A Conceptual Framework for Sustainable HR Practices in Saudi SMEs: Exploring the Roles of AI, Employee Engagement, and Digital Skill Development

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Abstract

In the context of rapid digital transformation and growing sustainability demands, small and medium-sized enterprises (SMEs) in Saudi Arabia face increasing pressure to modernize their human resource management (HRM) practices. This study develops a conceptual framework that examines the combined influence of artificial intelligence (AI) and employee engagement on sustainable HRM practices, with a particular focus on the mediating role of digital skill development. Drawing upon the Sustainable HRM theory, the Resource-Based View (RBV), and the Technology Acceptance Model (TAM), the framework captures the interplay between technological innovation, human capital, and organizational sustainability. While existing literature addresses these variables in isolation, few studies have integrated them into a cohesive model, especially within the unique socio-economic and digital context of Saudi Arabian SMEs. This research addresses that gap by proposing that digital skill development enables employees to effectively utilize AI systems and enhances their engagement in sustainability-driven HRM initiatives. The framework also underscores how digitally capable and engaged employees can become catalysts for sustainable organizational practices. The study provides practical implications for HR managers, SME leaders, and policymakers by emphasizing the need for targeted digital training, strategic engagement practices, and supportive infrastructure to promote sustainable HR outcomes. It also offers a theoretical foundation for future empirical validation. This integrative approach offers a timely contribution to the evolving discourse on digitalization, engagement, and sustainability in human resource management.

Keyboard*: Artificial Intelligence (AI), Employee Engagement, Digital Skill Development, Sustainable Human Resource Management, Small and Medium-Sized Enterprises (SMEs)*

1. Introduction

In an era marked by climate urgency and digital transformation, organizations are under increasing pressure to align their human resource management (HRM) strategies with principles of sustainability. Sustainable HRM, which integrates environmental, social, and economic considerations into HR practices, is emerging as a strategic imperative for firms seeking long-term viability (Ehnert, 2011; Pellegrini, Rizzi, & Frey, 2018). This paradigm is particularly critical for small and medium-sized enterprises (SMEs), which form the backbone of many economies, including Saudi Arabia. As part of its Vision 2030 initiative, the Kingdom of Saudi Arabia is actively promoting a knowledge-based and innovation-driven economy. SMEs are expected to contribute significantly to national growth, sustainability, and employment targets (Vision 2030, 2023). However, their capacity to adopt sustainable HRM practices remains underexplored, especially in the face of digital disruption and workforce reskilling challenges. Among the key enablers of sustainable HRM in the digital era are Artificial Intelligence (AI) and employee engagement. AI technologies have revolutionized HR functions, automating repetitive tasks, enhancing talent acquisition, enabling predictive analytics, and facilitating personalized employee experiences (Gélinas, Sadreddin, & Vahidov, 2022; Arfah, 2025; Budhwar et al., 2023). For SMEs, which often operate with resource constraints, AI offers a cost-effective mechanism to drive innovation and operational efficiency (Badghish & Soomro, 2024). However, the integration of AI in HRM also presents challenges, particularly in terms of employee adaptation, ethical considerations, and skill gaps (Dwivedi et al., 2021; Mohapatra, Kamesh, & Roul, 2023).

Concurrently, employee engagement, defined as the emotional and cognitive commitment an employee has toward their organization, is increasingly recognized as a critical driver of sustainable behavior and organizational citizenship (Ababneh, 2021; Saks, 2022). Engaged employees are more likely to embrace sustainability initiatives, participate in green HRM practices, and demonstrate higher levels of innovation and collaboration (Ali Ababneh, Awwad, & Abu-Haija, 2021; Graham, Cadden, & Treacy, 2023). In the context of Saudi SMEs, fostering engagement is particularly vital given the rapid pace of digital change and the cultural emphasis on organizational loyalty and social cohesion (Alshehri & McLauglin, 2021).Despite the growing scholarly attention to AI and engagement, limited research exists that explores their combined impact on sustainable HRM, especially within SMEs. An emerging factor that potentially connects these elements is digital skill development. The transition to AI-driven HRM systems requires employees not only to accept new technologies but also to develop the digital competencies necessary to use them

effectively (Agaoglu et al., 2025; Seker, Kwon, & Kocak, 2025). The Technology Acceptance Model (TAM) (Davis, 1989) underscores that digital skills shape perceptions of ease of use and usefulness, core predictors of technology adoption. Furthermore, from a Resource-Based View (RBV) (Barney, 1991), digital literacy represents a strategic resource that can enhance employee performance, adaptability, and engagement, ultimately leading to sustained competitive advantage.

The literature also supports the view that digital skill development mediates the relationship between AI adoption and organizational outcomes such as innovation, creativity, and sustainability (Zervas & Stiakakis, 2024; Vitezić & Perić, 2024). Within HRM, this mediating mechanism has profound implications. For instance, employees who receive targeted digital training are more likely to perceive AI systems as beneficial, increasing their engagement and commitment to sustainability goals (Emon & Khan, 2025; Mahade et al., 2025). However, existing research predominantly focuses on large firms or public sector institutions, neglecting the unique challenges and capabilities of SMEs in the Saudi context. Therefore, there is a pressing need to develop a conceptual framework that captures the complex interplay between AI, employee engagement, and digital skill development, and how these elements jointly influence sustainable HRM practices. Such a framework can provide both theoretical insight and practical guidance for Saudi SMEs seeking to navigate the twin transitions of digitalization and sustainability.

2. Theoretical Foundations

To comprehensively investigate the complex relationship between artificial intelligence (AI), employee engagement, and sustainable human resource management (HRM), with digital skill development as a mediating construct, this study draws on three key theoretical frameworks: the Sustainable HRM theory, the Resource-Based View (RBV) of the firm, and the Technology Acceptance Model (TAM). Each framework provides unique insights into the organizational, behavioral, and technological mechanisms that drive sustainable HRM, particularly within small and medium-sized enterprises (SMEs) operating in the rapidly transforming Saudi Arabian context.

The concept of sustainable HRM, as introduced by Ehnert (2011), reflects the increasing necessity to balance economic performance with environmental stewardship and social responsibility within HR practices. Unlike traditional HRM models that prioritize short-term efficiency and productivity, sustainable HRM adopts a long-term perspective, integrating ecological and social dimensions into workforce management. This approach aligns well with Saudi Arabia's Vision 2030, which emphasizes sustainability, economic

diversification, and technological innovation (Vision 2030, 2023). Sustainable HRM emphasizes practices such as green recruitment, energy-efficient operations, environmental training, and sustainable performance evaluations (Pellegrini, Rizzi, & Frey, 2018; Gomes, Sabino, & Antunes, 2023). In this paradigm, employees are not only seen as organizational assets but also as environmental stewards, capable of driving eco-conscious behavior within the workplace. Furthermore, research underscores the importance of employee engagement in the success of sustainable HRM initiatives. Engaged employees are more committed, proactive, and aligned with organizational values, which facilitates the internalization of sustainability goals (Gupta & Jangra, 2024; Aloqaily & Al-Zaqeba, 2024). The emotional and cognitive involvement of employees in sustainability efforts enhances organizational citizenship behavior and contributes to a culture of environmental responsibility (Graham, Cadden, & Treacy, 2023). In SMEs, which often rely on cohesive internal cultures due to their size and resource constraints, engaged employees can be instrumental in embedding sustainability at the operational level (Alshehri & McLauglin, 2021).

The Resource-Based View (RBV) of the firm, articulated by Barney (1991), provides a strategic management perspective by asserting that firms achieve and sustain competitive advantage through the possession and deployment of valuable, rare, inimitable, and non-substitutable (VRIN) resources. Within the domain of sustainable HRM, human capital, particularly in the form of digital competencies and engagement levels, qualifies as such a strategic asset. In the context of increasing digitalization, digital skill development becomes a critical enabler of technological adaptation and organizational innovation (Zervas & Stiakakis, 2024; Kowalski et al., 2024). Employees equipped with digital literacy are better positioned to leverage AI tools effectively, leading to more agile, data-driven HR practices and improved sustainability outcomes. The RBV also highlights the role of employee engagement as a unique organizational resource that contributes to productivity, innovation, and change-readiness (Sypniewska, Baran, & Kłos, 2023; Hosseini et al., 2022). In Saudi SMEs, where external market turbulence and internal capacity constraints frequently coexist, fostering such internal capabilities is crucial. Investments in employee engagement and skill development not only contribute to immediate operational efficiency but also reinforce the organization’s long-term strategic sustainability goals. This synergy becomes even more important in the deployment of AI, which demands significant human adaptability and cultural alignment (Arfah, 2025; Mohapatra, Kamesh, & Roul, 2023).

The Technology Acceptance Model (TAM), developed by Davis (1989), offers a behavioral perspective on technology adoption. According to TAM, two primary beliefs, perceived usefulness and perceived ease of use, influence users'

attitudes toward new technologies, which in turn determine their intention and actual usage behavior (Davis, Bagozzi, & Warshaw, 1989). In the domain of HRM, TAM is particularly relevant in understanding how employees interact with AI systems and digital platforms. The model has been widely applied in studies examining AI implementation in HR processes, including recruitment, performance appraisal, and talent management (Votto et al., 2021; Budhwar et al., 2023).Digital skill development plays a pivotal role in enhancing both perceived usefulness and ease of use. Employees with higher digital literacy are more likely to experience positive interactions with AI tools, perceive them as beneficial, and integrate them into their daily routines (Seker, Kwon, & Kocak, 2025; Emon & Khan, 2025). This, in turn, fosters higher engagement and reduces resistance to technological change. Moreover, organizations that provide continuous digital training create a supportive environment that boosts employee confidence and fosters a sense of psychological safety, a prerequisite for sustainable engagement and innovation (Menon et al., 2024; Mahade et al., 2025).Importantly, TAM also suggests that organizational support structures, such as digital infrastructure and leadership backing, mediate the effectiveness of technological adoption. In SMEs, where such structures may be limited, investing in digital upskilling becomes even more critical. It bridges the gap between technological potential and practical utility, enabling employees to realize the value of AI systems and contribute meaningfully to sustainability efforts (Zervas & Stiakakis, 2024).

By synthesizing the Sustainable HRM theory, RBV, and TAM, this study presents a multi-level framework that accounts for organizational resources, employee behavior, and technological adoption. Each theoretical perspective contributes uniquely: sustainable HRM offers a normative and strategic justification for integrating sustainability into HR functions; RBV highlights the importance of internal capabilities, such as engagement and skills, as sources of sustainable advantage; and TAM elucidates the behavioral dynamics underpinning technology acceptance. In the context of Saudi SMEs, this theoretical integration is especially critical. These enterprises face mounting pressure to adopt digital innovations while aligning with national sustainability mandates. However, limited budgets, lack of digital infrastructure, and skill shortages pose significant barriers (Alnamrouti, Rjoub, & Ozgit, 2022; Soomro et al., 2024). The proposed framework underscores that the strategic development of digital competencies, supported by AI technologies and reinforced by employee engagement, can catalyze the transformation of HRM systems toward greater sustainability. This theoretical foundation not only anchors the study conceptually but also informs the proposed conceptual

framework in the following section, which visualizes and hypothesizes the interrelations among the core constructs under investigation.

3. Gap in the Literature

While the fields of artificial intelligence (AI), employee engagement, and sustainable human resource management (HRM) have each received considerable scholarly attention, an integrative understanding of how these elements interact, particularly within the context of small and medium-sized enterprises (SMEs) in Saudi Arabia, remains significantly underexplored. Existing research has predominantly addressed AI in HRM from a technological or operational lens, often emphasizing its efficiency gains and predictive capabilities (Gélinas, Sadreddin, & Vahidov, 2022; Budhwar et al., 2023; Jarrahi, 2018). However, less attention has been paid to the human and behavioral aspects of AI integration, such as how employee engagement influences or is influenced by AI deployment in HR functions (Mohapatra, Kamesh, & Roul, 2023).Simultaneously, literature on sustainable HRM has made significant strides in highlighting the importance of green HR practices and employee behaviors in fostering environmental and social responsibility (Ehnert, 2011; Gomes, Sabino, & Antunes, 2023). Yet, studies in this domain often focus on large corporations or multinational enterprises, with limited application to SMEs, particularly in developing or transitioning economies like Saudi Arabia (Soomro et al., 2024). Given the distinct structural and resource constraints faced by SMEs, there is a need to contextualize sustainable HRM frameworks to better suit their operational realities (Alnamrouti, Rjoub, & Ozgit, 2022).

Furthermore, while employee engagement has been linked to sustainability outcomes (Gupta & Jangra, 2024; Saks, 2022), the mediating role of digital skill development in this relationship has not been thoroughly examined. With digital transformation accelerating in the wake of the Fourth Industrial Revolution, digital competence has become a critical variable in how employees perceive and interact with AI systems (Seker, Kwon, & Kocak, 2025; Vitezić & Perić, 2024). However, the literature rarely explores how digital upskilling efforts can bridge the gap between AI adoption and sustainable HR outcomes, particularly in SMEs where formal training infrastructure is often lacking. Moreover, while the Technology Acceptance Model (TAM) and the Resource-Based View (RBV) have been widely used to examine technology adoption and strategic resource allocation, respectively, there is a paucity of integrative studies that combine these perspectives with Sustainable HRM theory to explain how AI, employee engagement, and digital skills jointly influence

sustainable HRM. Most existing frameworks tend to examine these constructs in isolation rather than as part of a dynamic, interrelated system (Zhang & Chen, 2024; Mahade et al., 2025).

Lastly, the Saudi Arabian context is notably underrepresented in current empirical studies on AI, HRM, and sustainability. As the country actively implements its Vision 2030 agenda, which prioritizes digital transformation and economic diversification, there is an urgent need for research that reflects the unique cultural, economic, and regulatory environment of Saudi SMEs (Alshehri & McLauglin, 2021; Vision 2030, 2023). Addressing this gap is not only academically relevant but also crucial for informing policy and practice in a rapidly evolving national context. In light of these observations, this study contributes to the literature by developing a conceptual framework that integrates AI, employee engagement, and sustainable HRM, with digital skill development as a mediating factor, specifically within the under-researched setting of Saudi SMEs. This integrative approach helps address critical blind spots in the literature and provides a foundation for future empirical validation.

4. Conceptual Framework Development

The conceptual framework proposed in this study is designed to explore the interrelationships among Artificial Intelligence (AI), Employee Engagement, Digital Skill Development, and Sustainable Human Resource Practices within the context of Saudi Arabian small and medium-sized enterprises (SMEs). Grounded in the Resource-Based View (RBV) (Barney, 1991), Sustainable HRM theory (Ehnert, 2011), and the Technology Acceptance Model (TAM) (Davis, 1989), this framework positions digital skill development as a key mediating construct that links AI and employee engagement to sustainable HRM outcomes. The first dimension of the framework explores the direct influence of AI on digital skill development. As organizations increasingly adopt AI-based tools in HR functions, such as talent analytics, automated recruitment, and personalized training, the digital competence of employees becomes a prerequisite for effective system use (Budhwar et al., 2023; Arfah, 2025). Without sufficient digital literacy, AI applications may be underutilized or even resisted by the workforce (Seker, Kwon, & Kocak, 2025). This is particularly critical in SMEs, where formal digital training is often limited, yet the need to modernize operations is urgent (Badghish & Soomro, 2024). Thus, AI adoption drives the demand for targeted digital upskilling, aligning with TAM's assertion that perceived ease of use and usefulness of technology are shaped by user competence (Davis, 1989).

The second component emphasizes the relationship between employee engagement and digital skill development. Engaged employees are more likely to embrace learning opportunities, adapt to new technologies, and participate in digital transformation initiatives (Gupta & Jangra, 2024; Saks, 2022). High levels of engagement enhance motivation and openness to innovation, which are crucial for developing the digital competencies required in AI-augmented environments (Emon & Khan, 2025). This reflects the RBV's perspective that human capital, when well-nurtured, acts as a strategic asset capable of generating sustained competitive advantage (Barney, 1991).The third pathway in the framework hypothesizes that digital skill development positively affects sustainable HRM practices. Digital competencies enable employees to effectively use AI tools that support green HRM initiatives, such as digital monitoring of environmental KPIs, paperless documentation, or energy-efficient scheduling (Alshuaibi et al., 2024; Vitezić & Perić, 2024). In line with Sustainable HRM theory, equipping the workforce with relevant digital capabilities is essential for fostering environmentally and socially responsible behavior within HR systems (Ehnert, 2011; Gomes, Sabino, & Antunes, 2023).
Moreover, the framework also proposes direct relationships between AI, employee engagement, and sustainable HRM, reflecting the idea that both AI technologies and highly engaged employees can independently contribute to the adoption and implementation of sustainable practices (Aloqaily & Al-Zaqeba, 2024; Arsu, 2024). For instance, AI can optimize resource use and decision-making in HR, while engaged employees may voluntarily adopt pro-environmental behaviors that align with corporate sustainability goals (Ababneh, 2021; Graham, Cadden, & Treacy, 2023).However, the core novelty of the framework lies in the mediating role of digital skill development, which is posited as the mechanism through which AI and engagement are translated into sustainable HRM practices. While prior research has examined these constructs independently, limited empirical work has addressed how digital upskilling acts as a conduit connecting technological adoption and behavioral engagement with sustainability-oriented HR strategies, particularly in SMEs (Zervas & Stiakakis, 2024; Mahade et al., 2025).Finally, by focusing on Saudi SMEs, the framework addresses a significant contextual gap in the literature. These firms face unique structural, cultural, and regulatory challenges, including limited HR infrastructure, traditional management mindsets, and the dual pressure of digital transformation and sustainability compliance under Vision 2030 (Alshehri & McLauglin, 2021; Soomro et al., 2024). The framework thus serves as both a diagnostic tool and a strategic guide for HR practitioners and policymakers in the region.

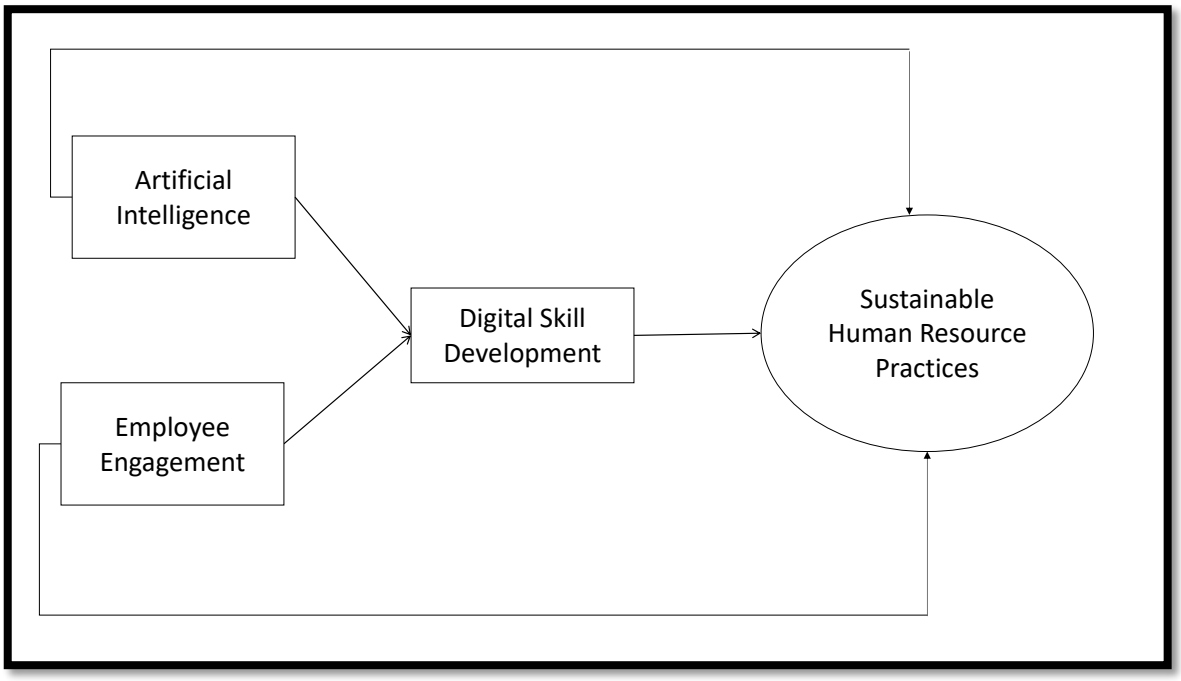

Figure 1 : Conceptual Framework

5. Practical and Policy Implications

The proposed conceptual framework carries significant implications for both organizational practice and public policy, particularly as Saudi Arabia accelerates its journey toward Vision 2030. The intersection of artificial intelligence (AI), employee engagement, and digital skill development presents not only a theoretical model for sustainable human resource management (HRM) but also a strategic blueprint for SME leaders and policy architects navigating digital and ecological transformation. From a managerial standpoint, the framework offers actionable guidance for HR professionals and SME executives seeking to integrate AI technologies without undermining human capital. First, it underscores the importance of investing in digital skill development as a foundational enabler for AI adoption and sustainability practices. Many Saudi SMEs lack formal training systems, yet digital upskilling is essential for employees to interact meaningfully with AI tools, especially in functions like e-recruitment, workforce analytics, and green operations (Zervas & Stiakakis, 2024; Mahade et al., 2025). By offering continuous learning programs and micro-credentialing pathways, SMEs can foster a more digitally fluent workforce capable of navigating the evolving technological landscape.

Second, the framework highlights employee engagement as a strategic lever in sustaining both digital transformation and environmental goals. Engaged employees are more receptive to AI adoption and more likely to participate in sustainability-focused initiatives (Graham, Cadden, & Treacy, 2023; Gupta &

Jangra, 2024). Thus, HR managers must move beyond transactional HRM models and cultivate a culture of inclusion, purpose, and learning. Practical strategies may include participatory decision-making, gamified training modules, recognition of green behavior, and AI-assisted feedback mechanisms that enhance trust and alignment with corporate sustainability values. For public policymakers, particularly those involved in Saudi Arabia's Vision 2030, the study offers critical insights into how digital transformation and sustainability agendas can be synchronized within the SME sector. While macroeconomic reforms have emphasized digitalization and environmental responsibility, policy frameworks often neglect the human capital infrastructure necessary to implement such reforms effectively (Vision 2030, 2023; Alnamrouti, Rjoub, & Ozgit, 2022). This research calls for targeted national programs that fund SME workforce training, subsidize AI adoption, and provide incentives for sustainable HR practices, especially in industries with high environmental impact.

Moreover, policymakers can benefit from supporting public-private partnerships that bridge the skill gap by linking universities, vocational centers, and technology firms with SMEs. Developing national digital competency frameworks, aligned with industry standards and HR requirements, could help institutionalize digital literacy and facilitate more inclusive participation in the knowledge economy (Koehorst et al., 2021).Lastly, the framework reinforces the value of holistic assessment tools that allow SMEs to benchmark their digital readiness, engagement strategies, and sustainability performance. By implementing monitoring systems based on this framework, both firms and government bodies can track progress, diagnose weaknesses, and allocate resources more effectively.

6. Conclusion

This study has proposed a conceptual framework that integrates artificial intelligence (AI), employee engagement, and digital skill development as key enablers of sustainable human resource practices, particularly within the context of small and medium-sized enterprises (SMEs) in Saudi Arabia. The framework positions digital skill development as a critical mediating factor that facilitates the effective translation of AI integration and employee engagement into sustainable HR outcomes. By aligning organizational capabilities with national development goals, the framework responds to the growing need for adaptable, future-ready HRM models that support both technological advancement and environmental responsibility. The model presents a strategic pathway for SMEs to enhance their competitive edge while contributing to broader sustainability objectives. In practice, this involves investing in

workforce digital competencies, nurturing a culture of employee engagement, and adopting AI solutions that reinforce rather than replace human input. For organizations with limited resources, this integrative approach offers a cost-effective and impactful method of achieving HR transformation and sustainable performance.

From a policy perspective, the framework emphasizes the need for supportive infrastructure, including national upskilling programs, SME-specific AI adoption incentives, and collaborative initiatives between public and private sectors. These efforts are essential to ensure that SMEs can fully participate in the digital economy and meet emerging sustainability expectations. This research contributes to the academic discourse by addressing key gaps in the literature and offering a multidimensional model for future empirical investigation. It encourages researchers to explore the proposed relationships through quantitative and qualitative studies and to extend the framework across different sectors and cultural contexts.

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