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The Synergy Between Artificial Intelligence and Green Entrepreneurship for The Achievement of The Sustainable Development Goals (SDGS): A Qualitative Synthesis Study

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Abstract: *The growing severity of global environmental challenges has accelerated the transition from traditional business models toward green entrepreneurship (ecopreneurship). This paper conducts a qualitative synthesis study to examine the synergy between Artificial Intelligence (AI) and green entrepreneurship in advancing the Sustainable Development Goals (SDGs). The findings reveal that AI serves as a powerful catalyst for optimizing resource management, minimizing waste, and fostering green innovation through highly accurate predictive models. The integration of human creativity with AI-driven big data analytics enables green enterprises to enter markets more rapidly while achieving superior ecological performance. The study further elucidates the underlying theoretical mechanisms through the lens of the extended Theory of Planned Behavior (TPB) and the Stimulus–Organism–Response (SOR) framework within the sustainability context. Nevertheless, the paper also highlights the unintended environmental costs associated with AI technologies, including electronic waste generation and increasing energy consumption by AI systems. Finally, an integrated governance framework based on green finance instruments and adaptive tax policies is proposed to ensure a sustainable symbiosis between technological advancement and environmental preservation.*

Keywords: *Green Entrepreneurship; Artificial Intelligence (AI); Sustainable Development; Eco-Innovation; Green Finance; Risk Management.*

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I. Introduction

Against the backdrop of climate change emerging as a pervasive threat to the global economy, restructuring production and consumption systems toward sustainability has become an urgent imperative. Green entrepreneurship, often referred to as *ecopreneurship*, has emerged as a critical approach for addressing environmental degradation and resource inequality while simultaneously creating economic and social value. By integrating environmental objectives into entrepreneurial activities, green ventures contribute to the transition toward a more sustainable and resilient economy.

The advent of Artificial Intelligence (AI) within the context of the Fourth Industrial Revolution has opened unprecedented opportunities to realize this vision. Through its capabilities in big data analytics, predictive modeling, process automation, and intelligent decision-making, AI has the potential to significantly enhance the efficiency and scalability of sustainable business practices. AI-driven solutions can optimize resource utilization, reduce operational waste, improve energy efficiency, and accelerate the development of environmentally friendly innovations, thereby supporting the achievement of sustainability objectives.

Despite these promising opportunities, a comprehensive understanding of how AI synergizes with green entrepreneurial values to generate sustainable competitive advantages remains underdeveloped. Existing studies have largely examined AI adoption and sustainable entrepreneurship as separate streams of research, while the mechanisms through which their interaction contributes to long-term sustainable development have received comparatively limited attention. Furthermore, the rapid diffusion of AI technologies has raised important ethical, social, and environmental concerns, including algorithmic bias, data privacy issues, energy-intensive computing processes, and the growing challenge of electronic waste generation.

In response to these research gaps, this paper synthesizes contemporary scholarly evidence to provide a comprehensive understanding of the role of AI as a catalyst for sustainable value creation within green entrepreneurship. The study further examines the theoretical foundations underpinning this relationship and critically analyzes the ethical and environmental challenges that may arise from the integration of AI into sustainable entrepreneurial ecosystems

II. Research Methodology

This study adopts a theoretical synthesis approach combined with qualitative content analysis based on a database of 44 reputable academic sources published between 2015 and 2026. The research methodology involves systematically extracting empirical evidence regarding the impact of Artificial Intelligence (AI) on green business performance and examining its relationship with prominent theoretical frameworks, including the Theory of Planned Behavior (TPB) and the Circular Economy (CE) paradigm.

The analytical process focuses on identifying recurring themes, conceptual relationships, and key mechanisms through which AI contributes to sustainable entrepreneurial activities and environmental value creation. By integrating findings from diverse streams of literature, the study seeks to provide a comprehensive understanding of the synergistic interaction between AI technologies and green entrepreneurship in advancing sustainability objectives.

The dataset encompasses evidence derived from a wide range of socioeconomic and institutional contexts, including developed economies such as those within the European Union (EU) and emerging economies such as Vietnam and India. This diversity enhances the robustness, generalizability, and multidimensional nature of the study's conclusions, enabling a more holistic assessment of the opportunities and challenges associated with AI-enabled green entrepreneurship across different developmental settings.

III. Theoretical Foundations of Artificial Intelligence and Green Entrepreneurship

Investigating the synergy between Artificial Intelligence (AI) and green entrepreneurship requires an integrated theoretical foundation capable of explaining the complex interactions among technology, human behavior, and environmental sustainability. The Theory of Planned Behavior (TPB), originally developed by Ajzen, has frequently been extended by incorporating the constructs of *AI adoption* and *green innovation* as critical antecedents influencing green entrepreneurial intentions. From this perspective, entrepreneurs' willingness to engage in environmentally sustainable ventures is shaped not only by their attitudes, subjective norms, and perceived behavioral control but also by their capacity to leverage AI-driven technologies to create sustainable value.

In addition, the Circular Economy (CE) framework provides a novel operational logic in which AI serves as an enabling technology for closing resource loops and enhancing resource efficiency. Through advanced analytics, predictive modeling, and intelligent automation, AI facilitates the transformation of waste into valuable resources by optimizing reverse logistics, recycling processes, and resource recovery systems. Consequently, AI contributes to the development of more sustainable production and consumption patterns while supporting the broader transition toward a circular economy.

Another important theoretical lens is the Stimulus–Organism–Response (SOR) model, which explains how stimuli generated by green technologies and AI applications influence entrepreneurs' internal psychological states and cognitive processes. These psychological responses subsequently trigger entrepreneurial hustle behaviors that drive innovation, opportunity exploitation, and venture creation within the context of digital green entrepreneurship. The SOR framework therefore provides valuable insights into the behavioral mechanisms through which technological advancements foster sustainable entrepreneurial actions.

Furthermore, Stakeholder Theory emphasizes that in the AI era, organizations are no longer expected to serve only the interests of shareholders. Instead, they must balance the expectations and well-being of multiple stakeholders, including local communities, customers, governments, employees, and the natural environment. AI-enabled transparency, data-driven accountability, and sustainability reporting mechanisms play a crucial role in helping firms achieve this balance while strengthening their legitimacy and long-term sustainability.

Finally, the Resource-Based View (RBV) and Dynamic Capabilities Theory offer complementary explanations of how firms strategically configure and reconfigure AI-related resources to achieve superior environmental performance and long-term resilience in volatile markets. While RBV highlights AI as a valuable strategic resource capable of generating competitive advantage, Dynamic Capabilities Theory emphasizes the firm's ability to continuously adapt, integrate, and transform AI-enabled capabilities in response to changing environmental and market conditions. Together, these perspectives provide a comprehensive theoretical foundation for understanding how AI can support sustainable value creation and competitive advantage within green entrepreneurial ecosystems.

One of the most significant challenges concerns the environmental costs associated with digital technologies themselves. The operation of large-scale data centers required to train and deploy advanced AI models consumes enormous amounts of electricity, much of which is still generated from non-renewable energy sources. Consequently, the use of AI may inadvertently increase the carbon footprint of enterprises that are striving to become more environmentally sustainable.

Furthermore, the rapid obsolescence of AI-supporting hardware contributes to the growing problem of electronic waste (e-waste). Such waste often contains hazardous substances, including lead, mercury, and other toxic materials, which can contaminate soil and water resources if not managed through rigorous recycling and disposal processes. This situation creates a paradox in which technologies designed to promote environmental

sustainability may simultaneously generate environmental harm in the absence of comprehensive product life-cycle management strategies.

From a social perspective, AI and automation present substantial challenges to labor markets, particularly through the potential displacement of low-skilled workers in traditional industries undergoing green transformation. Such structural shifts may exacerbate income inequality and contribute to social instability if entrepreneurs fail to incorporate social equity considerations into their sustainability strategies. Within the framework of the Triple Bottom Line (TBL), economic and environmental objectives must therefore be balanced with commitments to social well-being and inclusive development.

In addition, algorithmic ethics and data bias constitute significant sources of risk. AI systems may generate unfair business recommendations or reinforce harmful stereotypes when trained on biased or unrepresentative datasets. These concerns raise important questions regarding fairness, accountability, and transparency in AI-assisted decision-making. Moreover, issues related to data security and privacy in the use of large-scale AI platforms may contribute to what has been described as "technology anxiety," thereby reducing the willingness of small businesses to embrace innovation and digital transformation.

To address these challenges, the literature advocates the implementation of adaptive taxation policies and AI-integrated Enterprise Risk Management (ERM) frameworks. Instruments such as Value-Added Tax (VAT) incentives and carbon taxation can be strategically designed to encourage the adoption of energy-efficient technologies while generating financial resources to support workforce reskilling and upskilling programs for employees affected by automation. Such measures can contribute to a more equitable and sustainable transition toward AI-enabled economies.

Furthermore, green startups should establish dedicated AI ethics frameworks to ensure transparency, accountability, and responsible governance in machine-assisted decision-making processes. The relationship between humans and AI should be redefined as a collaborative partnership in which human judgment, social empathy, and strategic reasoning remain central to organizational decision-making. In this human–AI symbiosis, technology should function as an enabling tool rather than an autonomous decision-maker, ensuring that innovation ultimately serves the broader goals of human prosperity, social well-being, and environmental sustainability.

IV. Discussion and Policy Recommendations

The synergy between Artificial Intelligence (AI) and green entrepreneurship requires a comprehensive ecosystem approach in which financial, educational, and policy support mechanisms operate in a coordinated and mutually reinforcing manner. Governments play a pivotal role in fostering such an ecosystem by establishing clear regulatory frameworks that encourage innovation while ensuring ethical and sustainable technology deployment. Regulatory initiatives such as the European Union's AI Act provide valuable guidance for the responsible use of AI and can help reduce compliance burdens for micro-enterprises and startups with limited resources. Furthermore, strengthening collaboration between FinTech companies and green entrepreneurial ventures can facilitate the development of intelligent financial instruments capable of automating carbon footprint monitoring, improving environmental performance assessment, and promoting responsible investment practices.

From an educational perspective, entrepreneurship training programs should integrate AI literacy with environmental responsibility and sustainability awareness. Future entrepreneurs must be equipped not only with the technical competencies required to utilize AI effectively but also with the knowledge and ethical mindset necessary to address complex environmental challenges. By combining digital capabilities with sustainability-oriented thinking, entrepreneurs will be better positioned to leverage AI as a tool for generating both economic and environmental value.

In addition, higher education institutions, innovation hubs, and entrepreneurial support organizations should promote interdisciplinary learning environments that encourage collaboration among experts in technology, business, and environmental sciences. Such initiatives can enhance entrepreneurs' capacity to develop innovative solutions that simultaneously address market demands and sustainability objectives.

Finally, the establishment of dedicated "green innovation zones" where startups can access shared AI infrastructure, open datasets, technical expertise, and sustainability-oriented support services is essential for reducing market-entry barriers. These innovation ecosystems can accelerate the commercialization and diffusion of environmentally friendly products and services, thereby fostering the large-scale adoption of sustainable business practices. By providing equitable access to advanced technologies and innovation resources, green innovation zones can contribute significantly to the development of a more inclusive, resilient, and sustainable entrepreneurial landscape.

V. Conclusion

The study confirms that the synergy between artificial intelligence (AI) and green entrepreneurship constitutes an indispensable driver for achieving the Sustainable Development Goals (SDGs) in the digital era.

AI provides powerful tools to enhance the effectiveness of green innovation, reduce psychological distance, and optimize circular supply chains. However, this pathway is also confronted with challenges arising from the environmental costs of the technology itself, as well as complex socio-ethical concerns. The success of this entrepreneurial model depends on entrepreneurs' ability to maintain an appropriate balance between technological performance and human-centered values. Equipping the next generation of ecopreneurs with both advanced AI competencies and strong business ethics will serve as a critical foundation for building a greener, smarter, and more equitable future for all.

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