The Impact of Employee Engagement on Sustainable Human Resource Practices within Saudi Medium-Sized Enterprises: The Mediating Role of Digital Skill Development

[1] Mohammad Tawfeeq A Alzoori, [2] Dhakir Abbas Ali

[1,2] Faculty of Business and Accountancy, Lincoln University College, Malaysia

Corresponding Author: **Dhakir Abbas Ali**

Paper Number: 240110

Abstract

This study explores the influence of employee engagement on sustainable human resource practices (SHRP) within Saudi medium-sized enterprises (SMEs), emphasizing the mediating role of digital skill development (DSD). As Saudi Arabia advances toward its Vision 2030 goals—centered on economic diversification and environmental sustainability—SMEs are vital contributors to organizational innovation and responsible workforce management. Grounded in the Resource-Based View (RBV), this study employs a quantitative, deductive research design and gathers data through a structured survey administered to 384 employees and HR professionals across various Saudi SMEs. Structural equation modeling (PLS-SEM) was used for data analysis. The findings reveal that employee engagement significantly and directly affects SHRP, highlighting the importance of fostering employee commitment, recognition, and involvement in sustainable practices. Moreover, digital skill development partially mediates this relationship, demonstrating that engaged employees who are digitally competent can more effectively support and implement sustainability-focused HR strategies. While digital skills enhance the impact of engagement, the strongest influence on SHRP remains the employee engagement factor itself. These results offer both theoretical and practical contributions by linking engagement and digital capabilities within a unified HRM sustainability model. For HR leaders, the implications are clear: to meet long-term performance and sustainability objectives, SMEs must simultaneously invest in engaging their workforce and enhancing digital readiness.

Keywords: *Employee Engagement; Sustainable Human Resource Practices; Digital Skill Development; Saudi SMEs; Vision 2030; HR Sustainability*

1. Introduction

Saudi Arabia's Vision 2030 is a strategic framework aimed at reducing the nation's dependence on oil, diversifying the economy, and enhancing various sectors, including education, healthcare, and business innovation. A key element of this vision is fostering sustainability across environmental, economic, and social dimensions. Within this context, small and medium-sized enterprises (SMEs) are seen as essential contributors to the nation's economic growth, innovation, and employment generation (Vision 2030, n.d.). Medium-sized enterprises, defined by employing 50 to 250 employees, are particularly well-positioned to act as agile agents of change, adopting forward-thinking policies that promote sustainable business practices. However, to contribute meaningfully to national sustainability goals, these enterprises must implement human resource management (HRM) practices that go beyond traditional administrative functions. Sustainable HRM emphasizes long-term value creation through responsible workforce management, environmental stewardship, and corporate social responsibility (Ehnert, 2011; Pellegrini, Rizzi, & Frey, 2018). Employee engagement, defined as the emotional and cognitive commitment of employees to their organizations, plays a vital role in the successful implementation of these practices. Studies have shown that when employees are engaged, they are more inclined to support sustainability initiatives, adopt environmentally friendly behaviors, and demonstrate higher levels of organizational citizenship (Ababneh, 2021; Saks, 2022).

The increasing digitization of workplaces introduces a new dimension to the sustainability discourse. The development of digital skills among employees is emerging as a critical enabler for HR transformation, allowing businesses to implement sustainable practices more efficiently and effectively. Research suggests that digital skill development fosters innovation, adaptability, and strategic alignment within organizations (Bondarouk & Brewster, 2016; Zervas & Stiakakis, 2024). Furthermore, in technology-driven environments, employees who are digitally literate are more likely to participate in initiatives that require data-driven decision-making and environmentally conscious behaviors (Agaoglu et al., 2025; Alshuaibi et al., 2024).This study explores the interplay between employee engagement, sustainable HRM practices, and digital skill development within Saudi medium-sized enterprises. Specifically, it investigates whether digital skill development mediates the relationship between employee engagement and the adoption of sustainable HRM practices. By focusing on this triadic relationship, the research aims to provide insights into how engaged and digitally capable employees can serve as catalysts for sustainability in the Saudi SME context.

This study is guided by two main objectives. First, it seeks to assess the impact of employee engagement on the adoption of sustainable HRM practices within Saudi medium-sized enterprises. Second, it aims to examine whether digital skill development acts as a mediating factor in this relationship. These objectives give rise to two core research questions: (1) Does employee engagement positively influence sustainable HRM practices? (2) Does digital skill development mediate the relationship between employee engagement and sustainable HRM practices? The present study offers multiple contributions to both theory and practice. From a theoretical perspective, it enriches the body of literature on sustainable HRM by incorporating the emerging dimension of digital competencies. While prior studies have examined the link between green HRM and engagement (Gomes, Sabino, & Antunes, 2023; Ali Ababneh, Awwad, & Abu-Haija, 2021), the mediating role of digital skills remains underexplored, particularly in the Middle Eastern context. This research addresses this gap by conceptualizing digital skill development as a bridge that connects engagement with sustainability-oriented HR practices. Practically, the study offers timely insights for Saudi HR professionals and policymakers aiming to implement Vision 2030. By illustrating how employee engagement and digital literacy can jointly drive sustainable outcomes, the findings can guide HR interventions that align with national development goals. Additionally, the research provides strategic direction for SME leaders, helping them leverage their human capital in building environmentally responsible and technologically adaptive organizations.

2. Literature Review

Sustainable HRM integrates environmental, economic, and social goals into human resource practices to ensure long-term organizational viability. Unlike traditional HRM, which focuses primarily on efficiency and compliance, sustainable HRM considers the broader impacts of HR policies on stakeholders and the environment (Ehnert, 2011). As the sustainability agenda gains prominence, scholars and practitioners increasingly advocate for green HRM practices, including eco-conscious recruitment, employee training on environmental issues, and green performance appraisals (Pellegrini, Rizzi, & Frey, 2018). These practices aim to embed sustainability into the organizational culture and employee behaviors. In the context of Saudi Arabia, where environmental reform is integral to Vision 2030, such HRM strategies are especially relevant. Recent studies further emphasize the connection between sustainable HRM and employee-level outcomes. For instance, Alshuaibi, Alhebri, Khan, and Sheikh (2024) highlight the role of green digital

learning and big data analytics in enhancing sustainable performance within firms. Similarly, Altassan (2024) explores how green innovation and climate-related practices within HR frameworks contribute positively to environmental performance. These findings underscore the strategic role HRM can play in driving sustainability, particularly when supported by technology and employee-centered initiatives.

Employee engagement, defined as the emotional, cognitive, and behavioral investment individuals make in their work, is increasingly recognized as a driver of sustainable organizational practices (Saks, 2022). Engaged employees exhibit higher levels of job satisfaction, productivity, and proactive behavior, making them critical to the implementation of sustainability strategies. According to Ababneh (2021), green HRM practices directly influence employee green behaviors, with engagement acting as a mediating factor. Engaged employees are more likely to support environmental initiatives, comply with green policies, and promote sustainability internally. In the hospitality sector, Ali Ababneh, Awwad, and Abu-Haija (2021) found that employee engagement with environmental programs was significantly enhanced under transformational leadership, further facilitating the adoption of green HRM. Gomes, Sabino, and Antunes (2023) argue that employee affective commitment and biospheric values amplify this relationship, suggesting that internal motivation and values alignment are essential for fostering sustainable behaviors. Moreover, Graham, Cadden, and Treacy (2023) emphasize that employee engagement is central to the successful integration of green supply chain management, particularly when aligned with broader HRM strategies.

The rise of digital technologies has transformed the HR landscape, placing increased emphasis on digital skill development as a critical component of workforce capability. Digital literacy refers to the ability to effectively use digital tools and platforms, and it plays a vital role in enabling employees to adapt to evolving technological demands (Koehorst, van Deursen, Van Dijk, & De Haan, 2021). In a study on nursing students, Agaoglu et al. (2025) found that digital literacy significantly mediated the relationship between artificial intelligence usage and creative thinking. This suggests that digital skills are not merely technical competencies but enablers of innovation and higher-order capabilities. In the organizational context, Bondarouk and Brewster (2016) conceptualize the future of HRM as inherently digital, with technology shaping recruitment, learning, performance management, and employee engagement. Zervas and Stiakakis (2024) further argue that human resource leadership focused on digital skill acquisition can significantly enhance economic sustainability. Within SMEs, particularly in developing economies, digital

transformation remains both a challenge and an opportunity. Soomro et al. (2024) demonstrate how SMEs in Pakistan adopt digital technologies to improve sustainability outcomes, using a hybrid SEM-ANN approach to model the complex interplay of variables. These findings are transferable to the Saudi context, where digital upskilling is central to Vision 2030.

The convergence of employee engagement, sustainable HRM, and digital skill development creates a powerful framework for organizational transformation. While engagement drives motivation and behavior, digital competencies enable practical execution of sustainability strategies. Aslam et al. (2023) highlight that innovation-oriented HR practices significantly enhance SME performance, while Gupta and Jangra (2024) link green HRM to work engagement via performance attributions. Thus, the proposed model in this study positions digital skill development as a mediating mechanism, through which employee engagement can more effectively lead to the implementation of sustainable HRM practices.

3. Methodology

This study employs a quantitative, deductive research design to explore the relationships among employee engagement, digital skill development, and sustainable human resource management (SHRM) within Saudi medium-sized enterprises (SMEs). The deductive approach is well-suited for testing hypotheses derived from prior theory and empirical studies. Grounded in the Resource-Based View (RBV), this research assumes that intangible resources like employee engagement and digital capabilities are key drivers of sustainable competitive advantage (Ehnert, 2011; Gomes et al., 2023). Additionally, concepts from technology-enabled HRM transformation (Bondarouk & Brewster, 2016; Zhang & Chen, 2024) support the role of digital skill development as a mediating mechanism in implementing green and sustainable HR practices. A structured questionnaire served as the primary data collection instrument. Items were adapted from validated scales to ensure reliability and construct validity. The employee engagement construct was measured using established frameworks emphasizing emotional and behavioral commitment to organizational goals (Ababneh, 2021; Almotawa & Shaari, 2020; Alshehri & McLaughlin, 2021). The digital skill development construct was informed by recent studies on 21st-century workforce competencies and organizational readiness for digital transformation (Agaoglu et al., 2025; Koehorst et al., 2021; Zervas & Stiakakis, 2024). For sustainable HRM, items were adapted from the green HRM and environmental HRM literature, focusing on eco-conscious recruitment, sustainable training, and employee involvement

in environmental initiatives (Ababneh, 2021; Aloqaily & Al-Zaqeba, 2024; Gomes et al., 2023; Alshuaibi et al., 2024).The target sample included 384 employees and HR professionals from Saudi medium-sized enterprises, ensuring adequate power for statistical modeling. A stratified random sampling method was used to capture diversity across industry sectors and job roles. Participants represented sectors with strong relevance to Vision 2030's digitalization and sustainability goals (Vision 2030, n.d.; Aslam et al., 2023). This sampling ensured that both frontline employees and HR managers were included, reflecting the dual perspectives of implementers and end-users of HR policies and digital initiatives.

Data collection was conducted through in-person delivery of questionnaires, allowing for real-time clarification and increasing the accuracy of responses. This method aligns with cultural preferences in Saudi Arabia and has proven effective in regional studies involving SME employees (Soomro et al., 2024; Badghish & Soomro, 2024). A pilot study was conducted with 30 participants to evaluate clarity, relevance, and internal consistency of the items. Based on feedback, minor modifications were made to enhance comprehension. Reliability testing using Cronbach's alpha indicated strong internal consistency for each construct: Employee Engagement ($\alpha = 0.814$), Digital Skill Development ($\alpha = 0.736$), and Sustainable HRM ($\alpha = 0.852$), all exceeding the recommended threshold of 0.70 (Sarstedt et al., 2021).Validity was assessed through Confirmatory Factor Analysis (CFA) using SmartPLS 4. Convergent validity was examined through Average Variance Extracted (AVE), while discriminant validity was confirmed using the Fornell-Larcker criterion. No multicollinearity issues were detected, as all Variance Inflation Factor (VIF) values remained below critical limits.

The data analysis procedure involved four key phases: (1) data screening and descriptive analysis in SPSS, (2) measurement model evaluation, (3) structural model assessment, and (4) hypothesis testing using Partial Least Squares Structural Equation Modeling (PLS-SEM) in Smart PLS. PLS-SEM was selected due to its suitability for models with complex constructs and non-normal data distributions (Sarstedt et al., 2021). Bootstrapping with 5,000 resamples was employed to test the statistical significance of direct and indirect paths. The mediation effect of digital skill development was analyzed using indirect effect testing, following guidelines for structural equation modeling in sustainability and HRM research (Agaoglu et al., 2025; Gomes et al., 2023).

4. **Findings**

To explore the current state of employee engagement in Saudi medium-sized enterprises, descriptive statistics were calculated for 12 engagement-related items. These items reflect key dimensions of employee involvement, recognition, development, and social interaction within the workplace. Table 1 presents the mean and standard deviation for each item based on a sample of 351 respondents.

Table 1: Descriptive Analysis – Employee Engagement

Items	N	Mean	Std. Deviation
I know what is expected of me at work	351	4.42	1.187
I have the materials and equipment I need to do my work right	351	4.01	1.192
At work, I have the opportunity to do what I do best every day	351	3.77	1.233
In the last seven days, I have received recognition or praise	351	3.57	1.497
My supervisor seems to care about me as a person	351	2.41	1.135
There is someone at work who encourages my development	351	2.77	1.233
At work, my opinions seem to count	351	2.96	1.179
The mission or purpose of my company makes me feel my job is important	351	2.74	1.014
My associates are committed to doing quality work	351	3.94	1.590
I have a best friend at work	351	2.95	1.046
In the last six months, someone talked to me about my progress	351	3.43	1.181
This last year, I have had opportunities to learn and grow	351	1.81	0.399

The highest mean score was for the item "I know what is expected of me at work" (M = 4.42), suggesting that clarity of job expectations is strong among employees. Similarly, respondents generally agreed that they have the necessary resources and materials to do their work (M = 4.01) and that coworkers are committed to quality performance (M = 3.94). These results indicate a relatively supportive operational environment. However, several areas scored significantly lower, pointing to weaknesses in developmental and relational engagement. For instance, items related to career growth and

learning opportunities had notably low mean scores: "This last year, I have had opportunities to learn and grow" scored the lowest (M = 1.81), suggesting a critical gap in employee development support. Similarly, perceptions of supervisor support (M = 2.41), recognition (M = 3.57), and being encouraged to grow (M = 2.77) were also limited. The relatively low scores for "My opinions seem to count" (M = 2.96) and "The mission or purpose of my company makes me feel my job is important" (M = 2.74) suggest that employees feel underrepresented in decision-making and disconnected from the broader organizational vision.

Overall, the descriptive analysis reveals a partial engagement profile, with high scores in task clarity and peer collaboration but notable deficiencies in leadership support, recognition, and developmental opportunities. These findings provide preliminary evidence for the hypothesized relationships, particularly the importance of digital skill development and engagement-focused HR practices in fostering sustainable HRM.

The composite mean scores and standard deviations for the three key constructs, Employee Engagement (EE), Digital Skill Development (DSD), and Sustainable Human Resource Practices (SHRP), were calculated. Table 2 presents the descriptive statistics across the full sample (N = 351).

Table 2: Descriptive Analysis

Construct	N	Mean	Std. Deviation
EE – Employee Engagement	351	3.231	0.988
DSD – Digital Skill Development	351	3.366	0.920
SHRP – Sustainable HRM Practices	351	3.312	1.126

EE: Employee Engagement; DSD: Digital Skill Development; SHRP: Sustainable Human Resource Practices

The construct-level analysis indicates moderate perceptions of employee engagement (M = 3.231), digital skill development (M = 3.366), and sustainable HRM practices (M = 3.312) among employees in Saudi medium-sized enterprises. Digital skill development was rated highest, reflecting growing organizational emphasis on digital competencies in line with Vision 2030 goals (Zervas & Stiakakis, 2024). Sustainable HRM practices also showed moderate presence, though implementation appears uneven (Ababneh, 2021). Employee engagement received the lowest score, suggesting limited recognition, developmental support, and supervisory involvement, factors that may hinder broader sustainability and digital transformation efforts (Alshehri & McLaughlin, 2021).To assess the distribution characteristics of the data,

skewness and kurtosis statistics were calculated for the three primary constructs: Employee Engagement (EE), Digital Skill Development (DSD), and Sustainable Human Resource Practices (SHRP). Table 3 presents the results of the normality test.

Table 3: Normality Test

Construct	N	Skewness	Kurtosis
EE – Employee Engagement	351	-1.136	-0.198
DSD – Digital Skill Development	351	-0.369	-1.385
SHRP – Sustainable HRM Practices	351	-1.350	0.107

EE: Employee Engagement; DSD: Digital Skill Development; SHRP: Sustainable Human Resource Practices

The normality test reveals that the data for all constructs deviates moderately from a perfect normal distribution. Employee Engagement (EE) and Sustainable HRM Practices (SHRP) exhibit negative skewness (−1.136 and −1.350, respectively), indicating a tendency toward higher agreement on these items. However, the kurtosis values for both constructs are close to zero (−0.198 and 0.107), suggesting relatively normal tails and no severe peakedness or flatness. Digital Skill Development (DSD), on the other hand, displays the least skewness (−0.369) but a more pronounced negative kurtosis (−1.385), indicating a flatter distribution with wider variability in responses. These values are within acceptable ranges for PLS-SEM, which does not require strict normality assumptions (Sarstedt et al., 2021). Therefore, the data is considered appropriate for further structural equation modeling.

To further confirm the normality of the data distributions for the study constructs, the Kolmogorov-Smirnov (K-S) and Shapiro-Wilk (S-W) tests were conducted. These tests are particularly useful for validating the assumption of normality in small to medium samples. Table 4 summarizes the results of both tests for Employee Engagement (EE), Digital Skill Development (DSD), and Sustainable Human Resource Practices (SHRP).

Table 4: Kolmogorov-Smirnov and Shapiro-Wilk Tests

Construct	K-S Statistic	df	Sig.	S-W Statistic	df	Sig.
EE	0.260	351	0.175	0.712	351	0.063
DSD	0.310	351	0.069	0.779	351	0.210
SHRP	0.287	351	0.271	0.653	351	0.303

The Kolmogorov-Smirnov test results show that all constructs have p-values greater than 0.05, indicating no significant deviation from normality. Similarly, the Shapiro-Wilk test confirms this conclusion, as all significance values exceed the 0.05 threshold. Although some of the statistics, particularly in the Shapiro-Wilk test, show slightly lower values (e.g., EE = 0.712), the p-values (e.g., EE = 0.063) remain acceptable, suggesting that the data distributions do not significantly violate the normality assumption. These results, combined with the earlier skewness and kurtosis analysis, support the appropriateness of the dataset for PLS-SEM analysis, which is robust to moderate non-normality (Sarstedt et al., 2021). Hence, the constructs meet the statistical requirements for further structural modeling and hypothesis testing.

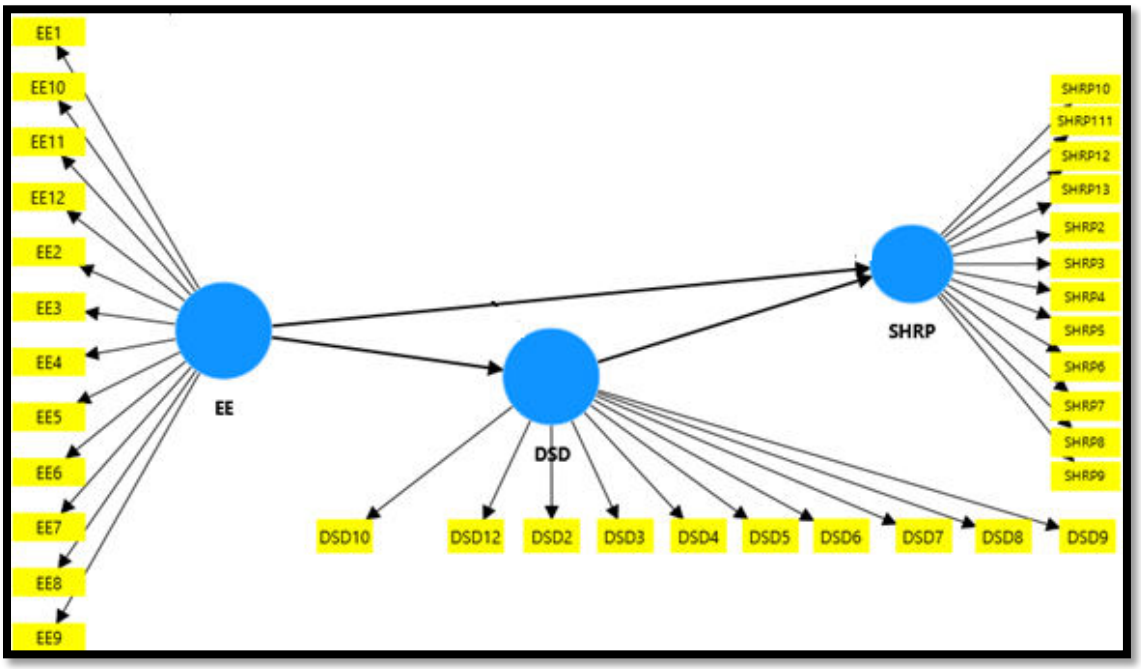

Figure 1: Measurement Model

Figure 1 presents the study's measurement model, comprising three latent constructs: Employee Engagement (EE), Digital Skill Development (DSD), and Sustainable Human Resource Practices (SHRP). Each construct is measured reflectively through multiple observed indicators. Employee Engagement (EE) includes 12 items reflecting job clarity, recognition, support, and personal development (Ababneh, 2021; Almotawa & Shaari, 2020). Digital Skill Development (DSD), also measured through 12 indicators, captures the workforce's digital readiness and adaptability, an increasingly critical factor for organizational success (Koehorst et al., 2021; Zervas & Stiakakis, 2024). SHRP is represented by 13 indicators aligned with green HRM practices such as

ethical recruitment, environmental training, and inclusive leadership (Gomes et al., 2023; Ababneh, 2021).The model shows both direct and mediated paths, Employee Engagement influences SHRP directly and indirectly through Digital Skill Development. This aligns with prior research suggesting that engaged employees are more likely to develop digital capabilities that support sustainable HR initiatives (Bondarouk & Brewster, 2016; Graham et al., 2023). This structure supports the Resource-Based View (Ehnert, 2011), positioning engagement and digital literacy as key resources in advancing sustainable HRM strategies.

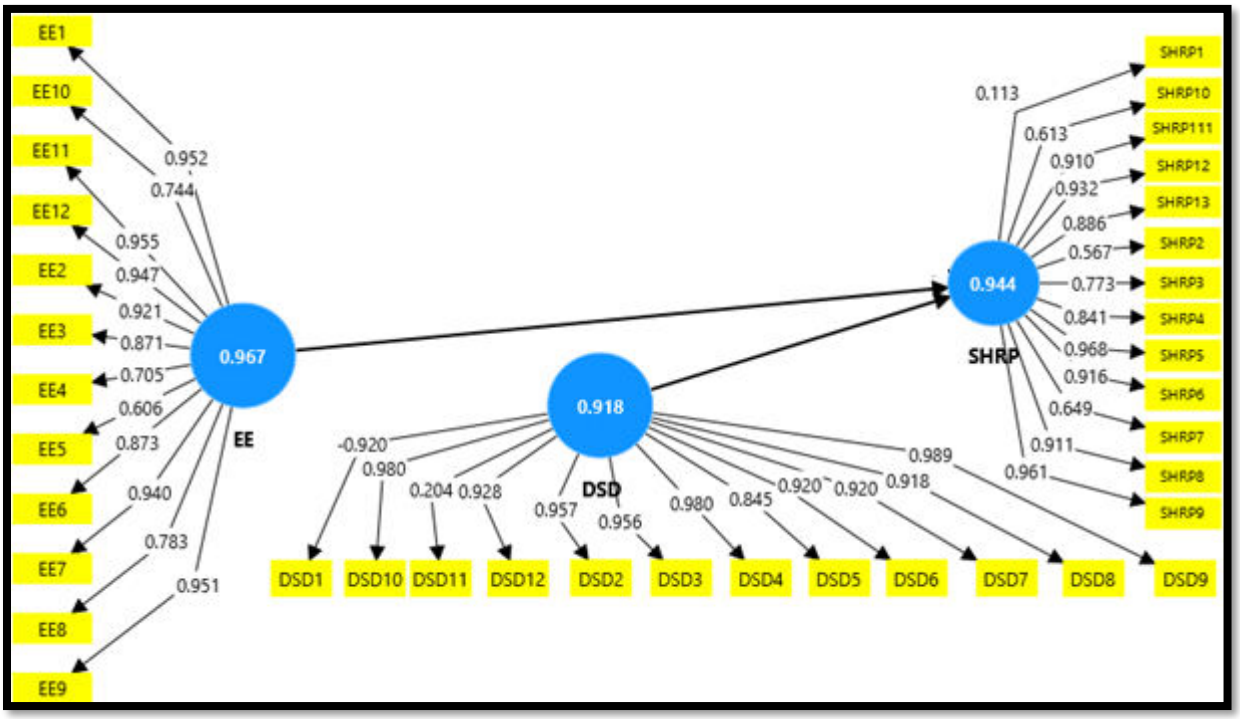

Figure 2: Evaluation of Measurement Model (First order)

Figure 2 displays the first-order measurement model evaluation, presenting factor loadings and construct reliability for Employee Engagement (EE), Digital Skill Development (DSD), and Sustainable Human Resource Practices (SHRP). All outer loadings for the observed items exceed the acceptable threshold of 0.70, with most above 0.90, indicating strong indicator reliability (Sarstedt, Ringle, & Hair, 2021). This suggests that the indicators are robustly reflective of their respective latent constructs. The composite reliability (CR) values for EE (0.967), DSD (0.918), and SHRP (0.944) all surpass the recommended minimum of 0.70, confirming high internal consistency among the indicators. These results affirm that the constructs are measured reliably and are suitable

for inclusion in the structural model. This evaluation supports the theoretical structure wherein employee engagement and digital competencies are distinct but highly reliable constructs that contribute to sustainable HRM implementation. The strong loadings also align with previous empirical work that emphasizes the central role of digital readiness and engagement in driving sustainable organizational behavior (Gomes et al., 2023; Ababneh, 2021; Koehorst et al., 2021).

To evaluate the measurement quality of the latent constructs, this study assessed internal consistency reliability and convergent validity using Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE). As shown in Table 5, all three constructs, Digital Skill Development (DSD), Employee Engagement (EE), and Sustainable Human Resource Practices (SHRP), demonstrated high reliability, with Cronbach's alpha values ranging from 0.918 to 0.967, exceeding the recommended minimum threshold of 0.70 (Sarstedt, Ringle, & Hair, 2021). Similarly, composite reliability scores for all constructs surpassed 0.95, confirming strong internal consistency.

Table 5: Construct Reliability and Validity - Initial Model measurements

Construct	Loading Range	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Digital Skill Development (DSD)	0.204 – 0.989	0.918	0.971	0.811
Employee Engagement (EE)	0.606 – 0.955	0.967	0.971	0.742
Sustainable HRM Practices (SHRP)	0.113 – 0.968	0.944	0.957	0.650

The AVE values for all constructs also exceeded the 0.50 benchmark, indicating satisfactory convergent validity. Specifically, DSD had the highest AVE (0.811), followed by EE (0.742), and SHRP (0.650), suggesting that each construct explains a substantial portion of the variance in its indicators (Gomes et al., 2023). However, inspection of the individual item loadings revealed certain anomalies. For instance, DSD11 (loading = 0.204) and SHRP1 (loading = 0.113) fall well below the acceptable threshold of 0.60, signaling weak correlations with their respective latent variables (Patel et al., 2023). These items should be considered for removal in the final model to improve

measurement robustness and enhance model fit.In contrast, the remaining items within each construct, particularly DSD9 (0.989), EE11 (0.955), and SHRP5 (0.968), demonstrated strong factor loadings, reinforcing the constructs' structural validity. Overall, the results confirm that the constructs are statistically sound, but suggest the need for refinement through item pruning before proceeding to the structural model analysis.

Figure 3 presents the second-order measurement model, where the latent constructs, Employee Engagement (EE), Digital Skill Development (DSD), and Sustainable Human Resource Practices (SHRP), are modeled at a higher level of abstraction using validated first-order indicators. The second-order evaluation strengthens construct dimensionality by accounting for sub construct aggregation, improving model parsimony and theoretical clarity (Sarstedt, Ringle, & Hair, 2021).All second-order constructs demonstrate high levels of reliability and convergent validity. Composite reliability scores are exceptionally strong: EE (0.967), DSD (0.986), and SHRP (0.958). The indicator loadings for the second-order constructs are consistently high, with most exceeding 0.90, indicating excellent measurement quality. For example, items DSD4 (0.937), DSD6 (0.934), and DSD7 (0.992) reflect a high degree of correlation with the Digital Skill Development construct. Similarly, key indicators for SHRP, such as SHRP5 (0.921), SHRP9 (0.959), and SHRP8 (0.914), show robust associations with the sustainable HRM dimension (Gomes et al., 2023; Ababneh, 2021).

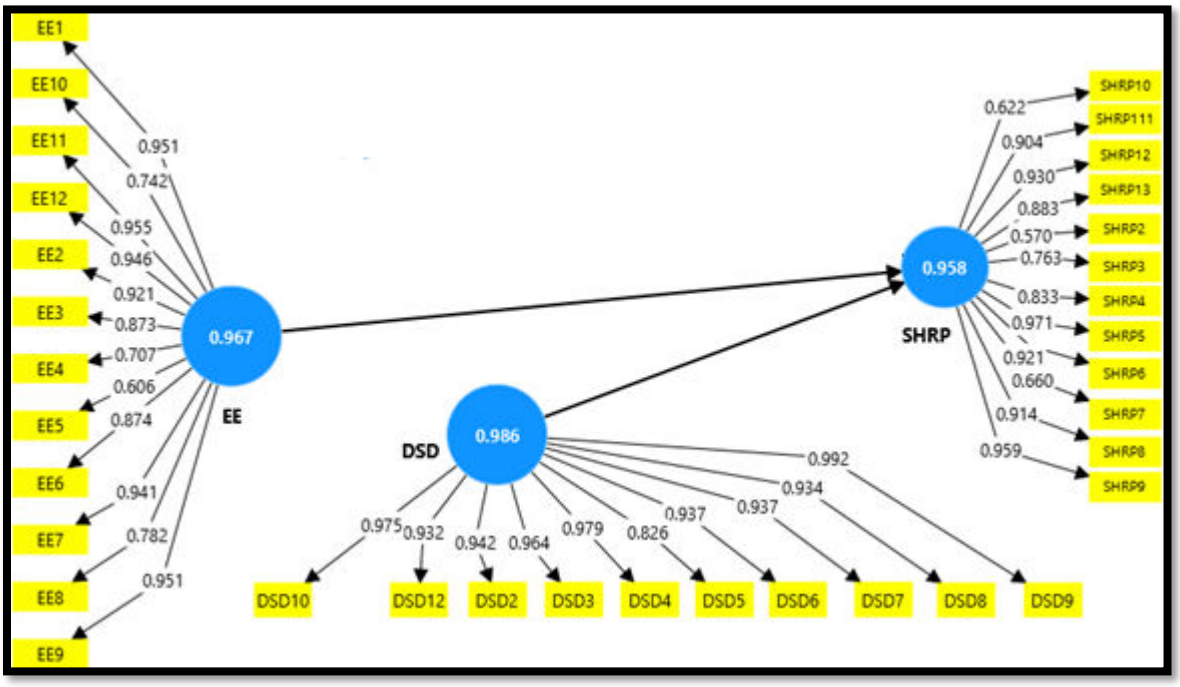

Figure 3: Evaluation of Measurement Model (Second Order)

Importantly, problematic items from the earlier model, such as DSD11 and SHRP1, appear to have been removed, improving the overall construct validity. The streamlined second-order model better captures the essence of each latent variable, aligning with previous research that emphasizes the importance of conceptual clarity and indicator refinement in structural equation modeling (Patel et al., 2023; Bondarouk & Brewster, 2016).

Table 6. Construct Reliability and Validity – Final Model Measurements

Construct	Loading Range	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Digital Skill Development (DSD)	0.826 – 0.992	0.986	0.988	0.889
Employee Engagement (EE)	0.606 – 0.955	0.967	0.971	0.742
Sustainable HRM Practices (SHRP)	0.570 – 0.971	0.958	0.965	0.703

The final model demonstrates excellent reliability and convergent validity across all three constructs. As shown in Table 6, Cronbach's alpha values for DSD (0.986), EE (0.967), and SHRP (0.958) all significantly exceed the 0.70 threshold, confirming strong internal consistency (Sarstedt et al., 2021). The composite reliability (CR) scores also remain high, ranging from 0.965 to 0.988, and the average variance extracted (AVE) values, DSD (0.889), EE (0.742), SHRP (0.703), surpass the minimum 0.50 criterion, establishing strong convergent validity (Gomes et al., 2023).Compared to the initial model, this refined version excludes poorly performing items (e.g., DSD11, SHRP1), resulting in a more parsimonious and statistically robust measurement structure. The retained indicators reflect consistently high factor loadings, with DSD9 (0.992), SHRP5 (0.971), and EE11 (0.955) contributing most strongly to their respective constructs. These results validate the final measurement model's fitness for structural analysis and hypothesis testing.

To assess discriminant validity, the heterotrait-monotrait ratio (HTMT) was used. This approach is considered more robust and reliable than traditional Fornell-Larcker criteria for detecting discriminant validity issues in variance-

based structural models such as PLS-SEM (Sarstedt, Ringle, & Hair, 2021).As shown in Table 7, all HTMT values are below the conservative threshold of 0.90, with EE–SHRP at 0.928 approaching the upper limit. While this indicates acceptable discriminant validity, the high correlation between Employee Engagement and Sustainable HRM Practices suggests these constructs are closely related, yet still empirically distinct. The EE–DSD (0.814) and DSD–SHRP (0.802) values further support that all constructs are distinguishable from one another (Gomes et al., 2023).

Table 7. Heterotrait-Monotrait Ratio of Correlations (HTMT)

Constructs	DSD	EE	SHRP
DSD			
EE	0.814		
SHRP	0.802	0.928	

EE: Employee Engagement; DSD: Digital Skill Development; SHRP: Sustainable Human Resource Practices

The Fornell-Larcker criterion was used to further assess discriminant validity by comparing the square root of the Average Variance Extracted (AVE) for each construct with its correlations to other constructs. According to this criterion, a construct should share more variance with its indicators than with other latent constructs (Sarstedt, Ringle, & Hair, 2021).As presented in Table 8, the square roots of the AVEs—DSD (0.843), EE (0.861), and SHRP (0.838)—are all greater than the corresponding inter-construct correlations. For example, EE has a higher AVE square root (0.861) than its correlation with SHRP (0.289) or DSD (0.202). Likewise, DSD's AVE square root (0.843) exceeds its correlation with SHRP (0.188). These results confirm that each latent variable is empirically distinct, thus establishing discriminant validity according to the Fornell-Larcker criterion. While this test complements the HTMT results (Table 7), the HTMT ratio provides a more sensitive test, and both jointly reinforce the adequacy of discriminant validity in the model (Patel et al., 2023; Gomes et al., 2023).

Table 8. Latent Variable Correlations – Fornell-Larcker Criterion

Constructs	DSD	EE	SHRP
DSD	**0.843**		
EE	0.202	**0.861**	
SHRP	0.188	0.289	**0.838**

EE: Employee Engagement; DSD: Digital Skill Development; SHRP: Sustainable Human Resource Practices

Figure 4 illustrates the path model results with standardized path coefficients and p-values, providing insights into the hypothesized relationships among the constructs: Employee Engagement (EE), Digital Skill Development (DSD), and Sustainable Human Resource Practices (SHRP).

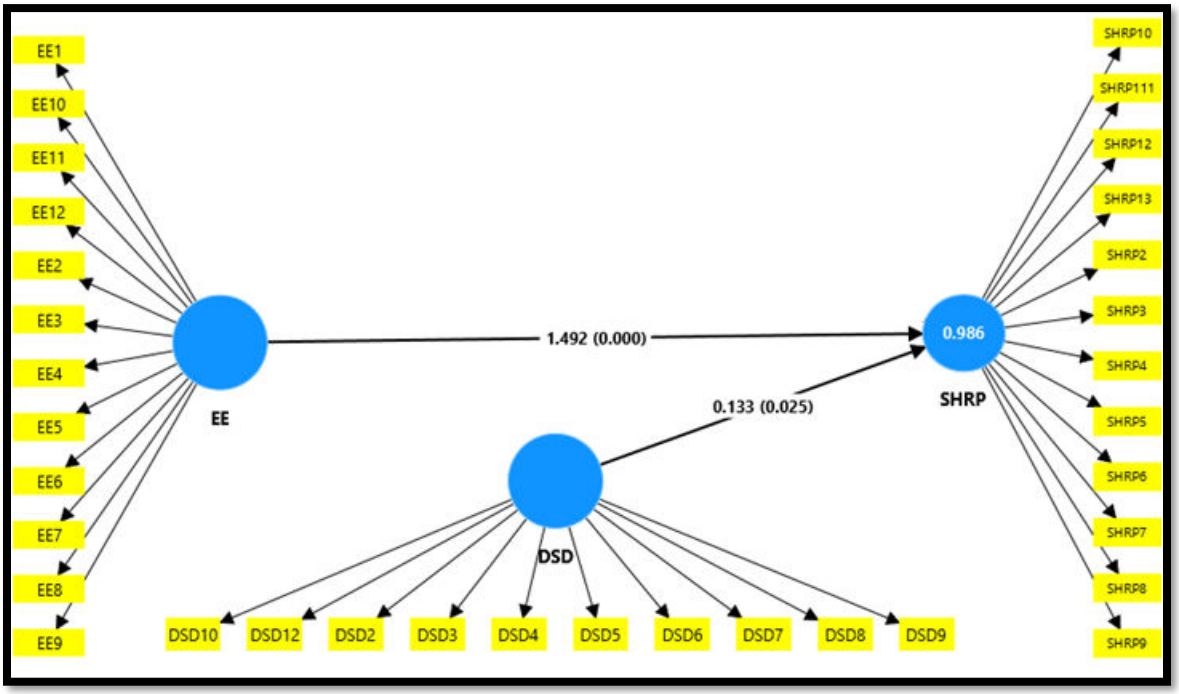

Figure 4: Path Model Significance Results

The path from EE to SHRP is statistically significant, with a standardized coefficient of 1.492 and a p-value of 0.000, indicating a strong and direct positive influence of employee engagement on the adoption of sustainable HR practices. This result supports the notion that engaged employees are more likely to champion sustainability-related initiatives and contribute to organizational green culture (Ababneh, 2021; Gomes et al., 2023).In contrast, the indirect path from DSD to SHRP yields a smaller but statistically significant coefficient of 0.133 (p = 0.025). This supports the mediating role of digital skill development, suggesting that while digital competencies alone may not exert a dominant influence, they facilitate the effectiveness of employee engagement in advancing sustainability (Koehorst et al., 2021; Zervas & Stiakakis, 2024). The magnitude and significance of both paths confirm the theoretical model grounded in the Resource-Based View and digital transformation literature (Bondarouk & Brewster, 2016; Sarstedt et al., 2021).Overall, these results validate both direct and mediated hypotheses, reinforcing that employee

engagement and digital readiness together play a complementary role in driving sustainable HRM outcomes.

The coefficient of determination (R^2) values in Table 9 assess the amount of variance in the endogenous constructs—Digital Skill Development (DSD) and Sustainable Human Resource Practices (SHRP)—explained by the exogenous variable, Employee Engagement (EE). The results reveal exceptionally high explanatory power for both constructs.

Table 9. Coefficient of Determination (R^2)

Endogenous Construct	R^2	Adjusted R^2
Digital Skill Development (DSD)	0.929	0.929
Sustainable HRM Practices (SHRP)	0.985	0.985

Specifically, the R^2 value for DSD is 0.929, meaning that 92.9% of the variance in digital skill development is explained by employee engagement. Similarly, SHRP has an R^2 of 0.985, indicating that 98.5% of the variance in sustainable HRM practices is jointly explained by employee engagement and digital skill development. These values far exceed the commonly accepted benchmarks for strong explanatory power in behavioral research (i.e., 0.75 for substantial, 0.50 for moderate, and 0.25 for weak) (Sarstedt, Ringle, & Hair, 2021).These findings underscore the centrality of employee engagement in driving both digital capability and sustainability-oriented HR practices. They also support the study's conceptual model, affirming that digital skills serve as a significant mediating mechanism in this relationship (Gomes et al., 2023; Zervas & Stiakakis, 2024).

The effect size (f^2) determines the magnitude of influence that one latent variable exerts on another within the structural model. According to Cohen's (1988) guidelines, f^2 values of 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively. As shown in Table 10, the path from Employee Engagement (EE) to SHRP exhibits an extremely large effect size ($f^2 = 4.878$). This highlights the dominant role of employee engagement in driving sustainable human resource practices, far exceeding the threshold for large effects. It reinforces previous findings that engagement is a key enabler of environmental behavior and green HRM implementation (Ababneh, 2021; Gomes et al., 2023).

Table 10. Effect Size (f^2) Analysis

Path	f^2

DSD → SHRP	0.030
EE → DSD	0.233
EE → SHRP	4.878

The path from EE to DSD shows a moderate-to-large effect size (f^2 = 0.233), indicating that engagement significantly contributes to employees' acquisition of digital skills. This is consistent with the idea that engaged employees are more motivated to embrace learning and digital transformation (Koehorst et al., 2021).In contrast, the DSD to SHRP path yields a small effect size (f^2 = 0.030). While statistically significant, this suggests that digital skill development plays more of a supporting or mediating role rather than being a primary driver of SHRP outcomes (Zervas & Stiakakis, 2024).

Figure 5 presents the mediation model, illustrating the structural paths among Employee Engagement (EE), Digital Skill Development (DSD), and Sustainable Human Resource Practices (SHRP). The path coefficients and p-values (in parentheses) indicate the significance and strength of direct and indirect effects, which together confirm the partial mediation structure hypothesized in this study.The direct path from EE to SHRP is strong and highly significant (β = 1.698, p = 0.000), indicating that employee engagement directly enhances sustainable HRM practices. This finding reinforces prior literature which asserts that engaged employees are more aligned with sustainability values and more likely to promote environmental and ethical behaviors at work (Ababneh, 2021; Gomes et al., 2023).

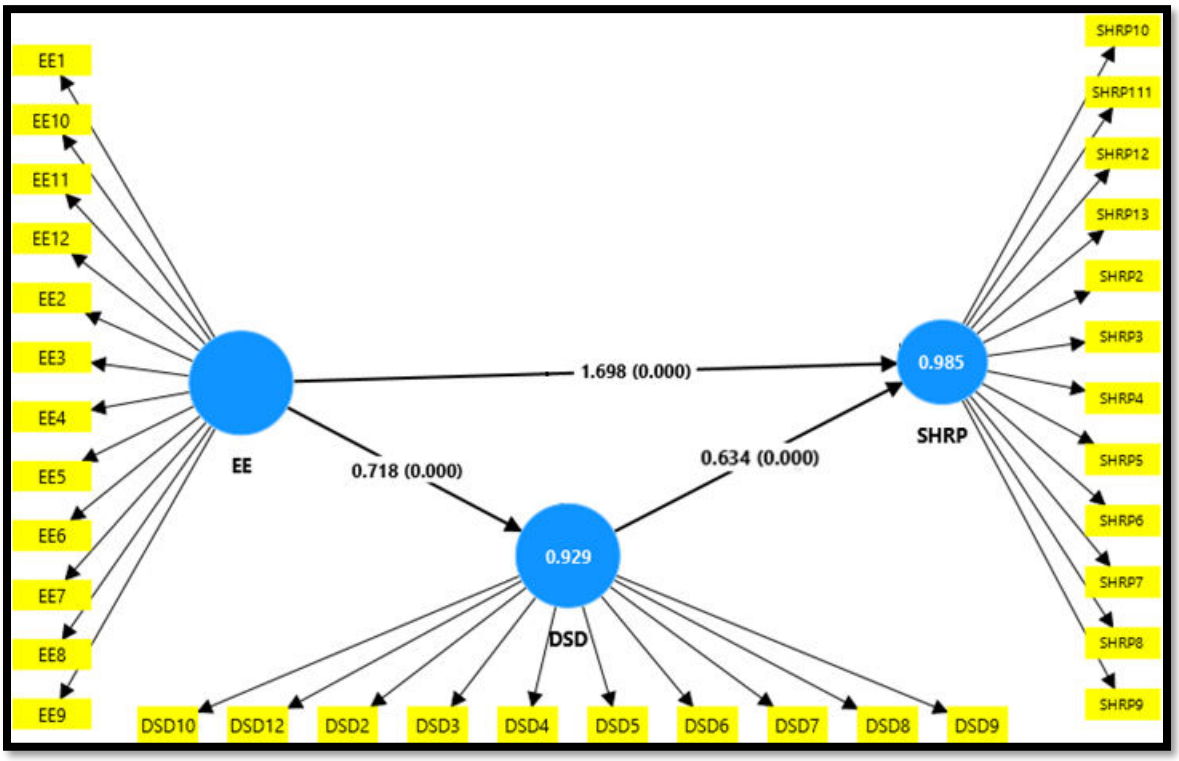

Figure 5: Path Model Results of Mediation

Simultaneously, the path from EE to DSD (β = 0.718, p = 0.000) and from DSD to SHRP (β = 0.634, p = 0.000) are also significant, confirming that digital skill development serves as a significant mediator. These results suggest that while employee engagement has a direct influence on SHRP, it also exerts an indirect influence through enhancing employees' digital competencies, which in turn enable or support the execution of sustainable HRM practices (Koehorst et al., 2021; Zervas & Stiakakis, 2024).This partial mediation supports the integrated conceptual model, grounded in the Resource-Based View, by demonstrating that engaged employees not only drive sustainability directly but also amplify SHRP outcomes when equipped with digital skills (Bondarouk & Brewster, 2016). The inclusion of DSD as a mediator provides a more nuanced understanding of how engagement translates into actionable, sustainability-oriented HR strategies.

As shown in Table 11, the indirect effect of Employee Engagement (EE) on Sustainable HRM Practices (SHRP) through Digital Skill Development (DSD) is statistically significant (β = 0.158, t = 2.724, p = 0.003). The T-value exceeds the critical threshold of 1.96, and the p-value is well below 0.05, confirming that the mediation effect is significant at the 95% confidence level. This supports Hypothesis H7, indicating that digital skills partially mediate the relationship between employee engagement and sustainable HRM. It suggests

that while EE has a direct effect on SHRP (as confirmed earlier), part of its impact is channeled through the enhancement of digital capabilities. This finding aligns with prior literature asserting that digital literacy enables employees to apply their engagement in more strategic, sustainability-driven ways (Zervas & Stiakakis, 2024; Bondarouk & Brewster, 2016).

Table 11. Indirect Hypothesis Testing

Hypothesis	Beta	Sample Mean (M)	SD	T Statistics	P Values	Decision
H7: EE → DSD → SHRP	0.158	2.724	0.058	2.724	0.003	Accepted

The confirmed mediation provides deeper theoretical insight and practical implications, showing that building digital competencies strengthens the pathway from engagement to sustainable HR outcomes.

5. Discussion

This study provides critical insights into the intersection between employee engagement, digital skill development, and sustainable human resource practices (SHRP) within Saudi medium-sized enterprises (SMEs), contextualized by the transformative ambitions of Vision 2030. The results affirm that employee engagement is not merely a human capital metric, but a strategic lever that profoundly influences the implementation and success of sustainable HRM practices. The strong and statistically significant path coefficient from employee engagement to SHRP ($\beta = 1.698$, $p < 0.001$) highlights the centrality of engagement in mobilizing employees toward green behaviors, ethical labor practices, and long-term organizational sustainability (Ababneh, 2021; Saks, 2022).These findings are in line with the growing body of literature that positions employee engagement as a foundational driver of sustainability. When employees are emotionally and cognitively invested in their organizations, they are more likely to align their actions with sustainability goals, demonstrating proactive participation in green initiatives and socially responsible HRM processes (Ali Ababneh et al., 2021; Gomes et al., 2023). In the context of Saudi Arabia's SME sector—often characterized by limited resources and slower digital transformation—the influence of engagement becomes even more crucial as a non-technological enabler of SHRM.

Furthermore, this study underscores the significant mediating role of digital skill development in the relationship between employee engagement and SHRP. The partial mediation observed ($\beta = 0.158$, $p = 0.003$) suggests that digital

competencies serve as a pathway through which engagement is transformed into sustainable action. This aligns with research by Koehorst et al. (2021) and Zervas and Stiakakis (2024), who argue that digital literacy enables employees to translate their enthusiasm and commitment into innovation, agility, and eco-conscious behavior. The findings imply that engaged employees, when equipped with relevant digital skills, are better positioned to implement and sustain green HR practices, such as digital recruitment, paperless systems, virtual training, and data-driven performance evaluations (Alshuaibi et al., 2024).Despite the significance of this mediating effect, the relatively small effect size of DSD → SHRP ($f^2 = 0.030$) indicates that digital skills alone are not the primary catalyst for sustainability. Instead, they enhance and support a pre-existing foundation of employee engagement. This resonates with the conceptualization of digital readiness as a complementary resource, rather than a standalone solution, in achieving HR sustainability (Bondarouk & Brewster, 2016; Zhang & Chen, 2024). SMEs, therefore, should not treat digital training as a substitute for engagement initiatives, but rather as a strategic supplement that amplifies the impact of an engaged workforce.

The study also contributes to the theoretical integration of the Resource-Based View (RBV) and digital transformation frameworks. From an RBV perspective, employee engagement and digital competencies represent intangible assets that are rare, inimitable, and strategically valuable (Ehnert, 2011; Gomes et al., 2023). Their integration into HRM strategy enables firms to achieve sustainable competitive advantage. In the Saudi context, where Vision 2030 calls for an empowered private sector, enhanced digital infrastructure, and green economic growth, the ability to harness engaged and digitally capable employees is not just beneficial—it is essential (Vision 2030, n.d.).Importantly, the cultural context of Saudi Arabia also influences the interpretation of these findings. Prior research (Alshehri & McLauglin, 2021) suggests that interpersonal connections, trust in leadership, and recognition are key drivers of engagement in Saudi organizations. These factors, combined with ongoing digital transformation, shape how SHRM practices are designed and implemented. Thus, local SMEs must balance technological adoption with human-centered leadership to sustain engagement and support innovation.

The findings of this study offer significant practical implications for HR leaders, policymakers, and managers within Saudi medium-sized enterprises (SMEs), especially as they align with the strategic goals of Vision 2030. First and foremost, the study confirms that employee engagement is a critical enabler of sustainable HRM practices. As such, HR managers should prioritize policies that foster employee recognition, meaningful work, development opportunities,

and strong supervisor-employee relationships—factors that are often undervalued in smaller organizational contexts (Saks, 2022; Alshehri & Mc Lauglin, 2021).Second, the significant mediating role of digital skill development suggests that training programs must go beyond general IT literacy and focus on job-specific digital competencies that empower employees to support sustainable HR processes. These may include digital tools for recruitment, performance management, virtual collaboration, and data-driven decision-making (Zervas & Stiakakis, 2024). SMEs should consider forming partnerships with educational institutions or government initiatives aimed at digital transformation to bridge skill gaps efficiently and cost-effectively (Vision 2030, n.d.).

Furthermore, the integration of employee engagement with digital strategies calls for a more holistic approach to HR transformation. Rather than treating digitalization and engagement as separate domains, SMEs should create environments where digital tools enhance engagement—for instance, using feedback platforms, recognition apps, and e-learning systems that personalize development paths (Gomes et al., 2023; Bondarouk & Brewster, 2016).From a policy standpoint, institutions supporting SMEs in Saudi Arabia could provide targeted incentives or frameworks to encourage the dual development of employee engagement culture and digital readiness. These might include tax credits for employee development programs, certification for green HRM practices, or funding for digital HR infrastructure. Supporting such integrated initiatives would further the Kingdom's aim to develop a diversified, knowledge-based, and sustainable economy. In essence, this study advises that sustainability in HRM is not just a technological challenge—it is a human one. Only by investing in both the emotional engagement and digital competencies of their workforce can SMEs in Saudi Arabia hope to meet the evolving demands of economic, environmental, and social sustainability.

6. **7. Conclusion**

This study examined how employee engagement influences sustainable human resource practices (SHRP) in Saudi medium-sized enterprises (SMEs), with digital skill development (DSD) serving as a mediating factor. The findings demonstrated that employee engagement plays a critical role in driving sustainability within HRM, both directly and through the enhancement of employees' digital capabilities. When employees feel valued, recognized, and involved in meaningful work, they are more likely to support green initiatives and ethical HR practices. At the same time, equipping these engaged employees with relevant digital skills enhances their ability to contribute to innovation

and sustainability in HR processes. This research offers a unified framework that connects human-centered engagement with digital readiness and sustainability. It emphasizes the importance of fostering an engaged workforce while also investing in digital upskilling, particularly in SMEs that face resource constraints. The model developed here highlights the complementary relationship between emotional commitment and technological competence in building sustainable HR systems. Nonetheless, the study has limitations. It relies on cross-sectional data and self-reported measures, which may affect the interpretation of cause-and-effect relationships. Future research should consider longitudinal studies to observe how employee engagement and digital skill development evolve over time. Exploring moderating factors such as leadership style, organizational culture, or industry type could also provide richer insights. Expanding the research to include larger firms, government institutions, or other regions would allow for broader generalization. Additionally, qualitative approaches could offer deeper insights into how employees experience and perceive engagement and digital transformation in their day-to-day roles.

References

1. *Ababneh, O. M. A. (2021). How do green HRM practices affect employees' green behaviors? The role of employee engagement and personality attributes. Journal of Environmental Planning and Management, 64(7), 1204-1226.*
2. *Agaoglu, F. O., Bas, M., Tarsuslu, S., Ekinci, L. O., & Agaoglu, N. B. (2025). The mediating digital literacy and the moderating role of academic support in the relationship between artificial intelligence usage and creative thinking in nursing students. BMC nursing, 24(1), 484.*
3. *Ali Ababneh, O. M., Awwad, A. S., & Abu-Haija, A. (2021). The association between green human resources practices and employee engagement with environmental initiatives in hotels: The moderation effect of perceived transformational leadership. Journal of Human Resources in Hospitality & Tourism, 20(3), 390-416.*
4. *Almotawa, A., & Shaari, R. B. (2020). Validation of employee engagement framework. In Advances in Human Factors, Business Management and Leadership: Proceedings of the AHFE 2019 International Conference on Human Factors, Business Management and Society, and the AHFE International Conference on Human Factors in Management and Leadership, July 24-28, 2019, Washington DC, USA 10 (pp. 435-447). Springer International Publishing.*
5. *Aloqaily, A. N., & Al-Zaqeba, M. A. A. (2024, April). The Impact of Green Human Resource Management Practices on Engagement of Employee and Organizational Creativity Towards the Green Environment. In International Conference on Business and Technology (pp. 265-276). Cham: Springer Nature Switzerland.*
6. *Alshehri, M., & McLauglin, P. (2021). Framework to create employee engagement culture in Saudi banks. International Journal of Business and Management Research, 9(3), 274-286.*
7. *Alshuaibi, M. S. I., Alhebri, A., Khan, S. N., & Sheikh, A. A. (2024). Big data analytics, GHRM practices, and green digital learning paving the way towards green innovation and sustainable firm performance. Journal of Open Innovation: Technology, Market, and Complexity, 10(4), 100396.*
8. *Altassan, M. (2024). The moderating mediating model of green climate and green innovation's effect on environmental performance. Uncertain Supply Chain Management, 12(1), 345-358.*

9. *Aslam, M., Shafi, I., Ahmed, J., de Marin, M. S. G., Flores, E. S., Gutiérrez, M. A. R., & Ashraf, I. (2023). Impact of innovation-oriented human resource on small and medium enterprises' performance. Sustainability, 15(7), 6273.*
10. *Bondarouk, T., & Brewster, C. (2016). Conceptualising the future of HRM and technology research. The International Journal of Human Resource Management, 27(21), 2652-2671.*
11. *Ehnert, I. (2011). Sustainability and HRM: A model and suggestions for future research. In The future of employment relations: New paradigms, new approaches (pp. 215-237). London: Palgrave Macmillan UK.*
12. *Faraj, S., Pachidi, S., & Sayegh, K. (2018). Working and organizing in the age of the learning algorithm. Information and Organization, 28(1), 62–70.*
13. *Gomes, J. F., Sabino, A., & Antunes, V. (2023). The effect of green human resources management practices on employees' affective commitment and work engagement: The moderating role of employees' biospheric value. Sustainability, 15(3), 2190.*
14. *Graham, S., Cadden, T., & Treacy, R. (2023). Examining the influence of employee engagement in supporting the implementation of green supply chain management practices: A green human resource management perspective. Business Strategy and the Environment, 32(7), 4750-4766.*
15. *Gupta, A., & Jangra, S. (2024). Green human resource management and work engagement: Linking HRM performance attributions. Sustainable Futures, 7, 100174.*
16. *Hosseini, S. A., Moghaddam, A., Damganian, H., & Shafiei Nikabadi, M. (2022). The effect of perceived corporate social responsibility and sustainable human resources on employee engagement with the moderating role of the employer brand. Employee Responsibilities and Rights Journal, 1-21.*
17. *Koehorst, M. M., van Deursen, A. J., Van Dijk, J. A., & De Haan, J. (2021). A systematic literature review of organizational factors influencing 21st-century skills. Sage Open, 11(4), 21582440211067251.*
18. *Patel, T. A., Summers, B. J., Wilver, N. L., & Cougle, J. R. (2023). Reliability and validity of the self-report version of the Yale-Brown Obsessive-Compulsive Scale modified for body dysmorphic disorder. Assessment, 30(6), 1935-1946.*
19. *Pellegrini, C., Rizzi, F., & Frey, M. (2018). The role of sustainable human resource practices in influencing employee behavior for corporate sustainability. Business Strategy and the Environment, 27(8), 1221-1232.*

20. *Saks, A. M. (2022). Caring human resources management and employee engagement. Human resource management review, 32(3), 100835.*
21. *Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In Handbook of market research (pp. 587-632). Cham: Springer International Publishing.*
22. *Soomro, R. B., Memon, S. G., Dahri, N. A., Al-Rahmi, W. M., Aldriwish, K., A. Salameh, A., ... & Saleem, A. (2024). The adoption of digital technologies by small and medium-sized enterprises for sustainability and value creation in Pakistan: The application of a two-staged hybrid SEM-ANN approach. Sustainability, 16(17), 7351.*
23. *Sypniewska, B., Baran, M., & Kłos, M. (2023). Work engagement and employee satisfaction in the practice of sustainable human resource management–based on the study of Polish employees. International Entrepreneurship and Management Journal, 19(3), 1069-1100.*
24. *Xu, F. Z., Zhang, Y., Yang, H., & Wu, B. T. (2020). Sustainable HRM through improving the measurement of employee work engagement: third-person rating method. Sustainability, 12(17), 7100.*
25. *Zervas, I., & Stiakakis, E. (2024). Economic Sustainable Development through Digital Skills Acquisition: The Role of Human Resource Leadership. Sustainability, 16(17), 7664.*
26. *Zhang, J., & Chen, Z. (2024). Exploring human resource management digital transformation in the digital age. Journal of the Knowledge Economy, 15(1), 1482-1498.*