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SYSTEMATIC LITERATURE REVIEW OF THE DEVELOPMENT AND RESEARCH DIRECTIONS OF TECHNOLOGY INNOVATION-BASED TECHNOPRENEURSHIP

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Abstract— *The rapid development of digital technology has positioned technopreneurship as a strategic approach to strengthening innovation-driven economic competitiveness. However, research on technology innovation-based technopreneurship remains fragmented, and a systematic mapping of research trends and success determinants is still limited. This study aims to analyze research themes, identify key success factors, and highlight future research directions in technology innovation-based technopreneurship. The study employs a Systematic Literature Review (SLR) approach following the PRISMA guidelines to ensure transparency and replicability in the article selection process. A structured literature search was systematically conducted using the Scopus database, focusing on publications published between 2022 and 2025. The search, guided by predefined keywords, yielded a total of 200 articles for initial consideration. After applying predefined inclusion and exclusion criteria, a final corpus of five articles was identified and analyzed using a thematic analysis approach. The results reveal several dominant themes, including digital innovation, entrepreneurial capability development, startup ecosystem collaboration, and sustainability-oriented technopreneurship. The findings also indicate that the success of technopreneurship is influenced by the integration of individual competencies, digital leadership, and collaborative innovation ecosystems involving academia, industry, and government. This study contributes by providing a systematic mapping of recent technopreneurship research and identifying thematic patterns that shape technology-driven entrepreneurship in the digital era, offering academic insights and practical implications for strengthening innovation ecosystems.*

Keywords: *Digital Entrepreneurship, Startup Ecosystem, Technological Innovation, Technopreneurship.*

Intisari—*Perkembangan teknologi digital yang pesat telah menjadikan technopreneurship sebagai pendekatan strategis dalam memperkuat daya saing ekonomi berbasis inovasi. Namun, kajian mengenai technopreneurship berbasis inovasi teknologi masih bersifat terfragmentasi sehingga pemetaan sistematis terhadap tren penelitian dan faktor penentu keberhasilannya masih terbatas. Penelitian ini bertujuan untuk menganalisis tema penelitian, mengidentifikasi faktor kunci keberhasilan, serta menyoroti arah penelitian masa depan dalam bidang technopreneurship berbasis inovasi teknologi. Penelitian ini menggunakan pendekatan Systematic Literature Review (SLR) dengan mengacu pada pedoman PRISMA untuk memastikan proses seleksi artikel yang transparan dan dapat direplikasi. Penelusuran literatur dilakukan secara terstruktur menggunakan basis data Scopus dengan fokus pada publikasi tahun 2022 hingga 2025, yang menghasilkan 200 artikel untuk tahap identifikasi awal. Setelah melalui penerapan kriteria inklusi dan eksklusi yang telah ditetapkan, diperoleh korpus akhir sebanyak lima artikel yang kemudian dianalisis menggunakan pendekatan analisis tematik. Hasil penelitian menunjukkan beberapa tema dominan, yaitu inovasi digital, pengembangan kapabilitas kewirausahaan, kolaborasi ekosistem startup, serta technopreneurship berbasis keberlanjutan. Temuan juga menunjukkan bahwa keberhasilan technopreneurship dipengaruhi oleh integrasi kompetensi individu, kepemimpinan digital, serta dukungan ekosistem inovasi kolaboratif yang melibatkan akademisi, industri, dan pemerintah. Penelitian ini memberikan kontribusi berupa*

pemetaan sistematis terhadap perkembangan riset technopreneurship terkini serta implikasi akademik dan praktis dalam memperkuat ekosistem inovasi berbasis teknologi.

***Kata Kunci**: Kewirausahaan Digital, Ekosistem Startup, Inovasi Teknologi, Technopreneurship.*

INTRODUCTION

The advancement of information technology over the past two decades has brought significant changes to the global economy. One of the most visible impacts is the emergence of digital business models that emphasize innovation, efficiency, and scalability. This transformation has enabled entrepreneurs to develop products and services more rapidly through the utilization of digital platforms and data-driven technologies. As a result, a new form of entrepreneurship known as technopreneurship has emerged, which integrates technological capabilities with entrepreneurial innovation to create competitive and sustainable business models in the digital economy (Kollmann et al., 2022). In this context, technology not only supports business operations but also becomes the main driver of innovation and value creation in modern entrepreneurial activities.

Technopreneurship is increasingly recognized as an important driver of innovation and economic growth, particularly in knowledge-based economies. The development of digital technologies has enabled startups and technology-based ventures to scale rapidly and expand beyond geographical boundaries. Consequently, the concept of digital entrepreneurial ecosystems has gained attention in recent studies. This concept refers to a network of interconnected actors, institutions, and resources that support the development of digital entrepreneurship, including digital infrastructure, financial capital, regulatory frameworks, and collaboration among stakeholders (Bejjani et al., 2023). Such ecosystems play an important role in facilitating technological innovation and transforming new technological ideas into commercially viable products and services.

In the Indonesian context, the growth of digital entrepreneurship shows significant potential, although it still faces several structural challenges. According to the Global Entrepreneurship Index (GEI) report, Indonesia still lags behind several ASEAN countries in terms of entrepreneurial readiness and innovation capacity. Factors such as limited technological capability, gaps in entrepreneurial competence, and uneven digital infrastructure remain obstacles to the development of technology-based entrepreneurship. These findings are consistent with studies that highlight the importance of strong digital ecosystems, institutional support, and technological infrastructure in fostering national entrepreneurship development (Zhang et al., 2023). Therefore, strengthening the technopreneurship ecosystem becomes a strategic effort to improve national competitiveness in the digital economy.

On the other hand, Indonesia's digital startup ecosystem has experienced rapid growth in recent years. The increasing number of digital platforms, startup incubators, and innovation hubs has created new opportunities for entrepreneurs to develop technology-based businesses. However, the sustainability of digital startups remains a challenge due to factors such as limited managerial capability, lack of innovation strategies, and intense market competition. In the context of small and medium-sized enterprises (SMEs), digital transformation and innovation capability significantly influence business performance and long-term sustainability (Al-Moameri et al., 2023; Edegbene et al., 2022). Previous studies suggest that collaboration among universities, industries, governments, and investors is crucial for strengthening startup ecosystems and accelerating technological innovation. Such collaboration facilitates knowledge transfer, improves access to resources, and supports the commercialization of technological innovations (Kayser et al., 2023).

Furthermore, innovation plays a vital role in ensuring the sustainability and competitiveness of technopreneurship. Innovation in this context does not only refer to the development of new products but also includes the transformation of business processes, digital strategies, and organizational capabilities to respond to rapidly changing market demands. In addition, digital innovation and technology adoption are widely recognized as key drivers of entrepreneurial performance and competitiveness, particularly in rapidly changing and technology-driven environments (Mutambik et al., 2022). The development of emerging technologies such as artificial intelligence, blockchain, and machine learning has further expanded opportunities for technopreneurs to create innovative solutions across various sectors. As highlighted in recent studies, the evolution of digital entrepreneurship is closely related to the continuous advancement of digital technologies that enable new forms of innovation and business models (Camps et al., 2026).

Despite the growing body of literature on technopreneurship and digital entrepreneurship, existing studies remain fragmented and often focus on specific aspects such as entrepreneurial intention, startup performance, or technology adoption. Comprehensive studies that

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systematically map the development trends, dominant research themes, and success determinants of technology innovation-based technopreneurship remain relatively limited. In addition, the rapid development of digital technologies necessitates continuous examination of how research in this field has evolved and what future research directions should be explored. Recent studies indicate that digital transformation plays a crucial role in shaping innovation-driven entrepreneurship and enabling scalable business models, particularly in technology-based ventures (Sabbagh et al., 2022). Furthermore, digital entrepreneurship is increasingly supported by innovation ecosystems that facilitate collaboration, resource sharing, and knowledge exchange among stakeholders (Bazi et al., 2022). Therefore, a systematic synthesis of the existing literature is essential to provide a clearer and more comprehensive understanding of the development and future directions of technopreneurship research. Based on this background, this study aims to systematically review the literature on technology innovation-based technopreneurship using a Systematic Literature Review (SLR) approach following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. Specifically, the objectives of this study are:

1. To analyze the research trends and publication patterns related to technology-based innovation in technopreneurship.
2. To identify the main themes and key success factors within the technopreneurship ecosystem.
3. To explore the research gaps and future research directions in the field of technology innovation-based technopreneurship.

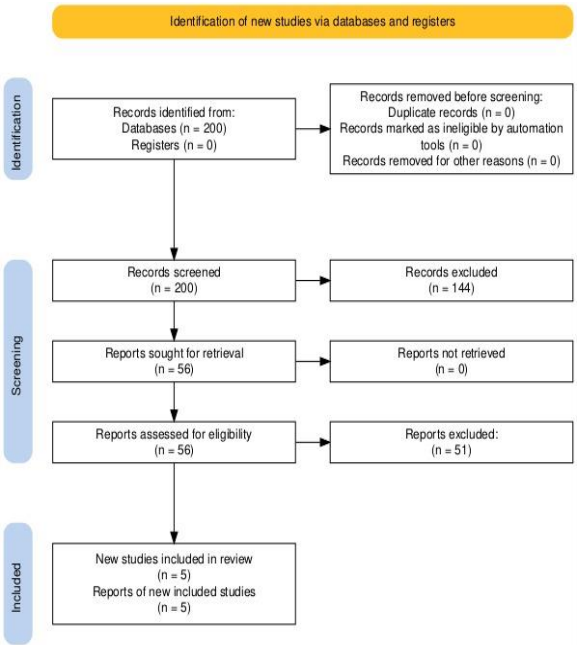
Through a systematic synthesis of existing studies, this research is expected to provide a comprehensive overview of the evolution of technopreneurship research and contribute to the development of future studies in this rapidly evolving field.

MATERIALS AND METHODS

This study employs a Systematic Literature Review (SLR) approach to systematically identify, evaluate, and synthesize previous studies related to technology-based innovation in technopreneurship. The SLR method was selected because it allows researchers to obtain a comprehensive and structured understanding of the development of research in a particular field while identifying research gaps and emerging themes (Tedja et al., 2024). To ensure transparency and replicability, the review process follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

The literature search was conducted using the Scopus database, which is recognized as one of the most comprehensive sources of peer-reviewed scientific publications across multiple disciplines. Scopus was chosen due to its extensive coverage of high-quality indexed journals and its relevance to research in entrepreneurship, innovation, and technology management. The article search was conducted using the Publish or Perish application, which was accessed on December 21, 2025. In the application, the articles retrieved using the specified keywords resulted in 200 articles. The search process was then followed by a screening stage based on predefined inclusion and exclusion criteria. The search process used a combination of keywords related to technopreneurship and technological innovation. The search query was formulated using Boolean operators as follows: ("technopreneurship" OR "technology-based entrepreneurship" OR "digital entrepreneurship") AND ("innovation" OR "technological innovation" OR "startup ecosystem").

The search was limited to articles published between 2022 and 2025 to capture the most recent developments in technopreneurship research in the context of digital transformation and emerging technological innovation.



Source: (Research Results, 2025)

Figure 1. *Flow Diagram PRISMA*

The literature selection process in this study was conducted systematically in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines

to ensure transparency, rigor, and validity of the findings. The selection procedure comprised four main phases: identification, screening, eligibility, and inclusion.

In the identification phase, a comprehensive literature search was performed using a database, yielding a total of 200 records. No duplicate records (n = 0) or automatically excluded records (n = 0) were identified at this stage; therefore, all retrieved records were advanced to the screening phase. During the screening phase, 200 records were evaluated based on their titles and abstracts. Of these, 144 records were excluded due to irrelevance to the research focus or failure to meet the initial inclusion criteria. Consequently, 56 records were retained for further assessment. In the eligibility phase, all 56 full-text articles were successfully retrieved (n = 56), with no inaccessible reports. A detailed full-text evaluation was then conducted, resulting in the exclusion of 51 articles that did not satisfy the predefined methodological standards or quality criteria.

Finally, in the inclusion phase, five studies met all eligibility criteria and were deemed suitable for inclusion in this systematic review. Thus, a total of five articles (n = 5) were included in the final analysis. The five articles that met all eligibility criteria constitute the final corpus of the systematic literature review and serve as the primary basis for data extraction and thematic analysis. Additional references cited in this study are used solely to support the theoritical background and discussion, and are not part of the PRISMA selected corpus. The inclusion criteria encompassed: (1) articles published in peer-reviewed journals; (2) studies addressing technopreneurship or technology-based entrepreneurship; (3) research focusing on technological innovation or digital entrepreneurship; (4) publications written in English; and (5) studies published within the specified time frame. The exclusion criteria comprised: (1) articles not directly relevant to the research topic; (2) non-research publications, such as editorials and book reviews; (3) duplicate records; and (4) studies with inaccessible full texts.

Following the final selection stage, relevant information was extracted from the selected articles to support the synthesis process. The extracted data included author names, year of publication, research objectives, research methodology, key findings, and each study's contribution to the development of technopreneurship research. These data were systematically organized to facilitate comparison across studies. The selected articles were analyzed using a thematic analysis approach to identify patterns and dominant themes in the literature. The analysis began with an in-depth reading of each article to identify key concepts related to technological innovation and technopreneurship. Similar concepts were grouped into preliminary categories, which were subsequently refined and consolidated into broader themes through an iterative comparison process. This approach enabled the identification of major themes, including technological innovation, entrepreneurial capability development, startup ecosystem collaboration, and sustainability-oriented technopreneurship. Finally, the findings of the systematic review were presented in both tabular and visual formats to enhance clarity and interpretability. The PRISMA flow diagram illustrates the article selection process, while a summary table presents the characteristics of the selected studies, including their research focus and key findings.

RESULTS AND DISCUSSION

Results

The article selection process followed the PRISMA guidelines to ensure transparency and replicability in the systematic review process. The initial search across the selected databases produced a number of records related to technopreneurship and technological innovation. After removing duplicate records and applying the inclusion and exclusion criteria, the screening process resulted in five articles that met all eligibility criteria for further analysis.

The final selection consisted of five articles published between 2022 and 2025, indicating that research on technopreneurship and technology-based innovation continues to evolve in recent years. These studies examine various aspects of technopreneurship, including digital platform utilization, innovation capability, sustainability-oriented entrepreneurship, and the use of machine learning in startup ecosystems.

The characteristics of the selected articles are summarized in Table 1.

Table 2. ***Selected Articles***

Author	Title	Published Year
(Andhella et al., 2024)	Technopreneurship in Pro-Environmental Behavior for Sustainable Carbon Emission Reduction in Central Kalimantan	2024
(Tarmizi et al., 2023)	Harnessing Digital Platforms for Entrepreneurial Success: A Study of Technopreneurship Trends and Practices	2023

Author	Title	Published Year
(Wibowo & Koerniawan, 2022).	Technopreneurship Development in Indonesia: Digital Business Development	2022
(Widjajanti & Jumbri, 2025)	Technopreneurship, innovation capability and social media marketing as catalysts for competitive advantages: A study of batik MSMEs in Pekalongan, Indonesia	2025
(Wijono et al., 2024)	Leveraging Machine Learning Models to Enhance Startup Collaboration and Drive Technopreneurship	2024

Source: (Research Results, 2025)

Table 1 presents the characteristics of the selected studies included in this systematic literature review. The five articles were published between 2022 and 2025, indicating the growing attention to technopreneurship research in recent years. The studies cover various topics, including digital platforms, innovation capability, sustainability, and the application of machine learning in entrepreneurial contexts.

RQ 1: What are the recent research trends in technology-based innovation in technopreneurship?

The findings indicate that recent research trends in technopreneurship increasingly emphasize the integration of digital technologies, innovation capability, and sustainability. The role of digital platforms in enhancing market access and operational efficiency is highlighted by Tarmizi et al. (2023), while Wibowo and Koerniawan (2022) associate technopreneurship development with digital business transformation in the Indonesian context.

In addition, the adoption of advanced technologies such as machine learning has emerged as a significant trend. Wijono et al. (2024) demonstrate that machine learning models support data-driven decision-making and facilitate collaboration among startups. Furthermore, sustainability-oriented technopreneurship is emphasized by Andhella et al. (2024), who show that technological innovation can promote pro-environmental behavior and contribute to carbon emission reduction.

Overall, these findings suggest that technopreneurship research is evolving toward a more integrated approach that combines digital transformation, advanced technologies, and sustainability considerations.

RQ2: What are the main themes and success factors in the technopreneurship ecosystem?

The findings identify several key themes and success factors shaping the technopreneurship ecosystem. Digital technology adoption is consistently recognized as a fundamental enabler of entrepreneurial activities (Tarmizi et al., 2023; Wibowo & Koerniawan, 2022). However, technological adoption alone is insufficient to ensure sustainable success. Innovation capability emerges as a critical factor in transforming technological opportunities into competitive advantage. Widjajanti and Jumbri (2025) demonstrate that innovation capability, combined with social media marketing strategies, significantly enhances the competitiveness of batik MSMEs.

Collaboration within the entrepreneurial ecosystem is also emphasized. Wijono et al. (2024) show that machine learning technologies can facilitate collaboration among startups by improving information exchange and supporting strategic decision-making. In addition, sustainability is identified as an important dimension of technopreneurship, as highlighted by Andhella et al. (2024), who link technological innovation with environmentally responsible entrepreneurial practices. Taken together, these findings suggest that technopreneurship success is shaped by the interaction between technological capability, innovation capacity, collaboration, and sustainability orientation.

RQ3: What research gaps and future directions remain in technopreneurship research?

The findings identify several important research gaps in the existing literature. First, most studies focus on the adoption and utilization of technology (Tarmizi et al., 2023; Wibowo & Koerniawan, 2022), while limited attention has been given to the long-term impact of technopreneurship on business sustainability and economic development.

Second, the reviewed studies are largely limited to specific contexts, such as MSMEs and localized startup ecosystems (Andhella et al., 2024; Widjajanti & Jumbri, 2025), which constrains the generalizability of the findings. This indicates a need for more comparative and cross-contextual research.

Third, there is a lack of longitudinal studies examining the evolution of technopreneurial ventures over time. Most existing research relies on cross-sectional approaches, limiting the understanding of dynamic processes such as innovation development and ecosystem interaction.

Finally, limited attention has been given to the interaction between technological innovation and human factors. While Wijono et al. (2024) focus

on technological facilitation, aspects such as entrepreneurial skills, leadership, and digital capabilities remain underexplored.

These gaps highlight the need for future research to adopt more comprehensive and integrative approaches in order to better understand the long-term and multi-dimensional nature of technopreneurship.

Discussion

The findings of this study demonstrate that technopreneurship is no longer viewed solely from a technological perspective but has evolved into a more integrated framework that combines digital transformation, innovation capability, sustainability, and ecosystem collaboration. This shift reflects the growing complexity of entrepreneurial activities in the digital era, where success is influenced by multiple interconnected factors rather than technology adoption alone.

In relation to existing literature, the results support the perspective of digital entrepreneurship, which emphasizes that digital technologies reshape business processes, market interactions, and opportunity recognition. However, this review extends prior studies by highlighting that technological adoption must be complemented by innovation capability and strategic orientation. For instance, while digital platforms facilitate market access (Tarmizi et al., 2023; Wibowo & Koerniawan, 2022), innovation capability and marketing strategies are critical in transforming these opportunities into sustainable competitive advantage (Widjajanti & Jumbri, 2025). This indicates that technopreneurship success is not determined by technology alone, but by the interaction between technological and organizational capabilities.

Furthermore, the findings highlight the increasing importance of collaboration within entrepreneurial ecosystems. The role of advanced technologies such as machine learning in facilitating collaboration (Wijono et al., 2024) suggests a transition toward data-driven and network-based entrepreneurship. This supports the ecosystem perspective, which argues that innovation emerges from the interaction among multiple actors, including startups, technology providers, and supporting institutions.

Another important insight is the growing integration of sustainability within technopreneurship. The findings from (Andhella et al. (2024) indicate that technological innovation can promote environmentally responsible practices, reflecting a shift toward sustainable entrepreneurship. This expands the conventional view of technopreneurship, which has traditionally focused on economic performance, by incorporating social and environmental dimensions.

Importantly, this study addresses several gaps identified in the literature. First, the lack of research on the long-term impact of technopreneurship is highlighted, indicating the need for studies that examine business sustainability and long-term performance. Second, the dominance of context-specific studies limits the generalizability of findings, suggesting the need for comparative and cross-country research. Third, the absence of longitudinal approaches restricts the understanding of how technopreneurial ventures evolve over time. Finally, the limited exploration of human factors, such as entrepreneurial skills and leadership, indicates an important area for future investigation.

Based on these gaps, this study makes a significant contribution by providing an integrated synthesis of recent technopreneurship research. Unlike previous studies that focus on isolated aspects, this review combines insights from digital technology, innovation capability, sustainability, and ecosystem collaboration into a unified perspective. This integrative approach offers a more comprehensive understanding of the factors shaping technopreneurship success and provides a foundation for future research.

In addition to its theoretical contribution, this study also offers practical implications. Entrepreneurs should not rely solely on technology adoption but must also develop innovation capability and strategic market orientation. Policymakers are encouraged to support collaborative ecosystems and promote sustainable innovation practices to enhance the competitiveness of technopreneurial ventures.

CONCLUSION

This study provides a systematic synthesis of recent research on technology-based innovation in technopreneurship by reviewing selected scientific publications published between 2022 and 2025. The findings indicate that contemporary technopreneurship research increasingly emphasizes the integration of digital technologies, innovation capabilities, collaborative startup ecosystems, and sustainability-oriented entrepreneurship. These elements collectively shape how entrepreneurs leverage technological innovation to create competitive advantages and long-term value. From a theoretical perspective, this study contributes to the development of technopreneurship research by highlighting that technological adoption alone is insufficient to explain entrepreneurial success. Instead, the reviewed studies suggest that technopreneurship

performance emerges from the interaction between technological capability, innovation capacity, ecosystem collaboration, and sustainability orientation. This synthesis helps clarify the conceptual relationship between technological innovation and entrepreneurial competitiveness within the broader framework of digital entrepreneurship and innovation ecosystem theory.

In addition to its theoretical contributions, this study also offers several practical implications. For policymakers, the findings underline the importance of strengthening innovation ecosystems through supportive regulations, digital infrastructure, and funding mechanisms that encourage the growth of technology-based startups. For educational institutions, the results highlight the need to develop entrepreneurship education programs that integrate technological competencies, digital innovation skills, and interdisciplinary collaboration. Meanwhile, for startup entrepreneurs, the findings emphasize that successful technopreneurship requires not only technological adoption but also continuous innovation capability, effective digital marketing strategies, and active participation in collaborative ecosystems.

Despite these contributions, this study acknowledges several limitations. The relatively small number of studies included in the review indicates that empirical research on technopreneurship and technological innovation remains limited in certain contexts. Future research could therefore expand the scope by incorporating a larger dataset, conducting comparative studies across countries or industries, and applying longitudinal approaches to better understand the long-term dynamics of technopreneurial ventures. Overall, this systematic literature review highlights that technology-based innovation in technopreneurship represents an increasingly important research area for understanding how technological transformation shapes entrepreneurial activities. The insights generated from this study are expected to support future academic research as well as guide policymakers, educators, and practitioners in fostering more innovative and sustainable technopreneurship ecosystems.

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