary studies that examined the entrepreneurial ecosystems of universities were not taken into account.

Despite all the limitations, this paper contributes to the discussion on intrapreneurs at entrepreneurial universities by shedding light on the current research in the field. The re-

sults can help future researchers looking to explore this topic further; policy makers to gain a better understanding and identify the most impactful authors; and journals, universities and countries, as well as indicate the major research gaps and the emerging topics.

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