Región Científica

e-ISSN: 2954-6168
Región Científica. 2025. 4(1), 2025382
doi: 10.58763/rc2025382

Business management of sustainability, CSR and Artificial Intelligence. A new frontier in decision-making

Gestión empresarial de la sostenibilidad, RSE e Inteligencia Artificial. Una nueva frontera en las decisiones

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ABSTRACT

This study explores how artificial intelligence (AI) is being used to improve sustainability management and corporate social responsibility (CSR) in Latin America. We analyze the regional context, identify challenges and opportunities, and present two case studies of IT companies that have implemented AI solutions to promote sustainable practices. The findings highlight the positive impact of AI on operational efficiency, cost reduction, and improved corporate image, while underlining the importance of a multidisciplinary approach and continuous collaboration.

Keywords: artificial intelligence, enterprises, information technology, social responsibility, sustainable development.

JEL Classification: M14, O33, Q01

RESUMEN

Este estudio explora cómo la inteligencia artificial (IA) es utilizada para mejorar la gestión de sostenibilidad y la responsabilidad social empresarial (RSE) en América Latina. Analizamos el contexto regional, identificamos desafíos y oportunidades, y presentamos dos estudios de caso de empresas de Tecnología de la Información (TI) que han implementado soluciones de IA para promover prácticas sostenibles. Los hallazgos destacan el impacto positivo de la IA en la eficiencia operativa, la reducción de costos y la mejora de la imagen corporativa, al tiempo que subrayan la importancia de un enfoque multidisciplinario y la colaboración continua.

Palabras clave: desarrollo sostenible, empresa, inteligencia artificial, responsabilidad social, tecnología de la información.

Clasificación JEL: M14, O33, Q01

Received: 30-08-2024 **Revised:** 30-10-2024 **Accepted:** 15-12-2024 **Published:** 03-01-2025

Editor: Carlos Alberto Gómez Cano

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Cite as: Sarián, M., Bruna, C., Robles, C. y Vaca, G. (2025). Gestión empresarial de la sostenibilidad, RSE e Inteligencia Artificial. Una nueva frontera en las decisiones. Región Científica, 4(1), 2025382. https://doi.org/10.58763/rc2025382

INTRODUCTION

In the global context, sustainability and CSR have emerged as essential components of the most recent corporate strategies (Fallah Shayan et al., 2022; Yuan et al., 2020). This is largely due to the growing awareness among companies that their success is measured not only in financial terms, but also by their environmental and social impact. Adopting sustainable and responsible practices has become an expectation of consumers, investors, and other stakeholders (Indriastuti & Chariri, 2021; Khuong et al., 2021).

In Latin America and the Caribbean, the need for sustainability and CSR is even more urgent due to the region's unique challenges (López-Morales et al., 2020; Monteiro Mello et al., 2021). These challenges include high levels of social inequality, environmental degradation, political and economic instability, and a pronounced vulnerability to the effects of climate change (Azócar et al., 2021). According to the Economic Commission for Latin America and the Caribbean (CEPAL, 2020), the region is one of the most unequal in the world, making CSR crucial for equitable and sustainable development (Aguilar & López Guerrero, 2022).

Given this scenario, this study integrates a systematic review of the literature and an examination of a case study. This methodological approach aims to lay the theoretical and empirical foundations for interpreting advances in the use of AI for responsible and sustainable management in business organizations.

Vulnerability to climate change

A crucially important dimension is the environmental one, in which multiple studies point to the need to rethink adaptation and resilience strategies (Azócar et al., 2021). An important metric in this regard is the climate change vulnerability index, which measures countries' susceptibility to its negative impacts. Its scale ranges from 0 to 100, with a higher value indicating greater vulnerability (Notre Dame Global Adaptation Initiative, 2020). As can be seen in Table 1, except Chile and Argentina, the rest of the Latin American countries show an index higher than the world average.

Table 1.
Climate Change Vulnerability Index

Country	Climate Change Vulnerability Index (2020)
Brazil	45
Colombia	50
Mexico	55
Argentina	40
Chile	35
Peru	48
Regional Average	45

Source: Notre Dame Global Adaptation Initiative (2020)

High vulnerability to climate change underscores the importance of adaptation and resilience, especially in critical sectors such as agriculture, livestock, energy, and others that influence the achievement of sustainable development goals (Acaroğlu et al., 2023; Beltrán-Tolosa et al., 2022). Faced with this range of interrelated factors, companies must incorporate sustainability into their strategic planning and take proactive measures to mitigate climate risks (Seroka-Stolka & Fijorek, 2020). Among the most studied responses are investments in green infrastructure and clean technologies, which can improve resilience and contribute to sustainable development, but also contribute to environmental awareness within industries (D'amato & Korhonen, 2021; Khoshnava et al., 2020; Merino-Saum et al., 2020).

Environmental challenges

Latin America and the Caribbean, as a region, is home to rich biodiversity and a wealth of natural resources. However, the unsustainable exploitation of these resources has led to significant environmental degradation (Nathaniel et al., 2021). Deforestation in the Amazon, water pollution, and biodiversity loss are some of the most serious problems (Bowman et al., 2021). According to the World Bank, the region lost approximately 5% of its forests between 2000 and 2020 (World Bank, 2020). Furthermore, the literature suggests that climate change exacerbates these problems in regions highly vulnerable to extreme weather events such as hurricanes, floods, and droughts (Imperiale & Vanclay, 2021). These not only affect the environment but also have a significant economic and social impact, displacing communities and affecting livelihoods (Schilling et al., 2020).

Environmental degradation

The ecological footprint index measures human impact on the environment. The ecological footprint is expressed in global hectares per capita (amount of biologically active land).

Table 2.
Ecological footprint

Country	Ecological Footprint (global hectares per capita, 2020)
Brazil	3.1
Colombia	2.8
Mexico	3.4
Argentina	3.0
Chile	3.2
Peru	2.6
Regional Average	3.0

Source: Global Footprint Network (2020)

Social challenges

In addition to environmental problems, Latin America and the Caribbean face profound social challenges. Income inequality is one of the highest in the world, resulting in unequal access to education, healthcare, and other opportunities (Adeleye et al., 2020; Delaporte et al., 2021). Relevant studies in this field point out that companies in vulnerable regions have an important role to play in addressing these challenges through CSR (Abu Zayyad et al., 2021; Bavorová et al., 2021).

Therefore, social and economic inclusion is a priority for companies and their management to reduce poverty, improve working conditions, and promote gender equality (Cezarino et al., 2022; Raynolds, 2021). In these scenarios, CSR offers a framework for companies to implement programs that benefit local communities and contribute to sustainable development (Saz-Gil et al., 2020).

Social inequality

The Gini coefficient is one of the most widely used indicators for measuring social inequality (Sitthiyot & Holasut, 2020). The Gini coefficient ranges from 0 to 1, where 0 represents perfect equality and 1 represents maximum inequality (CEPAL, 2020).

Table 3.
Gini coefficient

Country	Gini coefficient (2020)
Brazil	0.53
Colombia	0.50
Mexico	0.48
Argentina	0.42
Chile	0.44
Peru	0.43
Regional Average	0.47

Source: CEPAL (2020)

Governance and Artificial Intelligence

The definition of "governance" will be considered as the set of structures, processes, and practices through which an organization, institution, or society is directed and controlled (Naciti et al., 2022); it involves decision-making, policy implementation, and the oversight of activities based on principles of transparency, accountability, participation, and ethics (König, 2021). Governance seeks to ensure that decisions and actions are effective, accountable, and benefit all stakeholders, thus promoting efficiency, trust, and long-term sustainability (Abhayawansa et al., 2021).

Artificial intelligence policies in Latin American countries

In Latin America, several countries have developed national strategies and policies for implementing and

developing AI (Filgueiras, 2023). These policies range from research and technological development to ethics and regulation, as seen in the following description.

Brazil

Brazil launched the Brazilian AI Strategy in 2021 (Filgueiras, 2023). This strategy fosters AI research and development, promoting education and training in emerging technologies. It also establishes ethical principles and regulations to ensure the responsible use of AI and incentives for innovation in the private sector (Filgueiras & Junquilho, 2023).

Mexico

Mexico adopted the National Artificial Intelligence Agenda in 2020 (Ruvalcaba-Gomez & Cifuentes-Faura, 2023). This agenda seeks to position the country as a regional leader in developing and using AI. Its objectives include developing human capital, supporting innovation and entrepreneurship, and promoting ethical and governance principles for using AI (Filgueiras, 2023).

Argentina

Argentina's National Artificial Intelligence Plan, launched in 2020, establishes a roadmap for integrating AI into various sectors of the economy and government. The plan highlights the importance of AI education and the need to create regulatory frameworks for its ethical use (Filgueiras, 2023).

Chile

Chile implemented its National Artificial Intelligence Policy in 2021, focusing on innovation, competitiveness, education, training, rights, and ethics. One of the objectives is to prepare the workforce for the changes AI will bring and encourage its adoption in industry (Filgueiras, 2023).

The contribution of Artificial Intelligence and sustainability

The integration of AI into sustainability and CSR management offers new opportunities. AI can help companies optimize resource use, reduce waste, improve energy efficiency, and make data-driven decisions to maximize their positive impact. For example, AI algorithms can predict energy consumption patterns and adjust resource use to reduce environmental impact. In the social sphere, AI can analyze large volumes of data to identify areas where further intervention is needed, helping to design more effective and targeted CSR programs.

Business management

In a world that recognizes the importance of sustainable and responsible business, various methodologies and standards have emerged to guide organizations in managing their social and environmental responsibilities. Among them, the AA1000 accountability method and the ISO 14001 standard are recognized for promoting sustainability and continuous improvement in business management. Although both approaches emphasize sustainability and environmental management, they can be integrated through AA1000 and ISO 14001 to form the business management model. To understand the importance of these methods, it is important to examine their history and how they began in general business processes.

The AA1000 accountability approach has its roots in the growing concept of corporate social responsibility (CSR) developed in the second half of the 20th century. In the 1980s and 1990s, globalization and the expansion of multinational corporations increased interest in business operations' social and environmental impacts. Non-governmental organizations, activists, and the public have begun demanding greater transparency and accountability from companies and encouraging them to adopt responsible practices.

In response to this need, the UK-based Institute for Social and Ethical Accountability developed the AA1000 standards in 1999. The first edition of the AA1000 Assurance Standard was published in 2003; it was then the first global standard for sustainable development assurance engagements. It was developed to ensure the credibility and quality of performance and communication on sustainable development and was the result of an extensive two-year global consultation involving hundreds of organizations from the professional world, the investment community, NGOs, the world of work, and business.

Subsequently, the AA1000AS (2003) standard replaced the sustainability assurance information provided in the AA1000 Framework Standard published in 1999. The 2003 edition was accompanied by an attached note (Guidance Note) on applying the principles and a User's Note that includes five case studies on applying the principles during assurance missions.

The 2008 edition of the AA1000 Assurance Standard, AA1000AS (2008), is the second edition and has been enriched by a growing number of practices and experiences in sustainable development assurance. It cancels and replaces previously published versions. AA1000AS (2008) requires organizations to report on their management of sustainable development issues, their performance, and their reporting regarding sustainable development, assessing their degree of adherence to the AA1000 AccountAbility Principles and the quality of their information. It also allows for verifying and certifying specific aspects of sustainable development, such as greenhouse gas emissions, environmental management systems, sustainable forestry, or Fair Trade labels. Thus, the sustainability reports designed provide stakeholders with sufficient information to understand the organization's sustainability performance and make informed decisions.

Credibility is a prerequisite for effective sustainability reporting and can be enhanced by the provision of assurance by an independent third party, using generally accepted professional standards. More and more reporting organizations and their stakeholders recognize that the provision of assurance by a reputable and competent independent third party is essential to strengthening the credibility and effectiveness of their reports and, ultimately, their performance.

This set of standards is designed to help organizations improve their sustainability performance by engaging stakeholders and their interest groups. The creation of AA1000 represents an important element in transforming corporate work, providing a framework for organizations to manage and account for their impact on society and the environment.

The AA1000 approach is unique because it focuses on stakeholder engagement, enabling organizations to identify and prioritize issues relevant to their work and stakeholder expectations. Over the years, the AA1000 system has evolved to include additional tools and guidance to help organizations integrate sustainability into daily operations and increase awareness and accountability at all business levels.

Introduction and development of the ISO 14001 standard

The ISO 14001 standard is part of the ISO 14000 series of environmental management standards, developed by the International Standards Organization (ISO) and first published in 1996. With the rise of environmental awareness in the 1980s, environmental degradation and climate change began to be considered important issues requiring an urgent response.

The standard has responded to this demand by developing standards designed to help organizations improve environmental management, the most popular and accepted of which is ISO 14001. It is recognized as a tool that helps organizations establish an environmental management system that complies with environmental laws and regulations and encourages continual improvement to reduce environmental pollution. This standard specifies the requirements for planning, implementing, monitoring, and improving environmental management so organizations can effectively manage their environmental activities.

The ISO 14001 standard, created in 1996 by a global federation of national standards bodies, has emerged as the most widely used of the ISO 14000 family of standards, designed to guide companies and organizations in any sector in implementing an effective Environmental Management System (EMS). The standard does not establish rigid requirements, but rather measures that allow organizations to develop a tailored approach to sustainability and environmental protection. Its central objective is to reduce the environmental impact of companies, creating a framework that ensures compliance with basic regulations and promotes certification as a guarantee of quality and environmental commitment.

Fundamental Principles of ISO 14001

The ISO 14001 standard is based on the four principles of the Deming Cycle, or quality management approach that promotes continuous improvement. These are:

- Plan: establish environmental objectives that are aligned with the organization's environmental policy.
- Deploy: implement a program of actions to achieve these objectives.

- Monitor: evaluate the impact of the actions taken and ensure compliance with environmental regulations through audits.
- Improve: Reflect on and adjust processes to optimize the organization's environmental performance.

This continuous improvement cycle allows companies to comply with environmental regulations, as well as increase their long-term performance, maintaining their certification through periodic verifications.

Impact on CSR

En el contexto de la RSE, la norma ISO 14001 ofrece dos grandes ventajas. Primero, proporciona un marco regulado que facilita el desarrollo de un SGA eficaz, permitiendo a las empresas gestionar de manera estructurada sus responsabilidades ambientales. Segundo, la norma certifica y reconoce los esfuerzos de las empresas para limitar su impacto en el medio ambiente, crucial para la reputación y la confianza del consumidor en la organización.

Operational management

El reconocimiento oficial obtenido a través de la certificación ISO 14001 mejora la imagen de la empresa y refuerza su competitividad en el mercado, al posicionarse como un actor responsable y comprometido con el desarrollo sostenible. Asociar la norma ISO 14001 con un enfoque de RSE permite a las empresas integrar las cuestiones ambientales y humanas en su estrategia de crecimiento, creando un valor añadido para la organización y la sociedad.

Environmental and economic benefits

Implementing ISO 14001 brings significant environmental benefits, including waste reduction, reduced CO2 emissions, resource savings, and efficient water and wastewater management. By reviewing and modifying their processes to minimize their environmental impact, companies not only comply with laws and regulations but also achieve significant financial savings.

For example, by reducing energy consumption, transportation costs, or the use of materials such as cardboard, companies can reduce unnecessary expenses, directly contributing to their profitability. In this way, ISO 14001 promotes environmental sustainability and improves the operational efficiency and competitiveness of companies in an environment increasingly aware of the importance of environmental management.

Since its inception, ISO 14001 has evolved in response to environmental changes and societal expectations. The latest review, published in 2015, included improved approaches to environmental management, integrated risk management, and a strengthening of the role of management and senior management.

The AA1000 approach to responsibility and the ISO 14001 standard emerged in response to growing social and environmental issues in business management. While AA1000 arose from a growing interest and need to integrate business practices, ISO 14001 was developed as part of a global effort to reduce the environmental impact of business activities. These approaches were developed to benefit a business environment that values sustainability and provides reliable operational performance, enabling companies to manage their impacts and be accountable in a transparent and responsible manner. Together, they provide a solid foundation for modern business management, in which sustainability and responsibility are key elements of long-term success.

Using sustainability and corporate social responsibility standards with the application of artificial intelligence

The AA1000 standard focuses on accountability and transparency in sustainability management, promoting stakeholder engagement, identification of material issues, and responsiveness. ISO 14001, on the other hand, focuses specifically on environmental management, establishing a management system that helps organizations comprehensively identify, manage, monitor, and control their environmental issues.

Please note the following comparison table between the AA1000 Accountability standard and ISO 14001: Environmental Management System, as it highlights the differences and similarities in terms of their approach, objectives, and key components.

Table 4.
Comparative table between the AA1000 Accountability standard and ISO 14001: Environmental Management System

Criteria	AA1000 Accountability	ISO 14001: Environmental Management System
1. Main Objective	Promote accountability and transparency in sustainability management, focusing on stakeholder inclusion and accountability.	Establish an effective environmental management system to improve an organization's environmental performance and ensure legal compliance.
2. Focus	It focuses on stakeholder inclusion, materiality, and responsiveness; it integrates sustainability into all aspects of the organization.	Focused on environmental management, with an emphasis on pollution prevention, legal compliance, and continuous improvement in environmental performance.
3. Key Principles	Inclusivity: engage stakeholders.	Continuous Improvement: use of the PDCA (Plan-Do-Check-Act) cycle to continuously improve environmental performance.
	Materiality: Identify and focus on the most significant themes.	Legal Compliance: ensure that activities comply with applicable environmental regulations.
	Responsiveness: respond effectively to the needs of stakeholders.	
4. Scope of Application	Applicable to all types of organizations and sectors seeking to improve their sustainability and social responsibility performance.	Applicable to all organizations, regardless of size or sector, that wish to improve their environmental performance.
5. Risk Management	It addresses the identification of risks and opportunities related to sustainability and stakeholder expectations.	It focuses on identifying risks and opportunities specifically related to environmental impact and legal compliance.
6. Indicators and Measurement	It uses sustainability indicators based on materiality and relevance to stakeholders. It focuses on transparency and accountability.	It uses specific environmental performance indicators to measure impact and improvements. It focuses on documentation and data recording for audits.
7. Review and Improvement	It emphasizes continuous review of sustainability performance and adaptation to changing stakeholder expectations.	It establishes a formal process for reviewing and continuously improving the environmental management system through internal and external audits.

Source: own elaboration

The application of Artificial Intelligence in the management of sustainability and corporate social responsibility standards

Integrating artificial intelligence (AI) into sustainability and CSR standards management offers powerful new tools to optimize and enhance these processes. AI can transform how organizations implement and manage these standards by providing advanced analytics, resource optimization, and accurate predictions, leading to more informed and effective decisions. Below, as a check, criterion "6. Indicators and Measurement," detailed in the table above, will be considered for the application of AI to improve sustainability and CSR management, taking into account standards such as AA1000 and ISO 14001.

RESULTS

Simulated business context

Real-time environmental monitoring and management

AI can be integrated with sensors and IoT (Internet of Things) devices to monitor gas emissions, energy consumption, and other environmental indicators in real-time. Within the framework of ISO 14001, this capability allows organizations to immediately detect deviations from their environmental goals and take timely corrective action. Furthermore, AI-based systems can optimize the use of natural resources, automatically adjusting operational processes to minimize waste and reduce the carbon footprint.

Below is an algorithm that uses AI and Internet of Things (IoT) devices to monitor and manage an organization's gas emissions, energy consumption, and other key environmental indicators in real-time. This algorithm is aligned with the principles of ISO 14001 for environmental management; it enables rapid detection of deviations and the implementation of automatic corrective actions.

Real-Time Environmental Monitoring and Management Algorithm

Algorithm Overview

Objective: Monitor environmental indicators in real time and optimize the use of natural resources, minimizing waste and reducing the carbon footprint.

Inputs: IoT sensor data on gas emissions (CO2, NOx, particulate matter PM10 and PM 2.5, among others), energy consumption, temperature, humidity, and other relevant environmental parameters.

Outputs: Deviation alerts, automatic corrective actions, environmental compliance reports.

Steps of the algorithm

1. System Initialization and Configuration:
   - Establish connections with IoT devices that collect environmental data.
   - Configure key indicator thresholds based on sustainability goals and ISO 14001 requirements (e.g., maximum emission levels, optimal energy consumption).
   - Define corrective actions for each type of deviation detected.

2. Real-Time Data Collection:
   - Receive real-time data from IoT sensors on gas emissions, energy consumption, etc.
   - Store the data in a database for continuous analysis.

3. Data Analysis with AI:
   - Apply machine learning algorithms to analyze data in real time.
   - Detect anomalous patterns or significant deviations from established thresholds.
   - Suggested algorithms: time series analysis to detect trends and anomalies; neural networks for environmental data prediction and classification.

4. Alert Generation:
   - If a deviation from the established thresholds is detected, generate an automatic alert.
   - Classify the alert according to severity (mild, moderate, critical).

5. Automatic corrective actions: Depending on the severity of the deviation, trigger automatic corrective actions. This could be:
   - Adjust equipment operation to reduce energy consumption.
   - Activate filtration or ventilation systems to reduce gas emissions.
   - Notify responsible personnel for manual intervention if necessary.

6. Continuous Optimization:
   - Use the collected and analyzed data to fine-tune AI models, improving the accuracy of predictions and the effectiveness of corrective actions.

- Conduct periodic analyses to identify opportunities for improvement in environmental management and carbon footprint reduction.

7. Report Generation:
   - Create automated reports that document environmental performance, detected deviations, and actions taken.
   - These reports can be used for internal and external audits, ensuring compliance with ISO 14001.

Implementation of this algorithm using Python

```
import pandas as pd
import numpy as np
from sklearn.ensemble import IsolationForest  # Anomaly (or deviation) detection model.
import smtplib  # To send email alerts

# Example thresholds for environmental indicators
EMISSION_THRESHOLD = 50  # ppm (parts per million)
ENERGY_THRESHOLD = 1000  # kWh (kilowatt hours)

# Function to send email alerts
def send_alert(message):
    server = smtplib.SMTP('smtp.example.com', 587)
    server.starttls()
    server.login("user@example.com", "password")
    server.sendmail("from@example.com", "to@example.com", message)
    server.quit()

# Simulation of IoT sensor data
def get_sensor_data():
    # Fictional data for illustration
    data = {
        'emissions': np.random.randint(30, 70, 100),
        'energy': np.random.randint(800, 1200, 100)
    }
    return pd.DataFrame(data)

# Anomaly detection algorithm
def detect_anomalies(data):
    model = IsolationForest(contamination=0.1)
    model.fit(data)
    anomalies = model.predict(data)
    return anomalies

# Main function
def main():
    # Step 2: Data Collection
    sensor_data = get_sensor_data()

    # Step 3: Data Analysis with AI
    anomalies = detect_anomalies(sensor_data)

    # Steps 4 and 5: Generate alerts and take corrective actions
    for index, row in sensor_data.iterrows():
        if row['emissions'] > EMISSION_THRESHOLD or row['energy'] > ENERGY_THRESHOLD:
            alert_message = f" Anomaly detected in the index {index}: Emissions: {row['emissions']} ppm, Energy:
{row['energy']} kWh"
            print(alert_message)
            send_alert(alert_message)
```

```
        if anomalies[index] == -1:
            print(f" Anomaly identified in the sensor data in the index {index}")

# Execute the main function
if __name__ == "__main__":
    main()
```

Code Description

a) Imports and configuration. Libraries for data manipulation (Pandas, NumPy), anomaly detection (Isolation Forest), and email alerting (smtplib) are imported.

b) Thresholds and alert function. Thresholds for emissions and energy consumption are established. A function is defined to send alerts when deviations are detected.

c) Simulation of sensor data. The get_sensor_data() function generates dummy data to illustrate how data would be collected from IoT sensors.

d) Anomaly detection. The detect_anomalies() function uses the Isolation Forest model to identify data that deviates significantly from normal patterns.

e) Generation of alerts and corrective actions. The main loop checks whether sensor data exceeds defined thresholds or if anomalies have been detected, and if so, sends an alert and takes action.

Final analysis

This algorithm demonstrates how AI and IoT devices can be integrated to monitor and manage environmental indicators in real-time. Implementing this type of system not only helps organizations comply with ISO 14001 and other sustainability standards, but also optimizes resource use, minimizes waste, and reduces environmental impact, thus contributing to a more sustainable future. In this regard, AI enables companies to optimize resource use significantly.

For example, in water management, AI algorithms can predict consumption needs and automatically adjust systems to reduce waste (Krishnan et al., 2022). According to a review study conducted in Australia, the increase in these practices has shown their potential for regulating energy consumption, increasing waste management efficiency, and reducing environmental impact (Bolón-Canedo et al., 2024). Likewise, in the supply chain, AI can reduce waste by up to 30% by improving the accuracy of demand prediction and inventory management (Capgemini, 2020).

In the social sphere, AI can analyze large volumes of data to identify areas where further intervention is needed. This allows companies to design more effective and targeted CSR programs. According to various studies, the use of AI to analyze data from IoT-based devices can identify areas for intervention with a higher accuracy rate (Nahavandi et al., 2022). Furthermore, it is crucial to highlight that CSR initiatives based on AI-derived data could be more effective regarding social impact than traditional methods (Kitsios & Kamariotou, 2021; Krakowski et al., 2023).

One of the main challenges in Latin America is technological infrastructure. The effective implementation of AI requires a robust infrastructure, which is still insufficient in many areas of the region. Investments in technological infrastructure are crucial to overcome this obstacle.

DISCUSSION

Integrating AI into sustainability and CSR management in Latin America presents a unique opportunity to address some of the region's most pressing challenges. From optimizing resource use to improving energy efficiency and implementing more effective CSR programs, AI can transform the way companies operate and contribute to sustainable development. However, to fully realize these benefits, overcoming challenges related to technological infrastructure, unequal access, and ethical and privacy issues is crucial. With a strategic and collaborative approach, Latin America can lead the way toward a more sustainable and equitable future.

Capitalists have long been criticized for focusing on short-term profits rather than long-term sustainability, often at the expense of social and environmental factors. "Conscious capitalism" is a business philosophy that seeks to balance economic prosperity with environmental and social good (Thompson & Kumar, 2022); it also requires a high purpose, integration of all stakeholders, conscious leadership, and conscious culture and governance. Conscious

companies go beyond generating profit and define a higher purpose that gives them a sense of transcendence and allows them to connect with the values of their employees and customers; this purpose must be authentic, inspiring, and aligned with global challenges. Conscious company leaders are agents of change who inspire and empower their teams, developing a culture of trust, transparency, and collaboration and fostering their employees' personal and professional development (Fry & Egel, 2021).

Implementing conscious capitalism requires a profound change in how businesses are conceived and managed. It entails adopting new performance metrics that go beyond traditional financial indicators and developing strategies that integrate sustainability into all business areas (Jabnoun, 2020). In this scenario, AI is emerging as an omnipresent tool in modern society, with applications ranging from the domestic sphere to public policymaking (Pallathadka et al., 2023). Its ability to process large volumes of data and optimize processes has opened up a range of possibilities that transform traditional sectors and offer innovative solutions to the most pressing environmental challenges. In this context, AI is presented as a key player in the fight against climate change and ecological footprint reduction by enabling precise monitoring of greenhouse gas (GHG) emissions, efficient management of natural and energy resources, and the prediction of natural phenomena. However, the deployment of AI also generates a debate around its externalities, especially environmental ones, which raises the need for a critical analysis of its role in global sustainability.

In today's world, marked by constant technological innovation, market volatility, and an increased focus on sustainability, companies face pressure to reinvent themselves to remain relevant and competitive (Zapata-Cantu and González, 2021). What is commonly referred to as "business regeneration" is a process of adaptation and transformation of organizations to address emerging challenges and seize new opportunities. Companies can survive in the changing environment and thrive through new forms of innovative products, digitalization, organizational restructuring, diversification, and the adoption of sustainable practices.

A fundamental pillar of business regeneration is innovation. A company seeking to revitalize itself, among other things, begins to rethink and improve its products or services to meet the changing needs of its consumers. Innovation refers to the creation of a new product, but it can also involve improving an existing product through the use of new technologies or materials that make the product's production process more effective, more sustainable, or simply more attractive (Albukhitan, 2020). This is essential to remain competitive in saturated and constantly evolving markets. For example, in the technology market, Apple provides a clear example of how a company can stay ahead by constantly innovating its products, as it periodically launches new device models with innovative features in terms of efficiency and design.

Digital transformation is another integral aspect of the business regeneration process; in the era of digitalization, incorporating advanced technology into business processes becomes a necessity rather than a choice. Through digitalization, a business can increase its operational efficiency, reduce expenses, and gain more revenue streams (Wang et al., 2023). Digitalization also helps companies make decisions with greater and better information while forecasting and adapting to future market trends quickly. Amazon is the most obvious example; the company has impacted the global retail economy through digitalization, from e-commerce to adopting AI in the supply chain.

Furthermore, renewing business activity often requires organizational restructuring. This can include changes in the distribution of management functions, operational culture, and organizational approach (Coskun-Setirek & Tanrikulu, 2021; Hahn & Tampe, 2021). Effective reorganization enables companies to react more quickly to market opportunities and threats. In some cases, restructuring involves simplifying hierarchical structures, fostering a culture of innovation, and making work more flexible; one example is the restructuring of General Electric. During its more than a century of existence, the company has regenerated itself several times and has managed to maintain its status as one of the world's largest industrial corporations.

Another important strategy in business regeneration is diversification. This strategy refers to penetrating new markets or industries to reduce dependence on one source of income (Caldera et al., 2022). For companies, diversification is a way to protect themselves against the risk of a saturated market and, thus, take advantage of new growth opportunities. A classic example of diversification is the Virgin Group, whose operations began in music and broadcasting and expanded into aviation, financial services, and space tourism, among others.

Consequently, business regeneration will become a vital component of companies' ability to survive and thrive in the highly uncertain world of the 21st century. Product innovation, digital transformation, organizational restructuring, diversification, and the incorporation of sustainable practices enable companies to overcome their immediate challenges while strategically positioning them for long-term success. In an environment where nothing is as constant as change, only companies that can regenerate themselves can face the future.

CONCLUSIONS

The study concluded that integrating AI into sustainability and CSR management in Latin America represents a key opportunity to optimize resource use and improve energy efficiency. However, the analyzed texts and the case study highlighted the importance of addressing challenges related to unequal access to technology and ethical and privacy concerns to ensure a full positive impact.

At the epistemic level, conscious capitalism proposes a business model that seeks to balance profit generation with social and environmental well-being. By triangulating all the valued elements, this approach, adopted by companies that integrate all stakeholders and promote leadership focused on trust and sustainability, can encourage creating a strong and responsible corporate culture, an essential requirement in the current and future scenario.

Finally, it was observed that business regeneration, driven by innovation in products and services, has been a fundamental approach for companies to remain competitive in constantly evolving markets; examples such as Apple and Amazon demonstrate how technological adaptation and digital transformation are essential to ensuring long-term success. Diversification and adopting sustainable practices are equally strategic for reducing risks and taking advantage of new growth opportunities. In a global environment characterized by volatility and uncertainty, organizations that manage to regenerate through innovation, digitalization, and sustainability will be better prepared to face future challenges and thrive in a rapidly changing world.

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FINANCING
None.

CONFLICT OF INTEREST STATEMENT
The author declares that there is no conflict of interest.

ACKNOWLEDGMENTS
None.

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