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DIGITAL TRANSFORMATION IMPACT STRATEGY ON ESG IMPLEMENTATION IN VARIOUS INDUSTRY SECTORS: A LITERATURE REVIEW

STRATEGI DAMPAK TRANSFORMASI DIGITAL TERHADAP PENERAPAN ESG DI BERBAGAI SEKTOR INDUSTRI: SEBUAH KAJIAN LITERATUR

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ABSTRACT
In the ever-evolving digital era, digital transformation has become a major force driving the integration of Environmental, Social, and Governance (ESG) principles in various industrial sectors. This article aims to narratively examine how digital transformation contributes to ESG implementation, by reviewing academic literature and industry reports from the last five to ten years. The study was conducted using a narrative literature review approach with a focus on three ESG dimensions, namely environmental, social, and governance. The results of the study show that digitalization drives energy efficiency, green innovation, and emission reduction in the environmental sector; strengthens social inclusion, human resource development, and access to services in the social aspect; and improves transparency, accountability, and oversight systems in organizational governance. However, there are challenges such as the digital divide, data ethics risks, and technological bias, especially in developing countries. This article also highlights significant differences in infrastructure readiness and capabilities between developed and developing countries. By presenting cross-sector thematic mapping, this article is expected to be a conceptual and practical reference for academics, industry players, and policy makers in designing digital transformation strategies that are aligned with global sustainability goals.
Keywords: Digital Transformation, environment, social, governance, sustainability, literature review

ABSTRAK
Dalam era digital yang terus berkembang, transformasi digital menjadi kekuatan utama yang mendorong integrasi prinsip Environmental, Social, and Governance (ESG) dalam berbagai sektor industri. Artikel ini bertujuan untuk mengkaji secara naratif bagaimana transformasi digital berkontribusi terhadap penerapan ESG, dengan meninjau literatur akademik dan laporan industri dari lima hingga sepuluh tahun terakhir. Kajian dilakukan menggunakan pendekatan literature review naratif dengan fokus pada tiga dimensi ESG yaitu lingkungan, sosial, dan tata kelola. Hasil kajian menunjukkan bahwa digitalisasi mendorong efisiensi energi, inovasi hijau, dan pengurangan emisi di sektor lingkungan; memperkuat inklusi sosial, pengembangan sumber daya manusia, dan akses layanan di aspek sosial; serta meningkatkan transparansi, akuntabilitas, dan sistem pengawasan dalam tata kelola organisasi. Meskipun demikian, terdapat tantangan seperti kesenjangan digital, risiko etika data, dan bias teknologi, terutama di negara berkembang. Artikel ini juga menyoroti perbedaan signifikan dalam kesiapan infrastruktur dan kapabilitas antara negara maju dan berkembang. Dengan menyajikan pemetaan tematik lintas sektor, artikel ini diharapkan dapat menjadi referensi konseptual dan praktis bagi akademisi, pelaku industri, dan pembuat kebijakan dalam merancang strategi transformasi digital yang selaras dengan tujuan keberlanjutan global.
Kata kunci: Transformasi Digital, lingkungan, sosial, tata kelola, keberlanjutan, kajian literatur

1. INTRODUCTION

In the last two decades, the business world has experienced a significant paradigm shift, from an orientation solely on short-term profits to a broader focus on sustainability and social responsibility. One indicator of this shift is the strengthening of the application of the principles ofEnvironmental, Social, and Governance(ESG) in business practices across various industry sectors. ESG has become the primary framework for assessing a company's non-financial performance, which includes how an organization manages its impact on the environment, pays attention to social aspects in its operations, and implements transparent and accountable governance. Report fromGlobal Sustainable Investment Alliance(GSIA, 2021) shows that sustainably managed assets have reached more than $35 trillion globally, reflecting growing investor demand for companies with strong ESG performance.

The implementation of ESG is not only influenced by pressure from investors and consumers, but also by increasing regulations and sustainability reporting standards. Various international frameworks such as the Global Reporting Initiative (GRI), Sustainability Accounting Standards Board (SASB), Task Force on Climate-related Financial Disclosures (TCFD), and the latest initiative from the International Sustainability Standards Board (ISSB), encourage companies to be more transparent in disclosing their sustainability impacts. In Indonesia, the Financial Services Authority (OJK) has also required sustainability reports for public companies since 2021. However, despite significant progress, ESG implementation is still uneven, especially in sectors facing high cost pressures or limited human and technological resources. A study by Khan et al. (2023) noted that companies in the heavy manufacturing and fossil fuel sectors still face great difficulties in integrating ESG comprehensively into their business strategies.

On the other hand, the advancement of digital technology has created a wave of structural transformation in the operations and business models of organizations. Digital transformation does not only include the adoption of information technology, but also refers to fundamental changes in business processes through the use of big data analytics, artificial intelligence (AI), the Internet of Things (IoT), blockchain technology, and cloud computing. These technologies not only increase efficiency and productivity but also pave the way for achieving sustainability goals. For example, in the environmental context, AI and IoT enable real-time monitoring of emissions and optimization of energy consumption; in the social dimension, digital platforms encourage inclusion of public services and finance; while in the governance aspect, blockchain can support data transparency and accountability (George et al., 2020; El Baz & Ruel, 2021).

A growing body of research shows the potential synergy between digital transformation and ESG implementation. According to a report by Deloitte (2022), strategic integration of digital technologies can accelerate the achievement of ESG targets, such as decarbonization, social equity, and good governance. A study by Du and Xie (2023) shows that companies that invest in digital technologies such as cloud computing and AI tend to have higher ESG scores in the long term. In the agricultural sector, for example, the concept of precision agriculture data-based has been shown to reduce pesticide use and increase water efficiency (Klerkx & Rose, 2020). Similarly, in the logistics sector, AI-based route optimization technology helps significantly reduce the carbon footprint of transportation (Chen et al., 2022).

However, not all forms of digital transformation have a positive impact on ESG. Data privacy risks, inequality in access to technology, and algorithmic bias are new challenges that have not been fully anticipated in the traditional ESG framework. In many developing countries, there is a significant digital divide, which causes the adoption of technology to widen the gap between economic and social inequality (World Bank, 2022). In addition, the implementation of digital technology in ESG reporting is often not accompanied by adequate digital literacy and data use ethics. A study by Martin (2021) warns that digitalization without

an inclusive governance framework can give rise to form greenwashing digital, where companies manipulate sustainability data for image purposes.

As attention to the relationship between digitalization and ESG increases, the scientific literature still shows limitations in presenting a comprehensive and cross-sectoral mapping. Most studies still focus on case studies of large companies in the technology or financial sectors, thus lacking a comprehensive picture of how digital transformation impacts ESG aspects in other sectors such as agriculture, transportation, energy, and the public sector (Ghosh, 2021; Elkington, 2020). In addition, there are still few studies that compile a structured thematic synthesis based on the three ESG dimensions, even though such an approach can help clarify the causal and conceptual relationships between digitalization and sustainability.

Based on these phenomena and gaps, this article aims to narratively examine the impact of digital transformation on ESG implementation in various industrial sectors. This study not only aims to explore how digital technology has been used to strengthen ESG implementation, but also to understand the challenges, limitations, and potential risks that arise in the integration process. By adopting a narrative literature review approach, this article synthesizes various scientific sources and industry reports in the last five to ten years to present a comprehensive thematic mapping. It is hoped that this study can provide conceptual contributions to academics in developing digital-based ESG theories, as well as practical guidance for industry players and policy makers in aligning digitalization strategies with the global sustainability agenda.

2. LITERATURE REVIEW

2.1. ESG (Environmental, Social, Governance)

The ESG concept is rooted in the approachTriple Bottom Line Developed by Elkington (1997), which states that a company's success should not only be measured by financial profits, but also by its contribution to social and environmental aspects. This approach was later expanded into the ESG framework, which is currently widely used by investors, regulators, and academics to assess organizational sustainability.

ESG is rooted in the concept of stakeholder theory (Freeman, 1984), which states that companies are not only responsible to shareholders, but also to all parties affected by their operations—including society, the environment, workers, and regulators. Within this framework, ESG becomes an instrument that allows companies to demonstrate their commitment to the public interest and social sustainability.

The Environmental dimension covers a range of issues related to a company's impact on the environment, such as greenhouse gas emissions, energy efficiency, water use, waste management, and adaptation to climate change. In this context, companies are required to not only avoid environmental damage, but also actively contribute to conservation and restoration efforts. The natural-resource-based view (NRBV) theory**)**which was put forward by Hart (1995) provides the basis that natural resources can be a competitive advantage if managed sustainably, and companies that are proactive about environmental issues tend to have better long-term performance.

The Social dimension in ESG reflects the company's relationship with society and internal parties such as employees. It covers issues such as human rights, working conditions, diversity and inclusion, and social responsibility to the surrounding community. This aspect is heavily influenced by legitimacy theory, which states that the survival of a company depends on the extent to which society accepts its actions and business operations as legitimate and socially beneficial (Suchman, 1995). Therefore, concern for the social dimension not only creates a positive impact on society, but also builds a positive image and public trust in the company.

The Governance dimension refers to the decision-making systems and processes within an organization, including the structure of the board of directors, transparency, ethics,

anti-corruption, and shareholder rights. Good governance is an important foundation in ensuring accountability and integrity in business practices. Within the framework of agency theory (Jensen & Meckling, 1976), strong governance is needed to reduce conflicts of interest between management and shareholders, and to ensure that decisions taken reflect the collective interests of the company as a whole.

Strengthening the ESG dimension is also in line with the Sustainable Development Goals (SDGs) initiated by the UN. Companies that integrate ESG into their business strategies are considered to contribute to achieving global targets such as climate action, social justice, and inclusive economic development. Therefore, ESG is no longer just a philanthropic effort, but has become part of a comprehensive and long-term business strategy.

2.2. Digital Transformation

Digital transformation is defined as the process of integrating digital technology into all aspects of an organization with the aim of creating new value, increasing efficiency, and responding to the dynamics of the external environment (Vial, 2019). This transformation includes the digitalization of business processes, automation, the use of big data analytics, the adoption of artificial intelligence (AI), the Internet of Things (IoT), blockchain, and other digital technologies. In the industrial context, digital transformation has shown a broad and different impact between sectors. In the manufacturing sector, the conceptIndustry 4.0encouraging the use of robotics and cyber-physical systems to increase productivity. In the financial sector, digitalization creates inclusive payment systems and mobile-based services that reach marginalized communities. Meanwhile, in the public sector, digital technology supports increased bureaucratic efficiency through e-government and digital citizen services (Henriette et al., 2016). Digitalization not only brings efficiency, but also reshapes stakeholder expectations and governance practices. This creates new opportunities for strengthening sustainability aspects, especially through better data collection, automated reporting systems, and increased organizational transparency (George et al., 2020).

The link between digital transformation and ESG is becoming increasingly relevant as digital technologies have the potential to act as a catalyst in accelerating the achievement of sustainability goals. This approach is known in the literature asDigital Sustainability, namely the integration of digital initiatives and sustainability principles (George et al., 2020). Digital technology can help companies measure and report environmental impacts in real-time, strengthen supply chain transparency through blockchain, and empower communities through technology-based social platforms and inclusive services (Bai et al., 2022).

2.3. Stakeholder Theory

The relationship between digital transformation and ESG can be analyzed through several approaches.Stakeholder Theory Proposed by Freeman (1984) states that the success of a company is not only determined by the interests of shareholders, but also by the extent to which the company meets the needs and expectations of various other stakeholders. In this context, digital technology becomes a strategic tool to bridge communication, increase participation, and provide transparency to stakeholders. For example, web-based ESG reporting applications or blockchain technology allow stakeholders to verify sustainability claims directly, increasing trust and accountability.

2.4. Innovation for Sustainability Theory

The Innovation for Sustainability Theory emphasizes that innovation is not just an effort to improve economic performance, but must also contribute to social and environmental sustainability. In this context, innovation is seen as a key driving force in transforming a business system that was previously only profit-oriented into a system that takes into account long-term social and ecological impacts. This theory is based on the idea that companies and

organizations need to innovate systematically to develop new processes, products, business models, and strategies that integrate the principles of the triple *bottom line*: people (social), planet (environment), and profit (economic).

The Innovation Theory for Sustainability positions digital transformation as a strategic and systemic tool to achieve ESG. Digital innovation not only supports efficiency, but also helps organizations responding to sustainability challenges creatively and transformatively**.** In this framework, the synergy between digitalization and ESG is a form of innovation that is not only important for business continuity, but also for the future of the planet and society as a whole.

2.5. Dynamic Capabilities Theory

Dynamic Capability Theory (Dynamic Capabilities Theory) was developed by David J. Teece, Gary Pisano, and Amy Shuen in their 1997 classic work entitled“Dynamic Capabilities and Strategic Management”. This theory aims to explain how companies can survive and thrive in a highly dynamic and uncertain business environment, through the ability to integrate, build, and reconfigure internal and external competencies quickly and appropriately. The essence of this theory is that sustainable competitive advantage does not only come from the resources it has (resource-based view), but from the company's ability to adapt, learn, and innovate continuously in response to external changes.

Dynamic Capabilities Theory provides a powerful framework for understanding how digital transformation can strengthen ESG strategies across industry sectors. Companies that have the ability to continuously sense, seize, and transform will be better prepared to face the ever-growing ESG pressures. Thus, dynamic capabilities not only reflect the adaptability of a company but also become an important foundation in achieving sustainability through digitalization.

3. METHODS

The methodology used in writing this article is a narrative literature review approach, which examines various sources of literature related to digital transformation and the application of ESG (Environmental, Social, Governance) principles in various industrial sectors. This study collects articles, scientific journals, industry research reports, regulatory documents, and relevant white papers, obtained from international databases such as Scopus, Google Scholar, and publications from global institutions such as the OECD, World Bank, and World Economic Forum. The literature used is limited to publications within the last 5-10 years, with a focus on relevance to ESG topics and cross-sector digitalization.

The analysis process was carried out using a thematic approach, namely grouping information based on three ESG dimensions and related industry sectors. This article does not focus on quantitative comparisons, but rather on content synthesis, pattern identification, and narrative explanation of the relationship between digital transformation and sustainability practices. The main objective of this approach is to explore how digital technologies such as big data, AI, IoT, and blockchain support ESG implementation, as well as to identify potentials, challenges, and cross-sector implications. Through this methodology, this study provides a deeper conceptual understanding of the strategic role of digitalization in strengthening corporate sustainability performance.

4. RESULTS AND DISCUSSION

4.1. Article Findings

Table 1. Main Findings of Literature Review Results

No	Researcher	Research Focus	Methodology	Findings
1	Guohua Yu (2024)	The impact of digital transformation on ESG performance through human capital enhancement in China	Quantitative (*panel regression*)	Digital transformation significantly improves ESG through the path of improving human capital quality, especially in capital-intensive and technology-intensive companies. This result is consistent with the theory that digitalization demands a more skilled workforce, thereby improving green innovation, managerial efficiency, and ESG reporting quality.
2	Chen, Yitong & Gao (2024	The impact of digital transformation on ESG after the Environmental Protection Law policy in China	Quasi-experiment	Digital transformation has an intrinsic impact on improving ESG, especially in resource, environmental and polluting industries.
3	Regina P. Heryana & Harry Z. Soeratin (2025)	ESG and financial performance with digitalization as a moderating variable	Qualitative (literature study)	Digitalization strengthens the positive impact of ESG on corporate efficiency and profitability. Integration of technologies such as IoT, blockchain, and AI in ESG management can increase operational efficiency by up to 30% and risk identification speed by 60%. Manufacturing, finance, and energy sectors are said to benefit the most.

No	Researcher	Research Focus	Methodology	Findings
4	Ardiansyah S. Akili et al. (2024)	ESG integration in e-procurement systems for sustainable public procurement	Qualitative (document analysis)	This study emphasizes that e-procurement can be an effective digital tool for ESG implementation in the public sector, but the challenges are the lack of awareness, HR competencies, and specific ESG regulations.
5	Zhong, Zhao, Yin (2023)	The impact of corporate digital transformation on ESG performance	Data A-share Shanghai & Shenzhen (2010–2020), regresi panel	Digital transformation improves ESG through resource allocation efficiency, transparency and technological innovation.
6	Zhao, Li, Li (2023)	Digital transformation strategy & ESG performance in a large manufacturing company	Survey of 224 companies, hierarchical regression	Digital transformation has a positive impact on ESG, mediated by green innovation (products & processes)
7	Wibowo & Phase (2025)	Synergy of e-business & green banking through digitalization	Conceptual/descriptive study	Digital transformation drives efficiency, financial inclusion and carbon emission reduction and strengthens the implementation green *ESG finance*

Table 2. Impact of Digital Transformation on ESG in various Sectors

No	Sector	Environmental	Social	Governance
1	Manufacturing	The use of digitalization (IoT, AI) supports*green process* & *green product innovation*, reducing emissions and waste	Increasing worker inclusion through technology-based training, as well as accelerating access to corporate social information.	Increase accountability through automated reporting systems & platform-based monitoring

No	Sector	Environmental	Social	Governance
2	Banking/Finance	Digital banking reduces paper usage, energy efficiency and emissions (e.g. mobile banking, e-payment)	Increasing financial inclusion through equitable digital services	Enables data-driven governance & digital-based transparent audit system
3	Energy	Digital transformation supports renewable energy portfolio, increasing green energy production efficiency (up to 35% revenue growth)	Improving customer satisfaction through project transparency & digital CSR systems	Strengthening ESG risk management through blockchain and digital project control systems
4	Mining	Digital transformation plays a role in real-time emissions tracking and environmental monitoring post-China EPL policy	Enhancing social response to environmental impact issues through digital information systems	Increasing transparency of ESG performance, but high challenges due to the risky nature of the industry & prone to data manipulation
5	Technology & Telecommunications	Digital transformation supports energy efficiency & big data processing for environmental monitoring	Companies like Telkom are creating jobs for people with disabilities through inclusive digital programs.	Personal data security & consumer protection strengthened with digital governance system
6	Public / Government (e-Procurement)	Digitalization of procurement enables vendor selection based on environmental criteria (energy, waste, green materials)	Encourage local MSME participation, implementation of labor standards, and gender equality in procurement.	Suppressing corruption & strengthening transparency with digital audits and tax system compliance

4.2 Discussion

4.2.1. The Impact of Digital Transformation on Environmental Aspects (Environmental)

Digital transformation makes a significant contribution to supporting environmental sustainability through energy efficiency, emission reduction, and smarter resource management. Yu (2024) stated that the use of digital technologies such as artificial intelligence (AI), big data, and the Internet of Things (IoT) drives green innovation and operational efficiency, thus directly impacting carbon emission reduction and energy saving in the industrial sector. Another study by Zhao, Li, and Li (2023) emphasized that digitalization strategies drive green product and process innovation in large manufacturing industries in China, which ultimately improves overall ESG performance. In the banking sector, Wibowo and Fasa (2025) explained that digital-based e-business and green banking can reduce paper use, increase operational efficiency, and expand access to more sustainable finance. In line with that, Chen et al. (2024) through a quasi-natural experiment approach showed that digitalization supports strengthening compliance with environmental policies in China, especially after the implementation of the Environmental Protection Law (EPL).

4.2.2. The Impact of Digital Transformation on Social Aspects (Social)

Digital transformation also has a positive impact on the social dimension by expanding access to services, creating new jobs, and encouraging social inclusion. According to Yu (2024), digitalization accelerates changes in the human capital structure, which not only improves workforce competency but also expands high-skilled job opportunities in various sectors. Meanwhile, research by Zhao et al. (2023) revealed that digitalization encourages social innovation in the form of environmentally friendly and more socially inclusive products and processes.

In the context of the public sector, Akili et al. (2024) highlighted that the integration of ESG into digital e-procurement systems encourages compliance with labor standards, empowerment of local MSMEs, and gender equality in government procurement processes. An example of direct practice in the telecommunications sector is described by Pertiwi et al. (2024), where Telkom Indonesia through its digital ESG program creates jobs for people with disabilities, demonstrating the social impact of inclusive digitalization.

4.2.3. The Impact of Digital Transformation on Governance Aspects (Governance)

In aspect governance, digital transformation strengthens transparency, accountability, and oversight through sophisticated information and reporting systems. A study by Zhong, Zhao, and Yin (2023) showed that digitalization improves the resource allocation structure and increases the disclosure of internal corporate information, which ultimately results in more effective and efficient governance. Similarly, Chen et al. (2024) found that digitalization is an important instrument in responding to environmental regulations by improving ESG reporting and reducing the information gap between stakeholders.

In the context of strategic management and human resources, Sklavos et al. (2024) stated that the integration of AI with ESG principles enables companies to strengthen the role of digital leadership and a more accountable and secure data-based governance system, especially in terms of cybersecurity and data protection. In addition, the digitalization of the public procurement system as explained by Akili et al. (2024) strengthens the anti-corruption system, transaction tracking, and real-time monitoring, making it an important instrument for building clean and credible public governance.

4.2.4. Differences in the Impact of Digital Transformation on Developed and Developing Countries

The impact of digital transformation on ESG shows significant differences between developed and developing countries, especially in terms of infrastructure readiness, regulatory framework, and digital literacy levels. In developed countries, digitalization has generally been integrated with governance and sustainability systems from the start. Yu (2024) noted that companies in the more economically developed eastern and central regions of China showed more significant ESG improvements than those in the western region. This is due to the presence of skilled human resources and better digital infrastructure.

Meanwhile, in developing countries, the main challenges lie in the gap in access to technology, low ESG awareness, and limited investment in green technology. Akili et al.'s (2024) study in Indonesia confirmed that although the ESG-based e-procurement system has great potential in increasing transparency and accountability, its implementation is hampered by limited personnel capacity and the absence of specific ESG guidelines in public procurement. In addition, Wibowo and Fasa (2025) show that the integration of digital technology in the Indonesian financial sector still requires cross-sector policy support so that digital transformation not only increases efficiency but also truly drives long-term sustainability. This difference emphasizes the need for strategies tailored to each country's context, so that digital transformation can provide optimal ESG impacts.

5. CONCLUSION

Digital transformation has become a major force driving companies and institutions in various sectors to accelerate the implementation of Environmental, Social, and Governance (ESG) principles. Based on a review of several studies, it can be concluded that digital transformation has a positive contribution to environmental sustainability through energy efficiency, carbon emission reduction, and green innovation based on technology such as IoT, blockchain, and AI. In the social aspect, digitalization encourages social inclusion and increasing human resource capacity, while expanding access to services and strengthening stakeholder engagement. In the governance dimension, digitalization strengthens transparency, accountability, and monitoring systems through automated reporting and real-time data management, including in the public sector through an ESG-based e-procurement system.

However, contextual differences between developed and developing countries show that the benefits of digital transformation are not uniform. Developed countries tend to be more prepared in terms of infrastructure and supporting policies, while developing countries still face challenges in terms of institutional capacity and digital divide. Therefore, strategies for implementing digital transformation to support ESG need to be designed contextually, taking into account technological readiness, human resources, and national policies.

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