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Leveraging Digital HRM for Sustainable Workforce Transformation: The Role of Green Employee Engagement in Achieving ESG Goals

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Abstract. The shift to having sustainable and responsible business practices has made Human Resource Management (HRM) one of the strategic functions in realizing Environmental, Social and Governance (ESG) objectives. Digital Human Resource Management (Digital HRM) has become a revolutionary facilitator of workforce practices based on sustainability in this respect. This paper is an empirical investigation of how Digital HRM influences Sustainable Workforce Transformation and how Green Employee Engagement mediates this connection. The research design was quantitative as it used data gathered on 384 HR professions and sustainability-oriented managers in the medium and large organizations. The analysis of data was carried out through Partial Least Squares Structural Equation Modeling (PLS-SEM), which was implemented using SmartPLS 4.0. The results confirm that Digital HRM affects both Green Employee Engagement and Sustainable Workforce Transformation in a positive manner, and engagement is an important partial mediator. These outcomes illustrate the strategic importance of combining digital human resources and green engagement programs in order to speed up ESG-related workforce achievement. The research adds to the literature on sustainable HRM and digitalization, as well as offers managerial suggestions on how HR strategies can be designed to promote the sustainability through employee contribution in digitalized workplaces.

Keywords: Digital Human Resource Management; Green Employee Engagement; Sustainable Workforce Transformation; ESG Goals; Sustainable HRM; Digital Transformation.

1. Introduction

In the modern business world, the ability to match the Environmental, Social, and Governance (ESG) standards has emerged as one of the main triggers of the change in the internal people practices. Companies are increasingly regarding sustainability as not just a business approach and a regulatory necessity, but both a cultural and labor market mandate that must be incorporated across all business areas including the Human Resource Management (HRM) (Mushtaq and Akhtar 2024). Digital Human Resource Management (Digital HRM) the application of digital tools and platforms to manage HR functions has fundamentally altered how organizations recruit, develop, engage and support their workforce in an attempt to work towards performance and sustainability goals (Mahmoud et al. 2025);(Ibrahim and Eitah 2025a). Digital HRM allows data-driven HR decisions and increases the agility of HR, transparency, and inclusiveness through the use of digital systems like AI-driven talent platforms, cloud-based HR analytics, and employee self-service applications (Ahmad Ali Atieh Alia, Abdel-Aziz Ahmad Sharabatia, Daher Raddad Alqurashib et al. 2024). However, despite its strategic potential, the contribution of Digital HRM to the progress of sustainable workforce practices that can contribute to ESG objectives is not studied in modern literature.

One of the key issues of fulfilling ESG agendas is Sustainable Workforce Transformation, which can be understood as a process in an organization that develops an environmentally responsible, socially supported, and ethically aligned workforce, which is able to increase sustainable development agendas (Abu-AlSondos et al. 2024);(Ibrahim and Eitah 2025b). Such transformation goes beyond the green policies to institutionalize the sustainability factor in the values of employees, their skills and behaviors. Although most organizations publicly declare their dedication to social and environmental sustainability, they still face difficulties in converting the promises into work practice and outcomes. As a result, researchers highlight the fact that HRM must become an agent of sustainable change and connect organizational strategy and employee action (Abdallah Ali Mohammad Alrifae 2025);(Ibrahim and Eitah 2025b). Nevertheless, existing HR systems are often very disjointed or under-congruent with the sustainability models, which presents an important research gap at the intersection of HR digitization and ESG implementation. In this study, ESG is treated as a contextual framework that shapes organizational priorities and HR digitalization efforts, rather than as a directly measured construct.

One of the promising avenues of sustainable workforce transformation can be seen in Green Employee Engagement the degree to which employees should engage in and be committed to pro-environmental behaviors, initiatives, and values at the workplace. Green engagement is a strong measure of both psychological and behavioral congruity with organizational sustainability goals and purposes, and it is an important mediator between HR work and sustainable performance. It has been found that engaged employees have an increased chance of engaging in green practices and contributing to ESG, and those who do so are more likely to persuade their colleagues to do so (Ab Aziz, Alshdaifat, and Al Amosh 2025);(Farrukh Shahzad, Liu, and Zahid 2025). Digital HRM offers an enabling platform to develop such engagement, supporting green learning platforms, integrating sustainability into performance management platforms, and gamifying green behavior using digital recognition platforms (Adama et al. 2024);(Singh and Milan 2025).

Theoretically, this research will make a contribution to literature on three major aspects. First, it broadens the sustainable HRM theory to the normative sustainability concepts by empirically investigating digital HRM facilitation of operationalization of the ESG objectives at the workforce level. Second, the study has advanced the prior research since the outcome concept is no longer the general organizational or environmental performance but the Sustainable Workforce Transformation conceptualized as developing sustainability-oriented skills, values, and behaviors among employees (Al-Ajlouni, Nawafleh, and Alsari 2019). Third, in comparison to the existing literature, which views green employee engagement as the direct results of the HR practices, the present research puts green employee engagement in the central role as the mediating factor, which can be used to explain how digital HR capabilities can be converted into ESG-compatible workforce results. The combination of

the information on sustainable HRM and digital transformation literature helps the study to narrow the gaps in the existing theoretical perspectives and provide a more subtle explanation of human-based mechanisms underlying ESG implementation.

There is little research on the indirect impact of the Digital HRM on sustainable workforce transformation due to its role on green employee engagement, in spite of emerging evidence. The current research fills this gap by hypothesizing and evaluating a mediation model where employee engagement in green proposes an explanation of the relationship between Digital HRM and workforce transformation in accordance with ESG objectives. Through the evidence-based approach, this study is adding to the growing area of sustainable HRM and provides practical implications to the leaders who aim to operationalize ESG with digitally enhanced HR practices.

2. Literature Review and Hypotheses Development

Digital HRM implementation has altered traditional HR architecture to be dynamic and data intensive systems that can facilitate strategic organizational goals, among them, sustainability. Digital HRM is the incorporation of new and sophisticated technologies, like artificial intelligence, automation, and cloud-based platforms, into the HR processes, which will allow conducting recruitment, performance management, employee engagement, and learning and development processes more efficiently (Atieh 2025);(Alzubi 2025b);(Oluwafunmilayo Esan, Funmilayo Aribidesi Ajayi, and Olufunke Olawale 2024). According to research, Digital HRM does not only facilitate the administrative work, but it also enhances strategic HR activities, making them more deft, open, and responsive to organizational demands (Khan 2025);(Ibrahim and Eitah 2025a);(Oluwafunmilayo Esan et al. 2024). According to the recent research, digitized HR systems are the baseline of sustainability-focused HR practices, especially through the facilitation of real-time data analytics, remote collaboration, and the integration of indicators of environmental performance into talent and reward systems (Waqar et al. 2025);(Alzubi 2025a);(Nisar et al. 2021). However, little empirical study has been done on the immediate impact of Digital HRM on sustainable workforce performance thus expanding the necessity to examine its impact on this phenomenon in the framework of the ESG-related organizational change.

The fact that Sustainable Workforce Transformation is regarded as a separate dependent variable is theoretically justified since it covers the human capital processes, which precondition and enable sustainable organization functioning. Although previous studies often use the workforce-related sustainability results as a subset of the overall performance or culture-specific constructs, these approaches can be viewed as potentially harmful to the cause of revealing the centrality of the workforce as the driving force of the ESG implementation. By Sustainable Workforce Transformation refers to the ability of an organization to develop a workforce that assists in sustaining the environment, social welfare, and business resiliency. The cause of this transformation is the change in employee mindsets, change in behavior, and the introduction of the green competencies in job roles and organizational functions (Al-Ajlouni, Nawafleh, Alsari, et al. 2019; Lai, Feng, and Zhu 2023). It has also been noted that sustainable workforce results in minimized resource use, enhanced employee welfare, and the increased organizational legitimacy among stakeholders (Awad and Mahmoud 2024). Good HR systems are key to facilitating this change but it is the influx of digital technology that is making HR departments more and more capable of scaling, measuring, and supporting sustainability-oriented activities (Chatterjee and Chaudhuri 2022);(Ringle et al. 2020). Therefore, the hypothesis is that Digital HRM has a positive impact on sustainable change of the working force as it offers the technological framework and alignment of the strategy which ensures that the concept of sustainability is introduced into the routine HR activities(Girsang and Rahayu 2025). With this reason in mind the following hypothesis is developed. The current paper is based on the theoretical background of the Resource-Based View (RBV) of the firm that is complemented with the information supplied by the Ability-Motivation-Opportunity (AMO) model and the Social Exchange Theory. Digital HRM, as a strategic organizational capability, is seen through the prism of the RBV in a way that it enables the creation,

implementation, and maintenance of the valuable, rare, and inimitable human-capital resources. The organizations can develop workforce capabilities that support the long-term ESG-oriented transformation by incorporating the principles of sustainability into digital HR systems. The AMO theory also explains how Digital HRM supports the capabilities of the employees, through digital learning and skills development, motivation, through the performance management and rewards based on the sustainability goals and opportunities, through the participatory and digitally-enabled work practice. The Social Exchange Theory argues that when employees feel that organizations invest in sustainable and digital HR practices, they will reciprocate with high rates of interest and discretional pro-environment behavior. All these theoretical approaches provide a strong basis of the hypothesized relationships. In the lens of the resource-based view, the digital human resource management encourages sustainability at the level of workforce through contributing to the formation of human-capability resources that are adjusted to the environmental, social, and governance goals and become a regular routine within an organization.

H1: Digital HRM has a positive effect on sustainable workforce transformation.

One of the major ways in which Digital Human Resource Management can contribute to the sustainability outcomes is by increasing Green Employee Engagement. Green employee engagement refers to the mental and behavioral aspect of engagement of employees to environmentally friendly practices and sustainability initiatives (Albouti and Balaji 2025; Saini et al. 2025). The commitment of employees to organizational objectives associated with the environment, green activities, and encouraging others to embrace a sustainable approach are more likely to be achieved with engaged employees (Srivastava et al. 2022). Research shows that engaged employees are viewed as internal champions of sustainability, which makes them vital to sustainability implementation at the workforce level. Gamified platforms, virtual sustainability learning courses, and digital reward systems are among the tools offered by the Digital HRM that support green engagement through active participation and visibility of sustainability within the organization (Latif, Mahmood, and Ali 2020). With the help of these tools, the HR can spread the sustainability objectives, monitor green behaviors, and reinforce the efforts of employees, as a result, increasing the overall engagement and aligning HRM with the sustainability targets. Therefore, Digital HRM is expected to have a major impact on green employee engagement. Digital HRM combines the AMO theory and Social Exchange Theory to enhance the motivation and increase the chances of employees to engage in sustainability efforts, thus creating the higher levels of green employee engagement development.

H2: Digital HRM has a positive effect on green employee engagement.

In its turn, green employee engagement has been proven to have a considerable impact on sustainable working force change. When employees are psychologically engaged with the environmental sustainability, they tend to pursue green practices and eco-competencies and facilitate a sustainable cultural change in the workplace (Chanana and Singh 2024). The organization that incorporates the idea of sustainability into employee engagement plans not only achieves better eco-friendly results but also a more sustainable, socially more meaningful workforce that can continue to ensure an ESG performance in the long run (Shamshuddin et al. 2025). This literature is strong to the claim that green employee engagement serves as a major antecedent in transformation of the sustainable workforce and could be used to moderate the connection between Digital HRM and sustainability realization. In line with Social Exchange Theory, the employees who are engaged will return green values and behaviors as a reward to investments made by the organizations in keeping them at work hence transforming the workforce sustainably by working collectively. It is theorized, therefore, that:

H3: Green employee engagement has a positive effect on sustainable workforce transformation.

Given the relatedness of these variables, it is also hypothesized that the relationship between Digital HRM and sustainable workforce transformation happens through the mediation of green employee engagement. Digital HRM enables the creation of the structures and systems, which make the employees engaged in sustainability, and increase workforce change in accordance with the principles of ESG. The theories of strategic HRM and the resource-based view (RBV), which claim that the capability of the HR through the utilization of technology and the alignment of behavior among employees creates a unique competitive advantage, value, and hard to imitate, are relied on in this mediating effect (Khan et al. 2025). The main impact of Digital Human Resource Management on the organizational processes is through the use of digital systems, platforms, and practice based on data. However, these systems do not change the workforce directly excluding the cases when they shape the psychological condition and participate behaviors of employees. In the view of sustainable HRM, HR technologies only generate the value when employees have a conceptual awareness about the sustainability goals, when they are emotionally convinced of it, and when they practically put it into action in their everyday work behaviors(Al-Ajlouni et al. 2024).

This psychological and behavioral activator mechanism is fulfilling of green employee engagement. The HR practices enabled digitally, i.e. sustainability-based performance systems, online training environment, real time feedback, and gamified green programs, will first raise awareness, motivation, and engagement of employees in environmental programmers. This involvement then assists at the level of workforce change through instilling sustainability-focused behaviors, habits and personalities across the organization(Al-Fawaeer 2024). Green employee engagement is the behavioral expression of digitally empowered human-capital resources by merging the Resource-Based View and behavioral engagement approaches and, therefore, moderates the connection between Digital Human Resource Management and sustainable transformation of the workforce.

Therefore, green employee engagement is the nearest channel in which Digital HRM is transformed into Sustainable Workforce Transformation because it is directly related to the design of the HR system and collective transcription of the workforce. Based on this, the given final hypothesis is the following:

H4: H4: Green employee engagement mediates the relationship between Digital HRM and Sustainable Workforce Transformation by translating digitally enabled HR practices into sustained workforce-level sustainability behaviors.

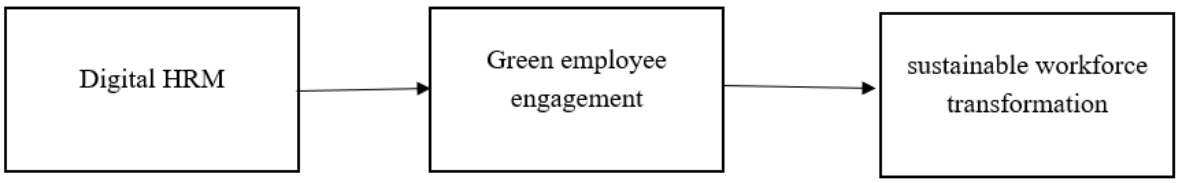

Fig.1: model of study

2.2 Conceptualizing Sustainable Workforce Transformation

Sustainable Workforce Transformation refers to a long-term, institutional process in which organizations nurture an environmentally responsible, socially inclusive, and ethically aligned work force based on the ESG principles. As opposed to isolated green practices or instantaneous behavioral results, sustainable workforce transformation involves lasting shifts in employee skills, values and

abilities and work patterns that have accumulative effects in favour of sustainability-focused organizational transformation.

This construct operates at the labor force level and believes in transformation in lieu of individual sustainability measures. It does manifest the internalization of sustainability within the financial professional identity, abilities, and daily decision-making of workers and, thus, allows organizations to ensure the continuous translation of ESG promises into operation reality. Based on this, Sustainable Workforce Transformation can be viewed as a dynamic response to human resource systems and engagement processes and not as a fixed measurement of sustainability performance or individual green behaviors(Al-Fawaeer 2024).

In spite of the fact that Sustainable Workforce Transformation is connected to various sustainability-related constructs, it is conceptually different. Green HRM outcomes typically deal with those HR practices and policies that are intended to advance the environmental goals, whereas Sustainable Workforce Transformation focuses on the outcome changes in the workforce capabilities and behaviors that are expected on the long run. The concept of employee green behavior represents individual-level and task-oriented pro-environmental behaviors, whilst Sustainable Workforce Transformation represents long-term change at an organizational level. On the same note, sustainable performance focuses on firm-level environmental or social performance, and Sustainable Workforce Transformation focuses on human-capital bases that make it possible. Lastly, organizational sustainability culture involves common values and norms, Sustainable Workforce Transformation involves the transformation of workforce performed and operationalized, which is a result of but not comprehensible to the alignment of cultures.

Table 1. Conceptual Distinction Between Sustainable Workforce Transformation and Related Constructs

Construct	Level of Analysis	Temporal Focus	Core Emphasis	Role in ESG Implementation
Green HRM Outcomes	HR system / practices	Short–medium term	Environmentally oriented HR policies	Input mechanism
Employee Green Behavior	Individual	Short term	Specific pro-environmental actions	Behavioral manifestation
Sustainability Culture	Organizational	Long term	Shared values and norms	Cultural context
Sustainable Performance	Organizational	Outcome-focused	Environmental & social results	Performance indicator
Sustainable Workforce Transformation	Workforce (collective)	Long-term, dynamic	Capabilities, skills, and behavioral change	Human capital foundation

3.Methodology

The research methodology used in this investigation is the quantitative research to determine the effect of Digital Human Resource Management (Digital HRM) on Sustainable Workforce Transformation and the Green Employee Engagement as a mediating variable. The purposive sampling strategy was utilized to ensure that the sample of the respondents had the relevant background knowledge on Digital Human Resource Management and ESG-related practices; however, the approach will limit the ability to

include variety in respect to organizations that are less digitally mature or engaged in sustainability practices. The research design will be cross-sectional and explanatory that will aim to measure the causal relationships between the constructs over a specific period of time. The information was collected via a structured online survey that was distributed to HR professionals, line managers, and sustainability officers in medium-to-large organizations which have implemented digital HR systems and are currently seeking to achieve ESG goals. Purposive sampling was employed in the selection of the respondents, which ensured that the respondents had the necessary expertise related to digital HR practices and sustainability initiatives to provide substantive responses. The total number of valid responses was 384, which is enough to support the minimum sample size requirement of structural models with medium effect sizes according to (Hair Jr et al. 2021). Multi-items scales that were adapted using the well-developed earlier studies were used to measure all constructs and ensure content validity. The adaptation process involved putting the original items in context in a way that will reflect on the Digital HRM practices and ESG-based sustainability in purposes without losing the original conceptual meaning. Revisions of minor words had been done to put the items in line with the context of the organization and the workforce of the study.

To provide more support to the content validity, three academic professionals in the field of HRM and sustainability and two older HR professionals with experience in digital HR systems were involved in their consideration as well. A pilot test was then conducted on thirty respondents to test the clarity of items, its relevance and consistency. Based on the pilot feedback, some minor improvements were made to improve words and contextual fit. Since the survey was done in English and that the respondents were professionals, translation and back-translation processes were not necessary.

Multi-item scales that have been developed and validated to be used in prior studies were used to operationalize the constructs so that there would be content validity. The scales were used to measure Digital HRM, which consisted of items that refer to the use of digital platforms and analytics in HR practices modified by (Clausen, Nielsen, and Mathiassen 2024). The evaluation of Green Employee Engagement was conducted through the items reflecting the participation and psychological desire of employees to sustainability practices according to the scales used by (Oluwafunmilayo Esan et al. 2024). The Sustainable Workforce Transformation was measured by items that indicate the organizational efforts to facilitate workforce-related eco-conscious behavior, skills and culture, based on (Siddiqi et al. 2025). All the items were measured using a five-point Likert scale, i.e. 1 = Strongly Disagree, and 5 = Strongly Agree.

In order to ensure construct reliability and validity, the measurement model was tested before the assessment of the structural relationships. With a view of establishing internal consistency, composite reliability (CR) and Cronbach alpha were computed, whereas convergent validity was tested through average variance extracted (AVE) (Alzubi 2025c). Both the Fornell Larcker criterion and the heterotrait monotrait (HTMT) ratio were used to test discriminant validity. Partial Least Squares Structural Equation Modelling (PLS -SEM) was then used to analyses the structural model with SmartPLS 4.0 due to its appropriateness in the complex mediation model and predictive research design. In order to establish the relevance of direct and indirect effects, bootstrapping based on 5,000 subsamples was adopted. Moreover, a mediation analysis was conducted to determine the significance of the relationship between Green Employee Engagement as an intermediary of the effects of Digital HRM on Sustainable Workforce Transformation. The research was conducted according to all the ethical principles of research, as it was voluntary and the answers were kept in secret, with informed consent.

Table 2. Measurement Scales and Sources

Construct	No. of Items	Sample Measurement Items	Original Sources	Adaptation Notes
Digital HRM	6	"Our organization uses digital platforms and analytics to support recruitment and talent management. "HR decisions in our organization are supported by real-time digital data and analytics."	Clausen et al. (2024); Khan (2025)	Items adapted to reflect AI-enabled HR platforms, HR analytics, and ESG-related HR digitalization
Green Employee Engagement	6	"Employees in my organization actively participate in environmental sustainability initiatives. " I feel personally committed to supporting environmental goals at work."	Esan et al. (2024); Khan et al. (2025)	Items adapted to emphasize engagement in ESG and pro-environmental initiatives
Sustainable Workforce Transformation	6	"Our workforce has developed sustainability-oriented skills and competencies." Sustainability values are increasingly embedded in employees' daily work practices."	Siddiqi et al. (2025); Lashari et al. (2022)	Items adapted to capture long-term workforce-level transformation aligned with ESG objectives

4.Results

The findings of the data analysis consist of the evaluation of the measurement and structural models to confirm the reliability, validity, and hypothesis testing outcomes. Measurement model was initially tested so as to check the internal consistency and construct validity of scales.

The results of the reliability and validity are found in Table 3. There was a high internal consistency in all constructs where the value of Cronbach alpha and composite reliability (CR) were well above the level of 0.70. The convergent validity was also established because the Average Variance Extracted (AVE) values of all constructs were over 0.50 in value, which means that the constructs accounted over 50% of the variance in indicators. These are values that portray high reliability and validity. Besides path coefficients and explained variance (R 2), the structural model was also investigated by using the effect sizes (f 2) and predictive relevance (Q 2) and the collinearity diagnostics, within the recommended standards of reporting Partial Least Squares Structural Equation Modeling (PLS-SEM). To determine the substantive effect of all exogenous constructs on the endogenous variables, effect sizes (f 2) were computed and 0.02, 0.15 and 0.35 values were considered small, medium, and large effects, respectively. Predictive relevance (Q 2) was measured through the procedure of blindfolding and a positive value means that the model has some predictive power. The issue of collinearity was tested using values of variance inflation factor (VIF), all of which were below the conservative value of 3.3 hence, showing that there is no issue of multicollinearity.

Table 3. Construct Reliability and Validity

Construct	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Digital HRM	0.861	0.903	0.699
Green Employee Engagement	0.877	0.915	0.732
Sustainable Workforce Transformation	0.853	0.901	0.694

All the constructs exceeded the suggested levels (Alpha and CR of at least 0.70; AVE of at least 0.50), which validated internal consistency and convergent validity.

The assessments of discriminant validity were then done through Fornell-Larcker criterion. As shown in Table 4, the square root of the AVE of each construct is greater than any other correlation with constructs, which means that the discriminant validity is sufficient.

Table4. Fornell-Larcker Criterion Analysis

Construct	Digital HRM	Green Employee Engagement	Sustainable Workforce Transformation
Digital HRM	0.836		
Green Employee Engagement	0.521	0.856	
Sustainable Workforce Transformation	0.487	0.612	0.833

The diagonal values that have been boldly displayed were the square root of the extracted average variance (AVE) per construct thus validating a discriminative validity.

After the measurement model had been confirmed, the structural model was tested, to test the direct and mediating effects. The path coefficients, t-values and p-values are shown in Table 5 that has been obtained through the bootstrapping process with 5,000 subsamples.

Table 5. Heterotrait–Monotrait (HTMT) Ratio

Constructs	**Digital HRM**	**Green Employee Engagement**	**Sustainable Workforce Transformation**
Digital HRM	—	0.612	0.587
Green Employee Engagement	0.612	—	0.724
Sustainable Workforce Transformation	0.587	0.724	—

All HTMT values are below the recommended threshold of 0.85, indicating satisfactory discriminant validity among the constructs.

Table 6. Hypotheses Testing (Direct Effects)

Hypothesis	Path	β (Coefficient)	t-value	p-value	Result
H1	Digital HRM → Sustainable Workforce Transformation	0.294	4.512	< 0.001	Supported
H2	Digital HRM → Green Employee Engagement	0.485	8.376	< 0.001	Supported
H3	Green Employee Engagement → Sustainable Workforce Transformation	0.452	7.212	< 0.001	Supported

All the direct hypotheses were proven ($p < 0.001$), which validated the positive effect of Digital HRM and Green Employee Engagement on Sustainable Workforce Transformation.

In order to test the mediation hypothesis (H4), a bootstrapping test was conducted to determine the indirect effect of Digital HRM on Sustainable Workforce Transformation through Green Employee Engagement. Table 7 results suggest that there is a significant indirect effect.

Table 7. Mediation Analysis

Mediation Path	Indirect Effect (β)	t-value	p-value	Mediation Type
Digital HRM → Green Employee Engagement → Sustainable Workforce Transformation	0.219	5.983	< 0.001	Partial Mediation

The relationship between Digital HRM and Sustainable Workforce Transformation partially relies on Green Employee Engagement ($p < 0.001$).

The predictive accuracy of the model is also further supported by the coefficient of determination (R 2) of the dependent variables. Digital HRM and Green Employee Engagement both contribute 56.7% to the variance in Sustainable Workforce Transformation, but Digital HRM, only, contributes 37.4% to the variance in Green Employee Engagement.

Table 8 Variance Explained (R^2 Values)

Construct	**R^2 Value**
Green Employee Engagement	0.374
Sustainable Workforce Transformation	0.567

The model demonstrates moderate to substantial explanatory power.

Table 9. Effect Size (f^2) of Structural Relationships

Structural Path	f^2 Value	Effect Size Interpretation
Digital HRM → Green Employee Engagement	0.308	Medium to large
Digital HRM → Sustainable Workforce Transformation	0.142	Small to medium
Green Employee Engagement → Sustainable Workforce Transformation	0.276	Medium

Table 10. Predictive Relevance (Q^2) Values

Endogenous Construct	***Q^2 Value***
Green Employee Engagement	*0.261*
Sustainable Workforce Transformation	*0.318*

Table 11. Collinearity Assessment (Inner VIF Values)

Predictor → Endogenous Construct	VIF Value
Digital HRM → Green Employee Engagement	1.742
Digital HRM → Sustainable Workforce Transformation	1.689
Green Employee Engagement → Sustainable Workforce Transformation	1.921

All in all, the structural model has adequate explanatory power, size of effects, reasonable predictive relevance, and lacks evidence of multicollinearity, thus confirming the strength of the estimated associations.

5.Discussion

The results of the present research significantly expand the existing knowledge about how Digital Human Resource Management (Digital HRM) can add to the working outcomes in accordance with ESG principles, particularly with the moderating effect of Green Employee Engagement. The findings are in line with all the hypothesized points that argue that Digital HRM has the direct and positive effect on both Green Employee Engagement and Sustainable Workforce Transformation. These findings indicate the growing contribution of HR technology to the corporate sustainability goals and indicate that the digitization of HR operations does not limit to the efficiency of its operational performance but serves as an instrument of strategic change enabling the organization to alter its environmental and social outcomes.

The initial major finding confirms that there is a positive impact of Digital HRM on Sustainable Workforce Transformation (H1). This finding suggests that digitized HR products, including cloud-based HR systems, AI-based talent management and real-time HR analytics can help organizations foster transparency, accountability, and flexibility in HR practices that sustainability efforts. These tools can help organizations to determine sustainability skills and behaviors needed in various positions, gather environmental performance data, and match employee development and recognition programmed with the ESG requirements. This also goes in line with the more current academic sources that underscore the role of incorporating the digital capability in the HRM in order to enhance long-term sustainable performance (Srivastava n.d.).

In line with H2, the research proves that Digital HRM significantly affects positively the Green Employee Engagement. It proves that digitalized HR operations can assist in the engagement of employees in environmental activities by assisting in operational real-time feedback, communications and incorporating sustainability duties in digital workflows. Besides, the HR departments can use platforms like intranet dashboards, gamified sustainability activities, and virtual learning environments to encourage and track employee engagement in green activities, which in turn enhances commitment by the employees to the sustainability objectives of the organization (Shamshuddin et al. 2025). It is a finding that highlights the behavioral and psychological basis of sustainability in the workplace, which supports the notion that technological innovation cannot work without an equal investment in human interaction.

The results give some theoretical implications to the sustainable HRM and digital transformation studies. Firstly, the findings support the assumption that Digital HRM should not be primarily perceived as an efficiency-enhancing tool, but a strategic sustainability potential that allows ESG to be implemented by flexing the workforce. Second, this study narrows down so far as sustainability studies carried out previously have focused on performance measures, mostly at a firm level, as a result of digital HR programs. Thirdly, mediating the role of green employee engagement is confirmed, which contributes to the advancement of the theory, as the behavioral mechanism between HR digitalization and sustainable personnel outcomes is employee engagement. This supports the resource-based perspective by depicting that digitally empowered HR systems only have the effect of creating value in relation to engaged human capital, and hence to the development of inimitable sustainability-focused capabilities.

The third significant finding supports the fact that Green Employee Engagement does play a significant role in Sustainable Workforce Transformation (H3). This finding can be compared with the increasing amount of evidence that employee engagement, enthusiasm, and dedication to environmental practices are critical towards attaining overall sustainability objectives (Khan et al. 2025). By making employees internalize and engage themselves in sustainability, the behaviors of the employees become consistent with organizational strategies, which makes it easier to move the organizational culture towards eco-consciousness.

Lastly, the mediation analysis (H4), shows that Green Employee Engagement in between Digital HRM and Sustainable Workforce Transformation partially mediates the relationship. It implies that although digital systems have a beneficial effect on the sustainability outcomes in their own right, their influence becomes significantly enhanced with the involvement of the employees in the sustainability-oriented practice. The results add to the current debate on strategic HRM by pointing out the two-sided nature of technology and human behavior in ensuring sustainability and substantiates the Resource-Based View (RBV) theory: the view that technology-facilitated human capabilities produce unique competitive advantages unfamiliar, of value, and difficult to imitate (Barney 1991).

6.Conclusion

6.1 Digital HRM and Green Workforce Revolution

The results prove that Digital HRM is a strategic tool that facilitates the process of Sustainable Workforce Transformation, which proves that HR digitalization is to be approached as an ability based on sustainability, but not as a tool that helps to improve efficiency. This finding enhances the theory of sustainable HRM since it shows how HR systems that are digitally enabled can help bring about long-term workforce transformation which encompasses the acquisition of sustainability-related skills, values, and work routines. In contrast to the earlier studies, which put more emphasis on the outcome of organizational or environmental performance, the workforce is discussed in the current study as the key locus where the ESG objectives are realized.

In the context of the digital transformation, the findings indicate that the technology does not produce sustainability unattended until it is incorporated into HR architectures that can influence the employee

behavior and competencies. This observation contributes to the field of literature because it establishes a connection between digital HR potentials and workforce-level sustainability transformation as opposed to acknowledging digitalization as an abstract organizational input.

6.2 The Green Employee Engagement as the Key Mechanism

One of the theoretical contributions of the work is finding the green employee engagement as the main way in which Digital HRM is converted into Sustainable Workforce Transformation. Instead of engagement being considered as an outcome or peripheral variable, the findings make it a vital behavioral pathway and enable the potential of digital HR systems.

This mediating position supports the perception that the sustainability-focused HR technologies have an indirect impact on the results by determining the psychological engagement and involvement behaviors of the employees. In theory, this fits well into the views of sustainable HRM that focus on the agency of the employees as well as the views of behavioral engagement theory that assumes that the enduring organizational change involves cognitive, emotional, and behavioral commitment of the employees. The empirical validation of this mediation pathway enables the study to expand the literature and to describe that workforce transformation becomes evident when the digital HR practices are internalized and implemented by the engaged employees, and not only under the influence of the imposed top-down systems.

6.3 Theory of Integration and Boundary Conditions

The results are also relevant to the combination of sustainable HRM and digital change theories since they prove their complementary character in the implementation of ESG. Based on resource-based perspective, Digital HRM is a technological ability, whereas green employee engagement is a human behavior resource. The combination of the two factors brings out a sustainability-oriented ability that is precious, hard to copy, as well as integrated in the organizational practices and rituals.

Simultaneously, the findings indicate significant limit conditions. The identified relationships will be best applicable in organizations that have reached the adequate stage of digital maturity and actively strive to meet the goals of ESG. The engagement-based mechanism can be less strong in the situations when Digital HRM systems are still in their developed phase or sustainability initiatives are based on symbols instead of practices. This emphasizes the contingency of the digital sustainability strategies and creates possibilities of further research in the future to focus on alternative mechanisms or contextual moderators in various organizational contexts. The limitations of the study are that it is cross-sectional, and thus, cannot be used to infer cause and effect, and it is also limited by the fact that it only deals with organizations that are already using Digital HRM systems thus making it difficult to generalize the results. Further studies are possible to use longitudinal design to investigate the long-term effects of Digital HRM on sustainability or address other mediating impacts like green organizational culture or digital literacy. The model could also be used in further studies to apply the model to other sectors like healthcare, education or hospitality to compare the results produced in different settings. This paper is limited to a number of factors. To start with, the use of purposive sampling though suitable when seeking informed views, might create biasness among the managers and limit the external validity of results. The sample is rather representative of the perspectives of the human-resources professionals and sustainability-oriented managers of the medium-to-large organizations who have already adopted the digital HRM systems. Therefore, the findings might not be directly relevant to small organizations or the ones that are still in the initial phases of digital transformation or the adoption of ESG. Future studies might take the approach of probability-based sampling or comparative-designs to determine the persistence of the proposed relationships when the study is conducted in different organizational settings, and degrees of digital maturity.

Overall, this paper gives reason to believe that in the digital age, sustainable workforce transformation can only be attained by incorporating not only sophisticated HR technologies but also effective and

proactive employee participation in the green activities. The merging of Digital HRM and green engagement is critical towards realizing scalable, resilient and humanistic sustainability transformation in modern organizations.

7. Limitations and Future Research Directions

Although it has made several contributions, this study is also limited in a number of ways that need to be mentioned. To begin with, the study is qualitative in nature and therefore does not allow drawing strong causal conclusions between Digital HRM, Green Employee Engagement, and Sustainable Workforce Transformation. Even though the hypothetical relationships are theory based, future research may use longitudinal research design to elicit dynamic changes in workforce transformation with time. Second, the research is based on the self-report survey data obtained on one respondent group, a research design that is prone to common-method bias and the social desirability effect. Although the study used procedural remedies in the meticulous questionnaire design, procedural studies can further increase validity by using multi-source data, including combining employee survey outcomes with archival HR data or the objective ESG data. Third, the research is placed in a particular context of an organization and a region as the data presented is based on the medium-to-large companies that have already introduced Digital HRM systems and are actively seeking ESG-related opportunities. The Digital HRM and sustainability practices can be practiced in ways that are affected by culture, institutional and regulatory considerations. As a result, the results might not be completely applicable to the organizations working in different cultural contexts and industries and in various levels of maturity in digital and sustainability.

The cross-country comparative and cross-industry comparative studies would help determine how well the given model would be applicable in various settings. Fourth, despite the conceptual differences in constructs, there could be possible measurement issues because of the similarity of the concepts associated with sustainability e.g. green HRM outcomes, employee green behavior, and sustainable workforce transformation. Additional studies might further develop measurement tools or adopt mixed methods as a method to better measure the differences between these constructs. Lastly, the issues related to endogeneity cannot be completely discounted either because the unobserved organizational conditions, which include leadership commitment, or strategic orientation, can also produce similar effects on Digital HRM adoption and sustainability results.

This limitation could be overcome in future researches, which may involve the use of control variables, experimental or quasi-experimental design, or instrumental variables. The fact that these limitations would enhance the causal inference would also contribute to the better comprehension of the mechanisms by which Digital HRM facilitates the transformation of workforce in the context of ESG orientation.

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