STRATEGIC APPROACH TO SUSTAINABILITY-BASED TECHNOPRENEURSHIP: BALANCING THE DYNAMICS OF TECHNOLOGICAL INNOVATION AND SOCIAL RESPONSIBILITY IN THE DIGITAL ENTREPRENEURSHIP ECOSYSTEM

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ABSTRACT

This study aims to examine strategic approaches in sustainability-based technopreneurship, focusing on efforts to balance the dynamics of technological innovation and social responsibility within the digital entrepreneurship ecosystem. Using a qualitative literature review method with descriptive analysis, this research analyzes 25 selected scholarly articles from a total of 50 sources collected via Google Scholar and reputable academic databases spanning the period from 1997 to 2025. The findings reveal that sustainable technopreneurship strategies can be constructed through the integration of values from the Triple Bottom Line, Creating Shared Value, Stakeholder Theory, and Dynamic Capabilities. Case studies from startups such as TaniHub and JALA Tech reinforce the notion that technopreneurial success is not solely dependent on technological superiority, but also on the extent to which they generate positive social and environmental impact. This study concludes that sustainability must be positioned as the core of technopreneurial strategy rather than as a supplementary element. The findings carry significant implications for policy development, entrepreneurship education, and the design of inclusive, socially responsible digital business models.

Keywords: Technopreneurship, Sustainability, Technological Innovation, Social Responsibility, Digital Business Strategy, Entrepreneurship Ecosystem

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PENDEKATAN STRATEGIS DALAM TECHNOPRENEURSHIP BERBASIS KEBERLANJUTAN: MENYEIMBANGKAN DINAMIKA INOVASI TEKNOLOGI DAN TANGGUNG JAWAB SOSIAL DALAM EKOSISTEM KEWIRAUSAHAAN DIGITAL

ABSTRAK

Penelitian ini bertujuan untuk mengkaji pendekatan strategis dalam technopreneurship berbasis keberlanjutan, dengan fokus pada upaya menyeimbangkan dinamika inovasi teknologi dan tanggung jawab sosial dalam ekosistem kewirausahaan digital. Dengan menggunakan metode tinjauan pustaka berpendekatan kualitatif dan analisis deskriptif, penelitian ini menganalisis 25 artikel ilmiah terpilih dari total 50 literatur yang dikumpulkan melalui Google Scholar dan situs-situs akademik kredibel selama periode 1997–2025. Hasil kajian menunjukkan bahwa strategi technopreneurship yang berkelanjutan dapat dibangun melalui integrasi nilai Triple Bottom Line, Creating Shared Value, Stakeholder Theory, dan Dynamic Capabilities. Studi kasus dari startup seperti TaniHub dan JALA Tech memperkuat bahwa keberhasilan technopreneur tidak hanya bergantung pada keunggulan teknologi, tetapi juga pada sejauh mana mereka menciptakan dampak sosial dan lingkungan yang positif. Penelitian ini menyimpulkan bahwa keberlanjutan harus menjadi inti strategi technopreneur, bukan sekadar pelengkap. Temuan ini memberikan implikasi penting bagi pengembangan kebijakan, pendidikan kewirausahaan, serta model bisnis digital yang inklusif dan bertanggung jawab secara sosial.

Kata kunci: Technopreneurship, Keberlanjutan, Inovasi Teknologi, Tanggung Jawab Sosial, Strategi Bisnis Digital, Ekosistem Kewirausahaan

INTRODUCTION

The rapid advancement of digital technology over the past two decades has given rise to a new, more dynamic, open, and competitive entrepreneurial landscape. This phenomenon has spurred the emergence of technology-based entrepreneurship—commonly referred to as technopreneurship—which extends beyond conventional goods and services provision, involving the creation of value through the utilization of cutting-edge technologies such as artificial intelligence, blockchain, big data, and the Internet of Things. Amidst this innovation frenzy, a major challenge arises: how can technopreneurs achieve sustainable business growth without compromising social and environmental values? As emphasized by (Elkington, 1998) through the Triple Bottom Line framework, sustainability demands economic growth (profit) while also addressing social (people) and environmental (planet) considerations.

The digital transformation driving technopreneurship also reshapes the entrepreneurship ecosystem itself. This ecosystem now involves various actors, including business incubators, financial institutions, educational bodies, and digital communities. According to (Isenberg, 2010), entrepreneurial success is highly dependent on a supportive ecosystem comprising technological infrastructure, collaborative networks, and regulatory frameworks. However, recent studies indicate that the rapid growth of technopreneurship often places excessive emphasis on aggressive technological innovation (Wong, 2001), which in the long run poses risks such as digital inequality, environmental degradation due to electronic waste, and social exclusion of vulnerable groups lacking adequate technological access. Consequently, there is a need for strategic approaches capable of harmonizing the dynamics of technological innovation with the social responsibility inherent in sustainability principles.

In the sustainability context, Creating Shared Value concept emphasizes that technology companies integrating social value into their core business strategy can achieve long-term competitive advantage (Porter & Mark R. Kramer, 2011). This is especially relevant in technopreneurship, where innovation is measured not only by the scale of technological disruption but also by the social contributions it generates. For example, agritech startups such as Habibi Garden in Indonesia have demonstrated that the application of sensors and IoT can significantly boost farmers' productivity while reducing water waste—highlighting the alignment between innovation and sustainability (Pratama, 2025). This case underscores the importance of strategic approaches in technopreneurship that are financially profitable while simultaneously addressing pressing social and environmental needs in an adaptive manner.

In practice, many technopreneurs face a dilemma: should they accelerate technological innovation to gain market dominance, or slow down growth to ensure adherence to sustainability principles? This tension demands a strategic framework that can accommodate both imperatives in a balanced manner. Freeman's Stakeholder Theory (2001) provides a philosophical foundation for business strategies that consider not only shareholders but all stakeholders, including communities, the environment, employees, and governments (Freeman & McVea, 2001). In the technopreneurship context, implementing this theory involves actively involving end-users, committing to digital inclusivity, and developing ethical, sustainable technology products. Nonetheless, challenges remain in measuring the effectiveness of such approaches, given the limited availability of integrated sustainability metrics across the digital ecosystem.

In Indonesia, the role of technopreneurs in supporting sustainable development has been gaining increasing attention, particularly in advancing the goals of the Sustainable Development Goals (SDGs). Several platforms such as KoinWorks, TaniHub, and JALA Tech have demonstrated that technological innovation can be directed toward expanding financial access, strengthening food security, and enhancing fishermen's productivity in a sustainable manner. However, their success cannot be separated from the support of enabling policies, mentoring programs, and cross-sector partnerships. Therefore, a strategic approach to sustainability-based

technopreneurship also requires multi-stakeholder collaboration as a reinforcing pillar. Research by (Eltalhi et al., 2025) emphasizes the critical role of government in creating regulatory frameworks that encourage green innovation and provide incentives to technopreneurs who adopt sustainability principles in their business models.

One crucial aspect that also deserves attention is how technopreneurs formulate internal strategies that embed sustainability values into their organizational culture and innovation processes. The Dynamic Capabilities Theory by (Teece et al., 1997) explains that adaptive firms are those capable of sensing external changes, seizing opportunities, and transforming internal resources rapidly and flexibly. Within this framework, technopreneurs seeking to remain relevant and sustainable must develop the ability to continually engage in learning, reconfiguring, and integrating social and environmental values into technological innovation processes. This implies that sustainability should not merely be an add-on CSR program but must become an integral part of the core strategy that shapes the technopreneur's identity.

Furthermore, the role of higher education institutions and business incubators in nurturing sustainable technopreneurs is equally significant. Entrepreneurship curricula that emphasize social innovation, sustainability, and inclusive technology contribute to the development of a holistic technopreneurial mindset. A study by (Al Hashimi et al., 2021) reveals that students who receive sustainability-oriented technopreneurship training are more likely to build businesses that are market-resilient and socially impactful. Consequently, the strategic design of technopreneurship education—research-based and integrated with sustainability principles—has become an urgent necessity for producing visionary and socially responsible digital entrepreneurs.

Based on the discussion above, it can be concluded that a strategic approach to sustainability-based technopreneurship is not merely an idealistic discourse but a tangible necessity born out of the tension between technological innovation dynamics and social responsibility. By referring to key theoretical frameworks such as the Triple Bottom Line, Stakeholder Theory, Creating Shared Value, and Dynamic Capabilities, this study aims to examine in depth how technopreneurs can balance technological innovation with commitments to social and environmental sustainability within the digital entrepreneurship ecosystem, and to formulate practical strategies that may serve as implementation guidelines for future technopreneurs.

LITERATURE REVIEW

Technopreneurship

Technopreneurship refers to a form of entrepreneurship that is rooted in the utilization of technology as the primary foundation for creating innovative and economically valuable products, services, or business models (Rafiana, 2023). A technopreneur combines the traits of conventional entrepreneurs—such as risk-taking, creative thinking, and resource management—with the ability to leverage digital technologies like artificial intelligence, the Internet of Things (IoT), cloud computing, and digital platforms. In practice, technopreneurs develop tech-driven business solutions, drive industry transformation, generate new employment opportunities, and address social challenges through adaptive and scalable technological approaches.

Sustainability

Sustainability refers to the capacity of a system or entity to endure and grow over the long term without degrading the environment, compromising social well-being, or neglecting intergenerational equity. In business, sustainability encompasses three core dimensions—economic, social, and environmental—commonly known as the Triple Bottom Line (Elkington, 1998). A sustainable company not only pursues profit but also considers its impact on society and the planet. In the era of technopreneurship, sustainability serves as a critical foundation to ensure that technological innovation contributes to inclusive and ecological development rather than systemic harm.

Technological Innovation

Technological Innovation is the process of developing or applying new technologies to create added value, improve efficiency, or solve complex problems (Choi & Yoo, 2022). This innovation can take various forms, from the creation of new software and the use of AI in automation to the integration of eco-friendly technologies in industry. In technopreneurship, technological innovation is both a key differentiator and a growth driver in digital businesses. However, the challenge lies not only in creating new technology but also in ensuring that innovation is designed ethically, addresses societal needs, and delivers sustainable social impact.

Social Responsibility

Social Responsibility refers to the moral and strategic obligation of individuals, organizations, or companies to consider and mitigate their impact on the wider community (Hamza & Jarboui, 2022). In the digital business context, social responsibility includes protecting user data, ensuring technology accessibility for all, empowering local communities, and avoiding the exploitation of resources or labor. A socially responsible technopreneur incorporates ethical principles and social advocacy into product design, marketing strategies, and stakeholder engagement. This underscores that financial success and social impact are not opposing goals but mutually reinforcing outcomes.

Digital Business Strategy

Digital Business Strategy is a long-term plan that leverages digital technology to achieve organizational goals, enhance competitiveness, and create adaptive and scalable business models (Suharto, 2024). This strategy involves the use of software and online platforms, and extends to transforming organizational culture, operational structures, and customer engagement approaches. In technopreneurship, an effective digital business strategy is one that can quickly respond to market changes, innovate continuously, and integrate social and environmental values into the core business processes.

Entrepreneurial Ecosystem

The Entrepreneurial Ecosystem is a dynamic network of various actors—such as entrepreneurs, investors, incubators, universities, governments, and user communities—that interact and contribute to the growth of new ventures. This ecosystem provides the resources, information, connections, and policy support needed to facilitate innovation and entrepreneurship. In the context of technopreneurship, the digital entrepreneurial ecosystem creates an environment that supports technology exploration, business idea validation, and startup growth acceleration (Baranauskas & Raišienė, 2022). However, to ensure that the ecosystem is truly inclusive and sustainable, collaborative governance and a shared commitment to social values and tech ethics are essential.

RESEARCH METHODOLOGY

This study employs a literature review method with a qualitative, exploratory approach and descriptive analysis. This approach is selected to deeply explore various conceptual, theoretical, and empirical perspectives on strategic approaches in sustainability-based technopreneurship, particularly in balancing technological innovation and social responsibility within the digital entrepreneurship ecosystem. The analysis aims to identify patterns, trends, and gaps found in prior studies in order to build a strong conceptual foundation and provide theoretical contributions to the development of sustainable technopreneurship studies.

The primary data sources are scientific publications and documents available online through platforms such as Google Scholar and reputable websites including ScienceDirect, SpringerLink, Taylor & Francis, as well as academic institution portals and trusted international organizations. The reviewed articles and documents span the publication period from 1997 to 2025 to ensure relevance with the latest developments in technology, entrepreneurship, and sustainability. Literature selection criteria include direct relevance to the topics of technopreneurship, sustainability, technological innovation, social responsibility,

and strategic discussions within the digital ecosystem context.

Data collection was conducted using keywords such as "strategic technopreneurship," "digital entrepreneurship sustainability," "innovation and social responsibility," "technopreneur strategy," and "ecosystem of sustainable entrepreneurship." The initial search yielded 50 relevant scholarly articles and documents. However, following a rigorous selection process based on academic validity, balance of theoretical and practical perspectives, and depth of discussion, the final analysis was narrowed down to 25 core articles considered the most representative and comprehensive in relation to the research objectives.

Data analysis was carried out using a descriptive-qualitative approach, presenting findings narratively and systematically based on classified key themes. This process involved the identification of core concepts, issue categorization, synthesis of theory and practice, and critical interpretation of each literature's contribution to the understanding of sustainability-oriented technopreneurship strategies. The results of this analysis are expected to serve as a foundation for developing new conceptual frameworks and formulating implementable strategies for technopreneurs and other stakeholders in the increasingly complex landscape of digital entrepreneurship.

RESULTS AND DISCUSSION

Within the framework of sustainability-based technopreneurship, the integration of technological innovation and social responsibility demands a holistic approach that considers cross-dimensional impacts, as articulated in the Triple Bottom Line framework (Elkington, 1998), which asserts that sustainability cannot be sustained by profit alone, but must also encompass contributions to social well-being (people) and environmental preservation (planet). In practice, technology within technopreneurship should not merely be viewed as a tool for business acceleration, but as a transformative medium capable of addressing socio-ecological challenges in a sustainable manner. However, in many developing countries like Indonesia, technopreneurs often remain trapped in short-term economic growth logic and have yet to embed social and environmental values as core components in their business strategy formulation. Therefore, adopting the Triple Bottom Line approach can serve as a normative paradigm that fosters transformation toward a form of technopreneurship that is competitive, ethical, and systemically impactful for long-term sustainability.

(Nagel, 2022) indicates that many young technopreneurs in Indonesia remain caught in the euphoria of high-tech product development without a strategic framework that comprehensively integrates social and environmental sustainability. At the same time, intense digital competition pressures them to prioritize business growth at the expense of ethical principles, resulting in exploitative and short-term technopreneurship practices. This condition underlines the relevance of the Creating Shared Value theory as a strategic foundation that promotes the creation of dual value—both economic and social—through innovations that directly address community challenges, such as access to education, healthcare, and financial inclusion, while simultaneously strengthening market differentiation and positioning (Porter & Mark R. Kramer, 2011). Implementing a shared value approach not only enhances customer loyalty and social legitimacy but also fosters long-term resilience within dynamic and uncertain startup ecosystems, especially in emerging markets like Indonesia.

Stakeholder Theory provides an essential foundation for technopreneurs in crafting business strategies that are not solely profit-driven or user-centric, but that also respond to the needs and expectations of a wide range of actors affected by digital activities, including local communities, regulators, freelancers, and populations indirectly impacted by technology penetration (Freeman & McVea, 2001). In today's increasingly complex digital economy, the success of startups hinges not only on technological innovation but also on their ability to build mutually beneficial

relationships with stakeholders through participatory and transparent approaches. Previous research shows that the involvement of local communities in co-creation processes can enhance social legitimacy, market acceptance, and resilience against external shocks (Even et al., 2024). Therefore, technopreneurial strategies grounded in stakeholder engagement strengthen social sustainability and create adaptive, collaborative spaces for generating shared, long-lasting value in an evolving digital ecosystem.

The case of TaniHub Group exemplifies the real-world application of socially sustainable technopreneurship in Indonesia. This agritech startup has successfully integrated digital technology into conventional agricultural systems, particularly by digitizing the supply chain to eliminate middlemen, enabling smallholder farmers to sell directly to consumers and retailers—thereby improving distribution efficiency and market access (Nabil, 2024). With the launch of TaniFund in 2017, TaniHub offered peer-to-peer (P2P) financing to small farmers, where loans are repaid through harvest yields rather than cash, easing access to capital and enhancing productivity. TaniFund received official licensing from Indonesia's Financial Services Authority (OJK) and disbursed billions of rupiah to expand financial inclusion in the agricultural sector (Dawn, 2021). Meanwhile, its logistics arm, TaniSupply, provides warehousing and packing services across regions, collaborating with FastPOS and utilizing NFC technology for produce sorting and grading—all aimed at streamlining the supply chain and reducing food waste (Ellis, 2021). As a result, more than 30,000 smallholder farmers have been integrated into the platform; farmer incomes have increased by 20–25%; 100% of loan recipients now have bank accounts; and TaniFund has disbursed over IDR 427 billion in credit by 2021 (Ventures, 2021). This ecosystem model illustrates how social sustainability can serve as the foundation of competitive advantage. TaniHub is not merely creating economic value but also restructuring the microeconomic landscape by empowering marginalized farming communities. Their strategy clearly aligns with the principles of Inclusive Innovation: leveraging technology as a bridge to reduce social inequality and include previously excluded groups in the digital ecosystem.

From an organizational capability perspective, the theory of Dynamic Capabilities emphasizes that technopreneurs who possess the ability to sense environmental changes, seize new opportunities, and transform resources adaptively hold a strategic advantage in navigating market uncertainties and evolving socio-ecological dynamics (Teece et al., 1997). Sustainability in technopreneurship is not merely about producing environmentally friendly products, but also encompasses the ongoing capacity to adapt business processes, service models, and operational strategies to remain relevant to the dynamic nature of sustainability issues. A concrete example is demonstrated by JALA Tech, an Indonesian aquaculture startup that leverages dynamic capabilities by continuously updating its algorithm based on weather data and water quality to help shrimp farmers improve harvest predictability while reducing ecological risks. The JALA App allows aquaculture farmers to monitor over 40 parameters—including pH, temperature, dissolved oxygen, oxidation-reduction potential, salinity, and weather conditions—in real time, and generates biomass estimates and harvest predictions (JALA, 2025a, 2025b). Such capabilities illustrate how mastery of real-time information systems and their transformation into adaptive operational strategies—through features like daily chemical parameter forecasting—are inseparable from sustainable technopreneurship (Vanessa, 2024). Furthermore, JALA Tech offers an integrated water quality monitoring system, including hardware modules like JALA Baruni, and employs multiparameter analysis using data-driven analytics—demonstrating what the literature describes as dynamic capabilities adaptive to changes in aquatic ecosystems. As a result, JALA Tech has created an innovative, resilient, and proactive ecosystem that enables informed decision-making based on weather and water conditions, directly supporting technical sustainability and improving the livelihoods of fishing communities using the technology.

Research by (Dewi & Gunadi, 2025) reveals that technopreneurs who receive early training in sustainability-based entrepreneurship are more likely to develop business models that are not only technologically innovative but also ethical and environmentally conscious. This finding underscores the crucial role of higher education institutions and business incubation programs in shaping strategic thinking frameworks that embed sustainability as a central component of innovation processes. In Indonesia, initiatives such as Startup Studio Indonesia and IDX Incubator have begun integrating sustainability values into their curricula. However, implementation remains partial and uneven across the startup development ecosystem. To make sustainability an integral part of technopreneurship, systemic integration is needed—where social and environmental considerations become key elements at every stage of business development, from ideation to market expansion. Entrepreneurial education that emphasizes growth strategies while internalizing social and ecological responsibility will cultivate technopreneurs who are not only competitive but also capable of contributing meaningfully to long-term sustainability.

In the digital entrepreneurship ecosystem, characterized by intense competitive pressure and rapid technological change, technopreneurs are often tempted to take shortcuts by exploiting user data, relying heavily on ad-based revenue models, or developing products that neglect long-term social and environmental impacts. This phenomenon presents serious challenges to the integrity and sustainability of digital business models. (Pratiwi et al., 2022) emphasizes that success in digital-era technopreneurship cannot be measured solely by technological sophistication or speed of innovation, but also by the moral courage to build business models grounded in ethical values. This includes a commitment to digital justice, privacy protection, transparent data governance, and socially responsible design practices. Unfortunately, discourse around sustainable digital business models in Indonesia remains relatively limited and has yet to become mainstream in literature or startup incubation practices. Yet this very strategy is essential for technopreneurs seeking to build businesses that endure competitive pressures, gain public trust, promote digital equity, and create long-term social value.

Based on a synthesis of relevant theories, empirical findings, and case studies discussed above, a strategic approach to sustainability-based technopreneurship demands an integration of progressive technological innovation, inclusive social orientation, and organizational flexibility that enables rapid adaptation to external environmental dynamics. Drawing from the Triple Bottom Line theory—which highlights the balance between profit, people, and planet; the Creating Shared Value theory—which advocates for generating mutual value between business and society; Stakeholder Theory—which broadens the range of stakeholders to be considered; and Dynamic Capabilities Theory—which stresses the importance of adaptive and transformative competencies—technopreneurs are equipped with a solid conceptual foundation for developing business models that are not only economically competitive, but also socially and ecologically constructive. This study affirms that success in technopreneurship today is no longer solely measured by the speed of disruption or market expansion, but by the extent to which innovation provides concrete solutions to sustainability challenges, builds public trust, and fosters a responsible value system in the face of increasingly complex global challenges.

CONCLUSION

This study concludes that the success of technopreneurship in the digital era is determined not only by the ability to create disruptive technological innovations, but also by the capacity to align those innovations with social and environmental sustainability values. Through the theoretical frameworks of the Triple Bottom Line, Creating Shared Value, Stakeholder Theory, and Dynamic Capabilities, it becomes clear that technopreneurs who integrate business orientation with social and

ethical values tend to achieve greater resilience and stronger legitimacy within the dynamic digital ecosystem. Case studies such as TaniHub and JALA Tech demonstrate that sustainable technopreneurship is not only feasible but can also generate tangible positive impacts on society, local economies, and the environment. Therefore, a strategic technopreneurship approach must prioritize the creation of shared value rather than solely focusing on short-term profits.

The theoretical implication of this research is the need to broaden the framework of digital entrepreneurship to include sustainability as a core strategy, not merely as a peripheral add-on. This also enriches the discourse on technopreneurship as an interdisciplinary field that encompasses strategic management, social innovation, and technological ethics. From a practical standpoint, the findings serve as a reference for startup actors, investors, business incubators, and policymakers in formulating strategies that foster the growth of technopreneurs who are not only technologically adaptive but also socially and environmentally responsible. Governments may use these findings to design regulatory frameworks and incentives that encourage sustainable digitalization, while educational institutions can incorporate sustainability and inclusivity values into technopreneurship curricula.

To foster sustainability-oriented technopreneurship, it is recommended that technopreneurs integrate sustainability indicators into their business models from the outset, including in product design, supply chains, and marketing strategies. Active stakeholder engagement from the early stages of product development should become a standard practice to build social legitimacy and strengthen market acceptance. Governments and startup-supporting institutions should provide access to sustainability training and facilitate cross-sector collaboration to enhance knowledge transfer and green innovation financing. For researchers and academics, it is suggested to develop sustainability evaluation instruments in technopreneurship that are more contextualized to the characteristics of developing countries such as Indonesia.

This study has several limitations. First, as a literature review, it does not collect primary data directly from technopreneurs, so its findings remain largely conceptual and general. Second, the selection of articles is limited to the 1997–2025 period and sourced from specific databases, which may result in selection bias and limited global perspective coverage. Third, there is no systematic mapping of the variations in strategic approaches across different technopreneurial industry sectors, meaning that in-depth analysis by sector (e.g., agritech, edutech, fintech) is not yet fully elaborated. Future research is encouraged to use mixed methods by incorporating field data to validate and confirm the theoretical constructs discussed in this study.

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