



Digital Innovation as a Mediating Mechanism in the Relationship Between Green HR Management and Sustainable Performance

Anwar Setiawan ¹⁾, Sudita²⁾, Sigit Arianto³⁾

Universitas Pamulang

Email : 1) anwarsetiawan242@gmail.com 2) suditadita03@gmail.com 3) arsigituhuy@gmail.com

Abstract. This research investigates how digital innovation acts as a mediating factor in the relationship between green human resource management (GHRM) and sustainability performance. A mixed-methods approach was employed, integrating primary data obtained through questionnaires and focus group discussions (FGDs). An experimental design was also applied, in which respondents received a treatment, leading to the distribution of the questionnaire on two separate occasions. The results reveal that digital innovation effectively mediates the influence of GHRM on sustainability performance. Furthermore, the study demonstrates that the mediating effect of digital innovation becomes stronger after the treatment compared to the pre-treatment phase. These findings offer theoretical contributions by showing that digital innovation can reinforce GHRM practices, providing a useful foundation for future research. They also present practical implications for government bodies and technology start-ups in developing solutions that support organizations in adopting GHRM. This is essential, as enhancing employees' environmental awareness serves as the initial step for companies striving to achieve sustainability.

Keywords: *Digital Innovation, Green Human Resource Management, Sustainability Performance.*

INTRODUCTION

In recent years, sustainability has emerged as a central concern for organizations and institutions across the globe. Corporate sustainability represents a comprehensive concept that extends beyond ecological issues to encompass social responsibility and the alignment of economic activities with environmental and social stewardship (Linnenluecke and Griffiths 2010). A firm's performance is now evaluated not only by the profits it generates but also by the extent to which it manages and protects its surrounding environment. Increasing awareness among stakeholders about the urgency of preserving the planet and preventing the degradation of ecological systems has resulted in growing demands to restore environmental damage caused by business operations (Nugroho and Anita 2023). These pressures compel organizations to reassess their practices and operational processes with a focus on sustainability (Saeed et al. 2022).

This heightened environmental consciousness has also fueled rising demand for environmentally responsible hotels (Alyahia et al. 2024). The hospitality sector, known for its high consumption of energy and natural resources to fulfill customer needs (UN Tourism 2019), bears substantial operational costs regardless of occupancy levels. Eco-friendly hotels seek to reduce their environmental footprint by adopting green strategies such as recycling, waste minimization, energy-efficient equipment and lighting, and the use of locally sourced organic food products (Khatter 2023).

The expansion of the hospitality industry is closely linked to the strength of regional tourism. Indonesia, recognized for its wide range of tourist destinations, consistently attracts both domestic and international travelers. Consequently, hotel occupancy rates and room revenues have risen in line with the growth of global tourism (Nisar et al. 2021). Data from the Central Bureau of Statistics in 2023 indicate that Bali hosts the highest number of hotels nationwide, with 3,895 establishments. This aligns with the province's diverse and rapidly growing tourism offerings. As the country's leading tourist center, Bali carries the responsibility of representing national tourism quality, placing additional pressure on its hotel industry to model effective and sustainable management practices.

Within business organizations, green human resource management (GHRM) has evolved into a key environmental tool aimed at aligning human resource (HR) functions such as recruitment, training, and reward systems with environmental objectives and regulatory requirements (Gayialis et al. 2022). GHRM supports environmental performance and strengthens an organization's long-term sustainability agenda (Renwick et al. 2016; Kim et al. 2019). These practices integrate conventional HR activities with environmental considerations to ensure that organizational goals are pursued in an ecologically responsible manner. Sustainable performance ultimately depends on the collective commitment and coordinated actions of individuals within the firm, who are expected to carry out their duties while upholding sustainability values. Achieving such change requires an organizational shift toward a sustainability-oriented mindset, supported by strong commitment from management and employees alike. This shared commitment is essential because environmentally driven HR practices help cultivate and sustain pro-environmental behavior across all members of the organization (DuBois and Dubois 2012).

To strengthen sustainability outcomes, companies are increasingly turning to emerging technologies and the substantial influence these technologies exert on organizational performance arguably one of the main reasons many firms are advancing so rapidly (S. U. Rahman and Bakar 2019). Since new technologies have the capacity to shape employees' cognitive processes, the availability of adequate technological infrastructure enables organizations to better understand environmental issues and enhances their perceived control over such challenges (Shayegan, Bazrkar, and Yadegari 2023). The integration of digital technologies complements environmentally friendly initiatives and is expected to accelerate the achievement of sustainable corporate performance. This study aims to address existing research gaps and refine insights from earlier empirical findings.

In recent years, HRM scholars have increasingly examined GHRM to understand how it contributes to organizational environmental objectives (Roscoe et al. 2019; Yong et al. 2020; Aftab et al. 2023). Although existing evidence confirms that GHRM positively affects environmental performance, only a limited number of studies have approached it from a comprehensive, holistic perspective (Aftab et al. 2023). Most previous research has explored GHRM in relation to only one dimension of sustainability either environmental performance or social performance (Nisar et al. 2021; Fang et al. 2022; Aftab et al. 2023; Aggarwal and Agarwala 2023).

A systematic literature review (SLR) by Benevene and Buonomo (2020) further highlights that the relationship between GHRM and sustainability performance is often mediated by additional organizational variables. Their findings show that the most commonly used mediators include green supply chain management, employee values, and employee motivation. Other studies have proposed additional mediating constructs such as green innovation (Kanan et al. 2023), green trust (Alyahia et al. 2024), green innovation combined with environmental strategy (Aftab et al. 2023), green organizational culture (Fang et al. 2022; Aggarwal and Agarwala 2023), and green intellectual capital (Nisar et al. 2021). Moreover, the work of Shayegan, Bazrkar, and Yadegari (2023) links GHRM to the accelerating influence of new technologies.

This study focuses on examining the mediating effect of digital innovation on the relationship between GHRM and sustainability performance. The aim of this research is to address the question of whether digital innovation can mediate the relationship between GHRM and sustainability performance, as well as to assess the impact of digital innovation before and after the respondents receive the treatment. This research is important because GHRM is still rarely implemented by hotels in Indonesia, particularly in Bali. The study is expected to serve as a reference for the government and start-up companies in accommodating the needs of businesses especially those in the hospitality sector in implementing GHRM.

LITERATURE REVIEW

1. Resource-Based View (RBV)

The Resource-Based View (RBV) explores how a firm's capacity to leverage strategic resources that are valuable, rare, and difficult for competitors to replicate shapes its competitive advantage (Wernerfelt 1984). As a foundational theory in strategic management, RBV underscores the significance of an organization's distinctive resources and capabilities as the essential drivers of sustainable competitive superiority (Barney 1991). According to this framework, resources such as specialized expertise, advanced technological capabilities, organizational culture, and well-structured business processes particularly those that cannot be easily copied form the basis of long-term competitive strength. RBV therefore encourages firms to prioritize the development and strategic use of these internal assets to enhance their competitive positioning (Barney, Wright, and Ketchen 2001).

In the context of this study, improvements in sustainability performance encompassing economic, social, and environmental outcomes are viewed as a form of competitive advantage. As global business environments increasingly emphasize sustainability, companies that actively advance the triple bottom line can differentiate themselves from competitors, draw and retain employees committed to social and environmental values, strengthen corporate reputation, and expand access to customer segments and markets that prioritize sustainability-oriented practices (Haseeb et al. 2019). Consequently, strong sustainability performance serves as a meaningful source of competitive advantage, enabling firms not only to build long-term resilience but also to position themselves as industry frontrunners, attract top talent, and cultivate durable stakeholder relationships (Saputra et al. 2023).

Strategic resources generate superior long-term performance and sustainable competitive advantage, particularly when they are costly or nearly impossible for competitors to imitate (Barney, Wright, and Ketchen 2001). Within this framework, GHRM can be conceptualized as a critical strategic capability. GHRM entails the proactive identification, development, encouragement, and reinforcement of employees' environmentally responsible behaviors, ultimately supporting organizational differentiation and competitive success (S. K. Singh et al. 2020). Human resources that are deeply embedded within an organization's social fabric often fulfill RBV criteria. As a result, human capital not only contributes to higher organizational performance but also advances sustainability strategies grounded in ecological objectives. Recognizing and nurturing these human resources can enhance business results while fostering stronger environmental and social stewardship within the communities in which firms operate (Yusoff et al. 2020).

2. Sustainability Performance

Elkington (1994) was the first scholar to introduce the term *triple bottom line* (TBL), using it as a sustainability framework to evaluate a company's social, environmental, and economic impacts. The TBL concept reflects three distinct bottom lines: profit or loss, the organization's social responsibility, and its environmental responsibility (Zaharia and Zaharia 2021). Environmental sustainability requires businesses to consider the consequences of their operations on the natural environment, while economic sustainability relates to the financial viability of the business, and social sustainability encompasses human-centered factors within organizational activities (Yong et al. 2020; Apriliyanto 2023).

Glavič and Lukman (2007) define social responsibility as a social principle that integrates both social and environmental business performance, representing humane development that is safe, dignified, liberal, fair, and equitable contributing to human and environmental well-being. They further describe environmental performance as environmental principles focused on minimizing the use of hazardous energy and resources through improvement, recycling, and reuse, while maximizing the use of renewable resources. In addition, economic performance must be assessed based on economic growth alongside environmental protection and improved quality of life (Abdul-Rashid et al. 2017).

3. Green Human Resource Management (GHRM)

Human resource management primarily concerns managing people effectively in the workplace to achieve both organizational and individual goals (Ivancevich 2010). With the growing emphasis on environmental management and green culture, organizations, companies, and institutions are increasingly seeking environmental tools and techniques that can support the greening of existing systems, policies, strategies, and resources. A new area of focus within human resource management is enabling organizations to “go green” in line with GHRM principles. Ren, Tang, and Jackson (2018) describe GHRM as the greening of human resources through a set of organizational policies aimed at protecting the environment, including green recruitment and selection, green training, green performance management, green compensation and rewards, and green involvement.

GHRM consists of five key green HR practices:

- a) **Green recruitment**, which refers to selecting employees who demonstrate environmental awareness and are committed to minimizing the negative environmental impacts of their activities to enhance organizational effectiveness (Guerci, Longoni, and Luzzini 2016).
- b) **Green training and development**, which focuses on improving employees’ ability to understand environmental issues and helping them learn various methods to save energy and reduce waste within the organization (Charbel Jose Chiappetta Jabbour et al. 2015).
- c) **Green performance management**, which involves assigning and evaluating employees’ tasks based on the organization’s environmental goals (Charbel José Chiappetta Jabbour and Santos 2008).
- d) **Green compensation**, a reward system that provides monetary incentives (such as cash bonuses) and non-monetary recognition (such as praise, awards, and acknowledgment) for employees who contribute to environmental management objectives (Charbel José Chiappetta Jabbour and Santos 2008).
- e) **Green involvement**, which encompasses employee participation in environmental management activities to produce meaningful environmental outcomes (Rizvi and Garg 2021).

4. Digital Innovation

Innovation refers to the process of developing new products and delivering them to consumers (Farida 2017). It is widely regarded as a critical element for organizational success (Siregar et al. 2020; Nasution, Siregar, and Pristiyono 2021). When organizations innovate effectively, their overall performance and competitiveness tend to improve. At the individual level, innovation is associated with a person’s creativity in generating novel ideas, whether in the form of products or new work processes. Technological advancements involve upgrading an organization’s infrastructure—such as hardware, software, and technological tools—which ultimately shapes organizational performance (M. Rahman, Mordi, and Nwagbara 2018). Digital innovation, in particular, represents a strategic asset that organizations can deploy to secure a competitive edge. Additionally, improved supply chain management capabilities enable firms to optimize their resources (Halldorsson et al. 2007), including supply chain risk management and knowledge development. Inter-organizational relationships are also considered valuable resources, emphasizing the role of collaboration in leveraging and integrating external partners’ capabilities to create distinctive relational advantages.

5. Hypothesis Development

Digital innovation functions as a resource that organizations can utilize to build competitive advantage (M. Wang and Teng 2022). Although most companies have implemented digital transformation in several departments such as finance and supply chain digital adoption within the HR division is still relatively overlooked. This is notable because HR plays a crucial role in supporting environmentally oriented work practices. Although HR activities may not directly influence sustainability performance, the HR function is essential in ensuring that sustainability initiatives are executed effectively across the organization. Chaudhary (2020) stresses that

adopting GHRM is vital for fostering green attitudes and behaviors among employees, as sustainability goals cannot be achieved without active human resource involvement.

To maximize HR's role in enabling GHRM, digital innovation must be integrated to reinforce the organization's sustainability agenda. Digital tools can enhance the efficiency of GHRM practices, improve the monitoring of employees' environmental awareness and behaviors, and support timely feedback or training interventions (Ma, Zhang, and Dong 2023). Consequently, environmental HR initiatives such as green recruitment, green training, and environmentally focused disciplinary systems—become more effective when HR managers can track employee engagement through digital platforms.

The Resource-Based View (RBV) offers a theoretical lens for understanding how strategic resources, including GHRM and digital innovation, contribute to superior performance. Within this framework, digital innovation acts as a mediating mechanism that strengthens the influence of GHRM on sustainability performance by harmonizing green management practices with digital technologies to generate greater sustainability outcomes.

H1: Digital innovation mediates the relationship between GHRM and sustainability performance.

The perspectives of HR professionals regarding the use of digital innovation vary, as do the applications implemented across organizations. Over the past decades, the adoption of digitalization strategies has become increasingly essential for supporting corporate sustainability. The advancement of digitalization, which encourages organizations to adopt new technologies, has enabled companies to formulate digital strategies that operationalize managerial activities more effectively (Chen, Li, and Shahid 2024). Prior to the engineered research condition, each company utilized different digital applications tailored to their operational needs and objectives. However, after the research treatment was introduced, all participating companies began using the same application for a unified purpose namely the implementation of application-based GHRM to strengthen sustainability performance. This shift indicates the presence of a deliberate digital transformation effort.

Digital transformation drives continuous innovation and fundamental changes in business models, ultimately enhancing sustainability performance (Sarfraz et al. 2022). Leveraging technological resources through digital transformation represents a crucial approach to improving organizational efficiency and sustainability (Ahmad et al. 2021). Companies that modernize their technological tools by adopting more advanced digital innovations experience significantly higher performance compared to when they relied on their earlier applications.

From a theoretical standpoint, RBV suggests that strengthening strategic capabilities through the treatment improves the mediating role of digital innovation in the relationship between GHRM and sustainability performance. Before the treatment, digital innovation may not have played a substantial role; however, after the treatment, the enhanced integration of resources strengthens its mediating effect. This results in a greater overall impact on organizational sustainability performance.

H2: There is an increase in the mediating role of digital innovation before and after the treatment is applied.

RESEARCH METHODS

This research adopts a mixed-method design that integrates quantitative and qualitative procedures. The quantitative component was executed by distributing questionnaires on two separate occasions: the first prior to the administration of the treatment where respondents were granted access to the application and the second after they had used the application. The qualitative component was carried out through Focus Group Discussions (FGDs), which were intended to explore participants' reasoning and responses toward the treatment provided. Structural Equation Modeling using PLS through SmartPLS 4.0 was utilized because the study involved a relatively small number of respondents, requiring an analytical tool that is more adaptable for limited sample sizes. The study also assesses the shifts in respondents' perceptions before and after the treatment by examining their arguments expressed during the FGDs.

An experimental approach was also incorporated, in which respondents were intentionally placed in a controlled scenario designed for the study. Each participant received access to the

same application, which functioned as an intervention to observe how digital innovation influences their daily operational tasks. Respondents were allotted one month to use the application during their routine work activities. The research population comprises all HR managers employed in four-star hotels and above in Bali. Based on 2023 data from the Central Bureau of Statistics (BPS), there are 261 HR managers meeting this criterion. Purposive sampling was applied, yielding a total sample of 51 HR managers. The sample selection criteria included: (1) HR managers working in hotels that have implemented sustainability programs; (2) HR managers currently or previously employed in hotels rated at least four stars; and (3) HR managers with a minimum of two years of experience in HRM.

Green Human Resource Management (GHRM) was measured through indicators adapted from Nisar et al. (2021), covering green hiring, green training and development, and green discipline management, complemented by an additional indicator green compensation and rewards drawn from Haldorai, Kim, and Garcia (2022). Sustainability performance indicators were adapted from Haldorai, Kim, and Garcia (2022); Ma, Zhang, and Dong (2023); and Montalvo-Falcón et al. (2023), consisting of social performance and environmental performance. Economic performance was excluded because it has already been extensively examined in prior sustainability research. Digital innovation was measured using indicators derived from Sedera et al. (2016), which include platform suitability for business needs, IT infrastructure, business expansion capability, and innovation.

RESULTS AND DISCUSSION

The Mediating Role of Digital Innovation in the Relationship Between GHRM and Sustainability Performance

The study reveals that digital innovation enhances the effect of Green Human Resource Management (GHRM) on sustainability performance. Initially, GHRM alone could not directly influence a company's sustainability outcomes. Environmental HR policies can only be effective when employees are committed to adhering to them. Well-designed policies do not automatically lead to sustainability achievements, as GHRM frameworks depend on how effectively organizations implement them. HR needs supportive instruments to ensure employees consistently follow environmentally driven policies. The introduction of new technologies has reshaped organizational functions and compelled companies to update their existing systems and procedures (R. K. Singh & Kumar 2020). Digital transformation influences multiple areas of business operations and reshapes coordination across units, ultimately altering structures, processes, and service delivery, especially within HR divisions (Crittenden, Crittenden, & Crittenden 2019). When technology becomes embedded in HR activities, it is expected to provide "extended human intellect" by assisting with tasks such as computation, communication, configuration, evaluation, creation, supervision, training, and competition (Kabul 2024).

Although HRM is not the primary driver of organizational success, it plays a crucial role in shaping employee behavior to align with corporate objectives. Integrating technology into HRM involves web-based approaches and modern managerial practices that rely on updated information and communication tools. HRM encompasses the policies and practices required for managing human resources in a dynamic and continuously changing business environment (Shaumya & Arulrajah 2016). Today's business climate is increasingly aware of environmental preservation, prompting HRM to develop policies that foster employees' environmental awareness and pro-environmental behaviors. To meet stakeholder expectations, HRM depends on digital innovation to communicate and reinforce GHRM practices. Digital innovation thus becomes a connecting mechanism that supports the dissemination and monitoring of GHRM initiatives, enabling their implementation and generating improved sustainability performance. Based on the Resource-Based View (RBV), digital innovation serves as a strategic resource that strengthens GHRM's capacity to create competitive sustainability outcomes, emphasizing the importance of investing in technologies that empower green initiatives and optimize human capital for long-term value.

The Mediating Impact of Digital Innovation Before and After the Treatment

The results also show an increase in the mediating effect of digital innovation after the treatment

compared to before. This can be understood by recognizing that modern companies cannot operate efficiently without technology. Organizations utilize different technologies depending on institutional needs and goals, yet few of these technologies are intentionally designed to support GHRM. Consequently, before respondents received the experimental treatment, their existing digital tools were insufficient to mediate the relationship between GHRM and sustainability performance. This highlights that the alignment between digital tools and organizational sustainability goals is essential. The findings are consistent with the observation that GHRM did not significantly influence sustainability performance. Although this was not a tested hypothesis, it helps explain why the second hypothesis of the study was supported. Respondents acknowledged that GHRM alone would not drive sustainability improvements if the technologies adopted by their companies were not oriented toward GHRM.

However, when respondents were provided with the same digital application as part of the treatment, the study produced different results. The application represented a form of digital innovation specifically developed to support the implementation of GHRM. When companies were simulated to have equal technological capabilities, the findings indicate that respondents perceived digital innovation as an effective facilitator that bridges GHRM policies and enables their execution, thereby enhancing sustainability performance. This demonstrates that the type of digital innovation utilized by companies significantly influences the effectiveness of GHRM in driving sustainability outcomes.

Insights from the FGDs further show that respondents believe digital innovation simplifies GHRM implementation when the chosen technology aligns with organizational needs. However, cost considerations remain a barrier, as many organizations still engage with GHRM at a conceptual level and have not fully adopted it. Respondents also agreed that the technology does not need to be overly sophisticated; rather, it should be simple, practical, and easy to operate. While some respondents expressed strong personal commitment to sustainability and GHRM, organizational policies ultimately depend on broader corporate priorities. Interestingly, their responses differed when the participants were individuals directly involved in corporate decision making processes.

The capacity to leverage digital technologies that maximize organizational resources plays a crucial role in securing long-term company growth (J. Wang et al., 2023). This capability enables firms to reassess and refine their digital strategies (Szczepańska-Woszczyna & Gatnar, 2022). Thus far, HRM has utilized several applications, but each serves different operational needs. Commonly adopted technologies include Human Resource Information Systems (HRIS) and Applicant Tracking Systems (ATS). These tools mainly emphasize process automation and digitalizing manual tasks, yet they do not explicitly support the implementation of GHRM.

Green hiring is one of the core components of GHRM. Currently, organizations have implemented digital recruitment methods. The use of digital recruitment offers various benefits, such as improving feedback to applicants, strengthening applicant trust in the hiring process, and reducing the volume of unsuitable applications (Srihari & Kar, 2020). However, these recruitment systems generally do not include assessments related to candidates' environmental knowledge or ecological competencies. This suggests that existing technologies are not yet able to fully accommodate GHRM requirements. Nevertheless, when organizations employ digital innovations that are correctly aligned with environmental objectives, these technologies can effectively support and operationalize GHRM. From the Resource-Based View (RBV) perspective, the increased mediating effect of digital innovation after the treatment indicates that organizations have been able to transform their digital innovation into a strategic resource through capability enhancement, synergy creation, and organizational learning. This strengthens the link between GHRM and sustainability performance and helps generate more sustainable competitive advantages.

Companies may reorient and redesign their digital innovation strategies to enhance implementation effectiveness. Digital strategies that involve transforming capabilities, skills, and business processes across all organizational levels have been shown to improve sustainable performance (Feroz, Zo, & Chiravuri, 2021). In essence, digital transformation provides abundant opportunities for businesses to adapt, grow, and innovate (Dura & Hamdani, 2024). Digital technologies function as powerful enablers, supporting firms in meeting their innovation targets (Chen, Li, & Shahid, 2024). Their potential allows managers to embrace technology, optimize

business processes, and enhance efficiency contributing to long-term organizational sustainability. Therefore, the selection of digital technologies must align with corporate objectives; when a company aims to operate with an environmental focus, appropriate technological support becomes essential to improving its sustainability performance.

CONCLUSION

Drawing from the study's results, it is evident that the mediating effect of digital innovation on the relationship between GHRM and sustainability performance becomes stronger after the treatment. Digital innovation acts as an amplifier, enhancing the impact of GHRM on sustainability outcomes. This implies that the effective implementation of GHRM requires technological innovations capable of supporting its processes, ensuring that GHRM objectives can be executed properly and ultimately improving the organization's sustainability performance.

The experiment carried out in this research further enriches these findings. It demonstrates that digital innovations specifically tailored to facilitate GHRM produce a stronger influence on sustainability performance compared to the digital systems currently adopted by the companies. This result suggests that the existing digital tools have not yet fully met the operational requirements of GHRM. These implications must be addressed by hotels, especially those that are implementing or planning to implement sustainability initiatives within their HR practices.

The findings also reveal that GHRM has not yet been positioned as a key priority by most companies, even though it can serve as an important foundation for cultivating employees' environmental awareness. Such awareness is essential to encourage employees to voluntarily support and participate in sustainability programs initiated by the organization. This outcome also provides a critical signal for policymakers and technology-driven start-ups, highlighting the limited availability of hotel applications that support GHRM implementation, which in turn presents a significant opportunity for technological contribution and advancement. Theoretically, this research also reinforces the notion that digital innovation can effectively complement GHRM, an area that has received limited scholarly attention to date.

There are several limitations to this study, particularly regarding the number of participants, as scheduling difficulties with managers during the FGDs prevented full attendance. Moreover, the findings cannot be broadly generalized to other regions or to the hospitality sector in Bali as a whole. Considerable opportunities remain for further research. Future studies could examine digital innovation in a more detailed and complex manner, given that this study assessed digital innovation in a general sense. Researchers may also explore comparisons across industries to identify which sectors are more prepared to adopt GHRM, extending beyond the hospitality industry.

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