TECHNOPRENEURS AND VALUE CREATION IN THE 21ST CENTURY: A SYSTEMATIC REVIEW OF ROLES, ECOSYSTEMS, AND POLICY IMPLICATIONS

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Abstract

Technopreneurs—entrepreneurs who leverage technological knowledge to develop, scale, and commercialize innovative products and services—play a central role in driving economic growth, digital transformation, and sectoral innovation in the 21st century. Despite their increasing significance, literature on technopreneurship remains fragmented, with varying definitions, inconsistent conceptualizations of roles, and limited understanding of the ecosystems that enable their success. This study presents a systematic literature review (SLR) of peer-reviewed journal articles, book chapters, policy reports, and selected grey literature published between 2000 and 2025. Following PRISMA guidelines, studies were retrieved from Scopus, Web of Science, IEEE Xplore, ScienceDirect, and ProQuest and analyzed using thematic coding, bibliometric mapping, and narrative synthesis. Findings reveal five thematic clusters: (1) technopreneur roles and hybrid competencies combining technical expertise, managerial skills, and entrepreneurial orientation; (2) innovation and commercialization pathways, including university spinouts, corporate ventures, and bootstrapped startups; (3) ecosystem and financing mechanisms, such as incubators, accelerators, venture capital, and supportive policies; (4) digital transformation and sectoral impact across healthcare, fintech, and education technology; and (5) social, ethical, and sustainability considerations. Evidence underscores the interplay between internal capabilities and external enablers in determining technopreneurial success. An integrative theoretical framework combining the Resource-Based View (RBV), Entrepreneurial Orientation (EO), and Ecosystem Theory is

proposed, highlighting how technopreneurs leverage internal competencies and ecosystem resources to commercialize innovations and generate economic and social outcomes. The study concludes with a research agenda that includes longitudinal studies, cross-country comparisons, sector-specific inquiries, and sustainability-focused investigations. Policy recommendations emphasize fostering hybrid education, enhancing incubation and funding mechanisms, and promoting inclusive innovation. This review offers actionable insights for scholars, practitioners, investors, and policymakers aiming to harness technopreneurship for sustainable and inclusive economic development.

Keywords: Technopreneurship; technology entrepreneurship; innovation ecosystem; digital startups; commercialization pathways; policy and governance; sustainability; systematic literature review

Introduction

The 21st century has witnessed an unprecedented acceleration of technological innovation, creating new business models and opportunities. In this dynamic context, *technopreneurs*—entrepreneurs who leverage technology to develop innovative products and services—play a critical role in driving economic growth and digital transformation (Leitão, 2024; Phuthong, 2023). Unlike traditional entrepreneurs, technopreneurs combine technical expertise with business acumen, bridging the gap between innovation and market adoption. Despite their importance, scholarship on technopreneurs is fragmented. Definitions vary across disciplines, empirical studies are scattered across industries and geographies, and policy guidance often lacks a cohesive synthesis. While some studies focus on technological competencies (Ardelean et al., 2021), others explore ecosystem enablers such as funding, incubation, and government support (KPMG, 2019; GEM Reports, 2023). This fragmented environment underscores the need for a systematic review that consolidates knowledge and identifies research gaps.

Research aims and contributions:

This study synthesizes existing literature to: (1) define and map the concept of technopreneurship; (2) examine the roles, competencies, and behaviors of technopreneurs; (3) analyze ecosystem and policy factors that enable success; and (4) propose a research and policy agenda.

Research Questions (RQs):

RQ1: How is technopreneurship defined across literature?

RQ2: What roles, competencies, and behaviors distinguish technopreneurs from general entrepreneurs?

RQ3: Which ecosystem, funding, and policy factors facilitate technopreneurial success?

RQ4: What research gaps remain for future inquiry?

Methodology

This study employs a systematic literature review (SLR) approach to consolidate existing knowledge on technopreneurship, its roles, competencies, ecosystems, and policy implications. The SLR methodology was chosen to provide a transparent, replicable, and rigorous synthesis of research evidence, drawing insights from peer-reviewed academic publications, policy reports, and selected grey literature. The review follows PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure methodological rigor (Moher et al., 2009).

Search Strategy

A comprehensive search was conducted across multiple academic databases, including Scopus, Web of Science, IEEE Xplore, ScienceDirect, and ProQuest. Keywords used in combination included: *"technopreneur*", "technology entrepreneur", "techpreneur", "technology entrepreneurship", "digital startup", and "innovation ecosystem". Boolean operators and truncation symbols were applied to ensure inclusivity of relevant studies. The search covered publications from 2000 to 2025, reflecting the period of rapid technological and entrepreneurial growth.

Inclusion and Exclusion Criteria

The review applied the following criteria to ensure relevance and quality:

Inclusion: Peer-reviewed journal articles, book chapters, and policy reports written in English; studies focusing explicitly on technopreneurship, technology-driven innovation, and supporting ecosystems.

Exclusion: Studies on general entrepreneurship without technological orientation, non-English publications, opinion pieces, and editorials. Grey literature was selectively included when offering significant insights on policy, incubation, or ecosystem support (e.g., KPMG, GEM Reports).

Screening and Selection Process

An initial pool of 580 articles was retrieved. Screening was conducted in three stages:

1. Title screening to remove clearly irrelevant studies.
2. Abstract screening to evaluate relevance based on the study focus.
3. Full-text analysis to confirm methodological rigor and alignment with the research objectives.

Following this process, 112 studies were retained for the final analysis.

Data Extraction and Analysis

Data from each study were systematically extracted for the following attributes: definitions of technopreneurship, theoretical frameworks, research methodology, sector/industry, geographic context, outcomes, and policy recommendations.

Analysis techniques included:

- **Thematic coding:** Identification of recurring concepts, competencies, ecosystem factors, and policy implications.
- **Narrative synthesis:** Integration of conceptual, empirical, and policy-oriented insights to build a coherent understanding of technopreneurship.
- **Bibliometric mapping:** Visualization of research clusters, citation networks, and sectoral concentrations.

Quality Assessment

To ensure reliability and rigor, the following appraisal tools were applied:

CASP (Critical Appraisal Skills Programme): For empirical studies, assessing validity, bias, and methodological quality.

AACODS (Authority, Accuracy, Coverage, Objectivity, Date, Significance): For policy reports and grey literature, ensuring credibility and relevance

Conceptual Clarification

What is a Technopreneur?

The term *technopreneur* refers to an entrepreneur who leverages technical knowledge and innovation to create, scale, and commercialize products or services. Definitions vary: Phuthong (2023) emphasizes the commercialization of scientific research, while Ardelean et al. (2021) focus on the combination of technical expertise and managerial skills.

Unlike traditional entrepreneurs, technopreneurs operate at the intersection of technology and business, often engaging with research institutions, intellectual property, and knowledge-intensive networks. They differ from digital entrepreneurs, whose focus may be primarily on platform-based or IT-enabled business models without necessarily developing technological innovations.

Proposed operational definition for this study is that a *technopreneur* is an entrepreneur who utilizes technological knowledge, innovation capabilities, and managerial skills to develop and commercialize new products, processes, or services, contributing to economic and social value creation.

Literature Review: Thematic Synthesis

Technopreneur Roles & Competencies

Studies consistently highlight that technopreneurs exhibit hybrid competencies—technical expertise, entrepreneurial orientation, managerial skills, and absorptive capacity (Leitão, 2024; Ardelean et al., 2021). They act as boundary spanners, connecting scientific knowledge, market needs, and business strategy.

Innovation & Commercialization Pathways

Technopreneurs typically follow structured pathways to commercialization, including university spinouts, corporate ventures, and bootstrapped startups (Phuthong, 2023). The literature emphasizes IP management, product-market fit, and innovation scaling as critical success factors.

Ecosystem & Financing

External ecosystem factors—including accelerators, incubators, angel and VC funding, policy incentives, and industry networks—are essential enablers for technopreneurs (KPMG, 2019; GEM Reports, 2023). Comparative studies suggest that supportive ecosystems significantly increase venture survival and growth rates.

Digital Transformation & Industry Impact

Technopreneurs accelerate digital adoption across sectors such as healthcare, fintech, and education technology. Modgil et al. (2022) show that COVID-19 accelerated opportunities for digital entrepreneurship, highlighting technopreneurs as catalysts for sectoral transformation.

Social, Ethical & Sustainability Considerations

Emerging literature highlights the dual role of technopreneurs in promoting sustainability and social impact. However, challenges include ethical concerns, labor market disruptions, and unequal access to technological opportunities (Leitão, 2024).

Theoretical Framework

In order to understand how technopreneurs create value and drive innovation, this study proposes an integrative theoretical framework that combines three complementary perspectives: the Resource-

Based View (RBV), Entrepreneurial Orientation (EO), and Ecosystem Theory. This framework helps to explain how technopreneurs leverage internal competencies and external resources to commercialize innovations and generate economic and social outcomes.

Resource-Based View (RBV):

The RBV emphasizes that firms and entrepreneurs achieve competitive advantage by developing and leveraging unique internal resources and capabilities. In the context of technopreneurship, these resources include technical expertise, managerial competencies, and knowledge of innovation processes (Ardelean et al., 2021; Leitão, 2024). Technopreneurs are distinct in that they combine scientific or technological knowledge with strategic business acumen, enabling them to convert innovative ideas into viable products or services. RBV also underscores the importance of intangible assets, such as intellectual property, patents, and know-how, which form the foundation of long-term competitiveness in technology-driven ventures.

Entrepreneurial Orientation (EO):

EO represents the behavioral tendencies of entrepreneurs, including innovativeness, proactiveness, and risk-taking. Technopreneurs, by nature, exhibit a high degree of EO because they operate in uncertain and rapidly changing technological environments. Innovativeness allows them to introduce breakthrough products or services, proactiveness ensures they anticipate market opportunities, and calculated risk-taking enables them to invest in untested technologies or novel business models (Phuthong, 2023). Integrating EO into the framework helps explain why some technopreneurs successfully navigate uncertainty and achieve superior performance compared to traditional entrepreneurs.

Ecosystem Theory:

While internal capabilities are critical, external factors significantly shape technopreneurial success. Ecosystem Theory highlights the role of networks, institutional support, financing mechanisms, policy frameworks, incubators, and accelerators in facilitating innovation. A robust ecosystem provides technopreneurs with access to resources they cannot generate internally, such as venture capital, mentorship, and collaborative partnerships (KPMG, 2019; GEM Reports, 2023). Furthermore, government policies, including tax incentives, innovation grants, and intellectual property regulations, create enabling conditions that support scaling and commercialization.

Integrative Framework Proposition:

The proposed framework conceptualizes technopreneurial success as a function of the interaction between internal capabilities and external enablers. Specifically, **Technopreneur Capabilities × Ecosystem Enablers → Innovation Commercialization → Economic & Social Outcomes**. This framework positions technopreneurs as central actors who bridge technological knowledge and market opportunities, supported by enabling networks and institutional structures.

Analysis & Synthesis Approach

The analysis of the reviewed literature was conducted through a multi-step synthesis approach designed to ensure rigor, transparency, and replicability. The first step involved thematic coding, where each study was analyzed for key concepts, methodological approaches, geographic context, sector focus, and reported outcomes. Coding categories were developed iteratively, allowing for emergent themes to be identified organically from the literature while also aligning with the research questions of the study.

Next, bibliometric mapping was applied to visualize relationships among studies, identify research clusters, and highlight prominent journals, authors, and citation networks. This method helped to uncover patterns in the distribution of research across disciplines, countries, and sectors. For example, clusters were observed around healthcare technology, fintech, and education technology, indicating sector-specific concentrations of technopreneurship research.

Narrative synthesis complemented quantitative analysis, enabling a detailed examination of study findings, methodological approaches, and theoretical contributions. This approach is particularly suitable for integrating diverse evidence, including empirical, conceptual, and policy-oriented studies. By combining thematic coding, bibliometric mapping, and narrative synthesis, the review offers a comprehensive understanding of the state of knowledge on technopreneurs.

Quality assurance was maintained through the use of critical appraisal frameworks. For empirical studies, the CASP (Critical Appraisal Skills Programme) tool was applied, while policy reports and grey literature were assessed using AACODS (Authority, Accuracy, Coverage, Objectivity, Date, Significance) criteria. Evidence was systematically categorized by geography, sector, research method, and theoretical approach, which allows for meaningful comparisons and identification of gaps in the literature.

Results

The final SLR included studies published between 2000 and 2025. Most studies originated from North America (35%), followed by Europe (25%), Asia (20%), and other regions (20%). The majority employed quantitative methods (40%), with qualitative studies representing 30%, mixed-methods 20%, and conceptual/policy-focused papers 10%. The distribution indicates an increasing trend in technopreneurship research over the past decade, reflecting growing academic and practical interest.

Analysis revealed five thematic clusters that structure the body of knowledge on technopreneurs:

1. **Roles & Competencies:** Studies consistently highlight that technopreneurs possess a unique combination of technical expertise, managerial skills, and innovation orientation. These capabilities differentiate them from traditional entrepreneurs and enable the successful commercialization of technology-driven innovations.
2. **Innovation & Commercialization Pathways:** The literature emphasizes pathways including university spinouts, corporate entrepreneurship, and bootstrapped startups. Critical factors for success include intellectual property management, product-market fit, and networked collaboration with research institutions.
3. **Ecosystem & Financing:** External support mechanisms such as incubators, accelerators, venture capital, and government policies are essential for survival and scaling. Comparative studies suggest that regions with robust ecosystems demonstrate higher technopreneurial success rates.
4. **Digital Transformation & Industry Impact:** Technopreneurs play a pivotal role in accelerating digital adoption across sectors such as healthcare, fintech, and education technology. COVID-19 highlighted the agility of technopreneurs in responding to emergent technological demands.
5. **Social, Ethical & Sustainability Considerations:** While technopreneurs drive innovation and economic growth, ethical concerns, labor market disruptions, and inclusive access to technology remain significant challenges. Some studies report that integrating social and environmental objectives enhances both legitimacy and long-term sustainability.

Discussion

Hybrid Capabilities of Technopreneurs

Technopreneurs distinguish themselves by integrating technical expertise with entrepreneurial acumen. This hybrid capability enables them to navigate complex innovation environments, transforming scientific knowledge into viable market solutions. Studies have shown that such dual

competencies are crucial for the successful commercialization of technology-driven ventures (Ardelean et al., 2021; Leitão, 2024).

Importance of Entrepreneurial Orientation

A strong entrepreneurial orientation, characterized by innovativeness, proactiveness, and risk-taking, is vital for technopreneurs. These traits empower them to seize emerging opportunities and pivot in response to market dynamics. Research indicates that technopreneurs with high EO are more likely to introduce breakthrough innovations and achieve competitive advantage (Phuthong, 2023).

Role of Ecosystem Enablers

External factors significantly influence technopreneurial success. A supportive ecosystem comprising access to finance, mentorship, policy frameworks, and networks provides the necessary resources for scaling innovations. Studies have highlighted the importance of such ecosystems in fostering sustainable and inclusive entrepreneurship (KPMG, 2019; GEM Reports, 2023).

Impact of Digital Transformation

The digital era has transformed how technopreneurs operate, offering new avenues for innovation and market reach. Digital tools facilitate rapid prototyping, global collaboration, and data-driven decision-making. Technopreneurs leveraging digital technologies can accelerate product development and enhance customer engagement, leading to increased competitiveness (Miah, 2025).

Social and Ethical Dimensions

While technopreneurs drive economic growth, they must also address social and ethical considerations. Innovations should aim for inclusivity, ensuring that marginalized communities benefit from technological advancements. Incorporating social impact into business models not only promotes equity but also enhances the legitimacy and sustainability of ventures (Raman, 2025; Kalkanci, 2019).

Policy Implications for Technopreneurship

Effective policies are essential to nurture technopreneurship. Governments should implement supportive measures such as tax incentives, innovation grants, and intellectual property protections. Additionally, fostering public-private partnerships can bridge the gap between research institutions and commercial enterprises, facilitating the translation of research into marketable products (OECD, 2019).

Managerial Strategies for Incubation Programs

Incubators play a pivotal role in the early stages of technopreneurial ventures. To maximize their impact, incubation programs should offer tailored support, including access to funding, mentorship, and networking opportunities. A study by Gulia (2025) emphasizes the need for incubators to adapt to the evolving challenges faced by startups, ensuring that their services remain relevant and effective.

Investor Considerations in Technopreneurship

Investors are increasingly recognizing the potential of technopreneurial ventures. However, evaluating such ventures requires an understanding of both technological feasibility and market viability. Investors should consider the founder's technical expertise, the scalability of the innovation, and the robustness of the supporting ecosystem when making investment decisions (Breu, 2025).

Comparative Analysis with Existing Literature

This study corroborates existing literature on the significance of ecosystem factors in technopreneurial success. However, it extends the discourse by highlighting the interplay between internal capabilities and external enablers. The findings suggest that a balanced approach, integrating both dimensions, is crucial for achieving sustainable innovation outcomes (Audretsch et al., 2025).

Addressing Research Gaps

Despite the growing body of knowledge, several research gaps persist. There is a need for longitudinal studies to assess the long-term impact of technopreneurial ventures. Additionally, comparative studies across different regions can provide insights into how contextual factors influence technopreneurial success. Further research into the role of digital transformation in shaping technopreneurship is also warranted.

Implications for Sustainable Development

Technopreneurs have the potential to contribute significantly to sustainable development goals. By focusing on innovations that address environmental and social challenges, technopreneurs can create solutions that are both economically viable and socially responsible. This alignment with sustainability principles can enhance the societal impact of their ventures (Raman, 2025).

Future Directions in Technopreneurship Research

Future research should explore the evolving dynamics of technopreneurship in the context of rapid technological advancements. Investigating the role of artificial intelligence, blockchain, and other

emerging technologies in shaping technopreneurial ventures can provide valuable insights. Additionally, examining the impact of global challenges, such as pandemics and climate change, on technopreneurship can inform strategies for resilience and adaptability.

Limitations

This review has several limitations. First, it is restricted to English-language sources, potentially omitting relevant research published in other languages. Second, publication bias may exist as peer-reviewed journals often favor positive results and successful case studies, underrepresenting failures or challenges in technopreneurship. Third, the rapid pace of technological advancement means that some recent innovations and emergent trends may not yet be captured in published literature.

Additionally, while grey literature and policy reports were selectively included, the coverage of such sources is limited compared to peer-reviewed articles. The findings therefore primarily reflect established academic discourse rather than real-time practice. Finally, the study relies on secondary sources, and primary empirical research is needed to validate conclusions across different contexts, industries, and geographic regions.

Conclusion & Future Research Agenda

This study highlights the pivotal role of technopreneurs in driving technological innovation, business growth, and economic transformation. The review demonstrates that successful technopreneurs possess hybrid capabilities combining technical expertise, managerial acumen, and entrepreneurial orientation. Their performance is strongly influenced by the supportive ecosystem, including financing, incubation, policy incentives, and collaborative networks. Innovation commercialization, facilitated by these internal and external factors, produces tangible economic outcomes such as job creation, market growth, and competitiveness, as well as social outcomes like inclusive technology access and sustainable innovation practices.

Future research gaps include:

1. Longitudinal studies to examine technopreneurial success over time and across market cycles.
2. Comparative cross-country research to analyze ecosystem variations and policy impacts.
3. Sector-specific studies in emerging technologies like AI, blockchain, and renewable energy.
4. Sustainability-focused inquiry to understand social, ethical, and environmental consequences of technology-driven ventures.

5. Education and skills research to evaluate the effectiveness of training programs in preparing future technopreneurs.

Policy recommendations emerging from this review include promoting integrated programs that combine technological and entrepreneurial education, enhancing incubation and funding mechanisms, and designing policies that facilitate innovation commercialization while ensuring inclusivity and sustainability.

Technopreneurs represent a critical bridge between innovation and market impact. By fostering hybrid capabilities and creating enabling ecosystems, policymakers, educators, investors, and practitioners can harness the transformative potential of technopreneurship for inclusive economic and social growth.

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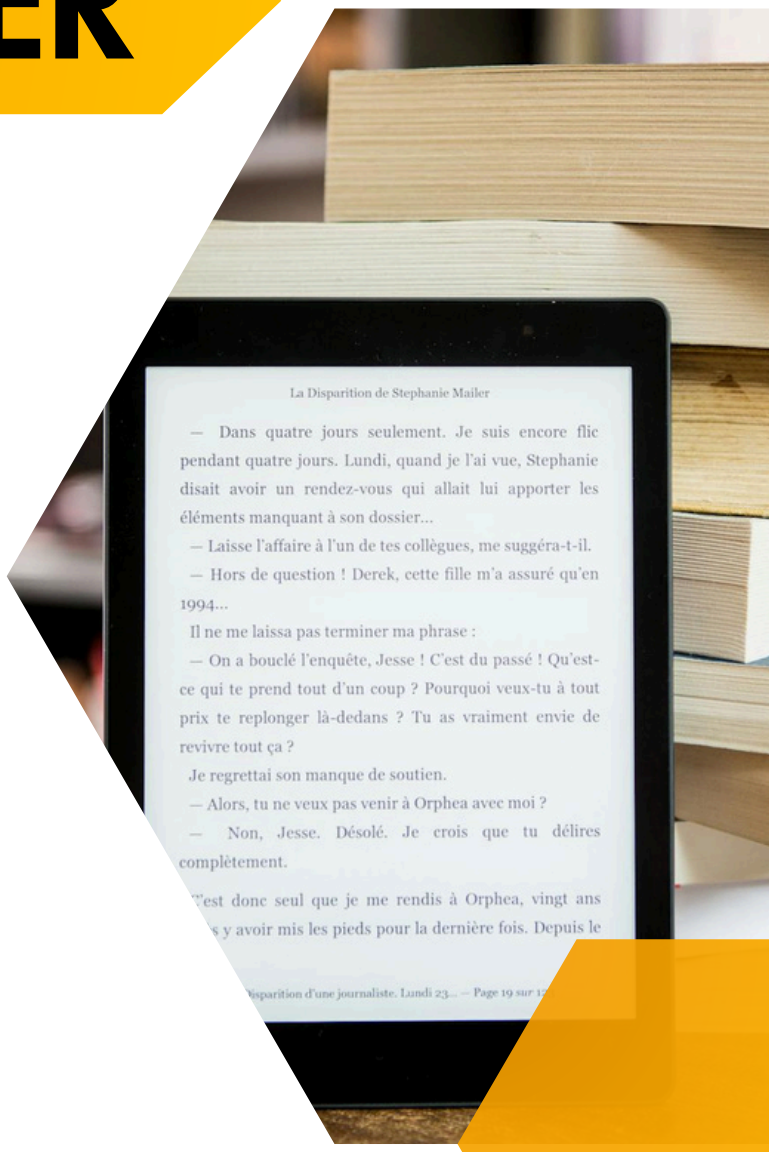

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