

Digital Transformation Integration and Sustainable Organizational Performance: Role of Green Innovation

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ABSTRACT

This study examines the influence of digital transformation on organizational sustainability in Indonesia manufacturing industry and the role of mediating and moderating variables. This study examines digital transformation and organizational sustainability in the manufacturing industry, highlighting the role of green innovation as mediating variables. A quantitative approach was employed using a survey method, distributing questionnaires to managers of multinational manufacturing companies in the Riau Islands, Indonesia with sample size of 214 respondents. The results indicate that digital transformation has a significant positive effect between green innovation, and organizational sustainability performance. The mediating variables of green innovation strengthen the relationship between digital transformation and organizational sustainability. The practical implications of this study highlight the importance of digitalization strategy, green innovation in enhancing organizational sustainability. This study has limitations, including its limited geographic scope and sample size, the use of cross-sectional data that cannot capture temporal dynamics, and variables that do not cover all aspects of sustainability.

Keywords: digital transformation, green innovation, sustainable organizational performance, manufacturing industry

INTRODUCTION

The rapid advancement of digital technology has profoundly transformed the landscape of industries worldwide. Digital transformation (DT) involves the integration of digital technologies into all aspects of an organization's operations, fundamentally changing how businesses operate and deliver value to stakeholders. In the manufacturing industry, particularly in Indonesia, the adoption and implementation of digital transformation processes are becoming increasingly vital for maintaining competitiveness and ensuring sustainability (Al Koliby et al., 2025).

Manufacturing industries in Indonesia play a significant role in the national economy, contributing substantially to employment, economic growth, and industrial development. For instance, the manufacturing sector has absorbed an increasing number of workers nationally, rising from 17.43 million in 2020 to an estimated 19.96 million in 2024, reflecting both economic growth and employment opportunities. However, despite their vital contribution, Indonesian manufacturing industries are facing challenges related to fierce global competition and declining competitiveness. According to the World Competitiveness Report (WCR) 2025, Indonesia's global competitiveness ranking has dropped 13 positions to the 40th rank, highlighting the urgent need for strategic improvements.

In response to these challenges, organizations are turning to digital transformation strategies to boost innovation, efficiency, and sustainability. Digital transformation enables organizations to optimize processes, develop new products, and enhance organizational agility, which collectively support sustainable performance. The integration of digital technologies like automation, data analytics, cloud computing, and artificial intelligence has become a cornerstone of modern industrial practices (Wang & Huang, 2025).

Furthermore, green innovation has emerged as a pivotal component in sustainable organizational performance. Green innovation refers to the development and application of environmentally friendly technologies and processes to reduce ecological footprints while maintaining economic growth. Its importance is increasingly recognized, as consumers, regulators, and societal expectations favor environmentally responsible products and corporate practices. Green innovation not only supports compliance with strict environmental regulations but also enhances company reputation and competitiveness in global markets (Mohamed & Hussein, 2025).

This background necessitates an investigation into how digital transformation influences organizational sustainability in the manufacturing industry, especially within the Indonesian context. Existing studies indicate that digital transformation positively impacts innovation and performance, with green innovation serving as an essential mediating factor. However, empirical research specific to Indonesia, particularly in the industrial context of Riau Islands region, remains limited. Most prior studies are general or context-specific to other regions or industries, thus creating a gap that this research aims to fill. In light of this, the present study seeks to address the following primary research questions: How does digital transformation influence green innovation? And, how does green innovation mediate the relationship between digital transformation and sustainable organizational performance? Employing a quantitative approach, this research surveys managers in multinational manufacturing companies in Riau Islands, Indonesia, collecting data to empirically test proposed relationships. The findings aim to contribute valuable insights for both academics and practitioners, emphasizing the significance of digital strategies and green innovations in fostering long-term sustainability.

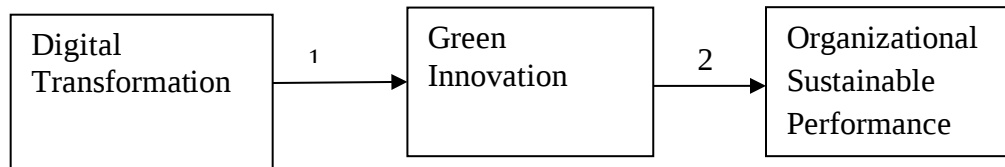
LITERATURE REVIEW

This study examines the Dynamic Capabilities Theory (DCT) developed by Teece et al. (1997). This theory is a conceptual framework that explains how companies are able to adapt, engineer, and utilize their resources and internal competencies to face a rapidly changing and uncertain environment. The main essence of dynamic capabilities theory is that the long-term success of an organization depends not only on its resources but also on the company's ability to change, integrate, and reconfigure these resources according to the demands of the market and evolving technology (Alrub et al., 2025). Dynamic capabilities emphasize that companies must be able to continuously adapt, integrate, and configure internal and external resources and competencies to maintain a competitive advantage in a rapidly changing environment. In this context, innovative performance and green knowledge management are part of dynamic capabilities that enable companies to innovate and adapt to technological developments and market conditions (Kim et al., 2025).

The Resource-Based View (RBV) theory was developed by Wernerfelt (1984), who first introduced this concept in his article entitled "A Resource-Based View of the Firm." RBV emphasizes that a company's competitive advantage stems from its unique resources and capabilities (Zhang & Li, 2025). In the context of digital transformation, this theory explains how the development and utilization of digital resources such as information technology, data, and digital competencies can improve a company's operational efficiency, innovation, and sustainability (Zhang & Li, 2025; Liu et al., 2025). Digital transformation enables companies to strengthen their capabilities in green knowledge management and innovation, which are critical factors in achieving sustainable performance (Yuswardi et al., 2022). The use of technology can help companies manage resources more efficiently and transparently, support environmentally friendly practices, and meet social and regulatory demands. RBV asserts that the success of digital transformation as a strategic resource will positively impact sustainable performance (Truong, 2025).

Digital transformation is a concept that refers to the process of integrating digital technology into all aspects of business and organizations, resulting in fundamental changes in how organizations operate and deliver value to customers (Westerman et al. 2014). This transformation includes the adoption of digital technologies such as big data, artificial intelligence, the internet of things, and automation to improve efficiency, innovation, and competitiveness. The concept of digital transformation began to develop academically and practically in the early 21st century along with the rapid advancement of digital technology. Its development is closely linked to studies and literature in the field of technology and innovation management. Research by Atobishi and Podruzsik (2025) shows that integrating entrepreneurial capabilities with ethical leadership creates a foundation for sustainable development in resource-constrained environments and is key to creating sustainable competitive advantage.

H3



THEORETICAL FRAMEWORK

The Influence of Digital Transformation on Green Innovation

The relationship between digital transformation and green innovation is very close, especially in the manufacturing industry. Digital transformation impacts innovation performance in financial services companies in Turkey (Asbeetah et al., 2025). Research by Zhang et al. (2024) revealed that digital transformation supports innovation performance by creating a more responsive and flexible environment to market and technological changes. According to Meng et al. (2025), digital transformation and innovation performance show a positive influence. Digital transformation in companies will help and encourage innovation and increase the competitiveness of these businesses (Meng et al., 2025; Mu et al., 2025; S. Wang et al., 2025).

The Influence of Green Innovation on Sustainable Organizational Performance

Research by Zhang et al. (2024) identified that a company's capacity to innovate has a positive impact on its chances of survival and sustainability. Furthermore, research by Mohamed & Hussein (2025) demonstrated the important role of process and product innovation, as well as administrative innovation, in sustainability. Research by Meng et al. (2025) demonstrated that process innovation can promote sustainability by reducing pollution, minimizing energy use, and increasing company efficiency and sustainability. With continuous innovation, manufacturing companies not only remain competitive but also contribute positively to global sustainable development (Liu et al., 2023). Homayoun et al. (2024) identified that innovation drives companies to develop technologies and processes that reduce energy consumption, waste, and greenhouse gas emissions. Through innovation in production processes, manufacturing companies can adopt green technologies and promote sustainability by reducing pollution, minimizing energy use, and increasing efficiency (Meng et al., 2025; Mohamed & Hussein, 2025; Zhang et al., 2024).

The Effect of Digital Transformation on Sustainable Organizational Performance with Green Innovation as a Mediating Variable

Research by Chao et al. (2025) shows that digital transformation enhances organizational innovation, which supports sustainable performance in manufacturing companies in China. Digital transformation has a significant and positive impact on sustainable organizational performance through innovation that can increase process efficiency and improve resource management in the manufacturing industry (Mohamed & Hussein, 2025). In the era of digitalization, companies continue to strive to utilize digital transformation not only to enhance organizational effectiveness but also to integrate digital technologies to improve performance, supporting sustainable product and process innovation (Homayoun et al., 2024).

METHODOLOGY

This research uses a quantitative approach with a survey research design. The research design stages applicable to this article involve several steps. First, the researcher must clearly formulate the research problem, namely to examine the influence of digital transformation on corporate sustainable performance, considering the mediating variable of green innovation. Second, a quantitative research approach with a cross-sectional design is chosen, so that data is collected at a single point in time to describe the current situation (Hermawan and Yusran, 2017).

Descriptive statistical analysis is conducted to provide an overview of the characteristics of the research data. Descriptive statistics include measures of central tendency (mean), measures of dispersion (standard deviation),

minimum values, and maximum values for each research variable. This analysis aims to understand the distribution and trends of the data and ensure there are no anomalies or extreme values that could affect the model estimation results. Furthermore, descriptive statistics are used to review the respondent profile based on specific categories, such as company type, job title, number of employees, and length of existence.

Variables	Categories	Frequency	Percent (%)
<i>Nature of Business</i>	Electronic and Automotive Manufacturing	149	70
	Food and Chemical Manufacturing	35	16
	Building Materials and Construction Manufacturing	22	10
	Textile and Garment Manufacturing	8	4
<i>Firm Size (number of employees)</i>	Below 100	53	25
	100 to 500	77	36
	Above 500	84	39
<i>Age of firm (years)</i>	Below 5 years	71	33
	5 to 10 years	85	40
	Above 10 years	58	27
<i>Position in the Company</i>	Directors or above	4	2
	Department Manager	121	56
	Assistant Manager	89	42

FINDINGS

The results of construct reliability testing indicate that all constructs in this research model have CR values above the minimum required limit. The digital transformation construct has a CR value of 0.921, the green knowledge management construct 0.878, the green innovation construct 0.888, the government regulation construct 0.927, and the sustainable organizational performance construct 0.882. These values indicate that the indicators in each construct have a high level of internal consistency and are able to measure the latent construct stably.

Variable	Construct Reliability (CR)	Decision
<i>Digital Transformation</i>	0,921	Reliable
<i>Green Innovation</i>	0,888	Reliable
<i>Sustainable Organizational Performance</i>	0,882	Reliable

H1: Digital transformation has a positive effect on green innovation

Based on the research results presented in Table 4.10, the standardized estimate is 0.199 and the p-value is 0.003. It can be concluded that there is a positive effect between digital transformation and green innovation. The estimate indicates a positive effect. Digital transformation acts as a key driver enabling organizations to develop and implement innovative, environmentally friendly solutions (Zhang et al., 2024). These test results indicate

that the hypothesis is supported and aligns with the hypothesis that digital transformation has a positive effect on green innovation.

H2: Green innovation has a positive effect on sustainable organizational performance

Based on the research results presented in Table 4.10, the standardized estimate is 0.134 and the p-value is 0.003. It can be concluded that there is a positive effect between green knowledge management and sustainable organizational performance. Implementing green innovation is associated with resource efficiency, such as reduced raw material use, more energy-efficient production processes, and operational cost savings. Thus, green innovation can improve both profitability and organizational sustainability performance. Green innovation also has positive social impacts. Innovative, environmentally friendly products and processes can improve an organization's image and reputation in the eyes of consumers, the public, and regulators. The results of this test indicate that the hypothesis is supported, as it aligns with the hypothesis that green innovation has a positive effect on sustainable organizational performance.

H3: Green innovation mediates the positive effect of digital transformation on sustainable organizational performance

Green innovation mediates the effect of digital transformation on sustainable organizational performance. Digital transformation drives green innovation, which impacts sustainable organizational performance, with an estimated effect value of 0.393 and a P-value of 0.028. This confirms that the implementation of digital technology in organizations not only directly improves a company's sustainability performance but also encourages innovation oriented toward environmental sustainability (Mohamed & Hussein, 2025).

Hypothesis	Standardized Estimate (β)	P Value	Result
<i>Digital Transformation $\rightarrow$ Green Innovation</i>	0,199	0,003	Significant positive effect
<i>Green Innovation $\rightarrow$ Sustainable Organizational Performance</i>	0,134	0,003	Significant positive effect
<i>Digital Transformation $\rightarrow$ Green Innovation $\rightarrow$ Sustainable Organizational Performance</i>	0,393	0,028	Significant positive effect

DISCUSSION

Based on the data testing and analysis results obtained in this study, digital transformation has been shown to have a significant positive impact on green innovation. This is evident from the standardized estimate of 0.199 and the p-value of 0.003, indicating a significant impact and supporting the hypothesis that digital transformation contributes to driving green innovation in organizations. Digital transformation is the process of integrating digital technology into all aspects of an organization's business and operations with the aim of increasing efficiency, innovation, and added value. In the context of green innovation, digital transformation acts as a key driver, enabling organizations to develop and implement innovative, environmentally friendly solutions (Zhang et al., 2024). The positive impact of digital transformation on green innovation can be explained through several mechanisms.

These positive results support previous findings showing that digital transformation is a key enabler in creating innovations focused on environmental and sustainability aspects (Xu et al., 2023). Digital transformation not only improves operational efficiency but also creates new opportunities for strategic innovations oriented toward green innovation. The test results indicate that digital transformation significantly increases green innovation in organizations. Organizations that successfully implement digital transformation will be better able to create green innovations that support sustainability goals and provide long-term competitive advantage (Meng et al.,

2025). These findings form the basis for recommendations for organizations to continue strengthening digital transformation efforts as a key strategy in accelerating green innovation.

The positive impact of green innovation on sustainable performance can be explained through several mechanisms. First, green innovation enables organizations to reduce their ecological footprint, such as greenhouse gas emissions, hazardous waste, and high energy consumption. Research by Meng et al. (2025) shows that this impact not only complies with increasingly stringent environmental regulations but also increases product competitiveness in international markets that demand sustainability. Second, green innovation is often associated with resource efficiency, such as the use of fewer raw materials, more energy-efficient production processes, and reduced operational costs. Thus, green innovation can increase both profitability and the financial sustainability of an organization. In addition to economic aspects, green innovation also has positive social impacts. Innovative, environmentally friendly products and processes can enhance an organization's image and reputation among consumers, the public, and regulators. Consumers are increasingly aware of sustainability and tend to choose products that have a positive impact on the environment. Therefore, green innovation also serves as an effective marketing strategy, helping organizations expand market share and increase customer loyalty (Mohamed & Hussein, 2025; Zhang et al., 2024).

Homayoun et al. (2024) emphasized that green innovation drives organizations to continuously innovate and adapt to changes in the external environment and evolving regulations. Organizations that integrate green innovation into their business strategies will be more resilient and able to achieve long-term sustainability. Within the framework of innovation and sustainability theory, green innovation is a key driver in developing future-oriented business models that are not only economically profitable but also socially and environmentally responsible. Green innovation significantly contributes to achieving sustainable organizational performance and encourages the development of innovative, environmentally friendly and resource-efficient solutions, ultimately enhancing competitive advantage and organizational sustainability (Zhang & Huang, 2024). This factor must be an integral part of modern organizational strategies to address increasingly complex global sustainability challenges that demand greater social and environmental responsibility (Liu et al., 2023).

Test results indicate that digital transformation has a positive influence on sustainable organizational performance, mediated by green innovation. The results showed a direct effect value of 0.393 and a p-value of 0.028, confirming that the implementation of digital technology in organizations not only directly improves corporate sustainability but also drives innovation oriented toward environmental sustainability. Digital transformation refers to the process of integrating digital technology into all aspects of an organization's operations and strategy (Mohamed & Hussein, 2025). By adopting technologies such as automation and efficient energy management systems, organizations can increase efficiency, reduce waste, and minimize negative impacts on the environment. In general, digital transformation opens up new opportunities for developing greener and more environmentally friendly products and processes (Homayoun et al., 2024).

The positive influence of digital transformation on green innovation is based on the fact that digital technology enables the creation of innovative solutions focused on environmental sustainability. Digital technology provides accurate data, efficient communication facilities, and innovative platforms that support the development of green products and processes. The results show that digitalization significantly encourages organizations to adopt green innovation. Several new findings in this study include: first, green innovation, as a mediating variable, plays a significant role in improving organizational sustainability performance (Marjerison et al., 2025). Green innovation drives the development of products and processes that are more environmentally friendly, resource-efficient, and compliant with regulations and market demands for sustainability. Thus, digital transformation encourages companies to implement green innovations that drive better and more sustainable sustainability targets (Zhang & Huang, 2024). Second, strategically generated green innovations can improve operational efficiency and market power, enriching previously underexplored models of mediating mechanisms.

CONCLUSION

The conclusion of this study indicates that digital transformation has a positive and significant impact on green innovation and sustainable organizational performance. These findings underscore the importance of implementing digital technology and green innovation strategies in comprehensively improving organizational

sustainability performance. The positive impact of digital transformation on sustainable organizational performance is also statistically proven, indicating that digitalization not only directly impacts sustainability performance but is also a key factor in improving operational efficiency, product innovation, and a company's social reputation. The implementation of digital technology provides organizations with a competitive advantage that contributes to the achievement of overall sustainability indicators (Xu et al., 2025; Zihan & Makhbul, 2024).

The analysis shows that digital transformation positively influences green innovation. These findings confirm that digital technology facilitates the emergence of more environmentally friendly product, process, and service innovations. Green innovation is a key pillar of corporate sustainability strategies, driven by easy data access and digital collaboration that enable the development of innovative solutions (Meng et al., 2025; Mu et al., 2025; Wang et al., 2025).

RECOMMENDATIONS

Future research could expand the scope of the study by including other variables that influence organizational sustainability, such as organizational culture, sustainable leadership, and external factors such as economic and social conditions. By including these variables, the success of digitalization and green innovation can be analyzed more comprehensively and in-depth. Longitudinal studies are needed to observe changes and dynamics in the relationships between variables over time. This approach will help understand how the implementation of digital transformation and green innovation evolves and impacts sustainability performance in the long term. Furthermore, longitudinal studies can uncover factors that moderate or mediate these relationships in different contexts, such as different industries or organizational maturity levels in adopting green technologies and practices.

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