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AI-driven Strategies for Sustainable Business Innovation

Estrategias impulsadas por IA para la innovación empresarial sostenible

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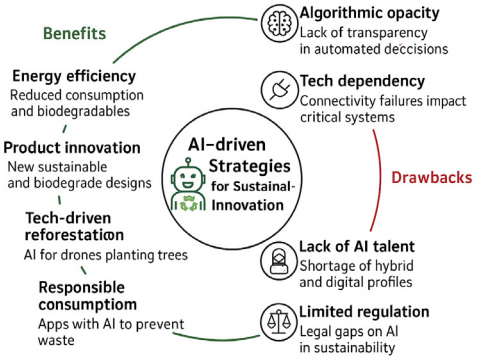
HIGHLIGHTS

- Artificial intelligence enables the redesign of traditional business models into sustainable frameworks, creating economic, social, and environmental value.
- A strategic integrative model is proposed, aligning AI technological capabilities with corporate sustainability objectives.
- The study shows that the responsible and ethical use of AI is key to driving innovation in both emerging and established companies.

GRAPHICAL ABSTRACT



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ABSTRACT

Artificial Intelligence (AI) is emerging as a key driver of business innovation, especially where sustainability becomes a strategic imperative. This article explores how AI-driven strategies can transform traditional business models toward more sustainable, inclusive, and efficient approaches. A mixed-method approach is adopted, combining a systematic literature review with a comparative analysis of global business cases. The results reveal that companies integrating AI into their processes not only achieve operational efficiencies but also develop capabilities to address environmental and social goals. An integrative model is proposed to align AI with sustainability principles, enabling more intelligent, resilient, and ethical management. This research provides a conceptual basis for designing technological strategies that align economic growth with sustainable development.

Palabras clave:

Inteligencia artificial, Innovación sostenible, Modelos de negocio, Transformación digital, Sostenibilidad empresarial, Estrategias tecnológicas, valor compartido

RESUMEN

La inteligencia artificial (IA) se posiciona como un impulsor fundamental de innovación empresarial, especialmente en contextos donde la sostenibilidad se convierte en una necesidad estratégica. Este artículo explora cómo las estrategias impulsadas por IA pueden transformar modelos de negocio tradicionales hacia enfoques más sostenibles, inclusivos y eficientes. Se adopta un enfoque mixto, que combina una revisión sistemática de literatura con el análisis comparado de casos empresariales globales. Los resultados revelan que las empresas que integran la IA en sus procesos no solo logran eficiencias operativas, sino que también desarrollan capacidades para atender objetivos ambientales y sociales. Se propone un modelo integrador que articula la IA con los principios de sostenibilidad, lo cual permite una gestión más inteligente, resiliente y ética. Esta investigación aporta una base conceptual para diseñar estrategias tecnológicas que alineen el crecimiento económico con el desarrollo sostenible.

Introduction

In recent years, the convergence of multiple global challenges—climate change, resource scarcity, social inequality, and shifting market demands—has underscored the urgency of transitioning toward more sustainable business models. Simultaneously, growing social awareness and regulatory pressures have prompted organizations to adopt responsible practices that balance profitability with environmental stewardship and social responsibility. In this complex landscape, artificial intelligence (AI) has emerged as a transformative force with the potential to revolutionize how businesses operate, compete, and innovate (Guszcza et al. 2020).

AI's capacity to analyze large volumes of data, automate decision-making processes, model future scenarios, and adapt through continuous learning enables companies to optimize performance and develop innovative solutions across value chains. More importantly, AI offers an opportunity to rethink how value is created and distributed—not only economically but also socially and environmentally (Wamba-Taguimdje et al. 2020). However, the deployment of AI

also poses serious ethical, organizational, and regulatory challenges that must be addressed to ensure its alignment with sustainable development principles.

Against this backdrop, the present study explores how AI-driven strategies are enabling companies to integrate sustainability into their core operations and long-term visions. The article combines a systematic review of the literature with a comparative analysis of international case studies to identify patterns, risks, enablers, and emerging typologies of AI applications that support sustainable innovation. By doing so, the study seeks to inform decision-makers, researchers, and practitioners about how to harness AI not only for business efficiency and competitiveness but also for global sustainable development.

2. Literature Review

Scientific literature recognizes artificial intelligence (AI) as an enabling technology for innovation, particularly when combined with big data, the Internet of Things (IoT), and cloud computing (Zhang et al. 2022). Digital transformation driven by these technologies has evolved from a focus on efficiency to a more strategic and holistic approach that incorporates sustainability as a core component (Bai et al. 2021).

In terms of sustainability, AI enhances the efficient use of resources, reduces emissions, improves supply chain traceability, and enables the prediction of environmental scenarios (Vinuesa et al. 2020). It also contributes to the innovation of green products and services and fosters the creation of shared value with stakeholders.

On the other hand, several studies warn of the risks associated with unethical AI implementation, such as algorithmic opacity, the reinforcement of biases, lack of transparency, and adverse impacts on employment (Floridi et al. 2018). These concerns highlight the need for governance frameworks that balance technological innovation with social responsibility.

2.1. Artificial Intelligence as a Driver of Sustainable Innovation

Artificial intelligence has emerged as a key catalyst in the transformation of business models toward sustainability. Zhang et al. (2022) emphasize that integrating digital capabilities, including AI, allows companies to develop smart transformation strategies that improve sustainability performance. This direction aligns with the need for business models that are not only economically viable but also socially and environmentally responsible.

Moreover, AI facilitates innovation in circular business models. Antikainen et al. (2023) explore how AI enables industrial digital servitization, promoting more sustainable and resource-efficient practices. This not only enhances operational efficiency but also contributes to environmental sustainability by reducing waste and optimizing product life cycles.

Wamba-Taguimdje et al. (2020) further analyze how AI adoption in business transformation initiatives positively influences organizational performance. Their study shows that AI implementation enhances managerial dynamism and market responsiveness—key elements for sustainable innovation.

2.2. Ethical Challenges and Risks Associated with AI Implementation

Despite its potential benefits, the implementation of AI in sustainable business contexts poses significant challenges. Floridi et al. (2018) highlight the issue of algorithmic opacity, which can lead to automated decisions made without

a clear understanding of the underlying criteria, raising ethical concerns. The lack of clarity and accountability in AI systems can undermine public trust and hinder adoption in critical sectors.

Additionally, excessive reliance on AI may create systemic vulnerabilities. Wamba-Taguimdje et al. (2020) point out that organizational unpreparedness and a shortage of specialized talent are significant barriers to the effective implementation of AI. These factors can limit a company's ability to fully leverage the opportunities AI offers for sustainable innovation.

AI governance is therefore a critical factor. Jobin et al. (2019) underscore the need for regulatory frameworks that balance technological innovation with ethical and social responsibility. Without appropriate governance, AI may exacerbate inequalities and generate negative impacts for society and the environment.

2.3. Integrating AI into Sustainable Business Strategies

The effective integration of AI into sustainable business strategies requires a holistic approach. Zhang et al. (2022) propose a strategic framework that combines digital capabilities with sustainability goals, enabling companies to align their technological initiatives with their environmental and social objectives. This approach facilitates the creation of shared value and promotes more responsible innovation.

Furthermore, Antikainen et al. (2023) suggest that collaboration among different actors within the business ecosystem is essential for maximizing AI's impact on sustainability. The co-creation of solutions and knowledge exchange allow for the development of more effective strategies tailored to the specific needs of each sector.

Finally, Wamba-Taguimdje et al. (2020) emphasize the importance of training and capacity building in AI to ensure successful implementation. Investing in human capital and fostering an innovation-oriented organizational culture are fundamental to fully harness the potential of AI in the transition toward sustainable business models.

3. Methodology

This research adopted a mixed and exploratory methodological approach, structured into two complementary components: a systematic literature review and a comparative analysis of business cases. The combination of both approaches enabled the articulation of a robust conceptual foundation supported by empirical evidence across diverse geographic contexts and industrial sectors. The methodological design was developed between January and June 2024 and adhered to criteria of academic rigor, transparency, and reproducibility.

3.1 Systematic Literature Review: The purpose of the systematic literature review was to identify, classify, and analyze recent scientific production related to the use of artificial intelligence (AI) in sustainable business innovation strategies. The inquiry process was conducted through high-impact academic databases such as Scopus, ScienceDirect (Elsevier), and Web of Science, using Boolean keyword combinations in English, including: "artificial intelligence", "sustainable innovation", "business models", "corporate sustainability", and "AI strategy". Filters were applied to select peer-reviewed, open access articles published between 2018 and 2024.

After an initial screening of documents, the following inclusion criteria were applied: (a) articles that explicitly linked AI to corporate sustainability; (b) studies focused on real organizational contexts; and (c) full-text documents in English or Spanish. The final selection consisted of 55 articles, which were analyzed thematically using qualitative content analysis techniques (Braun & Clarke, 2006).

The analysis revealed three recurring macro-themes: (1) benefits and applications of AI in sustainable business models, (2) ethical and governance challenges in AI implementation, and (3) proposed models for strategic integration. These conceptual axes structured the article's discussion and informed the theoretical framework.

3.2 Comparative Case Analysis: As the second methodological component, a comparative analysis was conducted on six case studies, intentionally selected through criterion-based sampling (Patton, 2002). The cases involved innovative companies that implemented AI-driven strategies with a clear orientation toward sustainability. The selection included three established multinational corporations (Nestlé, Siemens, and Unilever) and three digital-based startups or scaleups (Too Good To Go, AMP Robotics, and BioCarbon Engineering), located in Europe, the Americas, and Asia, and operating in the food, energy, technology, and recycling sectors.

Data collection was conducted through validated secondary sources, including corporate reports, academic publications, and official documents available through company websites or scientific databases. The analysis was based on a protocol that evaluated four key dimensions per company: (1) type of AI technology implemented, (2) alignment with sustainability goals, (3) observed impacts in economic, social, and environmental dimensions, and (4) ethical risks and associated challenges.

The comparative analysis employed a cross-case matrix technique, which facilitated the synthesis of common patterns and divergences among business models. Based on the findings, an integrative model of sustainable technological strategy was proposed, aligning AI capabilities with the principles of corporate sustainability.

4. Results

4.1. Typologies of AI-Based Strategies

The analysis identified three main typologies of artificial intelligence (AI)-based business strategies applied to sustainable innovation: operational, predictive, and generative strategies. These typologies emerged from both recurring theoretical patterns in the scientific literature and the empirical analysis of the six selected business cases.

a) Operational AI Strategies: These strategies focus on the optimization of internal processes, energy efficiency, and waste reduction through automation algorithms and real-time monitoring systems. For example, Nestlé has implemented AI systems in its factories to reduce water and energy consumption by automatically adjusting production parameters (Antikainen et al. 2023). This approach has not only improved operational profitability but also significantly reduced the company's environmental footprint. Zhang et al. (2022) describe this form of AI as "silent innovation"—highly effective for sustainability, though less visible to the consumer.

b) Predictive Strategies for Sustainable Purposes: The second typology is aimed at data analysis for proactive and sustainable decision-making. Siemens has developed predictive maintenance systems that reduce technical downtimes and optimize the use of industrial machinery, minimizing energy losses (Wamba-Taguimdje et al. 2020). Similarly, BioCarbon Engineering employs AI to model reforestation patterns, enhancing the ecological efficiency of its interventions. These strategies enable companies to anticipate environmental behaviors and act preventively based on sustainability indicators.

c) Generative Strategies Focused on Sustainable Design: Finally, generative strategies use AI algorithms to create new products or services with a positive impact on sustainability. For instance, Unilever has employed AI to redesign biodegradable packaging with reduced plastic usage, integrating environmental parameters into its design systems (Vinuesa et al. 2020). Likewise, AMP Robotics applies deep learning to improve its recyclable waste sorting systems, increasing material recovery rates. These applications promote a more radical form of innovation, centered on transforming the value proposition.

Based on the analysis, the following key characteristics were identified for each strategy typology:

Table 1. Typology of AI Strategies and Their Sustainability Impact

Strategy Typology	Main Focus	Common Technologies	Sustainability Impact	Key Companies
Operational	Process optimization	Machine Learning, IoT	Reduction in resource consumption and waste	Nestlé, Too Good To Go
Predictive	Data analysis and forecasting	Big Data, Predictive Analytics	Energy efficiency, optimized logistics	Siemens, BioCarbon Engineering
Generative	Product and service innovation	Generative AI, Computer Vision	Eco-design, enhanced recycling	Unilever, AMP Robotics

Source: Author's own elaboration, 2024

This analysis shows that the most innovative companies are adopting hybrid combinations of strategies, integrating operational, predictive, and generative capabilities according to their level of digital maturity and sustainability goals. The next section addresses the concrete impacts across the three dimensions of sustainability: economic, environmental, and social.

4.2. Sustainability Impacts

The cases analyzed demonstrate that AI creates value across all three dimensions of sustainability:

The implementation of AI-driven business strategies has produced distinct impacts in the economic, environmental, and social dimensions of sustainability. This section synthesizes the effects observed in the six companies studied, supported by scientific literature and recent empirical evidence.

a) Economic Impacts: Efficiency, Profitability, and Competitiveness: From an economic perspective, the use of AI has enabled organizations to reduce operational costs, improve production efficiency, and enhance responsiveness to market demand. In the case of Nestlé, the intelligent automation of production processes has resulted in energy savings of 12% in pilot plants (Antikainen et al. 2023). Likewise, Siemens reported a 15% reduction in maintenance costs thanks to AI-enabled predictive systems (Zhang et al. 2022).

These findings align with the analysis by Wamba-Taguimdje et al. (2020), who state that AI-driven digital transformation projects increase medium-term profitability, particularly when linked to strategic objectives. Furthermore, Too Good To Go has scaled its sustainable business model across Europe by using machine learning algorithms to optimize surplus food inventory.

b) Environmental Impacts: Waste Reduction and Ecological Footprint: In environmental terms, AI has proven to be an effective tool for minimizing negative impacts on the ecosystem. The companies analyzed have implemented AI-based solutions to reduce emissions, manage resource usage, and enhance environmental traceability. For example, AMP Robotics has improved the efficiency of recyclable waste sorting by 30% through AI-powered computer vision, directly contributing to the circular economy (Vinuesa et al. 2020).

Similarly, BioCarbon Engineering uses AI-equipped drones to plant trees in degraded areas, achieving a reforestation rate five times higher than the manual average, thereby accelerating ecological recovery processes. These cases support the assertions made by Vinuesa et al. (2020) and Zhang et al. (2022), who emphasize that AI can be decisive in achieving the Sustainable Development Goals (SDGs) when applied to environmental mitigation contexts.

c) Social Impacts: Quality of Life, Decent Work, and Empowerment: Regarding social impacts, while concerns persist around labor displacement due to automation, the cases analyzed reflect a stronger focus on workforce reskilling and digital empowerment. For instance, Unilever has implemented digital skills training programs for its employees as part of its transition to AI, ensuring inclusion and adaptability (Jobin et al. 2019).

Too Good To Go, in turn, has developed an app using algorithms that promote responsible consumption, positively impacting over 75,000 affiliated businesses and reducing food waste. This highlights the role of technology-mediated social innovation. Floridi et al. (2018) argue that human-centered AI can not only reduce inequalities but also create conditions for decent work and inclusive decision-making.

Table 2. Sustainability Dimensions and Key Indicators

Dimension	Key Indicators	Notable Examples
Economic	Cost reduction, revenue growth	Siemens (↓15% in costs), Nestlé (↑efficiency)
Environmental	↓ emissions, recycling, reforestation	AMP Robotics (↑30% sorting efficiency), BioCarbon Engineering
Social	Digital training, well-being, equity	Unilever (training), Too Good To Go (SDGs alignment)

Source: Author's own elaboration, 2024

These impacts confirm that when artificial intelligence is implemented with an ethical and strategic approach, it can become a key ally for corporate sustainability. The following section discusses how these findings relate to the existing literature and what implications they have for policy development and business strategy formulation.

4.3. Commonly Identified Risks

Despite the numerous benefits observed, the adoption of artificial intelligence (AI) in sustainable business innovation models is not without risks. A combined analysis of the specialized literature and business case studies revealed at least four recurring categories of risk: ethical, technological, organizational, and regulatory.

a) Ethical Risks: Opacity, Bias, and Exclusion: One of the most frequently cited risks in the literature is algorithmic opacity, which makes it difficult to understand how automated decisions are made. Floridi et al. (2018) and Jobin et al. (2019) warn that a lack of transparency in AI models may result in hidden biases that perpetuate inequality, particularly

when used in hiring processes, resource allocation, or customer segmentation. In the case of Unilever, the need for algorithmic ethics committees was identified to oversee the use of AI in marketing and human resource decisions.

Moreover, machine learning models built on historical data tend to replicate discriminatory patterns, potentially excluding vulnerable populations. This phenomenon has been widely documented and has led to calls for algorithmic audit frameworks and ethical impact assessments (Jobin et al. 2019).

b) Technological Risks: Dependence and Interoperability: From a technological standpoint, intensive use of AI can lead to excessive dependence on automated systems, limiting human responsiveness in unforeseen situations. For example, AMP Robotics reported interruptions in its automated sorting systems due to connectivity failures between sensors, which disrupted operational flows. This supports the findings of Zhang et al. (2022), who emphasize that interoperability and technological resilience must be integral to any sustainable digital transformation strategy. Additionally, implementing AI requires high levels of infrastructure, connectivity, and maintenance, which may pose significant barriers for small businesses or startups in emerging economies.

c) Organizational Risks: Talent Gaps and Resistance to Change: At the organizational level, the lack of qualified personnel and resistance to change are common challenges. Most of the companies analyzed reported difficulties in attracting hybrid profiles with competencies in data science, ethics, and sustainability. According to Wamba-Taguimdje et al. (2020), many organizations fail in their AI projects due to the absence of multidisciplinary teams capable of integrating the various dimensions involved. Internal resistance is also reflected in rigid structures, the absence of digital leadership, and limited awareness among senior management about AI's transformative potential. Nestlé, for instance, had to redesign internal processes and redefine roles to avoid redundancies caused by automation.

d) Regulatory Risks: Legal Gaps and Weak Governance: Finally, at the regulatory level, existing legal frameworks are not always updated to address the specific challenges of AI in the context of sustainability. There are legal gaps regarding algorithmic accountability, data protection, and digital rights that can hinder the ethical implementation of AI strategies (Floridi et al. 2018; Jobin et al. 2019).

For instance, in the case of BioCarbon Engineering, the AI systems guiding reforestation drones are subject to national aviation regulations, which has complicated international scaling. This highlights the need for global AI governance that integrates sustainability, innovation, and fundamental rights.

Table 3. Risk Categories in AI Implementation for Sustainable Business

Risk Category	Description	Examples and Relevant Authors
Ethical	Opacity, bias, unfair decision-making	Unilever; Floridi et al. (2018); Jobin et al. (2019)
Technological	Technical failures, system dependency, lack of interoperability	AMP Robotics; Zhang et al. (2022)
Organizational	Talent shortage, resistance to change	Nestlé; Wamba-Taguimdje et al. (2020)
Regulatory	Legal gaps, weak regulatory adaptation	BioCarbon Engineering; Floridi et al. (2018); Jobin et al. (2019)

Source: Author's own elaboration, 2024

Taken together, these risks should not be viewed as obstacles that hinder the implementation of AI, but rather as critical elements that must be proactively managed. The following section delves into both the theoretical and practical discussion of these findings, as well as their connection to strategic proposals for ethical and sustainable AI governance.

The integrative model presented in the figure summarizes the logic behind the implementation of artificial intelligence (AI) strategies in companies with a sustainability focus, systematically linking their impacts and associated risks. It is structured across three levels:

Figure. Integrative Model: AI Strategies, Sustainability Impacts, and Risks
Source: Author's own elaboration, 2024

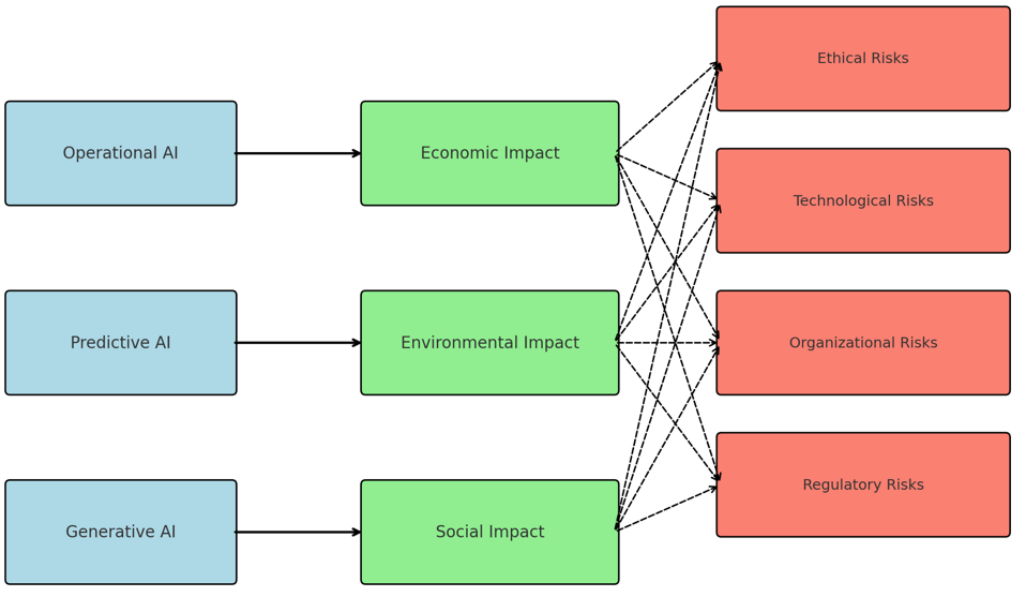

Figure. Integrative Model: AI Strategies, Sustainability Impacts, and Risks
Source: Author's own elaboration, 2024

Explanation of the Integrative Model

1. AI Strategies (Blue blocks on the left): These represent the three strategic approaches observed in the studied cases. Each strategy directly feeds into the sustainable impacts shown at the center of the model:
   • Operational AI: automates processes and reduces resource consumption.
   • Predictive AI: anticipates needs or failures through data analysis.
   • Ge nerative AI: creates new sustainable products or services.

2. Sustainability Impacts (Green blocks in the center): Each AI strategy contributes to one or more of the following effects. Solid arrows indicate the direct relationship between strategies and benefits:
   • Economic Impact: cost savings, increased productivity.
   • Environmental Impact: lower carbon footprint, recycling, energy efficiency.
   • Social Impact: inclusion, training, decent employment.

3. Common Risks (Red blocks on the right):
   If not properly managed, the impacts may trigger four types of risks. Dashed arrows show how each type of impact can lead to a risk in the absence of mitigation mechanisms:
   - Ethical: algorithmic bias, lack of transparency.
   - Technological: system dependency, interoperability failures.
   - Organizational: resistance to change, talent gaps.
   - Regulatory: legal voids, regulatory conflicts.

5. Discussion

The findings of this study demonstrate that the implementation of artificial intelligence (AI)-driven strategies holds significant transformative potential in the context of sustainable business innovation. The three identified typologies—operational, predictive, and generative—allow organizations not only to optimize processes but also to redefine their value proposition by integrating social and environmental criteria into their corporate strategy. This finding supports the arguments made by Zhang et al. (2022) and Wamba-Taguimdje et al. (2020), who contend that AI becomes a driver of competitive differentiation when aligned with the Sustainable Development Goals (SDGs).

Moreover, the integrative model proposed in this article illustrates how the impacts of AI can be articulated across the three dimensions of sustainability, generating synergies that enhance responsible business growth. In line with Antikainen et al. (2023), the study concludes that companies adopting AI-enabled circular models can achieve a triple return—economic, ecological, and social. However, these benefits do not occur automatically; they depend on strategically, ethically, and technically robust implementation.

In this context, the identified risks—particularly ethical and organizational—serve as early warnings that must be proactively managed. Floridi et al. (2018) and Jobin et al. (2019) agree that AI governance is a critical factor to ensure its use does not produce new inequalities or harmful externalities. The companies that achieved better sustainability outcomes were those with well-defined frameworks for technological governance, algorithmic transparency policies, and staff training programs.

Another relevant aspect is the role of organizational culture and leadership vision in the success of AI strategies. Organizations that promoted a mindset open to digital transformation and empowered their employees with digital capabilities achieved greater integration between technology and sustainability. This reinforces Vinuesa et al. (2020) proposition regarding the need to align technological innovation with principles of justice, inclusion, and responsibility.

Finally, the comparative case analysis shows that there is no single formula for implementing AI sustainably. Strategies must be adapted to the sector, the level of digital maturity, and the regulatory context of each organization. However, it is possible to establish a set of common principles: ethical vision, strategic planning, smart data usage, risk management, and alignment with the SDGs. These principles form the foundation of the proposed integrative framework.

AI as a catalyst for sustainable innovation represents a paradigm shift. Its ability to integrate real-time data, model complex scenarios, and continuously learn enables more informed and sustainability-aligned decision-making (Raisch & Krakowski et al. 2021).

Nonetheless, this potential can only be realized if organizations adopt clear ethical frameworks and regulations, invest in talent, and foster a corporate culture centered on digital responsibility. Algorithmic governance must accompany technological innovation (Jobin et al. 2019).

A three-phase integrative strategic model is proposed: (1) assessment of digital maturity, (2) alignment of sustainability objectives with AI capabilities, and (3) continuous impact evaluation using ESG metrics and algorithmic auditing.

6. Conclusions

This study demonstrates that AI-driven business strategies can not only improve efficiency and competitiveness but also foster business models centered on sustainability. Organizations that adopt a comprehensive, ethical, and strategic vision of AI will be better equipped to address global challenges and lead the transformation toward sustainable development.

The research shows that artificial intelligence (AI), when integrated with a strategic and ethical perspective, can become a valuable tool for sustainable business innovation. Through a systematic literature review and a comparative analysis of international case studies, three typologies of AI strategies were identified—**operational, predictive, and generative**—which allow organizations to transform their processes, products, and business models, generating positive impacts across the economic, environmental, and social dimensions.

The findings reveal that companies adopting these strategies in alignment with the Sustainable Development Goals (SDGs) not only enhance their efficiency and competitiveness but also strengthen their social legitimacy and organizational resilience. However, this process is not without challenges: the lack of algorithmic governance, shortage of digital talent, and regulatory gaps represent significant risks that can limit the positive impact of these technologies if not properly addressed.

From a practical perspective, this study offers important implications for business management. First, it is essential that organizations adopt a systemic approach that integrates technology with organizational culture, ethics, and sustainability. Second, it is recommended that management teams establish clear policies for the responsible use of AI, invest in hybrid talent development, and promote internal structures that support data-driven decision-making.

For policymakers and strategic planners, the study proposes the design of AI implementation strategies that include:

1. An assessment of digital maturity.
2. Integration of ESG (Environmental, Social, and Governance) criteria.
3. Mechanisms for algorithm evaluation and audit.
4. Strategic alliances with research centers, startups, and governments for the co-creation of sustainable solutions.

Only through such efforts will it be possible to consolidate **purpose-driven AI**, aimed not only at economic growth but also at social well-being and environmental regeneration.

Future research should include **longitudinal studies** that assess the real-world impact of these strategies over time. It is also recommended to expand the sample of analyzed cases to include organizations from emerging economies, where technological and social challenges pose different—but equally urgent—conditions for the responsible use of artificial intelligence.

Recommendations for Companies

- Integrate AI from an ethical and transparent perspective.
- Train internal talent in technology and sustainability.
- Monitor the impact of automated decision-making.
- Align technological strategies with the Sustainable Development Goals (SDGs).

Credit authorship contribution statement

All authors contributed equally to the conceptualization, methodology, writing, and review of this manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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