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The Role of Digital Transformation and Responsible Leadership in Green Innovation through Knowledge Sharing in Hybrid Work Environments in Indonesia's Manufacturing Industry: A Conceptual Framework

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A B S T R A C T
This conceptual paper proposes a framework explaining how digital transformation and responsible leadership foster green innovation in Indonesian manufacturing firms through knowledge sharing within hybrid work arrangements. Grounded in the Resource-Based View, Knowledge-Based View, and Natural Resource-Based View, the model positions hybrid work effectiveness as a contextual moderator that can strengthen or weaken the indirect effects of digital and leadership capabilities on green innovation. To the best of our knowledge, no prior study has simultaneously integrated digital transformation, responsible leadership, knowledge sharing, green innovation, and hybrid work effectiveness within this combined theoretical lens in a hybrid manufacturing context, offering both theoretical propositions and practical implications for future empirical research.

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INTRODUCTION

Over the past few years, rapid progress in digital technology and changing work habits have pushed many organizations to rethink and transform the way they operate from the ground up. Findings from the Q1 2025 national survey indicate that 60% of companies in Indonesia have adopted a hybrid work system, while 25% now offer fully remote arrangements for selected roles. Meanwhile, only 15% continue to rely entirely on onsite work, predominantly within the manufacturing and public service sectors (Deny, 2025). However, the manufacturing sector has been relatively slow in embracing hybrid work models, largely because its production activities require a strong physical presence on-site. Ulfianinda (2025) notes that nearly 80% of manufacturing activities continue to be performed directly on the production floor, limiting the adoption of hybrid work primarily to non-production roles such as administration, marketing, R&D, management, and supply chain functions (Sari & Wening, 2025; Ulfianinda, 2025). This situation shows that even though hybrid work is gaining broader acceptance in Indonesia, its application within the manufacturing sector is still constrained by structural limitations. As a result, organizations must adopt more flexible management approaches to sustain productivity and ensure effective cross-functional collaboration.

The limited adoption of hybrid work in the manufacturing sector is growing increasingly significant, particularly considering the sector's vital role in supporting Indonesia's economic structure. World Bank Data (2024) shows that the manufacturing sector contributes around 18.98% to Indonesia's national GDP, underscoring its substantial role in driving economic growth. To sustain industrial competitiveness, the government's Making Indonesia 4.0 initiative urges manufacturing firms to pursue digital transformation as a means to modernize their business processes and enhance operational efficiency. Digital transformation serves as a key strategy for automating workflows, integrating data systems, and enabling greater work flexibility, especially for roles that can accommodate hybrid work arrangements (Ulfianinda, 2025). Digital transformation also facilitates collaboration across divisions and accelerates knowledge sharing through the adoption of digital technologies. However, the successful implementation of hybrid work depends heavily on sufficient digital readiness and only about 39% of Indonesian companies have sufficient cybersecurity maturity to support hybrid work practices optimally (Nurhayati-Wolff, 2023). This challenge becomes even more pronounced for manufacturing firms outside the technology sector, as many still grapple with resistance to change, insufficient digital infrastructure, and deeply rooted traditional organizational cultures (Aryatama et al., 2024; Sergei et al., 2023). As a result, the digital transformation process has been slow and has yet to fully support the successful implementation of hybrid work.

Amid these ongoing challenges, environmental sustainability has become an increasingly pressing issue that the manufacturing sector can no longer overlook. Digital transformation and the adoption of more flexible work arrangements must be harmonized with the organization's broader commitment to minimizing environmental impact through sustainable forms of innovation.

The manufacturing industry is frequently associated with high energy consumption and significant emissions/pollution, prompting it to pursue green innovation in an effort to mitigate its negative environmental impact. Green innovation refers to a set of innovative efforts in products, processes, and management practices designed to reduce waste, prevent pollution, and improve the efficient use of resources (Jiang, 2025). Through green innovation, companies not only to meet environmental regulations and fulfill their social responsibilities, but also to build a sustainable competitive advantage over the long term. Munir et al. (2024) highlight that, over the past decade, global sustainability priorities have increasingly centered on achieving net-zero emissions (NZE) and advancing circular economy (CE) principles. Based on these two paradigms, Indonesian manufacturing companies must urgently integrate sustainability principles into their business strategies. This situation requires companies to identify internal factors that can stimulate creativity and encourage the development of green innovation.

One key internal factor that plays a crucial role is knowledge sharing. Knowledge sharing within an organization serves as a vital driver of innovation, including environmentally oriented initiatives. By facilitating the exchange of insights and experiences, it helps speed up decision-making processes and fosters the emergence of new ideas (Imanuddin et al., 2024). In the digital age, this process is increasingly facilitated by information technology and collaboration platforms. However, the effectiveness of knowledge flow is heavily influenced by organizational culture and leadership, making responsible leadership critical in fostering an ethical, collaborative, and sustainability-oriented work environment that encourages employees to share knowledge and participate in green innovation practices (Huo et al., 2022). On the other hand, digital transformation provides the infrastructure and tools needed for knowledge sharing, but these benefits can only be fully leveraged when employees are both motivated and able to use these technologies collaboratively. Because knowledge-sharing processes often depend on face-to-face interaction and a shared physical workspace, the challenges that arise in hybrid work arrangements become even more complex (Hernández-Soto et al., 2025). Therefore, sustaining effective knowledge-sharing practices in a hybrid work environment requires strong support from inclusive leadership and the successful implementation of digital transformation initiatives.

However, especially within the manufacturing sector, efforts to enhance knowledge sharing through responsive leadership approaches and digital transformation do not always produce the expected results. Implementing the digital transformation process effectively is becoming more difficult due to a number of structural challenges, such as cybersecurity concerns, traditional organizational culture, technological infrastructure constraints, and resistance to change. These challenges not only slow the adoption of new technologies but also hinder effective coordination and communication within organizations. In this context, the extent to which the positive potential of digital transformation and leadership initiatives can translate into greater innovation largely depends on how well the hybrid work system is implemented. When designed and managed

effectively, hybrid work arrangements can enhance employee productivity and overall job satisfaction. Conversely, poor management of hybrid work may lead to communication gaps, reduced spontaneous interactions, and feelings of social isolation—factors that can negatively impact an organization's innovation performance (Smith, 2025).

Ishaq (2025) finds that digital transformation and responsible leadership can enhance green innovation by strengthening knowledge-sharing practices. However, the study's findings remain inconsistent, largely because the use of organizational culture as a moderating variable does not reflect recent shifts in work patterns toward hybrid work systems. However, existing hybrid work research tends to concentrate more on employee performance and well-being, rather than exploring how the effectiveness of hybrid work arrangements shapes knowledge sharing and green innovation. Moreover, even though the Indonesian manufacturing sector has unique operational characteristics and faces more complex digitalization challenges, research on this topic remains notably limited. These gaps highlight the need to develop a comprehensive framework that integrates knowledge sharing, green innovation, digital transformation, responsible leadership, and the effectiveness of hybrid work systems into a unified conceptual model.

Based on this gap, the purpose of this study is to develop a conceptual framework that illustrates how responsible leadership and digital transformation influence green innovation through knowledge sharing within hybrid work environments, particularly in Indonesia's manufacturing sector. These five factors have rarely been examined together in previous research, especially in the context of post-pandemic hybrid work. Therefore, a conceptual study is necessary to construct a research model that theoretically links these variables. By emphasizing the role of digital capabilities and leadership as key drivers of sustainable innovation in today's manufacturing landscape, this study is expected to contribute to the advancement of Resource-Based View (RBV) theory.

LITERATURE REVIEW

Resource-Based View

According to the Resource-Based View (RBV), a firm's sustainable competitive advantage stems from its ability to develop and utilize internal resources that are valuable, rare, difficult to imitate, and non-substitutable (VRIN) (Andersén, 2021; Clulow et al., 2007). Rather than depending solely on market positioning, the RBV emphasizes the importance of unique resource combinations such as technological capabilities, organizational know-how, and firm-specific routines, that are difficult for competitors to replicate (Chen et al., 2015). The dynamic capabilities perspective highlights an organization's ability to continually integrate, adapt, and renew its resource base in response to changing environmental conditions (Chen et al., 2015). In this study, digital transformation and responsible leadership are viewed as strategic capabilities grounded in the RBV framework. They reflect unique combinations of resources, processes, and managerial practices that can strengthen organizational

competitiveness, especially when effectively leveraged through robust knowledge-sharing mechanisms.

Extending the RBV perspective, the Natural Resource-Based View (NRBV) incorporates environmental sustainability as a foundation for competitive advantage. NRBV suggests that firms can achieve long-term superiority by developing capabilities that minimize environmental impact while enhancing business performance, such as pollution prevention, product stewardship, and the adoption of clean technologies (Aboelmaged & Hashem, 2019). From this perspective, strategic resources include not only traditional internal assets but also 'green capabilities' such as green supply chain practices, environmentally responsible operations, and the development of eco-friendly products. Empirical evidence shows that these environmental competencies can enhance both environmental and financial performance, particularly when aligned with strategic orientations like entrepreneurial or sustainability-focused approaches (Wang et al., 2023). This underscores green innovation as a key mechanism that links the development of internal capabilities to tangible sustainability gains.

In the conceptual framework of this study, the integration of RBV and NRBV provides a coherent theoretical foundation. Digital transformation and responsible leadership are positioned as strategic capabilities that, when reinforced by effective knowledge-sharing mechanisms, can enhance organizational competitiveness. From the Knowledge-Based View, knowledge sharing functions as a fundamental integrative process through which organizational knowledge is gathered, mobilized, and converted into value, manifested in stronger innovation and performance outcomes (Danko & Crhová, 2025; Rehman et al., 2015; Zhang et al., 2024). At the same time, green innovation represents the concrete expression of NRBV's green capabilities—namely, a firm's ability to design products, processes, and systems that advance environmental sustainability. Taken together, the RBV, KBV, and NRBV perspectives suggest that digital capabilities, leadership competencies, and knowledge processes operating within hybrid work systems can collectively foster the development of long-term green innovation.

Digital Transformation

Digital transformation is a comprehensive process that reshapes an organization's operations, business models, and capabilities through the integration of digital technologies (Jibril et al., 2024; Vial, 2019). In the context of Indonesia's manufacturing sector, this shift aligns with the Industry 4.0 agenda, where technologies such as automation, IoT, and cyber-physical systems not only enhance production efficiency but also open up possibilities for remote work in certain roles. Moreover, information technology infrastructure and digital platforms—such as cloud-based knowledge management systems and collaborative applications—play a crucial role in enabling cross-divisional knowledge sharing, allowing employees to exchange best practices and insights from any location (Makhubele et al., 2012).

Several studies highlight that knowledge sharing serves as a critical link between digital transformation and innovation performance. Digital

transformation can significantly drive innovation, but its impact becomes far more substantial when it enables a smoother and more integrated flow of knowledge throughout the organization (Odai & Ahakwa, 2025). However, this impact is highly dependent on the readiness of leadership, organizational culture, and human resources. The extent to which technological investments translate into stronger innovation ultimately relies on visionary leaders and a culture that supports change, collaboration, and continuous learning (Mühlburger & Krumay, 2024). Thus, in this study, digital transformation is viewed not merely as the adoption of new technologies, but as a strategic enabler that can drive green innovation within hybrid work environments—provided it is supported by effective knowledge sharing, strong leadership, and an adaptive organizational culture.

Responsible Leadership

Responsible leadership refers to a leadership approach that prioritizes ethical and socially responsible decision-making while fostering cooperative relationships between leaders and their stakeholders. This leadership style places strong emphasis on accountability and the broader social impact of organizational actions. This leadership approach integrates sustainability values, accountability for the organization's social impact, and a balanced commitment to promoting positive outcomes while minimizing harm to the surrounding environment. Its core aim is to ensure long-term well-being for both society and the natural ecosystem (Soukupa & Sriteska, 2024; Stahl & De Luque, 2014; Voegtlin, 2012). At its core, responsible leadership is relational, grounded in interactions shaped by ethical values, mutual trust, and a strong commitment to sustainability (de Klerk & Jooste, 2023). Within an organizational context, responsible leadership not only guides strategic direction but also cultivates a work environment that is ethical, collaborative, and mindful of environmental sustainability.

Several studies indicate a strong connection between responsible leadership and both knowledge sharing and green innovation. Leaders who demonstrate integrity, empathy, and appreciation for employees' contributions tend to cultivate a cooperative culture that encourages open knowledge exchange (Chatzoglou & Vraimaki, 2009; Wu & Zhu, 2012). According to Huo et al. (2022) responsible leadership enhances employees' green innovative behavior through the mediating role of knowledge sharing. By demonstrating sustainability-oriented values, responsible leaders motivate employees to exchange environmental knowledge and generate creative, eco-friendly ideas. In hybrid work environments, the role of responsible leadership becomes even more critical, as leaders must intentionally build trust, sustain high-quality communication, and preserve a sense of connectedness despite predominantly virtual interactions. In this study's framework, responsible leadership is therefore positioned as a key driver that facilitates knowledge sharing and ultimately strengthens green innovation, particularly within hybrid work arrangements in the manufacturing sector.

Knowledge Sharing

Knowledge sharing serves as a vital organizational mechanism that enables the exchange of both explicit and tacit knowledge across individuals and work units, helping ensure that information does not remain isolated in silos but can be collectively accessed and utilized (Imanuddin et al., 2024). In the innovation context—especially in green innovation—knowledge sharing acts as a key source of new ideas. Research shows that the exchange of tacit knowledge through informal discussions, mentoring, and cross-department collaboration has a stronger influence on creativity and innovation than the sharing of explicit knowledge, as tacit knowledge carries deeper insights grounded in direct experience (Yıldız et al., 2025). Even so, well-documented explicit knowledge remains essential, as it provides the foundational basis needed to support and reinforce the overall innovation process.

Accordingly, research by Imanuddin et al. (2024) shows that green innovation is positively associated with the effectiveness of knowledge management practices, particularly knowledge sharing. Knowledge sharing often acts as a mediating variable that bridges the influence of organizational factors on innovative outcomes. Huo et al. (2022) explain that responsible leadership promotes green innovation through the mediating role of knowledge sharing. By modeling environmental values and demonstrating commitment to sustainability, responsible leaders motivate employees to exchange ideas and insights that ultimately contribute to environmentally friendly innovations. This finding aligns with Widodo et al., (2025), who show that trust and confidence in environmental values mediate the effect of knowledge on green behavior. This reinforces the idea that psychological factors and individual perceptions—alongside structural and technological elements—play a crucial role in determining the success of knowledge-sharing practices.

In hybrid work settings, knowledge sharing becomes both essential and challenging. Limited digital infrastructure and insufficient leadership support can disrupt coordination and weaken social connections, while reduced face-to-face interaction may hinder the transfer of tacit knowledge and slow the development of trust among employees (Hernández-Soto et al., 2025). Therefore, sustaining effective knowledge sharing in a hybrid work system requires a combination of inclusive, proactive leadership and the strategic use of appropriate collaboration technologies. The effectiveness of hybrid work is believed to determine how strongly these relationships can be realized in practice, and knowledge sharing is positioned within the framework of this study as a key mechanism that channels the influence of digital transformation and responsible leadership towards green innovation.

Green Innovation

Green innovation refers to system, process, or product innovations designed to reduce negative environmental impacts while simultaneously improving economic efficiency and creating social value (Kexin et al., 2012). According to the Natural Resource-Based View (NRBV), external pressures from customers, government bodies, investors, and local communities encourage companies to build green dynamic capabilities—sustainable competencies that

enable them to develop environmentally friendly solutions, thereby strengthening both their sustainability performance and competitive advantage (Singh et al., 2022).

Several studies show that beyond external pressures, green innovation is also driven by internal organizational practices, including management approaches and human resource management. Kuo et al. (2022) found that green HRM practices improve environmental performance through the mediating role of green innovation. This highlights the importance of green innovation as a mechanism that translates various managerial initiatives into measurable sustainability outcomes. These results show that knowledge management, employee behavior, and supportive work systems have a significant impact on green innovation.

Within this research framework, technological elements (digital transformation), human elements (responsible leadership and knowledge sharing), and the work system context (hybrid work effectiveness) interact to produce green innovation. Knowledge sharing functions as the primary channel for distributing ideas and experiences related to environmental innovation; responsible leadership cultivates sustainability-oriented values, vision, and an ethical climate that supports innovative behavior; and digital transformation provides the infrastructure and data needed to develop green solutions. The effectiveness of hybrid work is believed to shape the extent to which these factors can be translated into green innovation in practice. Therefore, in this study, green innovation is conceptualized as the product of a synergy among technological capabilities, leadership quality, knowledge-sharing processes, and work system designs that are adaptive to both digital-era demands and sustainability objectives.

Hybrid Working Effectiveness

Hybrid work is a flexible work arrangement in which employees alternate between onsite and remote work. Its effectiveness is largely shaped by organizational policies, technological infrastructure, communication practices, and the quality of managerial and leadership support (Knight et al., 2025; Naqshbandi et al., 2025). Numerous studies show that well-designed hybrid work arrangements—such as an effective balance between onsite and remote workdays, supportive HR policies, and the use of collaborative technologies—are positively associated with employee productivity, well-being, and overall performance (Knight et al., 2025; Sari & Wening, 2025). On the other hand, ineffective hybrid work management can result in social isolation, decrease impromptu interaction, cause misunderstandings, and eventually impair teamwork and innovation (Deny, 2025). This indicates that the effectiveness of hybrid work is shaped not only by the flexibility it provides but also by contextual factors that influence an organization's ability to communicate, coordinate, and collaborate effectively.

The effectiveness of hybrid work should be viewed as a contextual factor that shapes the success of various organizational initiatives, including knowledge sharing and green innovation. According to surveys conducted

worldwide, remote and hybrid work can boost productivity if it is accompanied by adequate facilities and arrangements (Deny, 2025), and similar insights appear in the green innovation literature, which emphasizes that the environmental context in which an innovation is carried out plays a crucial role in determining its overall effectiveness. Khan et al. (2022) found that consumers' environmental knowledge and pro-environmental behavior shape how green innovation practices affect consumer resistance, indicating that environmental factors play an important role in determining innovation outcomes. Following a similar line of reasoning, this study positions hybrid work effectiveness as a moderating variable that influences both the indirect effects of digital transformation and responsible leadership on green innovation through knowledge sharing, as well as the strength of the direct relationship between knowledge sharing and green innovation. When hybrid work functions effectively—supported by inclusive leadership, flexible policies, and adequate collaboration technologies—knowledge sharing becomes easier to achieve and more likely to generate green innovation. Conversely, in hybrid work environments with low effectiveness, the positive impacts of knowledge sharing may be reduced, thereby weakening the extent to which digital transformation and responsible leadership contribute to green innovation.

Theoretical Framework

Drawing from the literature reviewed, a framework can be formulated to explain the interactions among the five variables.

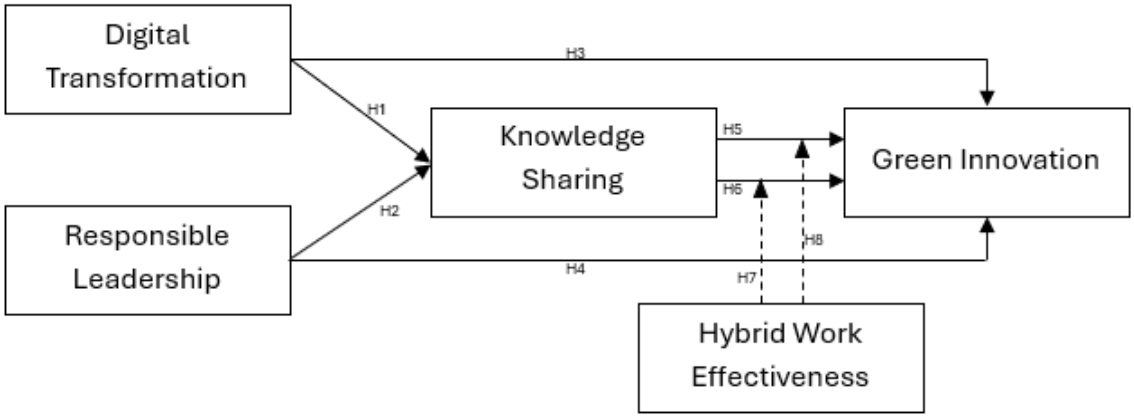

Figure 1. Conceptual Framework
Source: Author's Work

Through the use of technologies such as artificial intelligence (AI), cloud computing, big data, and the Internet of Things (IoT), digital transformation helps organizations build more integrated and efficient work systems. These technologies provide employees with accurate and up-to-date information, making it easier for them to exchange ideas, experiences, and insights across departments. By integrating these technologies, organizations are able to reinforce a culture of knowledge sharing and cultivate a more collaborative work environment (Ishaq, 2025). From the standpoint of the Ability–Motivation–Opportunity (AMO) framework and the Knowledge-Based View (KBV), digital transformation not only enhances process efficiency but also expands employees'

opportunities to share knowledge through improved information infrastructure and collaborative platforms. Consequently, digital transformation is expected to have a positive influence on organizational knowledge sharing, which in turn becomes a fundamental driver of the innovation process (Makhubele et al., 2012; Odai & Ahakwa, 2025; Vial, 2019). Accordingly, the following hypothesis is proposed:

H1: Digital Transformation has a positive effect on Knowledge Sharing.

Responsible leadership plays a key role in fostering a transparent and trustworthy work environment. Beyond focusing solely on business results, socially responsible leaders also take employee well-being and ethical considerations into account when making decisions. By embracing this mindset, leaders are able to cultivate trust among team members, creating an environment where individuals feel comfortable openly sharing their ideas, perspectives, and even mistakes (Ishaq, 2025). Drawing on Social Exchange Theory, responsible leadership helps build relationships grounded in fairness, trust, and genuine concern, which in turn motivates employees to reciprocate by contributing more, including by openly sharing their knowledge. When leaders demonstrate empathy, transparency, and fairness, employees feel valued and included, which in turn strengthens their willingness to share their expertise and work experiences. Work environments guided by this leadership style typically foster open and collaborative communication, which in turn strengthens knowledge-sharing practices among individuals and across departments within the organization. Accordingly, the following hypothesis is proposed:

H2: Responsible Leadership has a positive effect on Knowledge Sharing.

From a Resource-Based View (RBV) perspective, digital transformation equips companies with dynamic capabilities that enable them to convert digital resources into innovative, environmentally oriented processes or products. Technologies such as IoT, big data, AI, and cloud computing allow firms to track energy usage, reduce production waste, and streamline their supply chains (Ishaq, 2025). These technological advancements help drive green innovation, which focuses on creating environmentally friendly products and processes without compromising economic value. Digital transformation also enables organizations to conduct real-time data analysis, allowing them to identify areas for improving sustainability and uncover opportunities for more efficient resource use. Digitization not only boosts productivity but also opens opportunities for cross-departmental collaboration, which can accelerate the development of green solutions, such as the adoption of more environmentally friendly raw materials or the implementation of production systems powered by renewable energy. Accordingly, the following hypothesis is proposed:

H3: Digital Transformation has a positive impact on Green Innovation.

Responsible leadership plays a key role in advancing green innovation by aligning organizational goals with sustainability objectives, building trust, and ensuring the allocation of resources to environmental initiatives. Within the RBV framework, this leadership style facilitates the implementation of environmentally oriented initiatives by activating key organizational capabilities—such as ethical values and employee engagement—which ultimately contributes to improved sustainability performance. A sustainability-

oriented vision allows leaders to guide organizational strategies toward environmental goals such as reducing waste, improving energy efficiency, and adopting eco-friendly technologies. Research also shows that ethical leaders view environmental challenges not as obstacles but as opportunities to create new value for both the company and society. They allocate resources to innovative environmental programs and initiatives, which ultimately strengthen the organization's sustainability performance and enhance its public reputation. Accordingly, the following hypothesis is proposed:

H4: Responsible Leadership has a positive impact on Green Innovation.

Digital transformation enhances an organization's ability to manage and share knowledge through digital systems. Insights generated from technologies such as big data, AI, and IoT help employees understand more efficient and environmentally responsible ways of working. When this information is shared across the organization, it can be transformed into creative ideas and solutions that support waste reduction and energy efficiency. Consequently, knowledge sharing functions as a mediating mechanism that explains how digital transformation contributes to the development of green innovation. Accordingly, the following hypothesis is proposed:

H5: Knowledge Sharing mediates the relationship between Digital Transformation and Green Innovation.

Responsible leadership is essential for creating a workplace environment that promotes cooperation, transparency, and trust. Under this leadership style, employees feel encouraged to share information and experiences related to environmental sustainability. Over time, this flow of knowledge strengthens the organization's ability to generate green innovations. Thus, knowledge sharing acts as a crucial mechanism that explains how responsible leadership contributes to the advancement of green innovation. Accordingly, the following hypothesis is proposed:

H6: Knowledge Sharing mediates the relationship between Responsible Leadership and Green Innovation.

In a study of manufacturing SMEs, Ishaq (2025) examined a framework linking digital transformation and responsible leadership to green innovation through the mediating role of knowledge sharing, with organizational culture included as a moderating factor. The results showed that organizational culture did not moderate the relationship between knowledge sharing and green innovation, indicating that culture played only a minimal role in strengthening the connection between these two variables. These results suggest that structural and procedural factors, rather than just cultural climate, have a greater impact on the process of sharing green knowledge and innovation. Furthermore, Farooq et al. (2025) show that hybrid work significantly moderates the relationship between innovative work behavior and happiness at work. These findings confirm that the extent to which organizational resources and psychological factors translate into innovative behavior largely depends on the effectiveness of the hybrid work arrangement. Althammer et al. (2025) also emphasize that an organization's ability to manage communication, coordination, and collaboration technologies effectively is crucial to the success of hybrid work models. When these elements function well, collaboration and information sharing increase;

however, poor management can obstruct the flow of knowledge. Based on these findings, this study positions hybrid work effectiveness as a moderating variable that shapes the indirect influence of responsible leadership and digital transformation on green innovation through knowledge sharing. Although digital transformation and responsible leadership provide the technological foundation, leadership support, and collaborative climate needed to facilitate knowledge sharing, the extent to which this knowledge can be translated into green innovation ultimately depends on the effectiveness of the hybrid work arrangement. Put another way, the beneficial effects of digital transformation and responsible leadership through knowledge sharing on green innovation will be stronger if hybrid work effectiveness is high, whereas this indirect influence will be weakened if hybrid work effectiveness is low (Hernández-Soto et al., 2025; Huo et al., 2022; Knight et al., 2025; Odai & Ahakwa, 2025).

METHODOLOGY

This study employs a quantitative approach to examine the relationships and influences among the variables included in the proposed conceptual framework. Following Ishaq (2025), the research utilizes a 1–5 Likert scale, where 1 represents 'strongly disagree' and 5 represents 'strongly agree.' Data are collected through a questionnaire designed to assess how digital transformation and responsible leadership contribute to green innovation through knowledge sharing within hybrid work environments in the manufacturing sector.

The population of this study consisted of manufacturing firms in Indonesia that had implemented a hybrid work system. A purposive sampling technique was used to select respondents based on predetermined criteria, ensuring that only individuals with relevant experience and knowledge could provide data appropriate for addressing the research questions (Memon et al., 2025). The population relevant to this study is relatively limited, as hybrid work systems in the manufacturing sector are typically applied only to digital-enabled, non-production functions such as administration, PPIC, supply chain, R&D, marketing, finance, and HR. For this reason, purposive sampling was used to ensure that only respondents who were genuinely engaged in hybrid work arrangements were selected. The criteria included working in a non-production role, having at least one year of experience in a hybrid work system, and actively using digital technologies for coordination and collaboration. The collected data were then analyzed using Structural Equation Modeling (SEM) with the SmartPLS software.

RESEARCH RESULTS AND DISCUSSION

Within the proposed conceptual framework, digital transformation and responsible leadership are positioned as strategic capabilities that help manufacturing firms achieve sustainable competitive advantage. Digital transformation offers the technological infrastructure and information systems needed to support data flow, cross-functional coordination, and remote collaboration, thereby creating conditions that strengthen knowledge-sharing activities. At the same time, responsible leadership fosters an ethical, inclusive, and sustainability-oriented work climate in which employees feel safe and

motivated to exchange ideas and insights related to environmental improvement and innovation.

From the Knowledge-Based View and the Natural Resource-Based View, knowledge sharing serves as the central mechanism through which digital and leadership capabilities are transformed into green innovation. The exchange of accumulated knowledge across functions is expected to generate new ideas for environmentally friendly products and processes. However, this influence is highly context-dependent: the effectiveness of hybrid work determines whether shared knowledge can genuinely be converted into green innovation. When hybrid work is well managed—with clear guidelines, sufficient collaboration technologies, and strong team coordination—the link between knowledge sharing and green innovation is likely to strengthen. Conversely, poorly managed hybrid arrangements may weaken this positive effect. This issue becomes particularly important in the Indonesian manufacturing context, where hybrid work primarily applies to non-production roles, making empirical investigation even more necessary.

CONCLUSIONS AND RECOMMENDATIONS

Conceptually, this study concludes that the interplay between digital transformation and responsible leadership can enhance green innovation in manufacturing firms by strengthening knowledge-sharing practices, with hybrid work effectiveness acting as a key boundary condition that either amplifies or diminishes this indirect effect. The integration of RBV, KBV, and NRBV perspectives underscores that digital, leadership, and knowledge capabilities must be managed in a coordinated manner within hybrid work environments to achieve sustainable competitive advantage.

In practical terms, manufacturing firms adopting hybrid work arrangements are encouraged to: (1) invest not only in digital technologies but also in work processes that intentionally strengthen cross-functional collaboration and knowledge sharing; (2) cultivate responsible leadership styles that prioritize environmental concerns so that sustainability becomes embedded in daily interactions and learning activities; and (3) routinely evaluate the effectiveness of hybrid work using appropriate indicators. Future empirical studies are needed to validate this conceptual model and offer more detailed guidance for managerial practice within Indonesia's manufacturing industry.

ADVANCED RESEARCH

Advanced research on this topic could further explore how emerging digital sustainability technologies—such as green AI, digital twins, and intelligent energy-monitoring systems—interact with responsible leadership behaviors to strengthen green innovation outcomes in hybrid-enabled manufacturing environments. Future studies may employ longitudinal or multi-level designs to examine how dynamic knowledge flows evolve over time across remote and onsite settings, as well as how psychological safety and trust mediate or amplify these relationships. Additionally, researchers could investigate cross-industry comparisons or integrate environmental performance metrics (e.g., carbon intensity, waste reduction, energy efficiency) as objective indicators of

green innovation, enabling a more comprehensive understanding of how digital transformation and leadership capabilities jointly shape sustainable competitiveness in hybrid work ecosystems.

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