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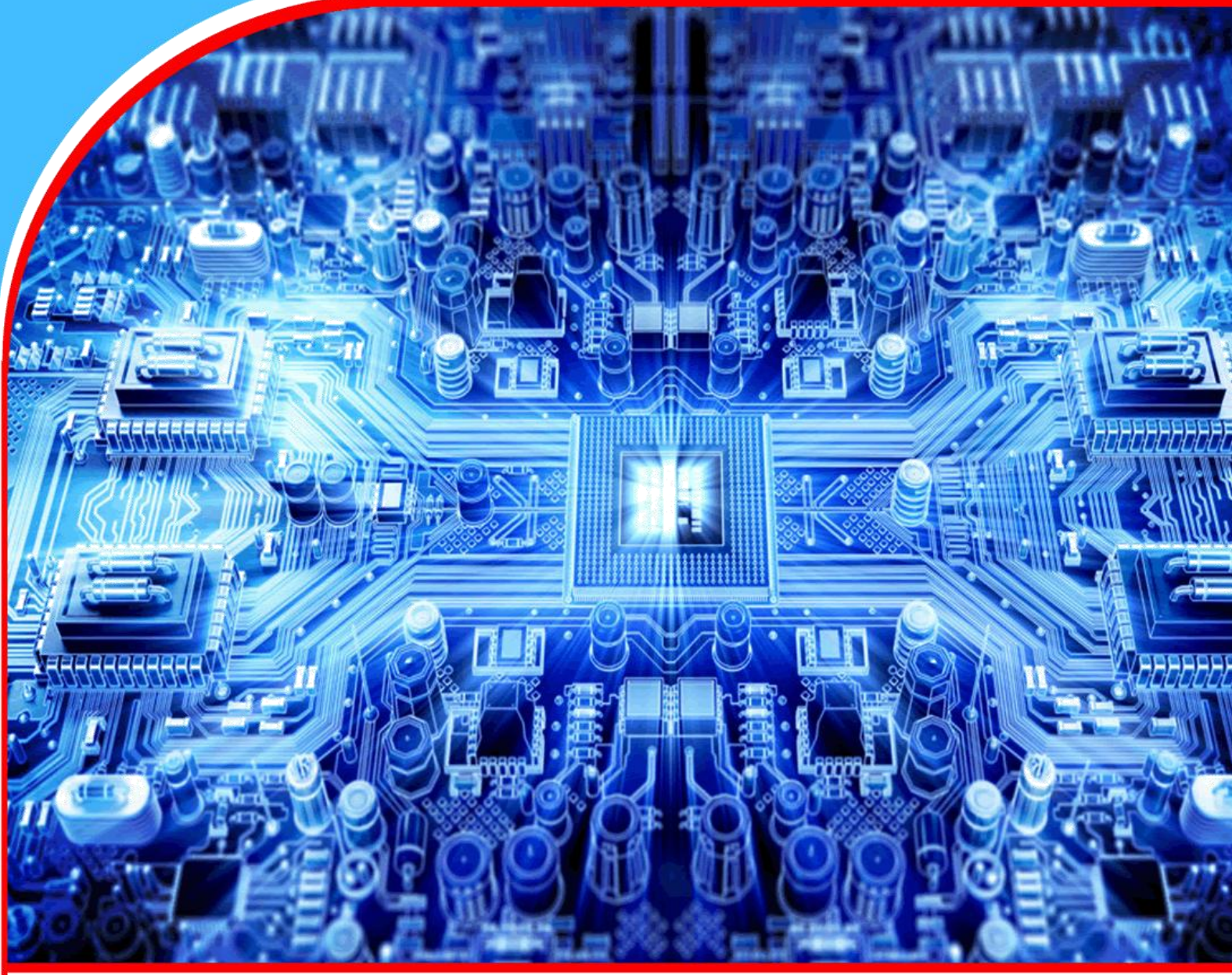

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Transforming Business Strategies: Management Information Systems, IoT, and Blockchain Technology to Advance the United Nations' Sustainable Development Goals

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Abstract

Purpose: Management Information Systems (MIS) function as the foundation for the integration of IoT and blockchain technology, facilitating data-driven decision-making and optimal resource allocation. This collaboration enables enterprises to innovate while tackling significant global issues. The United Nations' Sustainable Development Goals (SDGs) serve as a global framework aimed at addressing some of the most pressing issues facing humanity, such as poverty, inequality, and environmental degradation.

Material and Methods: In response, businesses worldwide are increasingly aligning their strategies to these goals, recognizing that sustainable practices can offer both social and financial value. Among the transformative technologies driving these efforts are the Internet of Things (IoT) and Blockchain. IoT, with its ability to gather real-time data from connected devices, and Blockchain, with its focus on creating secure, transparent, and tamper-proof records, present unique opportunities for businesses to contribute meaningfully to the SDGs.

Findings: This study explores how these technologies can be harnessed by businesses to advance the SDGs, examine their individual contributions, synergies, and case studies of successful implementation.

Implications to Theory, Practice and Policy: By delivering real-time information and promoting cooperation, MIS improves the execution of sustainable initiatives in accordance with the United Nations' Sustainable Development Goals.

Keywords: *Blockchain Technology, Business Strategy, IoT, MIS, SDGs*

INTRODUCTION

The framework of sustainable development goals, as outlined by the United Nations in 2015, to explore different dimensions of environmental sustainability. The SDGs are positioned as an integrated blueprint and a shared agenda for future peace and prosperity for the planet and its population. The 17 SDGs focus on the elimination of poverty and other deprivations to be pursued alongside strategies for improvement in health and education, with a reduction of inequality, with economic growth and addressing climate change, while protecting our forests and oceans (United Nations, 2015; United Nations, 2018). Companies of any size or production specialization can develop more responsible business models, giving a decisive boost to the implementation of SDGs through investments in technological innovation and multi-partnership involvement (Di Vaio et al., 2020). The urgency of achieving the United Nations' Sustainable Development Goals (SDGs) by 2030 cannot be overstated. With over 7.9 billion people on the planet, the global challenges outlined in the SDGs such as climate change, poverty, and inequality require immediate action. Businesses play a crucial role in this global endeavor, not only as drivers of economic growth but also as key contributors to the social and environmental dimensions of sustainability (United Nations, 2020). In recent years, businesses have been increasingly called upon to align their strategies with the SDGs. The World Economic Forum, the UN Global Compact, and numerous other global initiatives have encouraged businesses to incorporate sustainability into their operations, supply chains, and product offerings. Moreover, sustainable business practices have proven to be not only a moral obligation but also a competitive advantage, as consumers, investors, and employees are increasingly demanding responsible business conduct (Goodfellow et al., 2016; (United Nations, 2020).

However, meeting these global challenges requires more than just traditional corporate social responsibility (CSR) efforts. The evolving landscape of technology, particularly the advent of the Internet of Things (IoT) and Blockchain, provides new avenues for businesses to adopt sustainable practices at scale (Meiryani et al., 2020). These technologies are not just transforming operational efficiency but also enabling businesses to innovate in ways that align with the SDGs. Business strategies are evolving to meet the challenges posed by the SDGs (United Nations, 2018; United Nations, 2020). Traditionally, companies operated with a profit-maximizing mindset, often overlooking environmental and social consequences. However, this approach is changing rapidly. The concept of "shared value" has emerged, suggesting that businesses can simultaneously create economic value and social value by addressing societal challenges through their core operations. Strategic alignment with the SDGs is no longer seen as a peripheral or optional activity but as a critical component of long-term success (United Nations, 2020). By embracing technologies such as IoT and Blockchain, businesses can create more transparent, efficient, and sustainable systems that directly contribute to the SDGs. This alignment, however, requires an understanding of the role technology can play in sustainability efforts and how it can be integrated into core business processes. The Internet of Things (IoT) refers to the network of interconnected devices that collect, exchange, and analyze data. IoT is revolutionizing industries by providing real-time insights, improving efficiency, and enabling more informed decision-making (Karim et al., 2011). In the context of the SDGs, IoT can be used to monitor environmental conditions, optimize energy usage, reduce waste, and improve the management of natural resources. Blockchain technology, on the other hand, is a decentralized and distributed ledger system that ensures data integrity through cryptographic techniques. Blockchain's ability to provide transparency and traceability makes it a

powerful tool for ensuring ethical business practices, such as transparent supply chains and fair labor practices (Meiryani et al., 2020). By enabling secure transactions and record-keeping without the need for intermediaries, Blockchain can help businesses meet SDG-related challenges like corruption, fraud, and accountability. Furthermore, the nature of records and transaction security due to the use of blockchain technology ensures that company operations are transparent and reliable. More specifically, regarding supply chain management, the use of blockchain allows authentication of the origins of a product; hence, the advancement of SDG 12 (Saberi et al., 2019). IoT and Blockchain come with strong structures for sustainable company strategy integration. IoT sensors with blockchain increase traceability in energy networks, hence promoting SDG 7 (Gondchawar & Kawitkar, 2016; Nawar & Ullah says, 2020).

This study aims to explore how IoT and Blockchain can be leveraged by businesses to advance the United Nations' Sustainable Development Goals. By analyzing these technologies individually and in synergy, the article will outline the ways in which businesses can integrate IoT and Blockchain into their strategies to contribute to SDG achievement. The paper will provide practical insights, showcase real-world applications, and propose actionable recommendations for businesses aiming to implement these technologies as part of their sustainability initiatives.

The United Nations' Sustainable Development Goals (SDGs)

The SDGs, introduced by the United Nations in 2015, consist of 17 global goals that cover a wide array of issues including poverty, hunger, education, health, gender equality, clean water, affordable energy, climate action, and sustainable economic growth. Each goal is underpinned by specific targets and indicators to monitor progress. The SDGs are universally applicable, meaning they apply to all countries regardless of their level of development. The SDGs are interconnected, recognizing that economic, social, and environmental sustainability must be achieved in tandem. Achieving these goals requires collective action from governments, civil society, the private sector, and individuals (Pivoto et al., 2018; United Nations, 2020). The business sector, with its vast resources and global reach, plays a key role in the realization of these goals. Businesses have a critical role to play in achieving the SDGs. The private sector is a major driver of innovation, job creation, and economic growth, but it also has the potential to shape the future of sustainability through responsible practices (Riza et al., 2020). The private sector can contribute directly to many SDGs, from affordable and clean energy (SDG 7) to decent work and economic growth (SDG 8) to climate action (SDG 13).

The private sector’s contribution goes beyond corporate social responsibility initiatives. By integrating the SDGs into their core business strategies, companies can create value not only for their shareholders but for society at large. Technologies like IoT and Blockchain offer businesses the tools they need to align their operations with the SDGs in more efficient and scalable ways (Sudaryono et al., 2020; United Nations, 2018). Despite the significant opportunities, businesses face challenges when aligning with the SDGs. These challenges include high implementation costs, regulatory uncertainty, lack of infrastructure, and a shortage of skilled workers. However, the rapid development of technologies like IoT and Blockchain provides solutions to some of these challenges, offering businesses innovative ways to overcome barriers and make measurable progress toward achieving the SDGs. In the following sections, this article will examine how IoT and Blockchain can address some of these challenges and present opportunities for businesses to leverage their capabilities for sustainable development.

Furthermore, the inconsistent regulation creates an obstacle to doing business. For example, various environmental standards and unclear guidelines on how to adopt technologies supporting the SDGs-IoT or Blockchain, among others-can lead to slower adoption and increased costs of compliance. For example, the vagueness of regulations concerning carbon offsetting prevents companies from actively contributing to the attainment of SDG 13: Climate Action (Rogelj et al., 2018). The main barrier, however, is the lack of proper digital infrastructure in developing regions. Companies planning to implement IoT-based solutions in agriculture as part of SDG 2 (Zero Hunger) often find insurmountable issues such as poor connectivity to the internet and limited access to IoT devices (Dlodlo et al., 2016). Also, high implementation costs and a general lack of technical skills make the full adoption of blockchain an uphill task (Saberi et al., 2019). Incorporating SDG-aligned strategies often requires changes in organizational culture and processes. Resistance to change, coupled with a lack of awareness and training, can impede efforts to integrate sustainable practices (Schaltegger et al., 2017).

Internet of Things and its Potential for SDG Achievement

The Internet of Things (IoT) is a system of interrelated physical devices, vehicles, appliances, and other objects embedded with sensors, software, and network connectivity, enabling them to collect, exchange, and process data. These devices range from everyday objects like smartphones and wearables to specialized equipment used in industries like manufacturing, agriculture, and healthcare. The primary characteristic of IoT is its ability to enable real-time data collection and decision-making through interconnected networks (Sukmana et al., 2020).

IoT devices communicate through internet protocols, sending and receiving data to and from central platforms or other devices. This connectivity allows for automation, remote monitoring, predictive analytics, and enhanced operational efficiency (Winarno et al., 2019). As IoT technologies evolve, their applications in industries and business models continue to expand, providing opportunities to tackle complex sustainability challenges.

IoT and Sustainability

IoT's potential in contributing to the achievement of SDGs lies in its capacity to enhance resource efficiency, monitor environmental impact, and drive sustainability efforts (United Nations, 2018; United Nations, 2020). In the context of SDGs, IoT can be leveraged in several ways:

- **Climate Action (SDG 13)**: IoT-based solutions can help monitor climate patterns, track pollution levels, and optimize energy consumption in industries and urban areas. Smart grids and energy management systems enabled by IoT can significantly reduce carbon emissions by improving energy distribution and consumption efficiency.
- **Affordable and Clean Energy (SDG 7)**: Through smart meters, IoT technologies can help optimize energy use by collecting data on consumption patterns. IoT solutions can enable consumers and businesses to adjust usage, reduce waste, and use renewable energy sources more effectively.
- **Responsible Consumption and Production (SDG 12)**: IoT enables waste reduction by tracking resources, inventory, and product life cycles. IoT-based systems in manufacturing can monitor supply chains, ensuring waste is minimized, production processes are optimized, and materials are reused or recycled.

- **Sustainable Cities and Communities (SDG 11)**: In smart cities, IoT helps manage urban infrastructure like traffic systems, waste management, and water supply. Sensors embedded in public spaces allow for real-time data collection, helping cities to become more efficient, less resource-intensive, and environmentally sustainable.

Future Trends in IoT and SDG Alignment

As IoT technology continues to evolve, its potential for driving sustainability will only increase. The rise of 5G connectivity, for instance, will improve the speed and reliability of IoT networks, enabling real-time, large-scale deployments in industries like logistics and urban management. Additionally, the integration of IoT with Artificial Intelligence (AI) and Big Data analytics will allow for predictive capabilities, where businesses can anticipate resource needs, forecast demand, and improve efficiency to meet sustainability goals

A Game-Changer for SDG-Driven Business Practices

Blockchain technology is a decentralized, distributed ledger system that securely records transactions across multiple computers in a way that prevents tampering. Unlike traditional databases that rely on a central authority to validate transactions, Blockchain enables peer-to-peer transactions without intermediaries, making it both transparent and secure. Each block in a Blockchain contains a list of transactions, and once data is added to the Blockchain, it cannot be altered without the consensus of the network (Paliwal et al., 2020; Goyal et al., 2021). This feature ensures data integrity and makes Blockchain an ideal solution for creating transparent and verifiable records, which is crucial for businesses aiming to meet SDGs. One of the primary ways Blockchain can support SDG achievement is by fostering transparency, traceability, and accountability. Businesses that use Blockchain can create transparent supply chains, verify product origins, and ensure fair labor practices, helping to address issues like corruption (SDG 16: Peace, Justice, and Strong Institutions) and unethical sourcing (SDG 12: Responsible Consumption and Production).

For example, Blockchain can be used to trace the journey of goods from raw materials to finished products, ensuring that businesses do not unknowingly support practices like child labor, deforestation, or unsafe working conditions (Zhu et al., 2021; Islam et al., 2023). This level of transparency can drive responsible business conduct and ensure that sustainability claims are verifiable.

- **Supply Chain Transparency (SDG 12: Responsible Consumption and Production)**: Companies like Walmart have implemented Blockchain to improve food safety and reduce waste by tracking the entire supply chain of produce. By using Blockchain, they can trace contaminated products back to their source within seconds, reducing the risk of widespread recalls and minimizing food waste.
- **Renewable Energy (SDG 7: Affordable and Clean Energy)**: Blockchain is being used in the energy sector to enable peer-to-peer energy trading. For instance, in Australia, blockchain-based platforms allow users to trade excess solar energy directly with others, helping to promote the adoption of renewable energy sources while also democratizing energy access.

- **Decentralized Finance and Poverty (SDG 1: No Poverty)**: In emerging markets, Blockchain-based solutions are providing financial inclusion for people who lack access to traditional banking systems. By using blockchain-based financial platforms, people can send and receive money across borders with lower fees and without relying on banks, thus helping to reduce poverty.

Blockchain's decentralized nature also makes it a powerful tool for promoting social good. By ensuring that data is secure, transparent, and immutable, Blockchain can help create systems that are resistant to corruption and fraud. It can also be used in governance, identity verification, and charitable donations, ensuring that funds are allocated correctly and reach their intended recipients. One notable example is the use of Blockchain in humanitarian aid distribution, where the transparency and security of Blockchain can ensure that donations are not misappropriated and are delivered directly to the communities that need them most.

Integrating MIS, IoT and Blockchain for SDG Advancement

While IoT and Blockchain can each drive sustainability in isolation, their combination offers even greater potential for addressing SDG challenges. These interconnected elements collectively enable MIS to function effectively by facilitating data processing, storage, analysis, and communication for informed decision-making. Each component plays a vital role in achieving organizational goals through efficient management of information and resources (Figure 1). IoT collects vast amounts of real-time data, while Blockchain ensures that this data is secure, transparent, and tamper-proof. This synergy can enable more efficient, secure, and transparent systems that businesses can use to address sustainability challenges on a global scale (Bai et al., 2022). For instance, IoT sensors can monitor energy usage in real-time, while Blockchain can validate and store this data in an immutable ledger, making it possible for businesses to track and report their environmental impact transparently. This integration could lead to more accurate reporting, better decision-making, and a greater ability to meet sustainability goals. IoT and Blockchain together can create a connected and transparent ecosystem where businesses can monitor, verify, and optimize their sustainability efforts (Zhu et al., 2021). For example, in supply chains, MIS, IoT sensors can track the movement and condition of goods, while Blockchain can ensure that this data is recorded and cannot be altered, providing full visibility of the entire process from production to delivery.

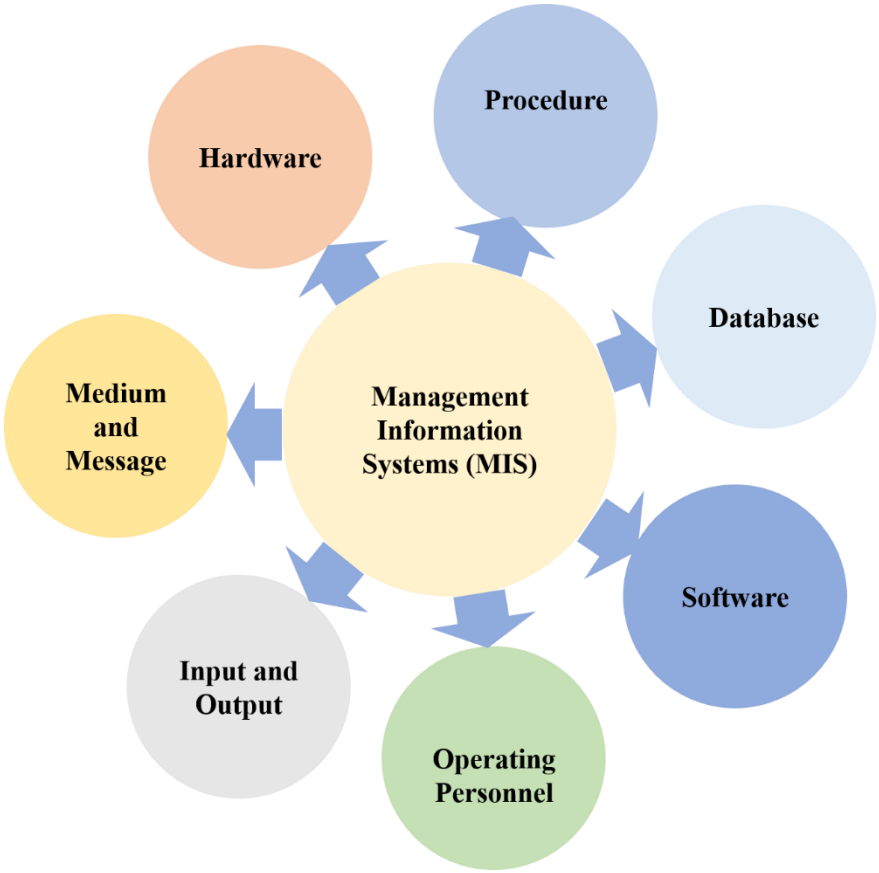

Figure 1 A Conceptual Diagram Illustrating the Core Components of Management Information Systems (MIS), Including Hardware, Software, Database, Procedure, Operating Personnel, Input and Output, and Medium and Message

To harness the full potential of IoT and Blockchain technologies in advancing the SDGs, businesses must first align their core strategies with sustainable development goals. This involves adopting sustainability as a key business driver and integrating it into the company's mission and operations (Zhu et al., 2021). Business leaders need to understand that sustainability is not only about environmental preservation but also about ensuring long-term economic growth and social equity.

Organizations can achieve this alignment through the following steps:

- **Embedding Sustainability into Corporate Vision**: Companies should revise their mission statements and corporate goals to explicitly reflect their commitment to sustainable practices. This may involve adopting sustainable sourcing, reducing environmental footprints, and investing in renewable energy and green technologies.
- **Establishing Sustainability Metrics**: To measure progress towards SDG goals, businesses need to establish clear sustainability metrics. These can include carbon footprint reduction, waste management, energy consumption efficiency, and labor practices. IoT devices can be used to gather the data necessary for these metrics, while Blockchain ensures that the information is securely and transparently recorded.

- **Engaging Stakeholders in SDG-Driven Strategies**: Companies must collaborate with key stakeholders including customers, suppliers, regulators, and NGOs—to ensure their SDG strategies are effective and transparent. IoT and Blockchain can facilitate this collaboration by providing real-time data and transparent records that stakeholders can trust.

Business models in various sectors are evolving rapidly, especially with the emergence of new technologies such as IoT and Blockchain. Traditional models are giving way to digital-first approaches that prioritize sustainability, transparency, and customer-centricity (Goyal et al., 2021; Chen et al., 2020; Islam et al., 2023; Aziz et al., 2023). IoT and Blockchain offer the ability to reimagine existing business processes to create more sustainable, efficient, and customer-focused models. For instance:

- **Smart Cities and Urban Development**: In the development of smart cities (SDG 11: Sustainable Cities and Communities), companies can adopt IoT and Blockchain technologies to build smarter urban infrastructures that optimize energy use, reduce pollution, and improve the quality of life for citizens. Smart lighting systems, smart waste management, and energy-efficient buildings powered by IoT sensors, alongside Blockchain's transparency, can make urban development more sustainable.
- **Circular Economy Models**: IoT and Blockchain are key enablers of the circular economy, a model where products are designed to be reused, repaired, and recycled, reducing waste and conserving resources. Blockchain can provide transparent records of product life cycles, ensuring that materials are recycled and reused in compliance with sustainable practices. IoT can monitor the condition of products in the recycling process, improving efficiency and reducing waste.
- **Sustainable Agriculture**: In agriculture, IoT-based systems can help farmers manage water usage, monitor soil conditions, and optimize crop production. By integrating Blockchain for traceability, consumers and businesses can track the sustainability of agricultural products from farm to table, ensuring ethical and environmentally conscious practices.

Data is at the core of both IoT and Blockchain technologies. By collecting real-time data from IoT devices and ensuring its integrity through Blockchain, businesses can make informed decisions that are aligned with SDG targets (Chen et al., 2020). For example, data on energy consumption, carbon emissions, and waste generation can be analyzed to identify areas for improvement and optimize resource use. Organizations can use advanced analytics and AI in combination with IoT and Blockchain data to forecast sustainability trends, track supply chain performance, and assess the impact of their actions on SDG outcomes. This data-driven approach ensures that businesses can continuously optimize their operations to meet sustainability goals.

For example, all the tracking and verification, to add to the transparency of this supply chain operation in procuring all raw materials in a very sustainable manner, would use blockchain technology. For instance, companies like Walmart monitor food supply chains using blockchain technology in line with SDG 12, which is Responsible Consumption and Production (Saberi et al., 2019). The Circular Economic Model uses IoT sensors that monitor resource usage and reduction of waste and hence further contributes to SDG 9, which is Industry, Innovation, and Infrastructure. IoT-enabled smart meters and management systems are crucial in optimizing energy usage in

buildings and manufacturing facilities, hence directly contributing to SDG 7: Affordable and Clean Energy (de Sousa Jabbour et al., 2018). EM3 provides a structured approach to effective analysis of energy efficiency, including the provision of data-based insights through Management Information Systems-IoT integration. Blockchain-based voting solutions securely and transparently allow the engagement of stakeholders in corporate governance, integrating business operations within SDG 16: Peace, Justice, and Strong Institutions. The guidelines provided by the Global Reporting Initiative may allow the management information systems alignment for sustainable reporting by organizations. IoT devices observe soil health, water usage, and crop condition to further best farming practices, thus advancing SDG 2: Zero Hunger. This is a SMART Agriculture platform that uses MIS integration for IoT data acquisition in informed decision-making (Majeed & Rupasinghe, 2017).

Challenges in Implementing MIS

While IoT and Blockchain offer immense potential for advancing SDGs, there are several technological challenges that businesses must address to successfully implement these solutions. Both IoT and Blockchain generate and store large volumes of sensitive data (United Nations, 2020). Ensuring the security and privacy of this data is a major concern. In particular, IoT devices are often vulnerable to cyber-attacks, and Blockchain, while secure, still faces challenges regarding scalability and speed. Solutions such as encryption, secure communication protocols, and decentralized data storage can mitigate these risks. MIS and IoT devices often come from different manufacturers, and Blockchain platforms are varied across industries (Alawamleh et al., 2021; Ampofo et al., 2020). Ensuring that these technologies can seamlessly communicate and share data is essential for achieving SDG objectives. Standardization efforts and the development of common protocols for IoT and Blockchain integration will be crucial to overcome interoperability issues. Scaling IoT networks to handle the massive amounts of data generated by millions of devices and ensuring Blockchain can handle such data volumes without compromising transaction speed is a challenge (Azadi et al., 2020; United Nations, 2020). Advancements in both IoT connectivity (such as 5G) and Blockchain consensus mechanisms (such as proof-of-stake) are helping to address these challenges. While the promise of IoT and Blockchain for SDGs is clear, the financial and resource investment required for their implementation can be significant. Many businesses, especially small and medium enterprises (SMEs), may lack the resources to adopt these technologies at scale. To overcome this barrier, companies can explore funding opportunities such as government grants, venture capital for green tech, and public-private partnerships aimed at promoting sustainability (Ali et al., 2021; Noman et al., 2022). Additionally, businesses can adopt a phased approach to implementation, starting with pilot projects and scaling up as they achieve measurable results. As IoT and Blockchain technologies evolve, so do the regulatory and legal frameworks surrounding them. Ensuring compliance with data protection laws, environmental regulations, and industry-specific standards is essential for businesses seeking to integrate these technologies for SDG-driven purposes. Governments and regulatory bodies must work with the private sector to create supportive environments for IoT and Blockchain adoption. This includes developing policies that promote sustainability, innovation, and data protection while addressing the potential risks associated with these technologies.

However, businesses face several challenges in adopting IoT and Blockchain for SDG-driven strategies. Technological barriers such as data security, interoperability, and scalability must be addressed through continued innovation and industry collaboration. Financial constraints may

deter smaller companies from adopting these technologies, but funding opportunities and phased implementations can help ease this transition. Regulatory and legal frameworks surrounding data privacy and technology use also need to evolve to support sustainable practices (Babaei et al., 2013). Despite these challenges, businesses that embrace IoT and Blockchain stand to gain not only in terms of competitive advantage but also in their ability to make a meaningful contribution to global sustainability efforts. Companies that adopt these technologies early and align their strategies with SDGs will be better positioned for long-term growth while driving positive societal and environmental change. To fully realize the potential of IoT and Blockchain in advancing the SDGs, a collaborative effort between the private sector, governments, and civil society is essential. Governments should create conducive regulatory environments that foster innovation while ensuring compliance with sustainability standards. Businesses must invest in technologies and adapt their strategies to prioritize long-term sustainability (Babu et al., 2019). At the same time, there should be a concerted effort to educate stakeholders, promote knowledge-sharing, and encourage collaboration across sectors to scale successful initiatives.

As we look to the future, the role of IoT and Blockchain in creating a sustainable and equitable world cannot be overstated. These technologies offer unprecedented opportunities to transform industries, improve efficiency, and reduce environmental footprints (Bahnsen et al., 2017; Cui et al., 2019). By embedding SDGs at the heart of business strategies and leveraging cutting-edge technologies, organizations can contribute significantly to achieving the global sustainability agenda. Through a concerted effort, businesses, governments, and stakeholders can build a future where technological progress and sustainable development go hand in hand. Now is the time for action embracing these technologies, adapting business strategies, and working toward achieving the SDGs will define the future of both business and global sustainability.

The Government Grants (India) program provides financial support and incentives to businesses and organizations for the implementation and use of digital technologies, including Management Information Systems (MIS), to improve operational efficiency and governance. Organizations in sectors such as agriculture and education have received money to implement Management Information Systems for real-time monitoring and data-driven decision-making (SBA, 2021). Distributes financial resources to small firms to promote new technological developments, including MIS-related projects. Funding has been designated for the advancement of Management Information Systems in healthcare management and public service delivery. A collaboration between the European Union and private firms to advance sustainable digital transformation. Financial and technical support is provided to implement MIS and IoT solutions, aligned with green energy goals and sustainable business practices.

In efforts like Singapore's Smart Nation, the public and private sectors collaborate to develop Management Information Systems frameworks for urban planning, energy management, and public transportation. Government finance and business acumen work together to tackle financial and technical challenges (European Commission, 2020). These instances illustrate how specific government subsidies and public-private collaborations mitigate budgetary constraints by offering financial resources, expertise, and incentives, thereby enabling the deployment of Management Information Systems (MIS) across various enterprises (Digital India Programme, 2019).

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CONCLUSION AND RECOMMENDATIONS

Recommendations

The combinations of MIS-integrated IoT using blockchain technology promise a great beginning toward the advance of the SDGs enacted by the United Nations. It is expected, meanwhile, that future paths which this interdisciplinary arena will take comprise calls for innovation, inclusivity challenges, and sustainability. These dimensions cover various fields, including natural resource management, pollution control, improved living standards, education, community development, economic progress, and research. By integrating these areas, Management Information Systems play a pivotal role in driving the comprehensive realization of the SDGs (Figure 2). One important future direction is to further advance global data interoperability. Various sectors, such as health, agriculture, and renewable energy, may make use of the MIS to develop centralized platforms that amass real-time data from IoT (Islam et al., 2023). Blockchain technology maintains data integrity and security, hence building trust and cooperation among different stakeholders. Such integration, according to Bai et al. (2022), can enable SDG 2 on Zero Hunger, where the supply chain in agriculture will be optimized by tracking transparently and performing predictive analytics. In the direction of allowing smart cities, SDG 11 dealing with Sustainable Cities and Communities can also be enabled. IoT devices installed with sensors may monitor not just the urban infrastructure but also traffic congestions and other environmental parameters. Integrating blockchain could safely share that data across different public and private entities, thereby allowing proactive planning in the reduction of urban congestion and increasing green initiatives (Zhu et al., 2021; Rahaman et al., 2023). MIS platforms can go a step further by providing insights through AI-driven analytics in order to make city management more efficient and equitable.

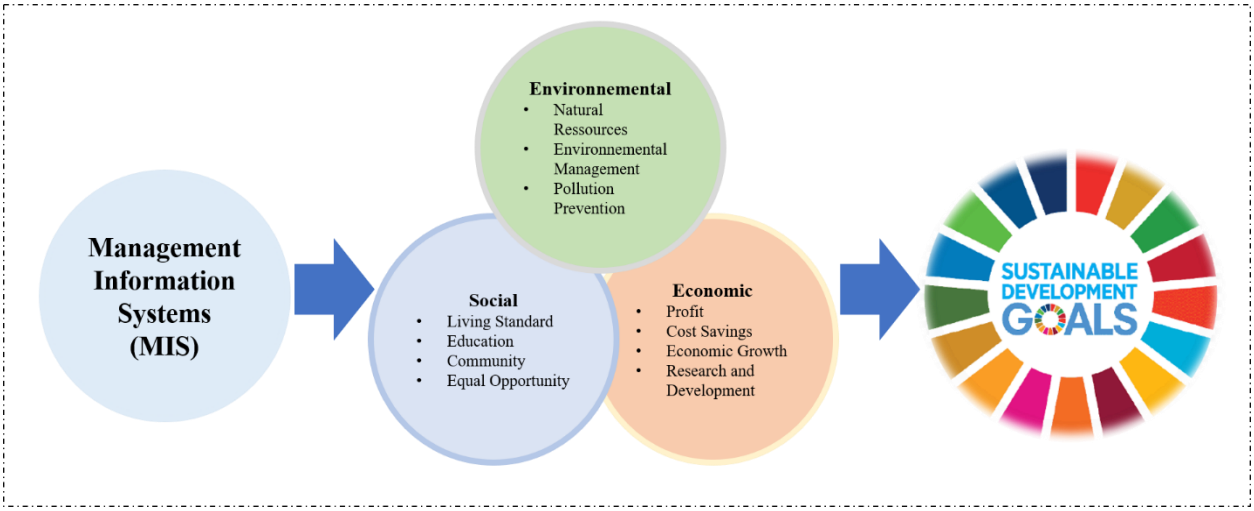

Figure 2 A Visual Representation of the Role of Management Information Systems (MIS) In Advancing the United Nations' Sustainable Development Goals (SDGs). MIS Acts as A Central Framework Influencing Three Interconnected Dimensions Environmental, Social and Economic. These Dimensions Encompass Areas Such as Natural Resource Management, Pollution Prevention, Living Standards, Education, Community Building, Economic Growth, And Research. the Integration of These Aspects through MIS Ultimately Supports the Holistic Achievement of the SDGs.

In healthcare, the synergy of these technologies can transform disease prevention, diagnosis, and treatment (SDG 3: Good Health and Well-being). IoT devices can collect patient health metrics, while blockchain ensures secure sharing of sensitive data across healthcare providers. MIS can analyze this data for early warning systems and personalized healthcare solutions, particularly in underserved regions (Goyal et al., 2021; Aziz et al., 2023). The other two objectives of the future with DeFi are reducing inequality and ensuring financial inclusion. DeFi on blockchain might extend financial services to the unbanked people, thus feeding into SDG 10: Reduced Inequality. MIS will track and analyze the results of such initiatives, while IoT devices allow digital identity verification and transaction recording. Finally, the future is demanding sustainability-related innovation for the realization of SDG 13: Climate Action (United Nations, 2018; United Nations, 2020). IoT can present detailed carbon emission and resource utilization data, while blockchain ensures accountability in carbon credit trading. MIS will be able to simulate various scenarios and guide policy decisions for mitigating climate change. All these directions, however, are possible only in collaboration with the governments, private enterprises, and academia. Policy makers have to ensure a policy of equity in access to technology, sound cybersecurity frameworks, and capacity-building programs so that MIS, IoT, and blockchain realize their potential in the attainment of SDGs.

The Triple Helix Model effectively organizes collaboration among governments, private enterprises, and academia, with each stakeholder fulfilling a specific function: governments offer policy support and funding, private enterprises supply technological expertise, and academia fosters research and workforce development (Etzkowitz & Zhou, 2017). EIT fosters cross-sector collaborations to create innovative solutions in energy, healthcare, and digital transformation. Additional instances of Living Labs encompass the Amsterdam Smart City program, which serves as authentic experimental environments for IoT and blockchain technologies to facilitate sustainable urban solutions (European Commission, 2020). In this context, these frameworks effectively match objectives and optimize resources for significant SDG-oriented innovation. Thirdly, the deployment of technologies such as IoT and blockchain entails ethical considerations. Integrating these technologies into Management Information Systems raises problems regarding data ownership and privacy. Businesses and governments must implement rigorous data governance policies to secure sensitive information, obtain user consent, and establish clear data ownership requirements. The immutable nature of blockchain offers safe data management capabilities but also poses issues in correcting inaccuracies and adhering to privacy requirements like the General Data Protection Regulation (GDPR) (Zwitter & Boisse-Despiaux, 2018). modern ethical concerns must be resolved to cultivate trust and ensure equitable distribution of the benefits of modern technology.

Conclusion

The integration of IoT and Blockchain technologies offers tremendous potential for transforming business strategies and advancing the United Nations' Sustainable Development Goals. By enabling real-time data collection, transparency, and decentralized decision-making, these technologies can help businesses optimize their operations, reduce waste, and improve sustainability outcomes. Furthermore, their combination offers even greater synergies that can be harnessed for broader societal impact. As businesses continue to adopt IoT and Blockchain, they will play a crucial role in driving SDG progress across industries. However, realizing this potential requires addressing technological, financial, and regulatory challenges while ensuring that

sustainability is embedded in every aspect of business strategy. By doing so, companies can not only achieve their sustainability goals but also contribute to a more sustainable and equitable world. To unlock the full potential of IoT and Blockchain for SDG achievement, businesses, governments, and NGOs must collaborate. Businesses should invest in these technologies, adapt their strategies, and work together to create scalable solutions for sustainability. With the right investments, partnerships, and policies, the transformative power of IoT and Blockchain can help build a more sustainable future for generations to come. The integration of IoT and Blockchain technologies offers transformative potential for businesses seeking to advance the United Nations' Sustainable Development Goals (SDGs). These technologies provide companies with the tools needed to enhance operational transparency, improve efficiency, and reduce their environmental impact, all of which are central to the pursuit of a sustainable future. IoT enables the collection of real-time data, while Blockchain ensures that this data is secure, traceable, and immutable, making it an ideal foundation for achieving SDG objectives. By leveraging IoT for smarter resource management, waste reduction, and energy efficiency, businesses can directly contribute to SDG goals such as affordable and clean energy (SDG 7), sustainable cities and communities (SDG 11), and responsible consumption and production (SDG 12). Blockchain, on the other hand, supports these initiatives by creating transparent and trustworthy systems, ensuring that sustainability practices are verified and accountable. While this review places much emphasis on the business perspective, the integration of the views of marginalized groups and underserved regions enhances inclusivity and equity. For example, IoT and blockchain technologies deployed to support smallholder farmers in low-income countries can enhance resource allocation and market access for value addition toward SDG 2 and SDG 10. Moreover, if the challenges these communities face are taken into consideration-for example, in terms of infrastructure or technical expertise-then such a technological advancement could have the power to reduce global inequalities rather than further increasing them. It is inclusive innovation which can enable business, government, and academia to collaborate in ways that could secure sustainable development for all levels of stakeholders.

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Conflicts of Interest

The authors declare no conflict of interest.

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