A bibliometric review of technopreneurship: intellectual structure, key themes, and research frontiers

Stefanus Rumangkit[1*], Antonius Satria Hadi[2], and Muhamad Zulkiflee Osman[3]

[1]*Bina Nusantara University, Indonesia*
[2]*University of Widya Mataram, Indonesia*
[3]*SEGI University, Malaysia*

Article Info:

Keywords:
Technopreneurship, Bibliometric Analysis, Digital Transformation, Innovation Ecosystem, Sustainable Entrepreneurship

*Correspondence email:
stefanus.rumangkit@binus.ac.id

DOI:
https://doi.org/10.64282/phi.v2i3.97

Received : 03-09-2025
Revised : 21-09-2025
Accepted : 27-09-2025
Published : 28-09-2025

Abstract

The rapid advancement of digital technologies has positioned technopreneurship as a key paradigm in modern entrepreneurship research. Unlike traditional entrepreneurship, technopreneurship integrates technological expertise with business vision to foster innovation, competitiveness, and sustainable growth. This study conducts a bibliometric review of technopreneurship literature in Scopus-indexed journals (2020–2025) within Business, Management, and Accounting. Using VOSviewer and Bibliometrix, the analysis covers publication productivity, citation impact, collaboration networks, thematic clusters, and research frontiers. Findings show Indonesia as the most productive country, driven by its dynamic startup ecosystem and academic focus. Key themes highlight business incubators, digital platforms, and green innovation. Eleven clusters are identified, spanning AI in education, digital transformation, sustainability, and Education 4.0. Emerging frontiers include technopreneurial self-efficacy, engineering education, economic growth, and disruptive technologies, offering theoretical and practical insights for stakeholders.

1. INTRODUCTION

The rapid transformation of the global economy in the digital era has fundamentally reshaped the nature of entrepreneurship (Alzamel, 2024). Advances in digital technologies, the rise of knowledge-driven industries, and the pervasive influence of innovation have paved the way for a new paradigm known as technopreneurship. Unlike traditional entrepreneurship, which relies primarily on market intuition and resource mobilization, technopreneurship emphasizes the integration of technological expertise with entrepreneurial vision (Maziriri et al., 2025). It seeks to harness the power of technology not only to create new ventures but also to enable sustainable innovation and long-term competitiveness.

Technopreneurship is best understood as a dynamic capability that extends beyond the mere application of technology in business (Soomro & Shah, 2021). It reflects the ability of individuals, start-ups, and established organizations to continuously adapt, reconfigure, and leverage emerging technologies to generate value in uncertain and turbulent

E-ISSN 3026-4111

environments (Cueto et al., 2022). In this sense, technopreneurship is both an entrepreneurial mindset and a strategic orientation. It combines creativity, risk-taking, and opportunity recognition with deep technological know-how, leading to the creation of innovative solutions, disruptive business models, and new market opportunities (Basly & Hammouda, 2020). Over the past two decades, technopreneurship has attracted significant scholarly attention, driven by its relevance in the context of digital transformation, Industry 4.0, and the global shift toward knowledge economies (Nguyen & Nguyen, 2024). As technology has become a critical driver of value creation, researchers across disciplines such as management, information systems, innovation studies, and entrepreneurship have sought to conceptualize, measure, and explain the dynamics of technopreneurship. This growing body of work, however, is highly fragmented, reflecting diverse theoretical perspectives, methodological approaches, and disciplinary boundaries. To synthesize and make sense of this expanding literature, bibliometric analysis offers a powerful methodological lens (Felicetti et al., 2024).

Despite the growing scholarly interest in technopreneurship, several research gaps remain. First, much of the existing literature tends to focus on conceptual discussions or case-specific analyses, without providing a consolidated understanding of the intellectual structure of the field. This fragmentation makes it difficult to establish a coherent theoretical foundation and to assess how different strands of research are connected or diverge. Second, while technopreneurship is often discussed in relation to broader phenomena such as digital entrepreneurship, innovation ecosystems, and Industry 4.0, there is limited systematic analysis of how these areas intersect and evolve together. This lack of integration has resulted in overlapping concepts and ambiguities in defining the scope and boundaries of technopreneurship. Third, previous reviews have been largely narrative in nature, offering valuable insights but lacking in methodological rigor and reproducibility. Such approaches may overlook hidden patterns in the literature, particularly in terms of influential authors, countries, institutions, or emerging thematic clusters. Finally, there is a scarcity of longitudinal perspectives that trace how the themes, collaborations, and knowledge networks in technopreneurship have developed over time. Addressing these gaps requires a more structured and evidence-based approach that can capture the complexity, diversity, and dynamics of the field.

Bibliometrics is the quantitative study of scientific publications. It provides tools for mapping knowledge domains, identifying influential authors, journals, and institutions, and tracing the evolution of research topics over time (Donthu et al., 2021). In the context of technopreneurship, a bibliometric approach allows researchers to systematically assess the scope, distribution, and intellectual structure of scholarly work. Rather than relying on narrative reviews, which may be selective and subjective, bibliometric techniques generate objective and reproducible insights based on large datasets of publications and their citation networks. This makes bibliometrics particularly suitable for examining how the field of technopreneurship has developed, where it currently stands, and what trajectories it might follow in the future (Felicetti et al., 2024). One of the key advantages of bibliometric analysis is its ability to uncover patterns that are not immediately visible through traditional reviews (Abu et al., 2024). Citation analysis, for instance, can identify the most influential works and authors that have shaped the intellectual foundations of

technopreneurship. Co-citation analysis reveals clusters of papers that share conceptual linkages, thereby illuminating the main schools of thought within the field. Co-authorship analysis highlights collaboration networks among scholars, institutions, and countries, providing insights into the global diffusion of technopreneurship research. Keyword co-occurrence analysis, on the other hand, sheds light on the thematic orientation of publications, showing how topics such as digital innovation, start-ups, business ecosystems, and sustainable entrepreneurship are linked to technopreneurship. Applying bibliometrics to technopreneurship has both theoretical and practical implications. Theoretically, it strengthens the conceptual foundations of the field by clarifying its intellectual boundaries and identifying dominant themes and paradigms. For example, technopreneurship research often intersects with studies of digital entrepreneurship, innovation ecosystems, and technology commercialization. Bibliometric mapping can reveal whether these intersections constitute integrated subfields or remain fragmented areas of inquiry. Such clarity is critical for advancing theory-building and avoiding conceptual ambiguity.

In order to provide a comprehensive overview, this study formulates six guiding research questions: RQ1: Which countries are the most productive in publishing articles on technopreneurship?, RQ2: Who are the most highly cited researchers in this domain?, RQ3: What are the popular themes in technopreneurship research from 2021 to 2025?, RQ4: What topics can serve as potential themes for future research? Together, these questions provide a structured lens through which to investigate the intellectual landscape of the field. They highlight the importance of not only identifying patterns of productivity and influence but also of capturing the temporal and thematic dynamics of scholarly discourse. By integrating these questions within a bibliometric framework, the study seeks to generate insights that are both descriptive and diagnostic, illuminating how technopreneurship has been conceptualized, disseminated, and expanded in the academic arena.

2. THEORETICAL REVIEW

Technopreneurship, a term that merges "technology" and "entrepreneurship," has emerged as a significant field of inquiry in recent decades, reflecting the increasingly central role of technological innovation in entrepreneurial processes. Scholars broadly define technopreneurship as the process of entrepreneurial activity that is driven by the development, commercialization, and diffusion of technological innovations (Soomro & Shah, 2021; Rumangkit, Irianto, & Hadi, 2024). Unlike traditional entrepreneurship, which may focus on identifying market opportunities across various sectors, technopreneurship emphasizes the integration of advanced technologies, such as information and communication technology (ICT), biotechnology, and artificial intelligence, into the creation of new ventures and the transformation of existing industries (Fernandes et al., 2022) .Early studies on the subject highlighted how technopreneurs leverage disruptive innovations to generate competitive advantage, create high-value products, and stimulate regional or national economic growth (Houessou et al., 2025). Recent literature underscores that technopreneurship plays a dual role: it not only contributes to the economic sphere by generating employment and wealth but also fosters social transformation by addressing challenges in education, healthcare, and sustainability through technology-driven

solutions (Ali et al., 2023). This multifaceted character makes technopreneurship an increasingly prominent subject of investigation across disciplines such as management, economics, and engineering.

A significant strand of the literature has examined the critical factors influencing technopreneurial success, with scholars identifying individual, organizational, and environmental determinants. At the individual level, studies point to the relevance of entrepreneurial orientation, risk-taking propensity, creativity, and technological competence as key drivers of technopreneurial activity (Mihajlović et al., 2022). Technopreneurs are often characterized as visionary leaders with the ability to bridge technological expertise and business acumen, translating innovations into commercially viable outcomes (Mok, 2022). At the organizational level, factors such as access to research and development (R&D), collaboration networks, and knowledge-sharing practices are highlighted as essential in sustaining technological innovation and competitiveness (Yuen & Lam, 2024). The literature also stresses the enabling role of external environments, including government policies, incubators, venture capital availability, and the broader entrepreneurial ecosystem (Bernardus et al., 2024). For instance, countries with strong innovation systems and supportive regulatory frameworks are more likely to nurture successful technopreneurs who can compete globally. However, scholars caution that excessive reliance on external support mechanisms may undermine entrepreneurial autonomy, raising questions about the balance between state intervention and market-driven innovation (Colovic & Lamotte, 2015). Thus, the interplay between micro-level capabilities and macro-level institutional factors emerges as a recurring theme in the study of technopreneurship.

Within this context, bibliometric approaches offer systematic tools to map publication trends, collaboration networks, and thematic clusters, providing insights into the intellectual structure and research frontiers of technopreneurship. By quantitatively analyzing large bodies of literature, bibliometric methods such as co-citation, co-authorship, and keyword co-occurrence enable researchers to identify influential authors, institutions, and countries that shape the field. They also reveal the evolution of research themes over time, distinguishing established topics from emerging frontiers. This methodological lens is particularly valuable in technopreneurship, a rapidly evolving domain, as it clarifies conceptual boundaries, highlights interdisciplinary linkages, and guides future investigations that can strengthen both theoretical development and practical applications.

3. RESEARCH METHODOLOGY

Research Method

This study employs a bibliometric research method to systematically map and analyze the academic literature on Technopreneurship. The primary objective is to provide a comprehensive overview of research development, thematic trends, and scholarly impact within the field. The bibliometric approach was chosen because it enables both performance analysis and science mapping, thereby identifying key contributors, thematic structures, and emerging topics in the domain of technopreneurship.

Data Collection

The dataset for this study was retrieved from the Scopus database, which is recognized as one of the most comprehensive and reliable sources of peer-reviewed academic literature. To ensure the relevance and accuracy of the data, a keyword search strategy was carefully designed by using the term "Technopreneurship" as the primary search keyword. Several filters were applied during the search process to align the results with the scope of the study. Specifically, the search was restricted to publications within the years 2020 to 2025, limited to the subject area of Business, Management, and Accounting, and confined to documents categorized as articles. In addition, only works written in English were considered to maintain consistency and accessibility in the analysis. After executing the search query, the bibliographic records were exported in CSV format, which included essential details such as titles, abstracts, authors, affiliations, keywords, citations, and source journals. This dataset served as the foundation for the bibliometric analysis conducted in the subsequent stages of the study.

Data Analysis

The bibliographic data collected from Scopus were processed and analyzed using VOSviewer, a specialized software tool designed for bibliometric mapping and visualization. The analysis was carried out in two main stages. The first stage involved performance analysis, which measured the research productivity of authors, institutions, countries, and journals, while also assessing citation impact through indicators such as total citations and h-index values. This provided insights into the distribution of scholarly contributions and the influence of different academic actors within the field of technopreneurship.

The second stage consisted of science mapping, which aimed to uncover the intellectual and conceptual structure of the research domain. This was achieved through the examination of co-authorship networks, co-citation patterns, and bibliographic coupling, all of which revealed collaborative linkages and scholarly interconnections. In addition, keyword co-occurrence analysis played a central role in identifying dominant themes, thematic clusters, and emerging topics. By tracking how keywords were related and clustered over time, the study was able to highlight both the established research areas and the evolving directions in technopreneurship scholarship.

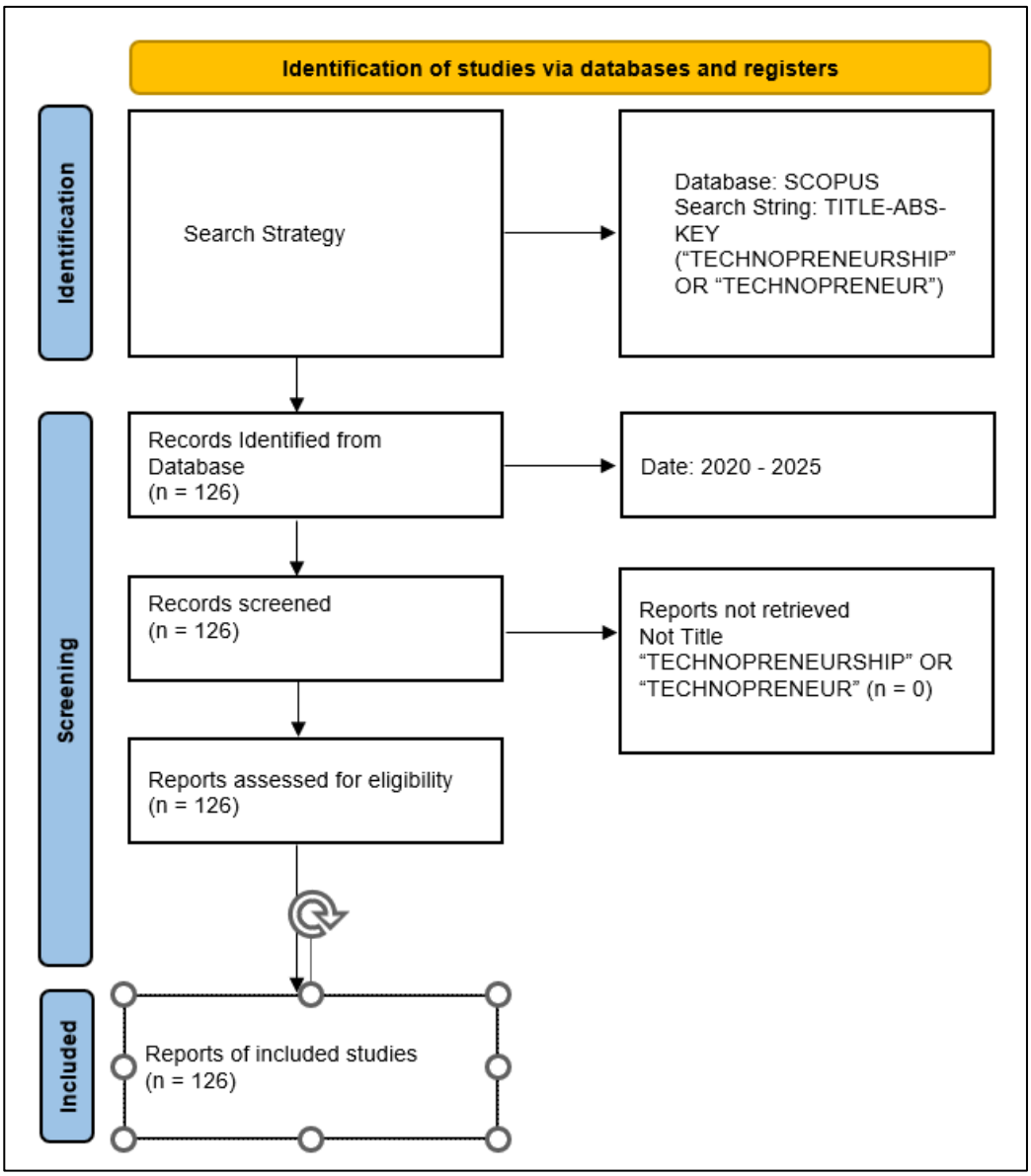

Figure 1. Prisma Diagram

4. RESULTS AND DISCUSSION

This research aims to map the latest research related to technopreneurship with a bibliometric approach. In this study, there are 6 research questions (RQ). The first analysis carried out was a descriptive analysis to see the countries that have the most publications related to technopreneurship. The results of the data analysis can be seen in the following table.

Table 1. Country Publication Productivity

Country	Number of publication
Indonesia	47
Malaysia	17
India	13
Philippines	6
United Kingdom	4

Country	Number of publication
Russian Federation	4
Australia	3
South Africa	3
Brunei Darussalam	2
Serbia	2

Indonesia is ranked first in technopreneurship publications because of the great research attention from academics to the integration of technology and entrepreneurship (Majid et al., 2024). Many researchers at the university examine digital business models, the development of technopreneurship-based e-learning, and the application of technological innovations in small and medium enterprises (Teoh et al., 2025). The research focus also includes how technopreneurship can improve students' skills, create new jobs, and strengthen global competitiveness. The high number of students and the rapid growth of local startups also encourage academic studies (Fayda-Kinik, 2024). Therefore, the dominance of Indonesian publications reflects the dynamics of technopreneurship research that is active and relevant to the needs of the industry.

Table 2. Citation Ranking

No	Authors	Title	Year	Number of Citations
1	D. Games, Donard; R. Kartika, Rayna; D.K., Sari, Dewi Kurnia	Business incubator effectiveness and commercialization success in technopreneurship	2020	34
2	R. Tarmizi, Rasyid; N. Septiani, Nanda; P.A., Nugroho, Putu Agung	Harnessing Digital Platforms for Entrepreneurship and Technopreneurship	2023	27
3	S. Andhella, Sylviana; H. Djajadikerta, Hamfri; N., Suryani	Technopreneurship in Pro-Environmental Behaviour and Green Innovation	2024	27
4	B.R., Bhardwaj, Broto Rauth	Adoption, diffusion and consumer behavior in technopreneurship ecosystems	2021	26
5	N. Anwar, Nizirwan; A.M., Widodo, Agung Mulyo	Comparative Analysis of NIJ and NIST Methods for Technopreneurship Evaluation	2024	22

Based on the table above, it can be seen that the research with the highest number of citations in the field of technopreneurship comes from the work of Donard et al. (2020) which discusses the effectiveness of business incubators and the success of commercialization. This topic is widely referenced because incubators are considered to play an important role in accelerating the growth of tech startups. Furthermore, the research of Rasyid et al. (2023) and Sylviana et al. (2024) both obtained 27 citations, focusing on the use of digital platforms and the link between technopreneurship and pro-environmental behavior. This shows that technopreneurship research does not only

address business aspects, but also sustainability and green innovation. Meanwhile, Broto's (2021) work highlights adoption and diffusion in the technopreneurship ecosystem with 26 citations, emphasizing the importance of consumer behavior. Finally, Nizirwan et al. (2024) with 22 citations show their contribution to the evaluation analysis of technopreneurship. Overall, these researches form an important foundation for the development of global technopreneurship.

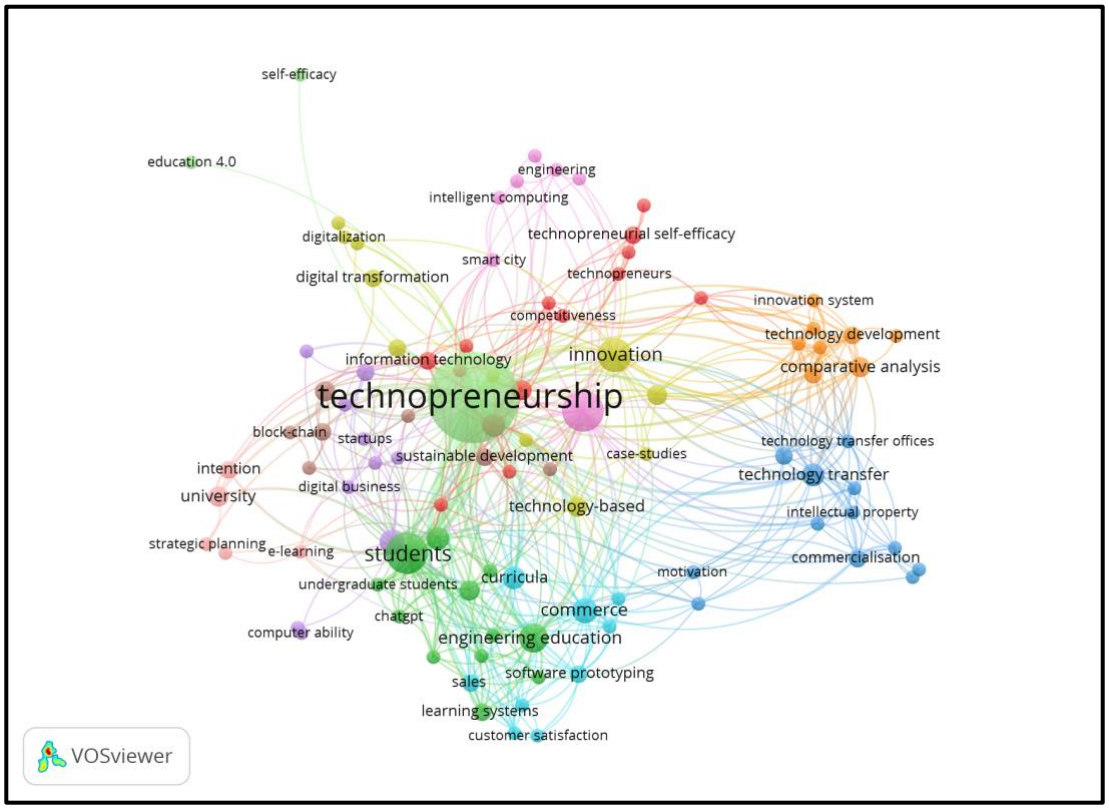

Figure 2. Tematic Map "Entreprenuership"

Figure 2 show that The clustering of themes reveals diverse but interconnected research areas. Cluster 1 emphasizes technopreneurship and innovation, covering aspects such as competitiveness, data analytics, decision making, and the role of entrepreneurs in the context of industrial revolutions and Industry 4.0. It highlights how information technology, software design, and innovation are shaping the activities, self-efficacy, and intentions of technopreneurs. Cluster 2 shifts the focus toward artificial intelligence and education, where issues such as AI, ChatGPT, content analysis, and education are central. Educational institutions and engineering education play a key role in fostering entrepreneurial activity and entrepreneurship education, while learning systems and undergraduate students reflect the application of AI-driven tools in shaping innovative education practices.

Cluster 3 explores the relationship between business performance and technology transfer, bringing together commercialization, intellectual property, motivation, and technological development. The cluster highlights the role of technology transfer offices in supporting start-ups and contextualizes these developments with cases such as those found in Nigeria, illustrating the significance of intellectual property rights in driving

entrepreneurial growth. In Cluster 4, the spotlight is on digital transformation and innovation, which includes themes like case-studies, digitalization, incubators, innovation, leadership, and startups. This cluster underscores how digital transformation drives technological innovation and technology-based growth, even extending into specific industries such as textiles, with leadership and incubators playing vital roles in this process.

Cluster 5 emphasizes digital business and higher education, linking business incubators, digital technology, and information management with higher education. It also highlights the context of Indonesia, where digital business and startups thrive with the support of technological ability and institutional backing, showing the importance of universities in nurturing entrepreneurial ecosystems. Cluster 6 centers on commerce and software development, bringing together research in behavioral science, commerce, customer satisfaction, and e-marketplaces. It shows how sales and online platforms are closely tied to curricula and research, while also pointing to the importance of software development practices such as prototyping and testing, with examples including the Philippines.

Cluster 7 draws attention to technology development and comparative studies, where commercialization technology, comparative analysis, and innovation systems are essential. This cluster highlights the significance of product innovation, computer programming, and technology development, emphasizing the role of systematic analysis in advancing innovation across contexts. Cluster 8 connects digital economy and sustainability, focusing on blockchain, business models, disruptive technology, and start-ups. The cluster reflects on how the digital economy transforms traditional practices while balancing economic growth with sustainable development goals, showing the potential and risks of disruptive change.

Cluster 9 emphasizes engineering and knowledge systems, integrating themes of engineering, entrepreneurship, intelligent computing, and knowledge management. It also includes smart cities, systematic literature review, and theoretical modeling, suggesting that the future of entrepreneurship lies at the intersection of technical expertise and structured knowledge creation. Cluster 10 turns to e-learning and strategic planning, focusing on universities' role in adopting e-learning technologies. The cluster highlights how learning intention, user experience, and strategic planning shape the success of digital learning initiatives in higher education. Finally, Cluster 11 reflects Education 4.0 and self-efficacy, which includes the interplay of self-efficacy, technopreneurship, and education 4.0. This cluster demonstrates how the transformation of education is deeply tied to students' confidence in their abilities, enabling them to embrace technopreneurship as a vital pathway in the era of Industry 4.0.

Figure 3 shows that there are several variables that can be explored in the future, namely digital transformation, technopreneurial self-efficacy, engineering education, economic growth, and disruptive technology. Digital transformation represents one of the most significant avenues for advancing the study of technopreneurship. It refers to the deep integration of digital technologies into business operations, organizational strategies, and value creation processes (Rasumov & Markaryan, 2022). For technopreneurs, digital transformation is more than simply adopting tools such as cloud computing, artificial intelligence, or data analytics. It involves rethinking business models, reshaping customer

engagement, and fostering organizational agility in an environment defined by rapid technological change (Shao, 2025).

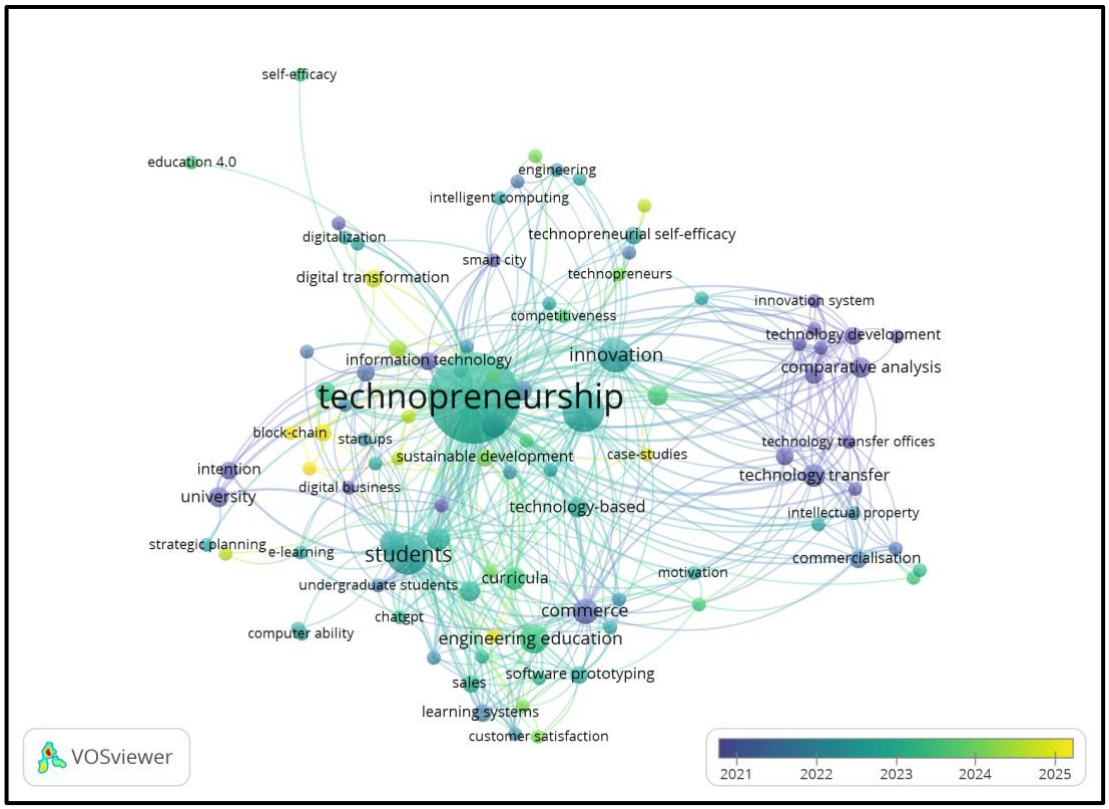

Figure 3. Overlay Analysis "Technopreneurship"

Entrepreneurs who embrace digital transformation can open new markets, streamline production, and enhance customer experiences in ways that traditional methods cannot achieve. Scholars can further explore how digital transformation interacts with institutional contexts, policy frameworks, and cultural dynamics to shape technopreneurial opportunities. There is also a pressing need to examine barriers such as digital inequality, cybersecurity risks, and gaps in digital literacy, which may hinder the full realization of digital transformation. Beyond the business domain, digital transformation is also connected to societal outcomes, including sustainable development, digital inclusion, and smart urban growth (Van & Vanthienen, 2022). Investigating these interlinkages can provide holistic insights into how technopreneurship contributes to broader economic and social progress. Thus, digital transformation should be seen as a multidimensional driver of innovation and competitiveness, influencing not only how businesses operate but also how they create sustainable value in the global economy. Its growing importance underscores the necessity of continuous research to capture the evolving relationship between technology adoption and entrepreneurial success (Singh et al., 2023a).

Technopreneurial self-efficacy is another critical theme with vast potential for exploration. At its core, this concept reflects the confidence that individuals have in their ability to succeed in technology-based entrepreneurial endeavors. A strong sense of self-efficacy is essential because it shapes intentions, decision-making, and perseverance in the uncertain world of technopreneurship (Sun et al., 2023). Unlike general entrepreneurial

self-efficacy, the technopreneurial variant emphasizes not only business acumen but also the belief in one's capability to master technology, adapt to emerging tools, and innovate effectively (Dutta et al., 2015). Future research can investigate how technopreneurial self-efficacy is developed through education, mentorship, and experiential learning. It may also focus on contextual influences such as cultural norms, access to resources, and the availability of supportive ecosystems (Schmutzler et al., 2019). From a pedagogical perspective, programs that combine engineering, digital literacy, and entrepreneurship training are particularly relevant in nurturing technopreneurial confidence (Neumeyer & Santos, 2023). Practically, individuals with higher self-efficacy are more willing to take calculated risks, overcome failures, and sustain their efforts in creating technology-driven businesses. There is also scope for studying how gender, socioeconomic background, and prior experience influence the development of technopreneurial self-efficacy (Caliendo et al., 2023). By addressing these issues, scholars and practitioners alike can design interventions to strengthen the mindset and capabilities of future technopreneurs. Ultimately, technopreneurial self-efficacy is not only a psychological construct but also a determinant of how effectively individuals and organizations transform technological opportunities into impactful ventures (Ratinho & Sarasvathy, 2024).

Engineering education plays a pivotal role in shaping the next generation of technopreneurs. Technical knowledge and problem-solving skills form the foundation of innovation, yet without exposure to entrepreneurial thinking, many engineering graduates may struggle to translate their technical expertise into viable ventures (Creed et al., 2002). Bridging this gap requires an intentional integration of entrepreneurship, innovation, and business strategy into engineering curricula. Project-based learning, design thinking, and interdisciplinary collaboration can prepare students to apply their technical knowledge in entrepreneurial contexts (Hammoda & Winkler, 2024a). Research can examine the effectiveness of these approaches across different educational settings, while also analyzing how digital platforms, prototyping tools, and simulation environments contribute to hands-on learning. Engineering education is also influenced by regional and cultural differences, making it essential to study comparative models across countries (Campos et al., 2020). For example, some universities emphasize incubation programs and industry partnerships, while others focus on curriculum reform and extracurricular activities. Understanding these models provides insights into how educational systems foster technopreneurship. Moreover, the role of faculty, institutional leadership, and government policy in supporting entrepreneurial education deserves attention (Boldureanu et al., 2020). Engineering education thus becomes a strategic mechanism for building national capacity in technology-driven innovation. By equipping students not only with technical skills but also with entrepreneurial mindsets, educational institutions can contribute directly to the creation of resilient, innovative economies. The growing intersection between engineering and entrepreneurship highlights the need for sustained research and practice in aligning curricula with the demands of the digital age (Hammoda & Winkler, 2024).

The relationship between technopreneurship and economic growth is another promising area of inquiry. Technopreneurship contributes to growth by creating new markets, stimulating job creation, and improving productivity through innovation (Singh et al., 2023). At the same time, the broader economic environment plays a decisive role in

determining the opportunities and constraints faced by technopreneurs. In economies experiencing rapid growth, entrepreneurs often benefit from expanding demand, increased investment, and supportive policy environments (Stoica et al., 2020). Conversely, in regions with slower growth, technopreneurs may face challenges related to limited resources, underdeveloped infrastructure, and regulatory hurdles. Research can delve into the bidirectional dynamics between technopreneurship and economic performance, asking whether technology-based entrepreneurship is a cause, consequence, or co-evolving factor of growth (Siqueira & Bruton, 2010). Comparative analyses across developed and emerging economies can highlight variations in how technopreneurship translates into economic outcomes. For instance, in emerging economies, technopreneurs may contribute significantly to inclusive growth by addressing societal challenges such as access to healthcare, education, or financial services (Amini et al., 2022). Meanwhile, in advanced economies, they may focus on high-value innovation in sectors like biotechnology or renewable energy. From a policy perspective, understanding these dynamics allows governments to design interventions that amplify the economic contributions of technopreneurs, such as funding initiatives, tax incentives, or innovation clusters. Ultimately, economic growth provides both the context and the outcome of technopreneurship, underscoring the importance of continuous research on this reciprocal relationship (Lindholm-Dahlstrand et al., 2019).

Disruptive technology is a central theme in understanding the trajectory of technopreneurship. These are innovations that fundamentally alter markets by displacing incumbents and introducing entirely new ways of delivering value (Martínez-Vergara & Valls-Pasola, 2021). Technologies such as artificial intelligence, blockchain, and the Internet of Things exemplify this phenomenon, offering vast opportunities while also posing significant risks. For technopreneurs, disruptive technologies are double-edged: they create space for new ventures to thrive but also demand constant learning, adaptation, and resource mobilization (Muldoon et al., 2023). Research into this area can focus on how technopreneurs identify, evaluate, and implement disruptive technologies across industries. It may also explore the role of ecosystems, collaboration networks, and institutional support in facilitating or hindering the diffusion of such technologies. Ethical and societal considerations are equally important, as disruptive innovations can raise questions about privacy, employment, and sustainability (Albuquerque & Albuquerque, 2023). From a strategic standpoint, technopreneurs who successfully harness disruptive technologies can reshape entire sectors, redefine consumer expectations, and achieve long-term competitiveness. For policymakers and educators, understanding the dynamics of disruptive technology is crucial for preparing environments where experimentation and innovation can flourish (Chemma, 2021). By examining this theme, scholars can shed light on the balance between risk and opportunity that characterizes technopreneurship in the digital era. Ultimately, disruptive technology is not just a variable to study but a force that continues to redefine the very essence of entrepreneurship and innovation (Chemma, 2021).

5. CONCLUSION AND RECOMMENDATIONS

This bibliometric review demonstrates that technopreneurship has developed into a dynamic and interdisciplinary field at the intersection of technology and entrepreneurship.

The analysis reveals Indonesia as the leading contributor to publications, while highly cited works highlight the significance of business incubators, digital platforms, and sustainability-oriented innovation. The thematic mapping illustrates eleven clusters that reflect diverse but interconnected research areas, ranging from artificial intelligence in education to digital business, technology transfer, and Education 4.0. Furthermore, the study identifies emerging research frontiers including digital transformation, technopreneurial self-efficacy, engineering education, economic growth, and disruptive technology. These findings provide a comprehensive understanding of the intellectual structure and evolution of technopreneurship, offering theoretical clarity and practical guidance for scholars, policymakers, and practitioners. Ultimately, this review underscores the importance of fostering interdisciplinary collaboration, integrating technological expertise with entrepreneurial competencies, and addressing global challenges to ensure technopreneurship contributes to inclusive and sustainable economic development.

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