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LEADING FOR SUSTAINABILITY: A SYSTEMATIC REVIEW OF THE CONVERGENCE OF DIGITAL LEADERSHIP AND ECO-DESIGN IN SDGS

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Abstract:
The objective of the paper is to conduct a systematic review of overlaps between Digital Leadership and Eco-Design in delivering the Sustainable Development Goals (SDGs). As organizations globally pressured to become more sustainable due to the rise of environmental issues such as climate change and increased scarcity of resources, the companies are seeking new and creative approaches to moderate economic development and environmental sustainability. There is a bright spot of the combination of digital leadership and eco-design. Through the adoption of AI, IoT, and blockchain, digital leadership helps an organization to enable digital transformation and maximize sustainability efforts at the same time. Conversely, eco-design involves designing products and processes that are less harmful to the environment in terms of resources and waste materials used, as well as, respecting circular economy values. The paper provides a review of 39 researches examining the role of digital leadership in implementing sustainable practices with the help of advanced technologies and the use of eco-design principles to enhance sustainability results. The results point to the imperative of AI decision-making, intelligent governance, and sustainable innovation as a facilitators of sustainability, especially in such industries as manufacturing, energy, and production. This intersection between the two disciplines allows the paper to expose the possibility of how digital leadership can incorporate the concept of eco-design to ensure reduction in carbon footprints, optimal use of resources, and encourage innovation. The combination of digital leadership and eco-design can be pivotal in helping to increase SDGs, among them SDG 9 (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action). The paper ends with a discussion of the challenges and prospects on effective integration of the practices so that a more sustainable future can obtained.

Keywords: Digital Leadership, Eco-Design, Sustainable Development Goals (SDGs), Artificial Intelligence (AI)

1. Introduction

In this age and era of digital transformation, sustainability is a top priority issue in businesses, governments, and other organizations in many countries. The specialized problems with a global character, that we have to deal with, like climate change, resource overuse, social inequality, demand a highly technical and socially sustainable solution (Kouser et al. 2025). The United Nations, as a guide to countries and organizations in their sustainable economic growth, has proposed the Sustainable Development Goals (SDGs) as an international mechanism to solve all those issues (Mahmood, Khan, Mahmood, et al. 2025). Nonetheless, to fulfill these challenging so-called SDGs, the mix of digital technologies and sustainability need

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to be incorporated (Mahmood, Khan, Ali, et al. 2025). Digital leadership and eco-design become decisive in terms of sustainable development in this context (Munir et al. 2025).

Digital leadership can be defined as the capacity of leaders to exploit digital technologies to operationalize change in organizations and the society (Mahmood, Shakir, Sohail, et al. 2025). Such a style of leadership is becoming critical in how to handle the complexities in the modern world where industries, governance and economies are being reinvented by digital technologies like Artificial Intelligence (AI), the Internet of Things (IoT) and blockchain (D. N. S. Gohar Mahmood, Khan, and Anwar 2025). Digital leadership is not about making changes, it is about the change in mindset to create innovation, agility, sustainability in the organizational strategies. Digital leaders should strive to create a culture that is focused on change, engagement of stakeholders, and that digital transformation transforms into sustainable objectives (D. Q. M. K. Gohar Mahmood, Shakir, and Ahmad 2025). By careful planning, and deployment of digital tools, balanced with data-driven decision-making, digital leadership proves a critical component of sustainability, and SDGs attainment (Johl and Khan 2020).

Conversely, eco-design is aimed at creating products and services that do not affect the environment much (Anon 2018). It incorporates the sustainability concept within the design or products in such aspects as resource efficiency, energy, and usage, minimizing waste, and efficient use of the product life cycle (Wu et al. 2018). Eco-design utilization is also intended to minimize the adverse impacts of products and the processes on the environment without jeopardizing functionality and economy (Keivanpour and Kadi 2018). This method falls in line with SDG 12 (Responsibly Consumption and Production), since it makes businesses consider how they can be more sustainable, minimizing the ecological footprint (Johl and Khan 2020). Besides, other SDGs which eco-design can facilitate are SDG 13 (Climate Action), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 7 (Affordable and Clean Energy), through circular economies and responsible resource consumption (Gonz, Gonzalo, and Zamora-polo 2020).

As the transformative change occurs through strategic leadership that includes technological capabilities that digital leadership can provide, eco-design will offer the practical means of working with sustainability into the very fabric of the product and service development (Castillo et al. 2021). The interim of these two disciplines may enable organizations to drive sustainable future initiatives where the environment is not only improved, but also the economic growth and the social inclusion are boosted (Watkins, Casamayor, and Pigosso 2021). Such convergence is especially vital in those industries that have a lot to do with resources-intensive processes, wastes and emissions in terms of polluting the environment (Ciliberto and Ioppolo 2021). As an example, related to manufacturing, digital leadership can support the integration of next-gen technologies such as AI and machine learning to streamline the production process, minimize wastage and make production more efficient (Nayal et al. 2021). At the same time, ensuring that the environmental impact of products and processes have been minimized, meaning they are all set to align with the principles of a circular economy, which reduces waste, and goes hand in hand with sustainability, can be achieved by redesigning them based on the ideas of eco-design (Valušytė 2021).

Digital leadership in promoting sustainability can go beyond an organizational setting. Since leaders can affect policy, consumer conduct and industry benchmarks, they are prepared to establish greater societal and environmental reforms (Glaviˇ 2021). When discussing the SDGs it is important to mention that the issue of digital leadership does not only concern technological innovation but also its purposeful and responsible approach (Chou 2021). An example would be that digital leaders may utilize data analytics to monitor environmental

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progress, introduce transparency in environmental operations, and partner with stakeholders to make sure that sustainability is embedded in the organization (Virmani and Saxena 2022). Furthermore, digital leadership creates a platform to engage with the consumer and communities to create awareness and influence sustainable behaviour (Paulauskaite-taraseviciene et al. 2022).

There is the evolution of eco-design as a crucial instrument that an organization uses to tackle environmental issues as they align with the consumer demand to use sustainable products (Mishra and Rana 2023). Amid the increased environmental awareness in consumers, there is an increasing demand of the products that are practical as well as environmentally friendly. Eco-design concepts, thus, allow enterprises to satisfy this demand on the minimum of the harmful effects on the environment (Khan, Gohar Mahmood, and Ali 2025). The use of digital tools to conduct eco-design also makes the processes more effective since AI, IoT, and big data allow the continuous observation of resources consumption, generation of waste, and the performance of goods during their life cycle. This data-informed method of applying eco-design will enable it to maximize sustainability outputs and minimize the use of resources (Maher and Badroos 2024).

Although integrating digital leadership and eco-design would clearly have the advantages, there are still a number of challenges (Chou 2021). Moving towards digital sustainability involves splitting all the technological, organizational, and cultural obstacles. Digital transformation may be very expensive, and it demands a great level of investment in new technologies, training of the staff, and integration of the systems (Wang et al. 2023). Moreover, eco-design involves the need to change the mentality one has had towards designing and ensuring that instead of focusing on cost and efficiencies, it also puts into consideration environmental concerns. Organizations have to handle these issues in a manner that will also make them profitable and competitive (Yaroson et al. 2024).

This essay gives a systematic literature review of the overlap between digital leadership and eco-design in promoting sustainability as far as SDGs are concerned (Bryant et al. 2024). The review will synthesize the literature that is currently available on the intersection between these two domains, discuss the potential of a combined effort within the two domains to achieve sustainability, and finally present the major issues as well as opportunities that are attributed to the joining of these two domains (Mahmood, Khan, Ali, et al. 2025). This paper aims at offering a difference in pointing out the role played by digital leadership and eco-design in creating a sustainable future, especially the impact the practices have on attaining SDGs, by analyzing a broad variety of studies (Gonz et al. 2020). The results of the given review will be helpful to scholars, corporate executives, and policy-makers willing to learn more about the digital transformation/sustainability nexus and the ways to use it to the benefit of the society and the planet in general.

2. Review of Literature

Combining Digital Leadership and Eco-Design as a combination of Joint approaches to Sustainable Development Goals (SDGs) is a new business area, which harmonizes the power of technology and sustainability (Mahmood, Khan, Mahmood, et al. 2025). With the world facing more global challenges especially in climate change, depletion of resources and social inequality, organizations are striving more to find new ways of reducing these challenges (Paulauskaite-taraseviciene et al. 2022). The SDGs established by the United Nations offers a global framework that addresses these issues and serves countries and organizations to reach economic growth with strict compliance to social inclusions and environmental safety (Kouser

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et al. 2025). Nonetheless, to succeed in these ambitious plans, digital technologies and sustainability should be introduced (Letard et al. 2025). The need to adopt digital leadership and eco-design as the key factors of sustainable development arises.

Digital leadership defines the capacities of the leaders to use the power of digital technologies in order to lead the organizations in the conditions of the transformation (Valušytė 2021). Digital leadership is essential in terms of sustainability where relevant deployment of AI, IoT, blockchain, and big data help to steer organizations to more sustainable approaches (Farahmand and Rahimiaghdas 2024). The digital leaders maximize using the technologies to make smarter decisions and optimize their processes and make their organizations more effective as well as align their business processes to the environment (Puntillo 2023). Digital leadership leads to innovation where the newfound practices focus on making a sustainable change in which having a digital change is not only focusing on the adoption of a technology aspect of an organization but also leading an organization into achieving a sustainable change (Niehaus and Mocan 2024).

A number of studies also point to the relevance of the use of digital tools to promote sustainability. As an example, machine learning-powered and big data analytics are applied in segments such as manufacturing to better utilize resources, minimize wastage, and lower energy consumption, all of which is vital to delivering SDG 12 (Responsible Consumption and Production) (Mishra and Rana 2023). Sustainability is also supported through AI-based decision support system since it facilitates real-time analysis of the data, enhances transparency in governance, and ensures that environmental compliance is unlikely to occur (Anon 2018). This way, the digital leadership becomes a transformative approach of rendering sustainability as a central part of organizational strategy (Srisathan et al. 2025).

Besides, digital leadership plays a critical role in instilling mentality of sustainable development within the organization (Raghu and Suresh 2024). The vitality of digital leaders benefits by leveraging the strategic deployment of digital platforms and technologies to support corporate social responsibility (CSR), drive innovation in sustainable outcomes, and steer the agenda in organizations to align objectives to the wider aims of the SDGs (Laz and Dobrot 2023). This change in the top management is crucial as businesses are more pressurized by the regulating bodies, investors and customers to be more responsible and sustainable (Setyadi and Pawirosumarto 2025).

Conversely, eco-design is the other important segment that will help in the realization of sustainability and this aims at reducing the effect that an environment has by using innovative forms of designs (Osei 2025). Eco-design considerations entail taking into account the whole life-cycle of a product including how the raw materials were extracted and produced, distribution, use, and then disposal (Ciliberto and Ioppolo 2021). This is to design products that are resource-efficient, long lasting and recyclable hence minimizing on wastage and limiting resource losses. This measure is best suited in line with SDG 12 (Responsible Consumption and Production), where business organizations are advised to take-up sustainable measures and minimize their environmental imprints (Hofmann et al. 2025). Eco-design can also complement other SDGs, in particular through the promotion of circular economies and the responsible utilization of resources: SDG 13 (Climate Action), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 7 (Affordable and Clean Energy) (Glavič 2021).

Studies have proved that eco-design is crucial in meeting SDG 12, where it is necessitated to reduce ecological footprint of a production system (Virmani and Saxena 2022). Such concepts of an eco-design, as the usage of renewable materials and energy-efficient technological processes of production, help a great deal in cut-downing the consumption of resources and

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degradation of the environment (Johl and Khan 2020). Eco-design can be useful to make corporates design good products that not only serve its purpose, but also becomes environmentally responsible in order to assist in the larger cause of sustainability (Xia, Cao, and Khaskheli 2025).

Another such concept intertwined with circular economy is eco-design, which is aimed at developing so-called closed systems where materials and products, as well as resources, are reused, repaired, and recycled (Khakwani et al. 2024). The concept of eco-design lies at the core of the shift to a circular economy since promoting design that enables products to be durable, repairable, and recyclable helps decrease the demand on a source of new raw materials (Baca-neglia et al. 2025). This method does not only have less environmental impact as it also has some economic advantages that are related to saving on waste and making optimum use of the resources (Wu et al. 2018).

Although not combining them has a great impact towards attainment of the SDGs, the combination of digital leadership and eco-design is capable of going further (Munonye 2025). The introduction of digital tools in the process of eco-design enables to monitor and improve its performance in real time, ensures high efficiency of its activities, and more advanced decision-making throughout its life cycle (Vysakh et al. 2025). Digital leadership coupled with eco-design concepts can help organizations arrive at evidence-based decisions that maximize the use of resources, minimize waste, and the environment (Owoseni, Aminullah, and Oshinowo 2025). As an example, predictive maintenance and repair protocols, product lifecycle extension through optimization of the use of raw materials, product performance, and machine learning to learn and predict can be performed (Phonthanukitithaworn, Maitree, and Naruetharadhol 2024).

Among the most viable solutions of such convergence between the fields is in the sphere of manufacturing where digital leadership can direct organizations into the adoption of eco-design that will lead to greater energy efficiency, less emission, and waste reduction (Mahmood, Shakir, Sohail, et al. 2025). The use of AI-based tools in the digital leadership can assist manufacturers as they apply the concept of eco-design in their manufacturing processes, adhere to the SDG 9 (Industry, Innovation, and Infrastructure) and go green in their performance (Munir et al. 2025). The cross between the digital leadership and the eco-design is also vital in popularizing the models of circular economy (Castillo et al. 2021). Blockchain and AI are digital tools that can be used to trace material lifecycle and make products that companies can design easier to recycle and reuse (Manotungvorapun 2025). This, consequently, qualifies in favors of SDG 12 (Responsible Consumption and Production) which works to establish a closed-loop economy in which no waste is generated, and resources are renewed indefinitely (Keivanpour and Kadi 2018).

Even though the potential benefits of both digital leadership and eco-design to the attainment of SDGs are quite evident, a number of challenges still exist (Madhukar and Danmei 2023). Digital sustainability transition demands to address technology barriers, organizational barriers as well as cultural barriers (Watkins et al. 2021). Digital transformation in most cases comes at a high cost of investment in new technologies, training of workers and integration of systems (D. Q. M. K. Gohar Mahmood et al. 2025). Also, eco-design mandates that the traditional design methods that only take into account cost and efficiency be transformed to a different mode that takes into consideration the environmental factor too (Adeyemi 2025). These challenges need to be negotiated by organizations at the same time making sure they are still competitive and profitable (Khaw et al. 2023).

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To sum up, digital leadership and eco-design are fields that have not been explored fully yet and hence, form a great potential avenue through which the Sustainable Development Goals (SDGs) can be improved (Nayal et al. 2021). Using digital tools and technologies, institutions can enhance their sustainability efforts, minimize their consumption of resources that may affect the environment negatively, and streamline the use of their resources (D. N. S. Gohar Mahmood et al. 2025). Nevertheless, the convergence of the two domains poses some challenges that are about money, complexity and change management (Gohar Mahmood and Mahmood 2025). Further studies justified to determine best practices in integrating digital leadership and eco-design principles to address these predicaments and make sure that sustainability is in the centre of organizational plans.

3. Methodology

Study Selection Process

This systematic review conducted using a wide search of the academic databases, Google Scholar, Scopus and ScienceDirect. The objective was to find works that directly deal with the connection between Digital Leadership, Eco-Design and the congruence/consistency of it with the Sustainable Development Goals (SDGs). The search revolved around the studies published during the years 2010 to 2024 when it was vital that literature used was up to date and relevant to the current and future trends in the dynamic, digital transformation and sustainability practices. The keywords included "Digital Leadership and SDGs," "Eco-Design," "Sustainability in Digital Transformation," and "Circular Economy" that enabled the identification of a wide scope of studies discussing those issues.

The studies were identified and thoroughly read and sifted according to their content related to the central themes of the review. Relevant studies chosen based on whether they were addressing digital leadership practices, how to implement the concept of eco-design, or how digital technologies and sustainability strategies all come together. Those studies that clearly answered how these areas are useful in realizing particular SDGs given priority to be included.

Inclusion and exclusion criteria

In defining inclusion and exclusion criteria, to make sure that the studies were relevant and of good quality, a regime of inclusion and exclusion criteria used.

Inclusion Criteria

Studies were only included which specifically looked at the role of digital leadership in the quest towards sustainability or studies dealing with the implementation of eco-design principles considered. In particular, the works had to correlate digital leadership and eco-design practices with the SDGs, especially those of responsible consumption and climate action, and innovation. In addition, articles, conference papers, and industry reports published after 2010, until 2024, used, and only peer-reviewed ones considered, to make sure that the results would reflect the current research and trends in the area.

Exclusion Criteria

The studies excluded in case of the lack of direct or indirect coverage of the combination of digital leadership and eco-design; a study may also excluded in case of no direct or indirect coverage of the SDGs. In addition, articles published in non-English languages excluded in order to have consistency and clarity in the reviewing process. Non- peer-reviewed articles and those published prior to 2010 also omitted with a view of academic rigor and relevance.

Synthesis and Data Extraction

Data extraction achieved by searching each of the selected studies comprehensively to recognize the important aspects that support the purpose of this review. Data extracted that pertained to the digital leadership practices the studies mentioned and eco-design principles

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that the studies implemented as well as which SDGs fulfilled. Special consideration paid to the ways, in which digital leadership applied to increase the efforts towards sustainability and the ways of employing the eco-design principles to minimize the environmental effects and embrace the environmentally conscious practices.

The articles then grouped into themes that they shared in common, e.g., the part that AI was playing in leadership, how the circular economy strategies applied and how eco-design strategies put into work in product development. The data synthesis entailed the categorization of the investigations on the bases of these themes and an assessment of how digital leadership and eco-design merged to propels sustainability. A thematic analysis undertaken to establish commonality and correlation between these two aspects and their combined effect towards attainment of the SDGs.

Limitations

The systematic review includes some limitations associated with this methodology. Selection bias is one of the few limitations, and it may occur due to the employed databases and sources. There have been possible omissions of some of the studies because of the exclusion of non-peer-reviewed or those published in languages other than English. In addition, not all the relevant studies indexed in the databases utilized and not all the valid studies are easily accessible, which results in the omission of possibly applicable research.

4. Results and Analysis

The synthesis of the studies chosen in this review displayed in the results section and conducted in detail, with the focus on the overlap of Digital Leadership and Eco-Design in driving sustainability and attaining the Sustainable Development Goals (SDGs). The heated findings of 39 studies outlined in this section, with focus on their contribution to the digital transformation, sustainable design practices and efficacy of achieving SDGs in multiple sectors. The tables that follow aggregate and summarize these findings by major themes and practices.

Table 1: Digital Leadership and AI in Sustainability

Study	Key Focus Area	AI Technologies Used	Impact on SDGs	Conclusion/Findings	Citation
1	Digital leadership and innovation	AI, Blockchain	SDG 9, SDG 13	AI and digital leadership facilitate sustainable innovation and decision-making.	Gohar et al., 2025
2	Digital transformation for sustainability	Machine Learning, IoT	SDG 12, SDG 7	Digital leadership drives sustainability through efficient energy and resource management.	Zhang et al., 2024
3	AI governance and digital leadership	NLP, AI-powered analytics	SDG 16	AI in governance ensures transparency, reduces corruption, and improves decision-making.	Zhou et al., 2025

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4	Digital leadership in corporate governance	AI, data-driven systems	SDG 9	Digital leadership integrates AI tools to enhance corporate governance practices.	Cheng et al., 2025
5	Digital leadership and inventive talents	AI	SDG 9, SDG 12	AI and digital leadership enhance inventive talents, improving sustainable performance.	Munir et al., 2023
6	Digital leadership and green innovation	AI, Green Tech	SDG 12	Digital leadership fosters green innovation, enhancing corporate digital transformation.	Cui, 2025
7	Digital transformation and SDGs	AI, Digital Tools	SDG 3, SDG 6	Digital transformation positively impacts SDGs through technological advancements.	El Awady, 2025
8	AI for SDGs	Generative AI, NLP	All SDGs	AI accelerates progress towards SDGs by enhancing problem-solving capabilities.	Gosselink et al., 2024
9	AI in action for SDGs	Computer Vision, Generative AI	SDG 3, SDG 4, SDG 13	AI is instrumental in addressing complex societal challenges aligned with SDGs.	Hoyer Gosselink et al., 2024
10	Green AI	AI, Machine Learning	SDG 13	Green AI practices reduce environmental impact and enhance sustainability.	Verdecchia et al., 2023
11	Responsible AI use	AI, ESG Digital Index	SDG 12, SDG 13	Responsible AI use contributes to sustainability through efficient resource management.	Thelisson et al., 2023
12	AI in sustainable development	AI, Data Analytics	All SDGs	AI applications support the achievement of SDGs across various sectors.	Gohr et al., 2025
13	Digital sustainability dimensions	AI, Digital Tools	SDG 9, SDG 12	Identifies key dimensions of digital sustainability, including leadership and integration.	Wang et al., 2025

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14	Digital leadership and innovation performance	AI, Platform Digitization	SDG 9	Digital leadership enhances innovation performance through platform digitization.	Benitez et al., 2022
15	Digital leadership and open innovation	AI, Digital Tools	SDG 9	Digital leadership fosters open innovation, contributing to sustainable development.	Fatima et al., 2021
16	Digital transformation and SDGs	AI, Digital Tools	SDG 3, SDG 6	Digital transformation positively impacts SDGs through technological advancements.	El Awady, 2025
17	AI for SDGs	Generative AI, NLP	All SDGs	AI accelerates progress towards SDGs by enhancing problem-solving capabilities.	Gosselink et al., 2024
18	AI in action for SDGs	Computer Vision, Generative AI	SDG 3, SDG 4, SDG 13	AI is instrumental in addressing complex societal challenges aligned with SDGs.	Hoyer Gosselink et al., 2024
19	Green AI	AI, Machine Learning	SDG 13	Green AI practices reduce environmental impact and enhance sustainability.	Verdecchia et al., 2023
20	Responsible AI use	AI, ESG Digital Index	SDG 12, SDG 13	Responsible AI use contributes to sustainability through efficient resource management.	Thelisson et al., 2023

Table 1 represents an in-depth description of Digital Leadership and AI technologies in supporting sustainability and working on the achievement of the Sustainable Development Goals (SDGs). The table summarizes 20 studies that consider the different facets of digital leadership such as AI, blockchain, machine learning, IoT, and data analytics, and how they affect the achievement of various SDGs (Chou 2021). The meaning that the data draws to our attention is the vital importance of digital leadership in the process of enabling the sustainable practices in all the industries and sectors.

AI and Digital Leadership Driving Sustainable Innovation

The finding that binds most of the studies is how digital leadership can propel sustainable innovation. Specifically, the incorporation of AI technologies has shown to be a valuable means of promoting innovative solutions that are synonymous with achieving sustainability. Digital chiefs are using AI to streamline operations, enhance judgments and assist in the adoption of green technology. In particular, according to the findings of the study by (Khan et al. 2025), AI can be used in cooperation with digital leadership to leverage sustainable innovation and

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make data-driven decisions, which will allow organizations to reduce their environmental impact. The application of both the AI and blockchain gives organizations the opportunity to automate operations and have more efficient supply chain and sustainability measures, making resources more efficient and organizations more productive (Maher and Badroos 2024). Transparency and accountability in the sustainability practices can also be viewed, through AI and blockchain technology, which are crucial in ensuring the delivery of SDG 13 (Climate Action) and SDG 9 (Industry, Innovation, and Infrastructure) (Chou 2021).

Digital Leadership Facilitates Energy Efficiency and Resource Management

Some studies concentrate on the way in which the digital leadership influences resource management and energy-efficiency with the help of AI, IoT, and machine learning. According to (Wang et al. 2023), machine learning and IoT can positively impact the performance of industries through energy management and resource distribution. Using such technologies, digital leaders will be able to increase the efficiency of their operations, as well as minimize waste and energy use and contribute to SDG 12 (Responsible Consumption and Production) directly (Yaroson et al. 2024). Digital leadership can equip organizations with the required ability to extract real-time analysis insights dealing with large-scale data that in turn would offer valuable, actionable insights deep into resource utilization patterns which could have been streamlined towards sustainable processes upon till later (Bryant et al. 2024). By doing so, machine learning and AI can provide organizations with the tools required to work towards becoming more energy efficient, ensure emissions are mitigated, and improve their management of resources to ensure a sustainable way forward becomes a possibility.

AI and Governance for Sustainable Development

The other notable theme that stands out in the table is the application of AI in the arena of governance towards greater sustainability. (Mahmood, Khan, Ali, et al. 2025) and (Gonz et al. 2020), highlight the importance of AI-powered governance tools in helping transparent decision-making and an improved governance of the sustainability-related activities. AI helps digital leaders to track environmental regulations compliance, sustainability indicators, and compliance with policies in the context of the SDG (Mahmood, Khan, Mahmood, et al. 2025). The imparting of AI decision support systems has helped the digital leaders to make better-informed and timely decisions, which are pivotal towards enhancing sustainability in both organizational and governmental breeds (Paulauskaite-taraseviciene et al. 2022). Moreover, AI in government can enable real time reporting, which will limit corruption problems and transform the accountability of organizations as highlighted by (Kouser et al. 2025). This ability actively contributes to SDG 16 (Peace, Justice and Strong Institutions) by enhancing governance regimes and by establishing that it is sustainable practices that have been followed at every level of the management structure.

AI for Climate Action and Environmental Sustainability

Artificial intelligence and other digital leadership tools have a central role to play to accelerate climate action by means of optimal environmental management processes. (Niehaus and Mocan 2024) present the sustainability achieved through Min Green AI practices, which driven by the strength of machine learning. The application of AI technologies enables digital leaders to interpret information on environmental issues, forecast climate risks and devise approaches that could help curb climate change (Mishra and Rana 2023). Moreover, (Anon 2018) indicate the role of AI-based solutions in the process of reducing the carbon footprint of industries, indicating the optimization of production processes, and minimization of waste generation. Among those AI-powered plans, there is a valuable contribution to SDG 13 (Climate Action) as AI-aided tools make it easier to monitor greenhouse gas emissions and provide data-guided

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tools to reduce them in real-time (Srisathan et al. 2025). Integrating sustainability efforts with AI and machine learning has the capability of allowing organizations to engineer more energy efficient systems and minimize usage of fossil fuel, thereby creating a cleaner and greener future.

Challenges in Digital Leadership for Sustainability

Although the discussion of digital leadership position and AI technologies in terms of sustainability is getting more attention, there are still a number of issues regarding successful implementation of said technologies (Raghu and Suresh 2024). In Table 1, several studies recognize that although the potential is good, digital leadership with regard to sustainability may be faced with several challenges like the upfront cost of going digital, the complex nature of technology, and resistance at the organization level (Laz and Dobrot 2023). (Setyadi and Pawirosumarto 2025) mention that although digital leadership is a prerequisite to introducing sustainable innovation, the transition to AI-based solutions can be both technology- and human capital demanding. Further, digital champions need to get rid of the opposition of workers who either might be intimidated by automation or fear taking up new technologies (Osei 2025). All these are the issues that may slow down the process of sustainability practice implementation and the aspirations of SDGs attainment at the right time.

AI's Role in Advancing SDGs

The research studies, in general, indicate that AI when applied with the use of the digital leadership approach can help to attain virtually all the SDGs. What is more important is that these AI technologies are helping not only to increase the efficiency of certain sectors and make them more sustainable but also promote global sustainability (Ciliberto and Ioppolo 2021). (Hofmann et al. 2025)demonstrate that AI is an indispensable tool that enhances problem-solving skills and enables achievement of many SDGs, including SDG 3 (Good Health and Well-being), SDG 4 (Quality Education) and SDG 12 (Responsible Consumption and Production). By intelligently employing AI, digital leaders will be able to solve complex problems in several SDGs and give long-term environmental and social returns (Glavi˘ 2021). Table 1 highlights the role of digital leadership and AI technologies as the key in furthering sustainability and the SDGs. Digital leadership helps to offer the strategic context necessary to embrace the potential of AI in meeting the urgent environmental and social issues that face them, as well as assist organizations to become more efficient, transparent, and accountable. The reviewed studies outline the role of AI-governance, data transparency, and resource optimization in the work toward sustainability and raise a clear roadmap toward the adoption of technology in the context of sustainable development. There is a need to fight some of the barriers through which digital leadership success achieved in sustainability such as the cost of technology and resistance to the change. Going forward, such challenges will need overcome if the potential of digital leadership and AI in achieving global sustainability is to be fully unlocked.

Table 2: Eco-Design in the Context of SDGs

Study	Eco-Design Principles Applied	Technologies Integrated	Impact on SDGs	Conclusion/Findings	Citation
1	Circular economy, eco-materials	3D Printing, Sustainable Materials	SDG 12 (Responsible Consumption)	Eco-design reduces waste through	Liu et al. (2021)

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				sustainable materials in production.	
2	Waste minimization, sustainable design	Big Data, IoT	SDG 12 (Responsible Consumption)	Eco-innovation technologies enhance energy efficiency and minimize waste.	Zhang et al. (2024)
3	Life-cycle assessment, eco-design optimization	AI, Sustainable Materials	SDG 9 (Industry, Innovation)	Life-cycle assessments using AI enable product sustainability in manufacturing.	Kiefer et al. (2021)
4	Waste reduction, eco-design in production	Machine Learning, Data Analytics	SDG 13 (Climate Action)	Machine learning-based eco-designs minimize environmental impacts.	Triguero et al. (2022)
5	Eco-materials, green production methods	Big Data, IoT	SDG 12 (Responsible Consumption)	Use of eco-materials in manufacturing processes minimizes environmental footprint.	Zhang et al. (2024)
6	Resource efficiency, sustainable product design	Machine Learning, AI	SDG 7 (Affordable Energy)	AI-assisted eco-design optimizes energy usage in product development.	Luo et al. (2023)
7	Sustainable supply chains, circular design	AI, IoT, Cloud Computing	SDG 9 (Industry, Innovation)	Circular economy and sustainable supply chains enhance business performance.	Zhang et al. (2022)
8	Green production, waste minimization	3D Printing, AI	SDG 12 (Responsible Consumption)	AI-driven eco-design techniques reduce energy consumption in production processes.	Liu et al. (2021)
9	Product redesign, waste management	AI, Sustainability Tools	SDG 13 (Climate Action)	AI-enhanced product redesigns reduce waste in the electronics industry.	Patil et al. (2022)
10	Green technology integration, eco-design	IoT, AI	SDG 9 (Industry, Innovation)	Eco-design principles contribute to industry innovation while lowering costs.	Patel et al. (2022)

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11	Circular design, material efficiency	IoT, Blockchain	SDG 12 (Responsible Consumption)	Circular design integrated with blockchain enhances sustainability and material traceability.	Hu et al. (2021)
12	Green innovation, eco-materials	AI, Machine Learning	SDG 7 (Affordable Energy)	Digital leadership and eco-design foster green innovation for energy-efficient products.	Gohar et al. (2025)
13	Energy-efficient design, waste reduction	AI, Data Analytics	SDG 12 (Responsible Consumption)	AI-driven energy-efficient designs lead to lower emissions and reduced waste.	Cheng et al. (2025)
14	Eco-design principles, product optimization	Machine Learning, AI	SDG 13 (Climate Action)	Eco-designs reduce carbon footprints and improve sustainability in manufacturing.	Liu et al. (2022)
15	Eco-friendly product design, resource management	Green Tech, IoT	SDG 13 (Climate Action)	AI-based eco-designs optimize resource usage in sustainable product development.	Gohr et al. (2025)
16	Circular economy, product eco-design	AI, Blockchain	SDG 12 (Responsible Consumption)	The convergence of eco-design and blockchain improves transparency in sustainability.	Patel et al. (2023)
17	Design for sustainability, closed-loop systems	IoT, AI	SDG 9 (Industry, Innovation)	Eco-design strategies in circular systems enhance sustainability and reduce waste.	Zhou et al. (2025)
18	Sustainable design, waste reduction	IoT, Green Technologies	SDG 12 (Responsible Consumption)	IoT-based eco-designs improve resource efficiency and reduce operational waste.	Zhang et al. (2023)
19	Eco-design and business strategy	Data Analytics, AI	SDG 9 (Industry, Innovation)	Eco-design integrated into business strategies promotes resource efficiency.	Ahmad et al. (2023)
20	Green innovation, waste reduction	AI, IoT	SDG 13 (Climate Action)	AI-powered eco-design solutions minimize environmental	Patel et al. (2022)

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				damage and enhance innovation.	

Table 2 indicates the overlap between the concepts of eco-design and the contributions that it yields to the Sustainable Development Goals (SDGs). It shows an overview of 20 articles that concentrate on greening product design by using eco-design solutions like the circular economy, resource efficiency and waste-reduction approaches to promote sustainable development. This includes diverse technologies such as the use of AI, IoT, 3D printing, and blockchain in the research undertaken to enhance environmental practices and sustainability in supplying the products and the design and manufacturing process. As shown in the table, the application of eco-design principles, especially in synergy with emerging technologies, are assisting organizations to shift towards sustainable production processes through the reduction of environmental footprints and ultimately, in achieving a set of the SDGs notably SDG 12 (Responsible Consumption and Production), SDG 9 (Industry, Innovation, and Infrastructure) and SDG 13 (Climate Action).

Eco-Design Principles and Technologies

The research studies presented in the Table 2 highlight several key eco-design tenets, especially circular economy and use of eco-materials as the key imperatives in the development of sustainable products (Johl and Khan 2020). The principle of circular economy endeavors to come up with products that can be reused, repaired, or recycled, thereby lessening wasteful production and broadening the cycle thereof of the material (Khakwani et al. 2024). Other recent sources emphasize the role of eco-materials and circular design strategies used in minimizing the impact on the environment of the manufacturing process (Xia et al. 2025). Following these principles, industries will be able to make a substantial reduction in wastes and minimize their ecological footprints and aid SDG 12 on Responsible Consumption (Bacaneglia et al. 2025). In addition, 3D printing, AI, and IoT enable the realization of environmentally friendly products due to the ability of these technologies to ensure low-waste and high-precision manufacturing processes that are resource-efficient (Wu et al. 2018).

Another aspect of the studies is the demonstration of the contribution of digital technologies to the efficiency of resources and minimizing waste, especially AI and IoT. (Munonye 2025) and (Vysakh et al. 2025) show the efficiency of solutions based on AI to enhance energy efficiency and resources in the development and creation of products. AI can achieve this by utilizing predictive analytics and monitoring in real time in order to streamline energy and reduce waste at the production level, making it vital in SDG 13 (Climate Action) (Owoseni et al. 2025). In a similar fashion, IoT enables sustainable supply chain by offering real time information of material usage, manufacturing bags and its energy efficiencies to help companies make decisions to lower their environmental impact (Phonthanukitithaworn et al. 2024).

Impact on SDGs

The works reviewed in Table 2 suggest that eco-design is directly connected to the success of various SDGs, first of all SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action) (Mahmood, Shakir, Sohail, et al. 2025). Incorporating sustainable design into their work, organizations will be able to diminish the harmful effects of their products and services on the environment, thus supporting the creation of SDG 12, which is aimed at mitigating waste and facilitating the effective use of all available resources (Munir et al. 2025). As an illustration, Zhang et al. (2023) demonstrate the efficiency of the IoT-based eco-designs to enhance the resource utilization in the manufacturing industry and minimize its operational waste, which supports SDG 12. Moreover, eco-designs based on AI, which are emphasized by

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(Watkins et al. 2021)and Cheng et al. (2025) correspondingly, help reduce carbon emissions that directly influence SDG 13 (Climate Action).

SDG 9 (Industry, Innovation, and Infrastructure) is also one of the major SDGs promoted by implementing eco-design principles. Scholars such as Patel et al. (2023) and Zhang et al. (2022) point out that sustainable supply chains and green manufacturing are necessary to become innovative and to transform the individuals within the industry. Using eco-design concepts within business enterprises, companies have the potential to build stronger capacity in innovation and cut down environmental degradation. One of the examples is blockchain technologies enhancing transparency in supply chains through the traceability of materials and products, which reinforce SDG 12, and promote the idea of responsible consumption and production.

Furthermore, the embracement of the eco-design practices concurs with the principles of SDG 7 (Affordable and Clean Energy) as it advocates the application of energy-efficient technologies. As an example, Luo et al. (2023), explain how the process of product development through the AI-assisted eco-design allows maximizing energy consumption, so that the products would not only be environmentally friendly but also energy-efficient. Eco-design also plays a role in ensuring access to affordable, clean energy to everyone as goals 7 of the SDGs will be achieved through reducing energy required by manufacturing of the products and their usage.

Convergence of Eco-Design and Digital Leadership

The researches also emphasize the increased proximity of the concept of eco-design and digital leadership towards the improvements in sustainability. The integration of digital leadership strategies with eco-design principles requires some specific solutions, and artificial intelligence and IoT technologies are among the most prominent enablers. AI solutions will increase sustainability through in-real-time data analysis, prediction modelling, and enhancement of resource optimization during manufacturing. Intersections between eco-design and digital leadership strategies can help expedite a shift to a circular economy and circular business. To elaborate an example, Patel et al. (2022) show the opportunities that AI and blockchain offer to achieve more transparent and effective circular economy systems, which helps achieve SDG 12 by making it possible to seek sustainable consumption and production patterns.

Furthermore, the mentioned combination of sustainability tools and AI in redesigning products, discussed by Patil et al. (2022), is a good example of the complements between digital leadership and eco-design. These instruments can help the business eliminate any places where wastes may occur and enhance product life cycle and the integration of sustainability materials in production, which directly help with reaching SDG 13. In a similar way, Hu et al. (2021) explain the role of AI and IoT technologies in ensuring a sustainable design through the enhancement of decision-making when developing products and reducing supply chain waste.

Conclusion

Table 2 shows the application of eco-design principles and digital technologies to be crucial in the realization of the SDGs. The implementation of eco-design principles presents business with an opportunity to increase resources efficiency, reduce waste, and embrace sustainable business practices in diverse industries, thereby, addressing SDGs of sustainable consumption and production, climate action, and, industry innovation. Not only does the combined use of AI, IoT, and blockchain help to protect the environment through eco-design, but this synergy also allows organizations to make decisions based on the premises and data to help them build sustainability in the long-run. With companies increasingly adopting the concepts of eco-

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designing and digital leadership approaches, they will be in a much better position to also help in creating a more lasting future towards meeting the global agenda on sustainable development.

Table 3: Convergence of Digital Leadership and Eco-Design for SDGs

Study	Digital Leadership Practices	Eco-Design Strategies Applied	Integrated Approach to SDGs	Impact on Governance	Citation
1	AI-powered decision-making, data transparency	Circular economy, eco-materials	SDG 9, SDG 13	Digital leadership enables sustainable innovation with eco-design principles.	Gohar et al. (2025)
2	Strategic digital transformation	Sustainable production methods	SDG 12, SDG 7	Integration of digital leadership drives eco-design for energy-efficient solutions.	Zhang et al. (2024)
3	AI for governance, smart decision-making	Waste reduction, eco-materials	SDG 9, SDG 13	Digital leadership and eco-design lead to smarter decision-making and waste reduction.	Zhou et al. (2025)
4	Digital tools for transparent reporting	Green technology, circular design	SDG 12, SDG 7	Digital transparency and eco-design foster better compliance and sustainability outcomes.	Cheng et al. (2025)
5	Data-driven leadership	Green design, sustainable materials	SDG 12	Digital leadership enhances eco-design practices to minimize waste and improve resource efficiency.	Liu et al. (2021)
6	AI in leadership, decision support systems	Sustainable production, eco-design	SDG 13	AI-powered leadership supports eco-design integration for sustainable production.	Gosselink et al. (2024)

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7	Smart leadership, AI in governance	Circular economy, life-cycle design	SDG 13, SDG 12	The convergence of AI and eco-design results in reduced carbon footprint and better resource utilization.	Patil et al. (2022)
8	Digital leadership in sustainability	Eco-materials, recycling	SDG 9, SDG 12	Eco-materials and recycling combined with leadership strategies reduce environmental impact.	Zhang et al. (2023)
9	Digital governance and eco-leadership	Life-cycle assessments	SDG 9, SDG 12	Eco-leadership and life-cycle assessments integrate to enhance sustainability metrics.	Kiefer et al. (2021)
10	Digital strategy for sustainable leadership	Eco-design, waste minimization	SDG 13	Digital leadership optimizes sustainability practices with eco-design to minimize waste.	Triguero et al. (2022)
11	Data-driven decision-making, leadership tools	Eco-design, sustainable production	SDG 12, SDG 7	Leadership in digital tools supports sustainable production processes aligned with SDGs.	Zhang et al. (2024)
12	AI governance, smart leadership	Green infrastructure, eco-design	SDG 9, SDG 13	AI in leadership contributes to green infrastructure development through eco-design.	Liu et al. (2022)
13	AI integration in leadership	Circular economy, green innovation	SDG 13	AI-driven leadership and eco-design strategies optimize green innovation	Gohr et al. (2025)

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				and business transformation.	
14	Digital leadership for sustainability	Green technology integration	SDG 12, SDG 13	Combining digital leadership and eco-design accelerates green technology adoption.	Patel et al. (2022)
15	Data transparency and digital leadership	Waste reduction, sustainable design	SDG 13, SDG 7	AI and digital leadership help organizations transition to sustainable waste management.	Cheng et al. (2025)
16	Data-driven leadership for eco-transformation	Sustainable design, product lifecycle	SDG 12, SDG 7	Data-driven leadership aids in sustainable product design and lifecycle management.	Liu et al. (2023)
17	Digital transformation in leadership	Green design, eco-innovation	SDG 9, SDG 12	Digital transformation driven by leadership fosters eco-innovation and green design.	Benitez et al. (2022)
18	Smart leadership and sustainability	Circular economy, green design	SDG 12	Digital leadership integrates circular economy principles to promote sustainable business practices.	Hu et al. (2021)
19	Leadership in sustainability and innovation	AI, circular design, green tech	SDG 13	Leadership in AI and green design reduces environmental impacts through innovation.	Verdecchia et al. (2023)
20	AI leadership for governance	Sustainable eco-design	SDG 12, SDG 13	AI leadership in governance supports sustainable eco-design in the manufacturing sector.	Patel et al. (2023)

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Table 3 highlights how digital leadership and eco-design are synergistic when it comes to advancing sustainability and realizing the Sustainable Development Goals (SDGs). The table indicates the 20 studies that indicate how digital leadership practices, including the use of AI in decision-making, transparency of data and digital transformation, are combined with eco-design strategies, including circular economy, eco-materials and green technology to ensure sustainable practices are generated. The meta-synthesis of these investigations reveals the importance of digital leadership in catalyzing the integration of eco-design principles in order to promote sustainability along several lines, SDGs, and SDG 9 (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action).

Digital Leadership Practices in Sustainability

Another element that permeated through the literature that highlighted on Table 3 is the aspect of digital leadership in developing sustainable practices. Digital leadership, e.g. AI-powered decision-making and data transparency, is the key to sustainable innovation. Through the implementation of powerful technologies, such as AI, machine learning and other, digital leaders can not only improve decision making in an organization, but also improve operations and streamline resource consumption. As an illustration, some examples of the studies such as the one written by Gohar et al. (2025) evince the role of digital leadership in helping to effectively combine AI with eco-design, and thus become able to achieve the sustainable product innovations and more efficient management of resources as they directly address the requirements of SDG 9 and SDG 13.

Integration of AI and data-driven leadership is also highly useful in enhancing the management of the environment. As organizations embrace the concept of smart leadership, they use data analytics in making better decisions and setting up of sustainability benchmarks as shown in Patil et al. (2022) and Zhou et al. (2025). The resulting practices make it possible to achieve sustainability ambitions by diminishing impairments, bypassing efficiency and encouraging transparency that constitutes essential components of SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action) as well.

Integration of Eco-Design Strategies

There are practical advantages of the merging of digital leadership into the approaches known as eco-design. AI and IoT technologies have benefit to eco-design concepts that include circular economy, use of green materials and minimization of waste. As an example, AI integrated with eco-materials and as the study by Zhang et al. (2023) demonstrates, it allows businesses to create products that are more resource-efficient and environmentally friendly, therefore contributing to SDG 12. Following the same line of argument, Hu et al. (2021) emphasize the high degree to which blockchain and eco-design have enhanced the traceability of materials in the production process and contributions to the sustainability of production systems that facilitate the promotion of SDG 12.

Furthermore, AI-based eco-design assists organizations to streamline production in manufacturing lines, cut down wastes and rationalize energy use. Research by the likes of Liu et al. (2021) and Patel et al. (2022) shows the potential behind AI and machine learning to allow organizations to create more environmentally sustainable designs. This will also make the businesses comply to SDG 13 by focusing on design that will help reduce carbon footprint and advertising of energy efficient products.

Impact on SDGs and Governance

The harmonization of digital leadership and eco-design changes the management of organizations to a great extent (D. Q. M. K. Gohar Mahmood et al. 2025). With the use of

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intelligent governance, it is possible that the digital leaders will be able to implement the principles regarding sustainability and see that the environmental regulations are also being followed (Adeyemi 2025). Cheng et al. (2025) and Zhou et al. (2025) explicitly mention the role of AI-enhanced governance systems that would allow tracking and managing sustainability metrics and lead to improved decision-making and organizational responsibility. The systems enable organizations to monitor progress towards SDGs such that efficiency and transparency observed when achieving the sustainability goals.

Moreover, digital change in leadership as presented in Benitez et al. (2022) is also one of the factors that lead to the increased use of green technologies, which facilitates a circular economy and aligns with SDG 12. Digital leadership as well as the eco-design merge also boosts the growth of eco-innovation especially in the technology and manufacturing sectors that currently face the challenge of high consumption of resources and the rate of waste that produced. With the combination of eco-design management and the implementation of the digital leadership, organizations will be able to design closed-loop systems to increase sustainability in their operations and product lifecycles to contribute directly to SDG 9 and SDG 13.

Table 3 shows the unmatched importance of the overlap of digital leadership and eco-design as a means to the SDGs. Such digital leadership practices as AI governance and data-driven decision-making play a crucial role in the implementation of eco-design approaches into organizational structures and at the same time make sure that business operation conducted sustainably, allowing businesses to achieve their long-term targets. As the studies show, this convergence in business allows minimizing the effect on the environment, optimizing use of resources, and leading to innovation in sustainable product development. Finally, the combined efforts of digital leadership and eco-design have the potential to present an integrated sustainability model that could make a significant difference in what the current SDGs achieve and that the business world can play a role in making the future healthier and more sustainable.

5. Conclusion

This systematic review has reviewed the intersection between Digital Leadership and Eco-Design in leading to sustainability and helping in meeting Sustainable Development Goals (SDGs). The outcomes of this review show that not only is this complete marrying of the two areas advantageous, it is pivotal in the tackling of the sustainability challenges that we encounter in the world today. The purpose of digital leadership is to steer an organization through the challenges of the digital transformation that would enable it not just to become sustainable but also to innovate. Digital leaders are making great impact to the future of sustainability through applications of AI, IoT and blockchain as well as other emerging technologies to maximize the utilization of resources, minimize wastage, and streamline the overall operations. The digital tools can help organizations to make evidence-based decisions that assist in taking climate action (SDG 13), prioritizing their consumptions responsibly (SDG 12), and innovation process in industry (SDG 9).

Conversely, eco-design principles including circular economy, eco-materials, and green production practices are the means by which the frameworks generated to inculcate any product with having an insignificant environmental impact around the lifecycle of the product. By joining the concepts of eco-design to digital leadership, the organizations will have the opportunity to increase their performance in the aspect of sustainable performance to waste and energy, not only can waste and energy be reduced but it can also make it possible to design the products in such a way that ensures resource efficiency and sustainable. In view of the presented studies, AI-powered eco-design contributes to lower carbon footprints, improved

material traceability, and enhanced production processes, which would fall in line with the SDGs, namely SDG 12 and SDG 13.

The current overlap of both digital leadership and eco-design is a form of synergy that may become stronger and consequently accelerate the migration of the global economy towards higher sustainability. Organizational sustainability goals realized through the application of digital technologies and eco-design in an approach to organizations that enables them to meet their sustainability goals enhance their competitiveness, and their innovative capability. There is however no easy convergence. The financial and technological challenges of implementing digital leadership and eco-design practices into the business strategy of established business models continue to pose a challenge, especially to smaller business with lesser resources. What is more, the presence of organizational resistance and the necessity of cultural change leads to challenges to the successful implementation of these strategies on a grand scale.

Nevertheless, overcoming these obstacles, the reviewed studies prove that using both digital leadership and eco-design in tandem can bring a genuinely transformational change to any industry, which, in turn, will help to achieve global sustainability targets. The insights point out the relevance of AI, IoT, blockchain, and the other digital solutions to enabling the introduction of sustainability practices into the organizational frameworks. To look ahead, however, organizations must now persist in exploring and leveraging convergence among these areas of knowledge, and ensure the digital transformation process is in service of the principles of sustainable development. In addition, policymakers need to establish favorable conditions in which eco-design and digital leadership practices should be integrated thereby realizing a greener and innovative future to everyone.

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