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A BIBLIOMETRIC AND TOPIC MODELING ANALYSIS OF ENTREPRENEURIAL EDUCATION AND ENTREPRENEURIAL INTENTION FORMATION

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Abstract

We examine the field of Entrepreneurship Education (EE) and Entrepreneurial Intention (EI) through bibliometric analysis and topic modeling to map its current intellectual landscape. Drawing on 390 documents from the Scopus database published between 2018 and 2023, we conduct a comprehensive analysis incorporating performance metrics, bibliographic coupling, topic modeling, and methodological assessment. Our findings reveal a growing scholarly focus on entrepreneurial education and intention formation. Bibliographic coupling analysis identifies six distinct research clusters addressing: the dynamics of entrepreneurial education and innovation, gender's role in entrepreneurial education, self-efficacy, antecedents of entrepreneurial intention, and applications of the theory of planned behavior. Complementing this structural analysis, Latent Dirichlet Allocation (LDA) topic modeling of article abstracts uncovers fifteen significant thematic areas that signal promising directions for future research. We advance understanding of the field's intellectual evolution by systematically mapping its knowledge structure and emerging themes. Our findings offer valuable implications for researchers, educators, and policymakers seeking to strengthen entrepreneurial education and cultivate entrepreneurial intentions among learners.

Keywords: *Entrepreneurial education, Entrepreneurial intention, Bibliometric analysis, Bibliographic coupling, Topic modeling*

1 INTRODUCTION

To foster the development of entrepreneurs globally, it is crucial to improve education related to entrepreneurship. Peter Drucker quoted in (Kuratko, 2003) has said, "The entrepreneurial mystique? It's not magic, it's not mysterious, and it has nothing to do with genes. It's discipline. And, like any discipline, it can be learned." In the realm of research on university entrepreneurship, the focus has consistently been on the entrepreneurial intention (EI) of students in higher education, specifically their inclination to create new ventures. The influence of Entrepreneurship Education (EE) can be gauged by the shift in students' EI. Simultaneously, in alignment with the Theory of Planned Behavior (Ajzen, 1991), behavioral intention serves as a

robust predictor of actual behavior, suggesting that individuals with high entrepreneurial intentions are more prone to emerge as future entrepreneurs. In the realm of entrepreneurship literature, it is widely acknowledged that entrepreneurial intention serves as the most effective tool for anticipating entrepreneurial conduct. Considering this, academic endeavors have concentrated on elucidating the factors that precede and influence this intention. Most studies on entrepreneurship education suggest a positive correlation between entrepreneurial education and the actual rates of entrepreneurship (Fayolle & Liñán, 2014; Lima et al., 2015).

Entrepreneurship education presents a potential avenue for nurturing the factors influencing entrepreneurial intentions and enhancing entrepreneurial skills (Bae et al., 2014). Numerous academic institutions have incorporated entrepreneurship-related courses and seminars into their curricula to cultivate entrepreneurial attitudes, skills, and personal traits. This approach equips individuals with the essential tools required to initiate and manage a new business (Fayolle, 2018; Wu et al., 2022). The impact of entrepreneurship education on entrepreneurial intentions has sparked a plethora of studies connecting both concepts. However, the outcomes haven't been as definitive as anticipated. Despite this surge in research, a notable deficiency in systematization and coordination persists, necessitating a fresh start with each new study (Fayolle & Gailly, 2015).

Our study is relevant to understanding how crucial entrepreneur education is in forming students' intentions to start a venture. Also, there is a need for evidence-based insights to improve the educational frameworks and policymaking on the part of educational institutions. Incorporating recent literature is crucial in any research field to ensure that the study reflects the current state of knowledge and addresses contemporary issues.

The field of entrepreneurship education is getting notable attention in terms of research studies and the domain, the reason being the significance of entrepreneurship at all levels. This encompasses various reviews of entrepreneurship education that advance a thorough comprehension of this discipline. Galvão et al., (2018) reviewed 383 studies of entrepreneurial education published during the period 1973-2016 and suggested a fresh, comprehensive viewpoint for upcoming research and emphasis on the co-dependence of universities, industries, and governments. After reviewing 159 studies that were released during 2004-2016 in top journals for management and entrepreneurship. Nabi et al. (2017) criticized a few shortcomings of entrepreneurship education research, which are concerned with intention-action gaps, and suggested new research directions. In more recent times, the research trajectory of entrepreneurship education, the identification of new research horizons, and the exploration of emerging trends in literature were investigated by (Tiberius & Weyland, 2023). A comprehensive literature review and bibliometric analysis by (R. T. Syed et al., 2023) attempted to identify a relationship between entrepreneurial education and entrepreneurial intention. Nevertheless, the substantial global growth of entrepreneurship education necessitates a more exhaustive and detailed analysis of studies on the subject. The rapid growth of the dynamics of entrepreneurship education calls for a comprehensive analysis of the development path and recent and upcoming trends in the field of entrepreneurial education.

The study will answer the following research questions:

RQ 1: What are the emerging research directions and trends in the field of entrepreneurial education and entrepreneurial intention?

RQ 2: What is the intellectual structure and key research themes in the field of entrepreneurial education and entrepreneurial intention?

RQ3: What are the methodological limitations of the existing literature on entrepreneurial education and entrepreneurial intention?

RQ 4: What are the research gaps and scope for future studies in the field of entrepreneurial education and entrepreneurial intention?

Addressing the above research questions, we present a comprehensive analysis of global literature to understand the evolution of contemporary research in the domain. This study contributes to

the literature in terms of key themes and significant topics of the domain, which are underexplored, i.e., STEM education and industry interface, the impact of E-learning and innovative pedagogies, the role of social entrepreneurship, and gender perspective in entrepreneurship education. The methodological analysis in the current study has also contributed to the literature by identifying the methods that need to be used to get the measurable impact of entrepreneurial education on intention. The current study has used techniques such as bibliographic coupling, citation analysis, and topic modeling to determine the intellectual structure, key themes, and significant topics of the recent times. Bibliometrics analysis offers a systematic, comprehensive visualization of themes and clusters of the domain. It has also applied topic modeling to complement the bibliometric coupling technique for better results. Secondly, we pinpoint areas within entrepreneurial education and entrepreneurial intention that require heightened attention, such as a growing focus on innovative pedagogies and the significance of dynamics in entrepreneurial education. Upcoming research should aim to explore the dynamics in entrepreneurial education, and the intentions-actions gap among university students, because it is crucial to enhance the rate of entrepreneurship and own ventures to get the potential financial outcomes that could be realized for national growth.

2 LITERATURE REVIEW

A country's elevated level of entrepreneurship corresponds to heightened economic growth, development, and innovation (Sánchez, 2013). Entrepreneurship contributes significantly to societies, contributing to heightened economic efficiency, the expansion of employment options, and the transmission of innovation to the market (Shane & Venkataraman, 2000). With the growing importance of entrepreneurship, it becomes necessary to acquire the skills and knowledge required. Peter F. Drucker (1953) incorporated the idea of innovation in entrepreneurship education.

As per Deveci (2022) the initial article on entrepreneurship education within an academic setting, as per the inclusion and exclusion standards, was established in 1991. The quantity of articles has risen since the year 2000. Numerous studies have investigated the most effective methods for teaching entrepreneurship. Nabi et al. (2017) in their study discussed pedagogies and their importance in entrepreneurial education and intention for university students. They analyzed 159 studies based on empirical evidence, published between 2004 and 2016, investigating the effects of entrepreneurship education in university education on diverse entrepreneurial achievements. The authors have used the research framework based on pedagogies in a systematic review (Fayolle & Gailly, 2015) and the measures of impact (Henry & Lewis, 2018) utilized in entrepreneurship education. They emphasize studies that refer to the temporary subjective indicators of lower impact levels of pedagogies in entrepreneurial education.

The literature has also shown that gender perspective is significant in the entrepreneurial intention domain. Many studies have examined gender roles in the formation of entrepreneurial intention. Gabrielsson et al. (2020) analyzed 1341 articles in the domain of entrepreneurial education and found that this field is getting significant attention from research scholars. According to Gabrielsson et al. (2020), Research focusing on teaching methods in entrepreneurial education has evolved into a notable research stream within the domain of entrepreneurial education studies. This development is characterized by a discernible knowledge structure in key topics and seminal research works, alongside several primary journal outlets for discussions and circulation of research outcomes. Syed et al. (2023) reported that a notable surge in publications over the past decade aligns with the period during and following the global economic downturn of 2008–2010. During this previous decade, governments and Higher Education Institutions (HEIs) worldwide have increasingly prioritized and invested in the development of entrepreneurial HEIs. He listed the USA, UK, and European countries among the top 5. The study reveals that 'Research commercialization and venture creation' and 'Entrepreneurial mindset and skills development' are the most prominent clusters in his study of 1072 articles for the period of 1996-2020.

The 'Education and Training' journal represents the most extensively studied theme within the en-

trepreneurial education and intentions domain, a finding of Deveci (2022), which aligns with the results of our study. Research on ethnic entrepreneurship within the framework of market expansion predominantly occurred in industrialized countries from 1988 to 2018, with a lesser proportion in emerging nations, particularly in Asia. Rodriguez-Ulcuango et al. (2023) discussed different factors that determine entrepreneurial intention, and entrepreneurial education is one of them.

Batista-Canino et al. (2024) in their review note a growing interest and emerging focus on women's entrepreneurial intention and the effects of digital transformation. The study addresses the significance of diverse and underrepresented regions and encourages the use of interdisciplinary frameworks. Another review (Chaudhary, 2024) discovers that in ASEAN+3 countries, entrepreneurship education is crucial for economic growth and innovation, but still, many higher education institutions are facing challenges due to scarce resources in comparison to other Western countries. Haji (2025) highlighted the factors such as personal motivation, social influences, and perceived self-efficacy that consistently affect entrepreneurial intention. Emerging research is focusing on contextual variances, digital influences, and policy interventions.

A growing number of studies on entrepreneurial education are emerging. Nevertheless, a structured review can encompass a limited number of these studies. The current study addresses this gap by offering a comprehensive, quantitative and structured evaluation of the entrepreneurial education domain, the education–industry interface, current topics in entrepreneurial education studies, and prospects for future research in the field of entrepreneurial education with a significant influence of technology.

3 METHODOLOGY

We have analyzed the period 2018–2023 to confine the most recent and relevant developments in the field of entrepreneurship education and intention. Although articles in this domain have been indexed in Scopus since 1997, the overall volume of research remained very limited until 2017, with fewer than 80 articles published. To ensure that our analysis highlights the contemporary trends, themes, and directions, we deliberately focused on the 2018–2023 period, which represents the most dynamic phase of this domain. Furthermore, bibliographic coupling, one of the techniques used in the study, works better for shorter periods (Zupic & Čater, 2014).

To understand the most significant influences of entrepreneurial education on entrepreneurial intention, and how the available literature is structured, we performed a bibliometric study. Bibliometrics methods are more significant in current times when comprehensive databases and critical analysis technologies are available. These methods are helpful in integration with traditional methods. Bibliometrics provides a broader overview of a research domain, which includes publications, journals, and authors (Merigó & Yang, 2017). Bibliometrics analysis is a part of scientific methods that uses statistical and mathematical techniques to examine the scientific events within a research domain (Callon et al., 1991). Scientific mapping and performance analysis are the two major approaches applied under bibliometrics analysis (Noyons et al., 1999).

Performance analysis is the technique to measure and evaluate the performance of different elements with published output in terms of the country, authors, affiliated institutions, and trends throughout time. The number of research publications and citations per year is the most significant measure of performance (Donthu et al. 2021). In a particular research domain, performance analysis also defines the contribution by authors and journals by measuring the frequency of citations to specific research (Heradio et al., 2016).

However, bibliometric or scientific mapping analysis investigates the relationships between publications, revealing the composition and development of the research field (Ding & Yang, 2022). Bibliographic analysis, co-word analysis, and citation analysis are a few techniques of scientific analysis. These techniques are significant in providing the intellectual structure of the research domain (Donthu et al., 2021). The goal of science mapping is to depict the configuration and evolution of scientific domains (Zupic & Čater, 2014).

Table 1: Review studies on entrepreneurial education and entrepreneurial intention

Year	Author	Title	Journal
2025	Anton Stuwart, Mansingh Paul	Entrepreneurial self-efficacy among students: a bibliometric mapping and topic modelling approach	Entrepreneurship Education
2024	Saloni Chaudhary	Mapping the Scientific Landscape of Academic Entrepreneurship in ASEAN Plus Three Countries: A Scientometric Exploration	Journal of Scientometric Research
2024	Rosa M. Batista-Canino, Lidia Santana-Hernández, Pino Medina-Brito	A holistic literature review on entrepreneurial Intention: A scientometric approach	Journal of Business Research
2023	Olga Rodriguez-Ulcuango, Cristian Guerra-Flores, Gabith Quispe Fernandez, Dante Ayaviri-Nina, José Miguel Giner-Pérez	Bibliometric Analysis of Determining Factors in Entrepreneurial Intention	Academic Journal of Interdisciplinary Studies
2023	Victor Tiberius, and Michael Weyland	Entrepreneurship education or entrepreneurship education? A bibliometric analysis	Journal of Further and Higher Education
2022	Hiranya Dissanayake, Anuradha Iddagoda, Catalin Popescu	Entrepreneurial Education at Universities: A Bibliometric Analysis	Administrative Sciences. An Open Access Journal from MDPI
2022	Juan-José Najera-Sánchez, Cristina Pérez-Pérez, Thais González-Torres	Exploring the knowledge structure of entrepreneurship education and entrepreneurial intention	International Entrepreneurship and Management Journal
2022	Gao Tingting, Yang Jiangfeng and Ye Yinghua	A bibliometric analysis of college students' entrepreneurial intention from 2000 to 2020: Research trends and hotspots	Frontiers in Psychology
2022	Syed M. Afraz Hassan Gillani, Aslan Bin Amat Senin, Jürgen Bode, Muniba, Syed M. Ahmad Hassan Gillani	Bibliometric Analysis of Digital Entrepreneurial Education and Student Intention; Reviewed and Analyzed by VOSViewer from Google Scholar	Dynamic Relationships Management Journal
2022	Raihan Taqui Syed, Dharmendra Singh, David Spicer	Entrepreneurial higher education institutions: Development of research and future directions	Higher Education Quarterly Wiley
2021	Carmen Florina FAGADAR, Diana Teodora TRIP, And Daniel BADULESCU	Entrepreneurial Competencies and Higher Education Institutions: A bibliometric study	Journal of e-Learning and Higher Education
2021	İsa Deveci	Review of Entrepreneurship Education Literature in Educational Contexts: Bibliometric Analysis	Participatory Educational Research (PER)
2020	Jonas Gabrielsson, Gustav Hagg, Hans Landstrom and Diamanto Politis	Connecting the past with the present: the development of research on pedagogy in entrepreneurial education	Education and Training
2019	Gloria Aparicio, Txomin Iturralde, Amaia Maseda	Conceptual structure and perspectives on entrepreneurship education research: A bibliometric review	European Research on Management and Business Economics
2018	Anderson Galvao, Joao J. Ferreira, Carla Marques	Entrepreneurship education and training as facilitators of regional development A systematic literature review	Journal of Small Business and Enterprise Development
2017	Nabi, G., Linan, F., Fayolle, A., Krueger, N., Walmsley, A.	The impact of entrepreneurship education in higher education: A systematic review and research agenda	Academy of Management Learning & Education

3.1 Data source and extraction

Scopus database has been recognized as one of the key platforms for peer-reviewed scientific research literature (Marzi et al., 2025). The Scopus database is the largest database, with over 27 million abstracts currently accessible (Burnham, 2006). We have used the Scopus database only for a few reasons. First, using a single database to avoid citation inflation and duplication of articles. Second, Scopus is the source of relevant and varied disciplinary journals, which is significant for analyzing the intellectual structure of a specific research domain inflation (Donthu et al., 2021; Plekhanov et al., 2023).Furthermore, the data available on Scopus is consistent for analyzing co-citation, co-word, and co-author analysis without manual synchronization (Wang et al., 2018).

Web of Science is a prominent database that focuses on significant research publications in the field of sciences and provides more through historical coverage (Mezquita et al., 2025). On the other hand, the Scopus provides publications, comparable journals in applied, interdisciplinary, and emerging domains (Powell & Peterson, 2017) and covers more journals than Web of Science, especially recent and international publications. We understand that single-database systems could overlook records that are exclusively indexed elsewhere; therefore, we reported complete search strings and filter boundaries. There is a large overlap between Scopus and Web of Science; both have broad coverage, and studies often use only one database (Marzi et al., 2025; Zupic & Čater, 2014). Therefore, using only Scopus database for bibliometric analysis is warranted.

Data is extracted using the Scopus database. The keywords **"entrep* education" and "entrep* Intention*"** were used for search criteria to identify articles. The search keywords used were confirmed based on expert recommendations and past literature. The initial search produced 1047 documents. The results show that the current domain has received more attention from researchers in the past three years.

For more precise results, we have applied five criteria to enhance the selection process. The period is defined as 2018 to 2023, as the purpose was to map the contemporary literature from the research field. The selected articles must be related to the fields of 'business, management, accounting' and 'Economics, Econometrics, and Finance' as these fields are more relevant to the given study. The other criterion was to select only peer-reviewed research articles, as we required the articles to be scientific papers released in scholarly journals, as these are viewed as credible information sources (Podsakoff et al., 2005). The articles only in the English language are considered (Cardella et al., 2020). After applying the above-mentioned filters, we have received 390 documents. With a manual check, it was confirmed that there were no duplicate or ineligible documents in the dataset. A bibliometric review workflow adapted from (Marzi et al., 2025) is presented in Fig. 1, showcasing the steps of the data extraction process.

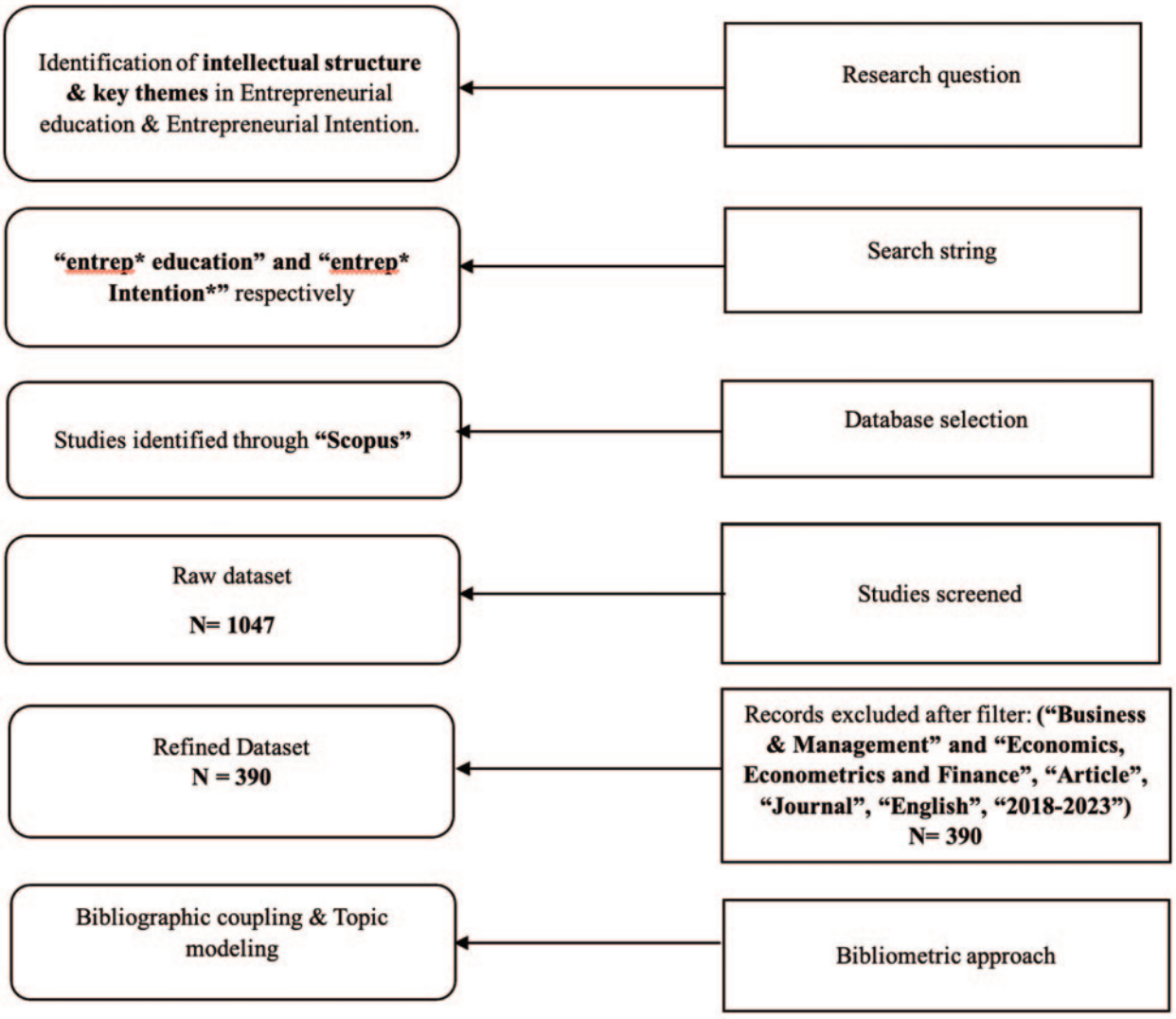
For our investigation, we used the VOS viewer program, version 1.6.10. With the use of this software's bibliometric techniques, clusters within a strategic matrix may be graphically shown, identified, and categorized based on their likenesses and dissimilarities. Making graphical maps enables a deeper examination of the relationships between variables, improving our understanding of a research field's features and establishing it as a crucial analytical tool (Vallaster et al., 2019).

In the current study, we have used both methods, performance analysis and science mapping. 1) Performance analysis- top 20 cited documents and journals. 2) Bibliographic coupling, 3) Methodological analysis, and 4) Topic modeling.

3.2 Performance Analysis-Top 20 cited documents and journals

Performance analysis evaluates published output by country, author, connected institution, and growth trend over time to provide insights into the performance of various constituents (Donthu et al., 2021). As a fundamental technique of bibliometrics methods, performance analysis is crucial, especially when analyzing the most cited articles and journals, as it helps the other researchers to determine the reliable channels and work that have significant contributions in the research domain. As per Teplitskiy

Figure 1: Workflow for bibliometric review (adapted from Marzi et al., 2025)



et al., (2022) most cited journals indicate the source of significant research in the research field and high-citation publications representing the intellectual standards, influencing the later research in terms of methods and agendas

3.3 Bibliographic coupling

A bibliographic coupling mostly assesses recent scientific publications, and scholarly papers are linked and cited using references in their knowledge foundation (Zupic & Čater, 2014). Bibliographic coupling, a science mapping technique under the bibliometrics methods, has been used in various practical contexts to help practitioners and policy-makers (Trang et al., 2023). By analyzing the shared references of documents, researchers can identify the foundational studies that have shaped a field and track how these foundations have evolved (Ma et al., 2022). Bibliographic coupling strength indicates the number of shared references between two documents. Overlapping bibliographies suggest a stronger similarity between them. Bibliographic coupling focuses on primary documents that cite identical secondary sources. Bibliographic coupling is more appropriate method to map current clusters of documents than co-citation as the coupling mea-

sure is not dependent on accumulated citations. The strength of the connection between two sources increases with the growing number of shared references (Martyn, 1964).

Bibliographic Coupling offers insights with respect to current trends and future priorities, examining the pathways, strengths, and gaps within the structure and evolution of distinct research domains. The technique of bibliographic coupling (based on documents) was employed on the database (390 documents) of entrepreneurial education and entrepreneurial intention, from which the top 250 documents with the greatest total link strength were chosen for visualization. To avoid biases in the bibliographic coupling, the number of citations is limited to zero, so that older articles cannot get the advantage of time. By using link strength as a criterion, the selection emphasizes documents that are strongly interlinked and contribute significantly to the core themes of the research domain, and this ensures that the analysis focuses on the most influential and relevant works within the dataset. Documents with stronger bibliographic coupling share more intellectual foundations, leading to more coherent and interpretable topic clusters. A smaller, high-quality subset of documents allows for more robust and meaningful topic modeling.

In VOSviewer, the resolution parameter is used to control the level of detail in the clustering process. Visualization is generated using a resolution size of 1.05 to achieve an optimal balance between interpretability and detail, avoiding both overdivision and overly broad clusters. The visualization's clarity and reliability were improved by setting the minimum cluster size at 5 to ensure that only significant clusters with adequate bibliometric weight were included. Our analysis resulted in six clusters as per the criteria given in the VOS viewer software visualization. The graphic network of visualization is shown in Fig. 3.

3.4 Topic modeling

The field of "generative probabilistic modeling" gave rise to topic modeling, which was first established in the 1980s. Topic modeling has also been applied to the analysis of bioinformatics data, and it works especially well with text data (Liu et al., 2016). Topic modeling is a statistical algorithm that reveals the underlying word clusters in a collection of text documents based on an unsupervised machine-learning approach (Blei, 2012). It helps examine the substance of scientific publications to find links, patterns, trends, and their evolution over time that might not be immediately obvious in large and complex datasets (Yang, 2024) (L. T. Nguyen et al., 2024). Topic modeling can help in interdisciplinary research by pointing out possible areas of correlation (Arzani et al., 2023).

One of the most effective text mining methods for detecting correlations between data and text is topic modeling, which is also useful for identifying latent data. Latent Dirichlet Allocation (LDA) is among the most widely recognized in this field (Jelodar et al., 2019). The LDA method, which is the Bayesian probabilistic model, adheres to the principle that documents (comprising titles, abstracts, and keywords) function as a random collection of latent topics, where each topic represents the word distribution (Blei et al., 2003). It comprises four basic parameters: text pre-processing, selection of model parameters, the number of topics to be created, and evaluation of reliability and validity (Asmussen & Møller, 2019). As mentioned by Kaushik et al., (2023) in the LDA method, "topics" are to be identified within a set of documents. In our study, 390 documents are analysed, where each abstract acts as a document.

The LDA model has four steps proposed by Griffiths et al. (2004) as the Gibbs sampling method. The first step is text preprocessing. As a text mining technique, topic modeling requires the dataset to undergo considerable pre-processing before analysis (Maier et al. 2018). Data preprocessing includes lowercasing, removal of stop words and punctuation, lemmatization, and construction of a document term matrix (DTM) (Churchill & Singh, 2021). Under the second step, a set number of topics is defined with the conditional probabilities of both the word's likelihood within a topic and the topic's relevance within a document, governed by Dirichlet hyperparameters (Schwarz, 2018).The next step is to identify the optimal number of topics; for this, different K values are evaluated using statistical mea-

sures such as log-likelihood, perplexity, and coherence scores (Farea et al., 2024). Finally, assessing reliability and validity by assessing the consistency and interpretability of the topic through topic stability, semantic coherence, and expert review (Schroeder & Wood-Doughty, n.d.). To perform the topic modeling analysis, the body of words is created using the data from the abstracts, with each unique word serving as an analytical unit.

Bibliographic coupling and topic modeling are popular methods for quantitative literature reviews. The combination of these two methods provides better results. There are various reasons to adopt these methods. Bibliographic coupling can occasionally miss conceptual connections between publications because two papers may have the same references but distinct areas of interest. By offering a more sophisticated comprehension of document content, topic modeling can overcome this constraint. The inability of topic modeling to pinpoint a field's intellectual heritage, on the other hand, can be overcome via bibliographic coupling. While topic modeling offers a content-based perspective, bibliographic coupling offers a view of a study field's intellectual structure based on citations. When combined, these techniques can offer a more thorough comprehension of the connections between papers and the defining ideas of a topic (Chen et al., 2022). The combination of bibliographic coupling and topic modeling can enhance trend analysis and forecasting (Bzhalava et al., 2024).

3.5 Methodological analysis

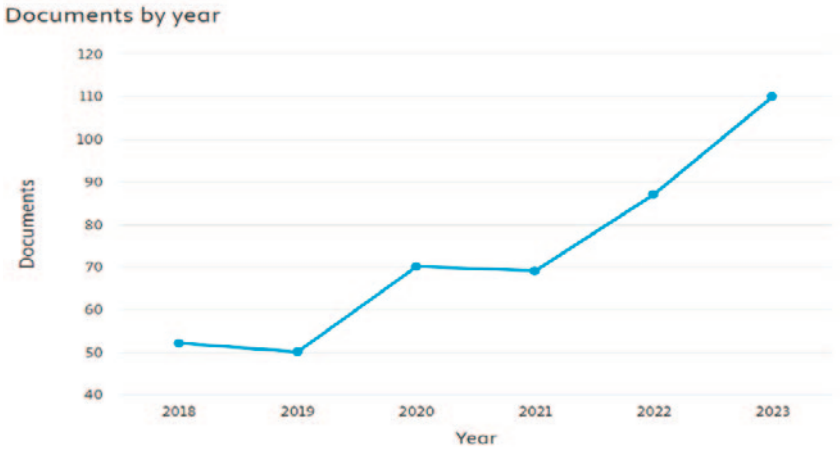
Methodological analysis ensures that the chosen methods generate data that is relevant, reliable, and practical for informing applied policy decisions (Bryman & GBurgess, 1994). Under methodology analysis, the study undertakes the different methodologies used by previous researchers and analyzes the research gap because of the methodology used. Effective use of bibliometric methods can increase the objectivity of literature reviews.

4 RESULTS

4.1 Scientific publication per year

As shown in Figure 2, the number of scientific publications on the subject is increasing in the given period, except for the year 2019. Although articles in this domain have been indexed in Scopus since 1997, the overall volume of research remained very limited until 2017, with fewer than 80 articles published. The progress in the chosen field within the selected study period remained low until 2018, when 52 publications were reported. However, the number of publications decreased again in 2019 (50), after which scientific publications increased in 2020 (70) and 2021(69) but remained almost at the same level. In the years 2022 and 2023, the publications increased rapidly, with 87 and 110 publications, respectively. The trends are showing the significance of this domain. We chose this period to analyze the contemporary research and focus on new trends.

Figure 2: Publication from 2018-2023



4.2 Top cited documents

Table 2 shows the list of the most cited documents in the field of entrepreneurial education and entrepreneurial intention. "Entrepreneurial intention among engineering students: The role of entrepreneurship education" (Barba-Sánchez & Atienza-Sahuquillo, 2018) has been cited 252 times, and it focuses on the effect of entrepreneurial education on the intentions of engineering students. Being a vast field, engineering is given more attention with respect to entrepreneurial intentions. Following this, (Nowiński & Haddoud, 2019) with 121 citations, (Şahin et al., 2019) with 118 citations, and (Ahmed et al., 2020) 103 citations are also contributing to the field with different constructs in combination with entrepreneurial education and intention.

4.3 Top-cited journals

Table 3 presents the list of the top 20 cited journals of entrepreneurial education and entrepreneurial intention based on data from VOS viewer software. "Education and Training Journal" has been cited 595 times with 31 documents. Though "International Journal of Entrepreneurial Behavior and Research" has 523 citations with only 19 documents and marks an important presence in the field. Following this, the "International Journal of Management Education" has also been contributing to the research field with 516 citations with just 24 documents. While comparing the average citation impact (ACI) we can conclude that despite having comparatively a smaller number of documents and citations 'International Journal of Entrepreneurial Behaviour and Research' has a high (ACI =27.52) significance as compared to 'Education and Training Journal' (ACI=19.19) and 'International journal of management education' (ACI=21.5) with high documents and citations.

4.4 Bibliographic coupling analysis

Cluster 1 (Red): Theory of Planned Behavior and Entrepreneurial Intention

The first cluster is the largest and comprises 80 documents. The focus of this cluster is the antecedents of intention based on the Theory of Planned Behaviour, which emphasizes how attitudes, subjective norms, and perceived behavioral control interact to shape intentions. The research articles in the cluster emphasize that entrepreneurial education acts as a facilitator, influencing not only the entrepreneurial skills and competencies among students but also impacting the antecedents of intention as per the Theory of Planned Behaviour. The studies also shed light on the impact of personal characteristics, such as creativity, proactivity, and risk propensity, in mediating the educational influence on intention. The most cited article in the cluster is (Ndofirepi, 2020) (n=88) validate that psychological characteristics serve as mediators in the predictive link between the perceived impacts of entrepreneurship education and entrepreneurial intention.

Adelaja & Minai, (2018) and Shah et al., 2020) (69 citations), have employed the true experimental design (post-test-only control group design), to examine how entrepreneurial education influences the intention. Bouarir et al., (2023) concluded that attitude, opportunity recognition, and need for achievement are the variables that affect the intention of women entrepreneurs. As per Kallas & Parts, (2021) there are three stages in becoming an entrepreneur: entrepreneurial intention, actions, and venture creation. Women are less active than men in stages two and three.

Cluster 2 (Green): Dynamics of Entrepreneurial Education and Innovation

It is the second largest cluster, consisting of 71 documents. Most of the studies delve into how different components of entrepreneurship education, such as formal and non-formal education, e-learning activities, pedagogical approaches, and technology-supported experiential education, and exposure to entrepreneurial environments (e.g., junior enterprises) influence intention towards entrepreneurship and play a role in enhancing knowledge, skills, and psychological attributes associated with entrepreneurship. The cluster is also focused on a range of factors that contribute to entrepreneurial intention, such as contextual factors (university environment, learning), cognitive variables (self-efficacy, attitude), emotional states (inspiration), and personal traits (self-efficacy, overconfidence).

Table 2: List of 20 most cited documents of entrepreneurial education and entrepreneurial intention

S. No	Document	Title	Citations
1	Barba-Sánchez Virginia (2018)	Entrepreneurial intention among engineering students: The role of entrepreneurship education	252
2	Nowinski w. (2019)	The role of inspiring role models in enhancing entrepreneurial intention	121
3	Sahin f. (2019)	Big five personality traits, entrepreneurial self-efficacy, and entrepreneurial intention: A configurational approach	118
4	Aparicio g. (2019)	Conceptual structure and perspectives on entrepreneurship education research: A bibliometric review	104
5	Ahmed t. (2020)	Entrepreneurship education programs: How learning, inspiration, and resources affect intentions for new venture creation in a developing economy	103
6	Shahab y. (2019)	Entrepreneurial self-efficacy and intention: do entrepreneurial creativity and education matter?	98
7	Passaro r. (2018)	The impact of higher education on entrepreneurial intention and human capital	96
8	Turner t. (2018)	Entrepreneurship Unleashed: Understanding Entrepreneurial Education outside of the Business School	93
9	Takawira Munyaradzi Ndofirepi (2020)	Relationship between entrepreneurship education and entrepreneurial goal intentions: psychological traits as mediators	88
10	Hassan a. (2020)	Entrepreneurial intention of Indian university students: the role of opportunity recognition and entrepreneurship education	70
11	Iqtidar A. Shah (2020)	The moderating role of entrepreneurship education in shaping entrepreneurial intentions	69
12	Virginia Fernández Pérez (2019)	Emotional competencies and cognitive antecedents in shaping students' entrepreneurial intention: the moderating role of entrepreneurship education	67
13	Susana C. Santos (2020)	Entrepreneurial self-efficacy and intentions: Outcome expectations as mediator and subjective norms as moderator	63
14	Galvão a. (2018)	Entrepreneurship education and training as facilitators of regional development: A systematic literature review	60
15	Kai Hockerts. (2018)	The Effect of Experiential Social Entrepreneurship Education on Intention Formation in Students	59
16	Chux Gervase Iwu (2021)	Entrepreneurship education, curriculum, and lecturer-competency as antecedents of student entrepreneurial intention	58
17	Hoang g. (2021)	Entrepreneurship education and entrepreneurial intentions of university students in Vietnam: the mediating roles of self-efficacy and learning orientation	56
18	Muhammad Shoaib Farooq (2018)	Impact of support from social network on entrepreneurial intention of fresh business graduates: A structural equation modelling approach	56
19	Fragoso r. (2020)	Determinant factors of entrepreneurial intention among university students in Brazil and Portugal	55
20	Yi g. (2021)	From green entrepreneurial intentions to green entrepreneurial behaviors: the role of university entrepreneurial support and external institutional support	54"

Table 3: List of 20 most cited journals of entrepreneurial education and entrepreneurial intention

S.No	Source	Document	Citation
1	Education and Training	31	595
2	International Journal of Entrepreneurial Behavior and Research	19	523
3	International Journal of Management Education	24	516
4	European Research on Management and Business Economics	3	356
5	International Entrepreneurship and Management Journal	12	238
6	Journal of Small Business Management	4	167
7	Journal of Entrepreneurship in Emerging Economies	11	125
8	Journal of Small Business and Enterprise Development	8	120
9	Journal of Intellectual Capital	3	104
10	International Journal of Innovation Science	7	86
11	Entrepreneurial Business and Economics Review	6	79
12	Journal of Entrepreneurship	6	69
13	African Journal of Economic and Management Studies	2	63
14	Industry and Higher Education	10	50
15	Journal of Education for Business	4	43
16	Journal of International Education in Business	2	32
17	Journal of Asian Finance, Economics, and Business	3	30
18	Journal of Enterprising Communities	6	22
19	Entrepreneurship and Sustainability issues	4	20
20	Entrepreneurship Research Journal	4	12

The impact of entrepreneurial education is different among different fields of education. The highest cited (n=252) article of the cluster, (Barba-Sánchez & Atienza-Sahuquillo, 2018) is determining the significance of entrepreneurship education in fostering the entrepreneurial development of engineers. Ten percent of studies (including Cera et al. (2020), González-López et al. (2019), Ismail et al. (2018) of the clusters are using a quasi-experimental design to analyze the impact of entrepreneurship education. The cluster contains articles that explore and measure the impact of entrepreneurship education in different socioeconomic contexts, learning environments, regions, and countries, including developing and developed nations.

Cluster 3 (Blue): Role of Gender in Fostering Entrepreneurial Intention through Education

The cluster comprises a total of 48 documents and has a diverse range of research studies that investigate how gender-based differences, societal norms, and stereotypes influence individuals' inclination toward entrepreneurship. The focus of the cluster is on gender parity in entrepreneurial intention formation. The articles have some contradictory findings in the cluster regarding the role of gender in entrepreneurial intention. Gurel (2021) highlighted that the impact of education is different between genders, and further on intentions, on the other hand, Fragoso et al. (2020) revealed that gender isn't a notable predictor of entrepreneurial intentions. Ramadani et al. (2022) suggest that gender doesn't moderate the connection between entrepreneurship education and entrepreneurial intention, but van Ewijk & Belghiti-Mahut, (2019) identified a negative impact of gender stereotypes on female students' entrepreneurial intentions in the UAE, irrespective of the course. Researchers also explored the significance of personal and con-

textual factors in integration with gender's role in boosting entrepreneurial intention across diverse contexts.

Notably, the study with the highest, 121 references, is Nowiński & Haddoud, (2019) delves into exploring the significance of role models in fostering entrepreneurial intention, with some similar studies (Abbasianchavari & Moritz, 2021) , (Achtzehn et al., 2023), and (António Porfírio et al., 2023).

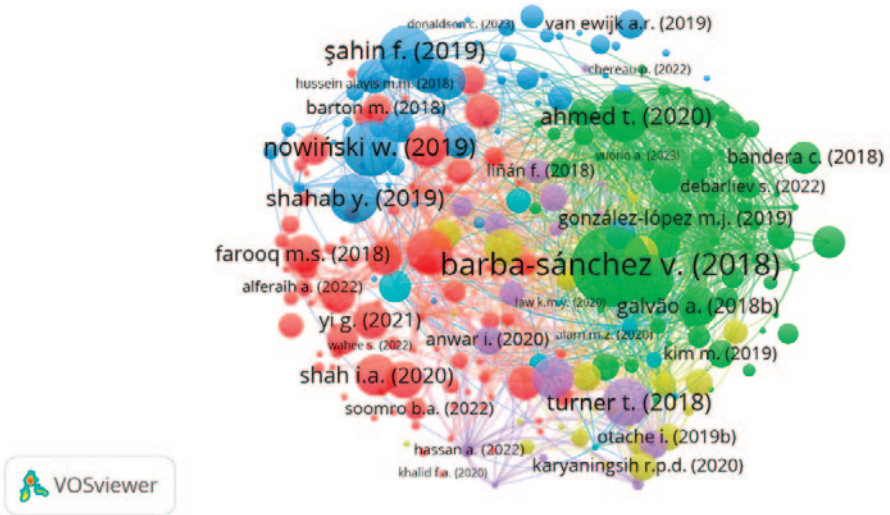
Cluster 4 (Yellow): Self-efficacy and Entrepreneurial Intentions

This cluster emphasizes the significant role of self-efficacy in the research domain of entrepreneurial intention. The cluster contains 25 scholarly articles dominated by self-efficacy literature. The mediating role of self-efficacy in conjunction with components of the Theory of Planned Behaviour and entrepreneurial capacity is studied deeply by (Duong, 2022) and (Q. Do Nguyen & Nguyen, 2023). Vietnam (6 documents) and Indonesia (4 documents) are the nations that have prominence within the cluster. (Kusumojanto et al., 2020), and (Wardana et al., 2021) explored the various fields of education, including various vocational, economic, and Islamic studies. Notably, the articles in the cluster explored the impact of cultural, institutional, and university contexts on entrepreneurial intentions. Self-efficacy among the students is one of the significant factors in intention formation, supported by entrepreneurial education.

Cluster 5 (Purple): Interplay of Personal Traits, Entrepreneurial Education, and Intentions

The cluster delves into a comprehensive exploration of the Theory of Planned Behavior with factors that indicate the individual attributes like entrepreneurial passion, capacity, self-efficacy, motivation, and individual entrepreneurship orientation, augmenting the understanding of the dynamics forming entrepreneurial intentions. Most of the articles in clusters have used the convenience sampling. The cluster contains 18 articles with a significant role of the individual attributes between entrepreneurial education and intention formation. The research articles highlight the impact of entrepreneurial education on students with diverse personal traits, including opportunity recognition competency, self-identity, creativity, and alertness. Moreover, the mediating role of entrepreneurial motivation and the moderating role of entrepreneurial education are explored by (Anwar et al., 2020) and (Hassan et al., 2020). With the highest references Turner & Gianiodis, (2018) the significant article in the cluster explores the action and experience-based entrepreneurial education beyond traditional methods.

Figure 3: Bibliographic coupling maps of entrepreneurial education and entrepreneurial intention



Cluster 6 (Light Blue): Perceptions and Individual Entrepreneurship Orientation

The cluster of 8 items focuses on students' perceptions as a significant factor. Individual Entrepreneurship Orientation is the focal point of the cluster. Martins & Perez, (2020) The highest citation within the cluster highlights the significant mediating role of Individual Entrepreneurship Orientation in the relationship between contiguous environmental factors and entrepreneurial intention. Moreover, the research by (Martins et al., 2022) revels the impact of entrepreneurial education on entrepreneurial intention through the lens of Individual Entrepreneurship Orientation. Research article by Lopez & Alvarez, (2019) highlights the influence of the university ecosystem and entrepreneurship course on entrepreneurial intention formation. Martins et al. (2023) and Wegner et al. (2020) Dig deeper into the innovative pedagogies at the university level to foster the entrepreneurship among students. Latin America is the dominant country in terms of research in the cluster.

4.5 Methodological analysis

Methodological analysis method describes or analyses the methods used (design, conduct, analysis, or reporting) in previous literature (Mbuagbaw et al., 2020). The methodology used in research has a significant impact on research outcomes. Each methodology has its advantages and limitations. The key characteristic that sets cross-sectional studies apart from other research types is the collection of relevant data at a specific point in time. As all data are gathered and typically relate to the time of data collection or around it, cross-sectional research does not involve a temporal dimension (Kesmodel, 2018). In a cross-sectional research design, since exposure and outcome are evaluated concurrently, there's usually no evident temporal connection between them. This lack of temporal linkage is the primary limitation of cross-sectional studies, making it challenging to establish a genuine cause-and-effect relationship without longitudinal data (Solem, 2015).On the other hand, longitudinal-experimental studies entail conducting subsequent surveys integrated with an experimental intervention (Farrington et al., 2010). Though these studies are time-consuming, the results are more accurate.

The study analysed the methodologies used in 250 documents, and the results are summarized in Table 4. Only 37 studies have used the longitudinal and experimental methods, which are only 14.8% of our data. On the other hand, 81.2% of articles have used cross-sectional studies, which comprise 203 documents. As explained by Nabi et al., (2017) while analysing the impact of entrepreneurial education on intentions, cross-sectional data is not enough to understand the real change in students' intentions to start a new venture. By this analysis, we conclude that cross-sectional data have their limitations when the question is to measure the gap between intention and action/ behaviour.

4.6 Topic modeling

We analyzed 390 abstracts of articles on entrepreneurial education and entrepreneurial intention using the latent Dirichlet allocation (LDA) approach. Our study discovered 15 different topics after following the recommended stages of text preprocessing, model parameter selection, topic num-

Table 4: Methodology used in the studies of entrepreneurial education and entrepreneurial intention

Types of Methodology	No of Documents	In Percentage
Cross Sectional Studies	203	81.2
Longitudinal Studies and experimental studies	37	14.8
Review Studies	9	3.6
Bibliometric Studies	1	0.4
Total No of Documents	250	100

ber determination, and reliability and validity evaluation. To assess reliability and validity coherence score is calculated. The value of the coherence score for our data set is 0.392. The coherence value typically ranges between 0 and 1, but the good value depends on data size and diversity, preprocessing quality, number of topics, and domain (S. Syed & Spruit, 2017). The *coherence score* of our study is *0.392*, which is moderate. The topics are interpretable but may overlap. LDA is the most popular method in text mining, but it is still not proficient enough to produce labels for every topic, and therefore, the outputs need to be labeled by humans (Blei, 2012). By analyzing the 20 terms per topic with respect to titles and abstracts, the results are summarized in Table 5.

As per the analysis of the top 20 terms per topic and assigned topics to those terms based on abstract analysis, we concluded and identified topics that helped in getting a deeper understanding of the structure and trends covered in the undertaken area of research. Each topic examines the different aspects of specific areas with some commonalities. While analyzing, we found that a few topics are similar in some respect and therefore summarized in the broad topic categories, namely, "dimensions of entrepreneurial education, students' traits and environment, entrepreneurial education and industry interface, entrepreneurial education and antecedents of intention". As a result, we may acknowledge the overlapping themes and provide a succinct summary of the research within a certain field.

Dimensions of Entrepreneurial Education

Entrepreneurial education has developed in different dimensions in recent times, and researchers have remained interested in measuring the impact of these dimensions on intention. This category includes topics *(topics no. 1,5,6,14),* namely, "exposure to entrepreneurial education, entrepreneurial education through E-learning, innovative pedagogy and entrepreneurial intention, entrepreneurial learning, and creativity". The focus of this category is on exposure to entrepreneurial education in traditional ways as well as through creativity, innovative pedagogy, and E-learning to measure the impact on the intention of students.

Student's traits and environment

This category contains articles in which significance is accorded to students' gender, characteristics, personality traits, environment, and educational field while measuring the impact on their entrepreneurial intention. Topics *(topics no. 8,12,13,15)* included here are "individual characteristics affecting entrepreneurial intention, students' environment and formation of intention, the significance of educational fields (STEM), a gender-based perspective of entrepreneurial education-intention". It has been observed that, along with education, these factors have a crucial role in shaping the intention among students.

Entrepreneurial education and industry interface

This category sheds light on a crucial aspect: the gap between the intentions and actions of students for entrepreneurship. This behavioral gap has a significant role in the direction of intention research. This category also focuses on the students' intention for social entrepreneurship and their experiences while choosing the industry for entrepreneurial activity. Topics *(topics no. 4,7,10),* under consideration here are "significance of intention-action/behavior gap in entrepreneurship, social entrepreneurial education and intentions, entrepreneurial education, and industrial interface".

Entrepreneurial education and antecedents of intention

The last category focuses on the link between entrepreneurial education and antecedents of intention, highlighting the significance of the Theory of Planned Behavior (attitude, perceived behavioral control, and subjective norms) in forming entrepreneurial intentions. Topics *(topics no. 2,9)* covered include "entrepreneurial self-efficacy and intentions, theory of planned behavior, and antecedents of intention". The articles focus on the impact of different variables in combination with the theory of planned behavior.

Table 5: A topic modeling analysis of entrepreneurship education and entrepreneurial intention

No	Title	Top Terms	Description	References
1	Exposure to entrepreneurial education	Entrepreneurial, intention, education, start, exposure, motivations, culture, tested, influence, evidence, determine, model, reveal, context, total, design, finally, analyzing, vocational, pre	This topic highlights the general perspective on exposure to entrepreneurial education. Articles on this topic focus on different dimensions of entrepreneurial education.	(Lopes et al., 2023) (Turuk et al., 2021) (Tseng et al., 2022)
2	Entrepreneurial self-efficacy and intentions	Relationship, effect, efficacy, role, positive, entrepreneurial, test, moderating, direct, hypotheses, mediating, modeling, psychological, investigate, ese, education, orientation, relationships, mediated, aims	This topic contains articles pertaining to how entrepreneurial self-efficacy mediates the relationship between different factors (educational support, attitude, subjective norms, prior exp, opportunity recognition) and entrepreneurial intentions.	(Sukavejworakit et al., 2018) (Cualheta & Abbad, 2022) (Balan et al., 2018)
3	Research methodologies	Students', questionnaire, structural, equation, analysis, universities, approach, quantitative, motivation, design, impact, modelling, developed, collected, respondents, method, methods, sampling, questionnaires, contributes	The topic contains articles, terms, and the research methodology used in research related to entrepreneurial intentions and education. University vocational students are considered respondents.	(Passoni & Glavam, 2018) (Almeida et al., 2021) (Daniel & Almeida, 2020)
4	Significance of the intention-action/behavior gap in entrepreneurship	Entrepreneurs, knowledge, level, role, analysis, gap, characteristics, potential, creation, specific, understanding, venture, entrepreneur, public, factor, international, contribute, understand, development, values	There is increasing focus on the intention-action gap among university students and analysis of different factors that are reasons for non-converting intentions into new ventures.	(Yongchun et al., 2021) (Mathews et al., 2021) (Lim et al., 2023)
5	Entrepreneurial education through E-learning	Entrepreneurship, education, policy, impact, aims, higher, affect, shows, college, foster, China, online, theoretical, valuable, contribution, enrolled, shaping, achieve, main, drivers	Articles and terms on this topic focus on online entrepreneurial education and its impact on intentions. In the world of digital technologies, e-learning is significant and attracts attention.	(Ali et al., 2019) (Otache, 2019b) (Draksler & Sirec, 2021)
6	Innovative pedagogy and entrepreneurial intention	Entrepreneurship, learning, activities, student, educational, outcomes, process, skills, focus, group, participants, effective, number, approach, experiential, field, effectiveness, programs, higher, teaching	This topic contains articles that analyze the role of innovative teaching methods (technological advancements, incorporating dynamic activities) and their positive impact on intentions to be an entrepreneur.	(Pham et al., 2023) (Ephrem et al., 2019) (Duong et al., 2024)
7	Social entrepreneurial education and intentions	Social, significant, career, personality, traits, cognitive, enterprises, achievement, present, sample, article, propensity, sustainable, future, influence, creative, antecedents, cross-sectional, enterprise, access	This topic enlightens how social entrepreneurial education encompasses students from different disciplinary backgrounds and encourages them to be more inclined to establish social enterprises.	(Aparicio et al., 2019) (Yatu et al., 2018) (Harima et al., 2021)
8	Individual characteristics affecting entrepreneurial intention	Entrepreneurial, behavior, individual, opportunity, model, theoretical, opportunities, risk, skills, provide, individuals, key, proposed, countries, recognition, ability, survey, positive, constructs, mechanism	The topic highlights the terms and articles that explain the different personality characteristics and their impact on intentions.	(Mónico et al., 2021) (Bian et al., 2021) (Loi et al., 2021)

9	Theory of planned behavior and antecedents of intent	Perceived, theory, attitude, control, planned, behaviour, subjective, norms, tpb, behavior, behavioral, model, intention, sample, programmes, significant, behavioural, pbc, antecedents, positively	The focus of this topic is the antecedents of intention based on Ajzen's (1991) Theory of Planned Behaviour, which sheds light on how attitudes, subjective norms, and perceived behavioral control interact to shape intentions.	(Oni & Mavuyangwa, 2019) (Swaramarinda et al., 2022) (Bux & van Vuuren, 2019)
10	Entrepreneurial education and industrial interface	Business, development, economic, entrepreneurship, employment, attitudes, important, graduates, youth, innovation, training, conducted, financial, country, economy, growth, schools, correlation, improve, analyze	This topic focuses on the articles that significantly correlate the knowledge from formal entrepreneurial education and experiences gained from the industry, explaining essential factors required for students to transition into entrepreneurs.	(Abdelfattah et al., 2023) (Salavou et al., 2021) (Hasan et al., 2020)
11	Research terminologies	Purpose, limited, originality, literature, design methodology approach, publishing, emerald, practical, programs, context, studies, eis, examine, limitations implications, work, aims, emerging, sample, insights, related	The topic incorporates key terms and articles deemed significant for advancing theoretical understanding and exploring diverse techniques and methodologies in researching entrepreneurial intentions.	(Shahverdi et al., 2018) (Talmage & Gassert, 2022) (Hasan et al., 2020)
12	Student's environment and formation of intention	Factors, influence, support, variables, environment, entrepreneurial, experience, university, family, studies, importance, variable, regression, contextual, significantly, aim, existing, developing, institutional, ecosystem	This topic emphasizes the University ecosystem, contextual, institutional, and family environment-related factors that play a significant role in forming entrepreneurial intention among students.	(Kobylińska & Ryciuk, 2022) (Aggarwal, 2019) (Pérez-Macías et al., 2022)
13	Significance of educational fields (STEM)	Students, university, higher, institutions, courses, universities, significant, engineering, education, south, undergraduate, management, analysis, innovativeness, conducted, impact, Africa, recommendations, contributes, science	The topic focuses on the significant impact of different fields of education. Studies emphasize how intentions are differently formed by students from engineering, management, or other backgrounds.	(Otache et al., 2021) (Santos et al., 2021) (Otache, 2019a)
14	Entrepreneurial learning and creativity	Entrepreneurial, intentions, students, education, creativity, model, personal, intent, formation, inspiration, survey, affects, relation, empirical, involved, stronger, effect, small, Inder science, educational	Studies on this topic delve into how entrepreneurial education and learning enhance creativity and intentions.	(Ali et al., 2019) (Padilla-Angulo et al., 2022) (Sitaridis & Kitsios, 2021)
15	A Gender-based perspective of Entrepreneurial education-intention	Impact, analysis, female, gender, models, differences, women, role, academic, high, develop, young, policymakers, promote, levels, school, government, program, universities, countries	The topic explores gender differences in entrepreneurial intentions and entrepreneurship education. Broadening the availability of entrepreneurship training programs can serve as a strategy to enhance female participation."	(Olutuase et al., 2018) (Chengchun et al., 2002) (Kallas & Parts, 2021)

5 DISCUSSION

5.1 Emerging research directions and trends

RQ 1: *What are the emerging research directions and trends in the field of entrepreneurial education and entrepreneurial intention?*

This study uses different methods of bibliometric analysis, i.e., bibliographic coupling, methodology analysis, topic modeling, and performance analysis, to understand the emerging research directions and recent trends in academic research related to entrepreneurial education and entrepreneurial intentions. This period (2018-23) is significant because of digital advancement and technology used in teaching methods for entrepreneurship. As per publication trends, the years 2022-23 are the most significant years and show the emergence of this domain in research. Bibliographic coupling analyzed broader themes of the area, and topic modeling provided terms that were used to determine the significance of the relevant directions. The present study has also used co-citation analysis to get the most cited documents and sources from the domain under performance analysis, which also determines the direction of the research. This research resonates with the findings of Galvão et al. (2018) saying that the journal 'Education and Training' has the largest number of documents published on entrepreneurial education and intentions.

Entrepreneurship education has been an emerging field for the past two decades, and educators are adopting the new dynamics of education in entrepreneurship. The current study indicates that Innovative pedagogical approaches, such as simulations, role-playing, and project-based learning, have been used to enhance entrepreneurial skills and intentions among students (Udekwe & Iwu, 2024). In the technology era, the incorporation of e-learning platforms and digital tools in entrepreneurship education is very evident. AI and other growing technologies and their impact on education and entrepreneurial intention are getting attention from researchers.

Social entrepreneurship among students is another trend in the entrepreneurial research area. This field of study examines how educational initiatives might foster the intention to use entrepreneurship to solve societal issues. Women entrepreneurship and gender dynamics are also an emerging direction in the field. Women in entrepreneurship, especially in developing nations, is a new trend (Bouarir et al., 2023). Sustainable entrepreneurship and education are other crucial trends in this field. Researchers are exploring how sustainable entrepreneurship intention can be enhanced via education. Sustainable entrepreneurship in the context of gender equality is also a significant area of research (Al-Qahtani et al. 2022).

5.2 Intellectual structure and key research themes

RQ 2: *What is the intellectual structure and key research themes in the field of entrepreneurial education and entrepreneurial intention?*

In any field of research, intellectual structure is the conceptual foundation for understanding the hows and whys. The current study identified theories that underpin to understanding of how and why entrepreneurial education influences intention formation. Intellectual structure helps to understand the field of research at a deeper level. Theory of Planned Behavior(Ajzen, 1991) given by Ajzen. Entrepreneurship education is believed to influence antecedents of intention, which include attitude toward entrepreneurship, subjective norms, and perceived behavioral control. Another significant theory is the human capital theory (Becker, 1964) given by Becker G in 1964, which argues that investment in education and skill development improves individuals' capabilities and productivity. Entrepreneurship education enhances knowledge, skills, and competencies, increasing entrepreneurial intention. Entrepreneurial Event Model (EEM) by Shapero & Sokol (1982) is another important theory that helps in forming the foundation of the literature of the current research field. Perceived desirability, perceived feasibility, and propensity to act are the factors that attract students toward entrepreneurship. Boutaky & Sahib Eddine, (2022) mentioned how Social cognitive theory highlights the role of social environment and self-efficacy in intention formation. Social cognitive theory was given by Bandura (1986).

The study, under bibliographic coupling, has extracted six clusters focusing on the different significant areas related to entrepreneurship education and its impact on entrepreneurial intention formation. Among the six clusters, "Theory of Planned Behavior and Entrepreneurial Intentions" and "Dynamics of Entrepreneurial Education and Innovation" are the dominating themes. Authors have used many other variables to test the relationship between entrepreneurial education and intentions, taking the theory of planned behavior, which has been the basis of measuring intention. Contradicting results show that a few authors concluded that gender doesn't affect the relationship between entrepreneurial education and intentions and vice versa. Van Ewijk & Belghiti-Mahut, (2019) identified an adverse impact of gender norms on female students' entrepreneurial intentions in the UAE, irrespective of the course. Ramadani et al. (2022) suggest that gender doesn't moderate the relationship between entrepreneurship education and entrepreneurial intention. The impact of entrepreneurial education on entrepreneurial intention through the lens of Individual Entrepreneurship Orientation (Martins et al. 2022) is also significant.

The current study has also contributed by using topic modeling techniques to enlighten specific areas in the current field. The analysis encapsulates the topics across 15 headings, encompassing information related to "Significance of intention-action/behavior gap in entrepreneurship", "Innovative pedagogy and entrepreneurial intention", "Social entrepreneurial education and intentions", "Entrepreneurial education and industrial interface", "A gender-based perspective of entrepreneurial education-intention", to name a few. Topic modeling also suggests that fields of education are very important and need to be focused on when measuring the impact of entrepreneurial education. Another topic under this technique is trying to identify the gap between insights gained from formal entrepreneurial education and the industry in clarifying the essential drivers for graduates to pursue entrepreneurship.

5.3 Methodological Limitations

RQ3: *What are the methodological limitations of the existing literature on entrepreneurial education and entrepreneurial intention?*

The present study uses methodological analysis to explore which are the most popular methods used in this research field. We concluded that very few studies have used longitudinal or experimental methods, and this may be the reason the studies are not able to understand the reasons for the gap between intention and action/behavior to be an entrepreneur. Articles also highlight the importance of experimental methodology (including Cera et al., (2020), González-López et al. (2019), Ismail et al. (2018)) and longitudinal studies García-Uceda et al. (2022) to understand the intentions over a period.

The study used data from post-2018, when digital advancement and technology were used in teaching methods and education. Pedagogy has a significant role to play in entrepreneurial education. (Nabi et al., 2017) has emphasized pedagogies and teaching-learning processes in education. Experiential and longitudinal methods are very significant in understanding the impact of education. However, in existing literature, it has been evident that authors have not used such methods due to the complexities of these methods. The gap between entrepreneurial intention and action taken cannot be addressed without such research.

5.4 Limitations and future research implications

5.4.1 Limitations

The study sample is restricted to the period 2018-2023. Though we have tried to take the recent data, this field is so significant that every day the amount of research is increasing. To analyze the evolution of this domain, the period could be extended. The research focused exclusively on publications from English-language journals that underwent peer review. Subsequent research endeavors may involve collaboration with authors proficient in languages beyond English. This expansion of language diversity not only facilitates the inclusion of a greater number of studies in future research but also enables authors to delve into the cross-cultural dimensions of entrepreneurship. The study relies solely on data retrieved from the Scopus database, which constitutes a limitation, even though Scopus is the largest database still We understand that single-database systems could over-

look records that are exclusively indexed elsewhere. Future research could benefit from incorporating other accessible databases, such as the Web of Science, to achieve a more comprehensive analysis.

5.4.2 Research gaps and scope for future studies

RQ 4: *What are the research gaps and scope for future studies in the field of entrepreneurial education and entrepreneurial intention?*

As the field of entrepreneurship education is in an emerging stage, there are some research gaps this study has identified. Most of the publications focused on higher education, but as entrepreneurship becomes significant, entrepreneurship education would be highly important in the case of elementary, vocational, and secondary schools. This gap can be addressed by future researchers. Intention-action gap could be a significant research gap for further investigation. Researchers can go deeper into how E-learning is impacting the intention and behavior of students to be entrepreneurs. Academic, Government and business collaborations could also be a crucial research gap here. As entrepreneurship is crucial for economic growth, these are the three fundamental pillars of any economy

This bibliometric research emphasizes the contribution of entrepreneurial education as a key tool in growing entrepreneurial intentions for being an entrepreneur and starting own venture. This current research provides a foundation for academics intending to undertake studies within a similar domain. The study highlights specific areas that exhibit potential for further research. Topic modeling under the science mapping technique brings us many crucial areas where future research is needed. Under topic modeling, we have analyzed terms that collectively form a topic. Out of 15 topics few have great potential to be explored and investigated further. Including the intention-action gap, (Harima et al., 2021) suggest that there is a gap between intentions and action (starting their own business) because students face challenges and procrastinate. There is significant potential for further investigation into why this gap exists and what could be measured on the part of educational institutions. Methodological analysis also contributes to this, as there are very few longitudinal and experimental studies that have explored the behavior of starting a new venture after taking the education program.

Another important topic that has a wider scope to explore further is entrepreneurial education through E-learning. In this era of technology (Industry 4.0), it's very crucial to understand that business depends on technology, and students with high adaptability to technology can be future entrepreneurs. MOOCS (massive open online courses) are a new way of learning. Researchers can go deeper into how E-learning is impacting the intention and behavior of students to be entrepreneurs. Innovation in teaching is again a field to be explored, as with technological upgradation, pedagogy is also taking different shapes. Different pedagogies and their impact on intentions (Gabrielsson et al., 2020). 'Entrepreneurial education and the industrial interface' is an area that needs to be explored continuously to get consistent results about how education is transferring the impact on intention.

We are at a time when Sustainable Development Goals (SDGs) are receiving extreme attention. Everyone around us is talking about a world that can be sustained for the upcoming generations. Social entrepreneurship is another crucial topic under topic modeling, which has a lot of scope for further research. Social entrepreneurship (Barton et al., 2018;Tan et al., 2021) the field is still in its infancy because of its growing importance. Students don't differentiate much between social entrepreneurship and traditional entrepreneurship in the early stages (Santos et al., 2021). The role of educational institutions in bringing awareness regarding social entrepreneurship is a question that needs to be answered. The link between entrepreneurial education and the industrial interface is a significant area to explore, as per the topic modeling technique in the current study. Entrepreneurial activities help in the economic development of a country. The interface between entrepreneurial education and industry is very important to explore and understand the missing link between knowledge and skills acquired from entrepreneurial education by collaborating with the industry to elucidate the necessary factors for graduates to become entrepreneurs. Our results also demonstrate that even high entrepreneurial intentions do not necessarily lead to entrepreneurial

behaviour/ actions. Future research could focus on longitudinal methods to ensure that entrepreneurial education helps to grow entrepreneurial intentions and entrepreneurial behavior, and action.

Ramadani et al., (2022) and Santos et al. (2021) highlights that gender doesn't play any role in growing intentions for entrepreneurship. But still, there is a conflict regarding the role of gender, and it still can hold importance to understand the role of gender in the intention of starting own venture in future research. However, authors can narrow their focus on innovation, AI, and pedagogy as different dimensions of entrepreneurial education. Conducting an in-depth interview-based qualitative study can highlight the recent perspectives of students and help to understand their intentions. The outcomes from this research can establish groundwork for both quantitative and qualitative studies that explore ways to bridge the gap between intentions and behavior.

In Table 6, we have discussed the future research scope underpinning the themes of topic modeling analysis. Using topic modeling analysis, we have identified fifteen topics and four themes where future research can dig deeper. The findings of this study also offer insights for policymakers and government officials. Educational institutions, governments, and industries together can benefit from this current research by understanding the reasons behind the high intentions of entrepreneurship among students. Institutions can design courses that can help students to experience entrepreneurship, and innovative pedagogies can also aid in. The government could also frame policies that can help students foster their intentions and convert them into actions in creating new ventures.

6 IMPLICATIONS AND CONCLUSION

6.1 Theoretical Implications

The bibliometrics analysis confirms that entrepreneurial education is found to be a significant predictor of entrepreneurial intention, validating human capital theory and the theory of planned behavior as foundational frameworks in this domain (Nam & Thi, 2024), showing theoretical saturation. This study has identified variables that need to be studied further by extending the Theory of Planned Behavior. This study has identified the action-intention gap as an emerging direction (Lim et al., 2023;

Table 6: Future research scope as per topic modeling analysis

Themes	Topics	Future Research Questions
Dimensions of Entrepreneurial Education	Exposure to entrepreneurial education, Entrepreneurial education through E-learning, Innovative pedagogy and entrepreneurial intention, Entrepreneurial learning and creativity	1. How can the framework of the learning ecosystem be optimized to foster innovation and creativity in entrepreneurial education? 2. How can technology be used to integrate academia with societal needs, influencing entrepreneurial intentions toward addressing global challenges?
Student's traits and environment	Individual characteristics affecting entrepreneurial intention, Student's environment and formation of intention, The significance of educational fields, A Gender-based perspective of entrepreneurial education-intention	1. What personality traits influence the choices of entrepreneurs between profit and purpose? How does the educational ecosystem influence the growth of different entrepreneurs? 2. What are the factors influencing the funding gap for the different genders of entrepreneurs? How can educational mediation address this disparity?
Entrepreneurial education and industry interface	Significance of the intention-action/behavior gap in entrepreneurship, Social entrepreneurial education and intentions, Entrepreneurial education and industrial interface	1. How does the interaction between university, industry, and government enhance the effectiveness of entrepreneurial education programs? 2. How do collaborations between universities and the government influence the students' intentions to engage in social entrepreneurship?
Entrepreneurial education and antecedents of intention	Entrepreneurial self-efficacy and intentions, Theory of planned behavior, and antecedents of intention	1.What factors contribute to the gap between entrepreneurial intentions and actual entrepreneurial behavior over time? 2. How experiential and instrumental attitudes impact entrepreneurial intention among students."

Mathews et al., 2021), contextual factors, including self-efficacy, family economic position, and personality traits, can be analyzed as moderators between entrepreneurship education and intention on the grounds of the Theory of Planned Behavior.

The analysis also highlights, through the clusters and topics from topic modeling analysis, the interdisciplinary nature of research in entrepreneurial education, identifying the relationship between entrepreneurship and other disciplines such as sociology, psychology, and education (Yu et al., 2025). This intersection demands that traditional theories should be expanded to include constructs from other disciplines as well. The study finds variations in entrepreneurial intention according to cultural or regional and different educational contexts (Batista-Canino et al., 2024). Being a significant theme in the study, E-education and innovation are recent trends; the study suggests existing theories and practices need to be revised to include recent pedagogies and learning outputs (Draksler & Sirec, 2021). Contemporary factors like Artificial Intelligence need to be considered.

The bibliometrics analysis reveals methodological insights. The study suggests that by integrating different methodologies, such as longitudinal, experimental, and qualitative, researchers can contribute to theoretical frameworks that help to understand the complexities in entrepreneurial behavior. To address the action-intention gap, the impact of entrepreneurship learning can be seen on early entrepreneurs also.

6.2 Practical Implications

The study offers valuable insights and recommendations for the authorities of HEI, educators, and policymakers. The insights can assist higher educational institutions (HEIs) authorities in understanding the need to develop inclusive, practical, and culturally sensitive entrepreneurship curricula that foster significant psychological drivers like confidence, resilience, and creativity. Authorities can also boost the multi-country academic partnerships, and sharing best practices across regions can significantly improve the quality and accessibility of entrepreneurship education globally.

The study recommends that policymakers develop regulatory policies to prioritize funding to support the entrepreneurship education programs and student entrepreneurship start-ups. The government and policymakers can use the insights of the study to understand contemporary areas, especially digital innovation, social entrepreneurship and initiatives for gender equity in entrepreneurial training. Educators can update the pedagogies that align with the evidence-based education for students. Educators also need to enhance their competencies, and emphasis should be placed on incorporating emerging technologies and digital skills into entrepreneurship education to make students industry-ready.

6.3 Conclusion

In conclusion, this bibliometric analysis of the research literature on entrepreneurial education and its impact on intention over the period 2018–2023 exhibits a notable increase in scholarly interest and an evolving research landscape. Furthermore, trends include the growing use of digital and experiential learning models, the increasing prominence of entrepreneurial behaviour as an outcome, and the emergence of new themes such as social and STEM-oriented entrepreneurship, innovation, and pedagogies. These findings offer future directions for research, policy, and educational practice, while highlighting the importance of cross-disciplinary collaboration and continual curriculum innovation to foster entrepreneurial mindsets among students.

EXTENDED SUMMARY/IZVLEČEK

V študiji raziskujemo področje podjetniškega izobraževanja (Entrepreneurship Education – EE) in podjetniških namer (Entrepreneurial Intention – EI) z uporabo bibliometrične analize in tematskega modeliranja, da bi začrtali njegovo trenutno intelektualno strukturo področja. Na podlagi 390 dokumentov iz baze Scopus, objavljenih med letoma 2018 in 2023, smo izvedli celovito analizo, ki vključuje kazalnike uspešnosti, bibliografsko povezovanje, tematsko modeliranje in metodološko presojo. Naše ugotovitve razkrivajo naraščajoč znanstveni poudarek na podjetniškem izobraževanju in oblikovanju podjetniških namer. Analiza bibliografskega povezovanja identificira šest ločenih raziskovalnih grozdov, ki obravnavajo: dinamiko podjetniškega izobraževanja in inovacij, vlogo spola v podjetniškem izobraževanju, samoučinkovitost, antecedente podjetniških namer ter uporabo teorije načrtovanega vedenja. Kot dopolnilo tej strukturni analizi tematsko modeliranje povzetkov člankov z metodo Latent Dirichlet Allocation (LDA) razkrije petnajst pomembnih tematskih področij, ki nakazujejo obetavne smeri prihodnjih raziskav. Razumevanje intelektualnega razvoja področja poglabljamo s sistematičnim kartiranjem njegove strukture znanja in nastajajočih tem. Naše ugotovitve ponujajo dragocene implikacije za raziskovalce, izobraževalce in oblikovalce politik, ki si prizadevajo okrepiti podjetniško izobraževanje in spodbujati podjetniške namere med učečimi se.

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