Enabling Green HRM Through Digital HR Transformation: Practical Insights and Future Strategies from UST University

Ryad Ali Gbr [1*]
Mohammed Fadhl Abdullah [1]

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[1] Faculty of engineering and computing, University of Science and Technology, Aden, Yemen.
*Corresponding Author's Email: Ryadaligbr@gmail.com, , m.albadwi@ust.edu

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Ryad Ali Gbr
Faculty of engineering and computing,
University of Science and Technology,
Aden, Yemen.,
Ryadaligbr@gmail.com

Mohammed Fadhl Abdullah
Faculty of engineering and computing,
University of Science and Technology,
Aden, Yemen.,
m.albadwi@ust.edu

Abstract — This study explores how digital transformation can enhance Green Human Resource Management (GHRM) at the University of Science and Technology (UST) in Yemen. Using a mixed-methods approach, the study assesses institutional readiness, employee awareness, and the challenges and opportunities associated with implementing GHRM. Interview results demonstrate this qualitative approach, along with an IT-based intervention that introduces a conceptual framework consisting of five key modules and implements one of these modules, a prototype Environmental Performance Module. Interview results revealed a 73% low employee awareness of the concept of Green Human Resource Management, along with other barriers such as limited funding and unclear policies. However, the study identifies key enabling factors, such as the adoption of digital HR processes, ongoing capacity-building efforts, and increased student engagement in sustainability initiatives. The study proposes a conceptual framework and strategic roadmap for integrating GHRM into the digital HR systems at UST. The study also highlights the promising future role of AI-based tools—such as smart recruitment systems, predictive analytics for workforce sustainability, and smart resource monitoring platforms—in supporting the integration of environmentally responsible human resource management. These findings underscore the potential of IT-based solutions to bridge the gap between policy and practice.

Keywords— Green Human Resources Management (GHRM), Sustainability, Smart HR Systems, Digital Transformation, Green Training.

I. Introduction

Green human resource management (GHRM) is responsible for integrating environmental sustainability into human resource policies and practices. This integration occurs in several aspects, such as green recruitment, environmentally friendly work policies, employee training on sustainability principles, environmentally friendly performance management systems, and environmentally friendly work policies. By integrating sustainability into human resource functions, organizations can foster and enhance a culture of environmental responsibility among employees and effectively contribute to achieving sustainability goals [1]. Recently, universities have increasingly sought to participate in global competition, especially following the rise in international university rankings. This competition among universities has shifted their focus from mere survival strategies to excellence, innovation, and creativity [2]. Therefore, achieving a long-term competitive advantage depends on meeting standards of quality, effectiveness, and innovation in terms of institutional flexibility and cost-effectiveness [3], [4]. Societies now expect higher education institutions to play a key and significant role in environmental conservation by graduating creative, adaptable, and highly competent human resources to manage their functions and achieve desired goals [5]. Therefore, employee behavior is considered essential and pivotal to improving environmental performance and reducing environmental degradation in higher education [6].
Currently, most universities around the world are increasingly adopting global human resource management (GHRM) practices in alignment with sustainable development goals and strategies. Many universities in developed countries have achieved remarkable success in implementing initiatives such as e-HR systems, employee engagement programs for achieving sustainability goals, and green performance standards for employees. Despite this, most universities in developing countries, such as Yemen, still face significant challenges preventing the adoption and implementation of global human resource management. Key challenges include limited resources, a lack of green policies, and a lack of employee awareness of sustainability principles.
The research gap is to determine the university's readiness to implement the concept of green human resource management, provide a conceptual framework for its implementation, and contribute to the implementation of one of the proposed framework components, the digital environmental performance assessment module. To fill these gaps, this study not only explores the readiness of higher education institutions but also seeks to provide a digital solution that applies information systems principles. By presenting a conceptual framework and a model interface for one of the proposed framework's modules, the Environmental Performance Assessment Module, this study seeks to highlight the prominent and significant role of technology in activating global human resource management (GHRM) practices within the context of higher education institutions.
The objectives of the study are to: (a) assess the awareness of University of Science and Technology employees of Global Human Resource Management (GHRM), (b) identify the institutional challenges hindering its adoption, (c) propose practical strategies, and (d) design a conceptual framework for implementing green human resource management and present a prototype of a digital Environmental Performance Assessment Module.

II. Literature Review

Global interest in Green Human Resource Management (GHRM) has grown in tandem with organizations' increasing efforts to embed sustainability principles within their HR policies and practices to gain competitive advantage. Recent studies, such as [7] and [8], highlight that GHRM encompasses several strategic

initiatives, notably green recruitment, sustainability-based performance management, and environmentally focused employee training programs, all aimed at aligning HR functions with environmental objectives.

Natalia's study [9] further underscores the crucial role of GHRM in cultivating a culture of sustainability within organizations. The research demonstrates a significant positive impact of green HR practices on both employee engagement and overall organizational performance. This finding validates the strategic value of GHRM beyond environmental benefits, linking it directly to enhanced organizational outcomes.

Despite this growing global emphasis, the adoption of GHRM in developing and resource-constrained countries remains fraught with challenges. Financial limitations, insufficient organizational awareness, and the lack of clearly articulated sustainability policies have been identified as critical barriers hindering implementation [10], [11]. Comparative analyses with global best practices reveal that effective GHRM adoption requires robust institutional frameworks, strong leadership commitment, and dedicated funding mechanisms [12], [13]. However, promising opportunities exist, including specialized training programs and digital transformation initiatives, which can mitigate some of these constraints.

In recent years, the integration of information systems into GHRM has emerged as a vital enabler for sustainable organizational transformation. As shown in [14], incorporating Human Resource Information Systems (HRIS) with green HR practices not only improves operational efficiency but also facilitates embedding sustainability principles into everyday HR processes. Similarly, [15] highlights how digital HR tools enhance employee environmental innovation by streamlining workflows and reducing resource consumption.

These insights are particularly relevant to higher education institutions, where limited resources and rigid administrative structures often impede the launch and scaling of environmental initiatives. Aligning digital systems with environmental performance metrics offers an effective pathway to overcome such limitations. Therefore, supporting GHRM through digital infrastructure has evolved from an optional enhancement to an urgent organizational necessity for achieving global sustainability standards and institutional excellence.

III. Methodology

1) Research Design

This study adopted a multi-method qualitative research design to assess the institutional readiness of the University of Science and Technology (UST) for adopting and implementing Green Human Resource Management (GHRM) practices. The qualitative approach was selected for its ability to provide rich, in-depth insights into stakeholders' perceptions, challenges, and opportunities related to GHRM implementation. Semi-structured interviews served as the primary data collection method, enabling guided yet flexible discussions to explore emerging themes effectively.

In addition, the study integrated an information systems design approach to develop a methodological framework consisting of five main modules. A prototype digital Eco-Performance Evaluation module was designed, including identification of system components and user interface development using standard information systems tools. This integration aimed to bridge theoretical insights with practical technological solutions.

2) Sampling and Data Collection

The purposive sampling technique was used to select participants relevant to the study's focus. The sample comprised 15 key stakeholders directly involved with or knowledgeable about the university's HR and sustainability initiatives, including human resource directors, department heads, faculty members, sustainability officers, and environmental stakeholders.

Interviews were designed around core themes aligned with the research objectives, such as participants' awareness of GHRM concepts, perceived institutional barriers to implementation, and potential strategies to promote sustainability-oriented HR practices.

3) Data Analysis

Data analysis followed a rigorous thematic analysis process. Interview transcripts were first transcribed verbatim and then subjected to open coding, where initial codes were inductively derived from the data without predefined categories. These codes captured meaningful units relevant to the research questions.

Subsequently, axial coding was employed to cluster related codes into broader categories, leading to the identification of four major themes: awareness of global human resource management, institutional challenges, opportunities for GHRM adoption, and benchmarking against global best practices.

To enhance the validity and reliability of the analysis, several measures were taken:

- **Member Checking:** Preliminary themes and interpretations were shared with selected participants to confirm the accuracy and relevance of the findings.
- **Peer Review:** A second researcher reviewed the coding process and theme development to minimize bias and ensure consistency.
- **Audit Trail:** A comprehensive record of coding decisions and thematic development was maintained to provide transparency and replicability.

The emergent themes were then interpreted through established theoretical lenses—including institutional theory, transformational leadership theory, and the resource-based view (RBV)—to frame the university's readiness for GHRM implementation within broader organizational and strategic contexts.

IV. Results:

The study revealed several critical insights regarding the University of Science and Technology's (UST) readiness to adopt Green Human Resource Management (GHRM) practices, as illustrated in Figures 1 and 2 and Table 1.

1) Awareness of GHRM

Figure 1 shows that awareness levels among participants were notably low. Specifically, 73% of respondents reported being

unaware of GHRM concepts, while only 27% demonstrated a clear understanding of the principles underlying green HR management. This low awareness indicates a significant knowledge gap that could hinder effective implementation of sustainability initiatives within the university's HR functions.

Interpretation:

The predominance of unawareness suggests an urgent need for awareness campaigns and capacity-building initiatives to sensitize stakeholders about GHRM's importance. Without a foundational understanding, attempts to integrate environmental practices into HR policies may face resistance or ineffective adoption.

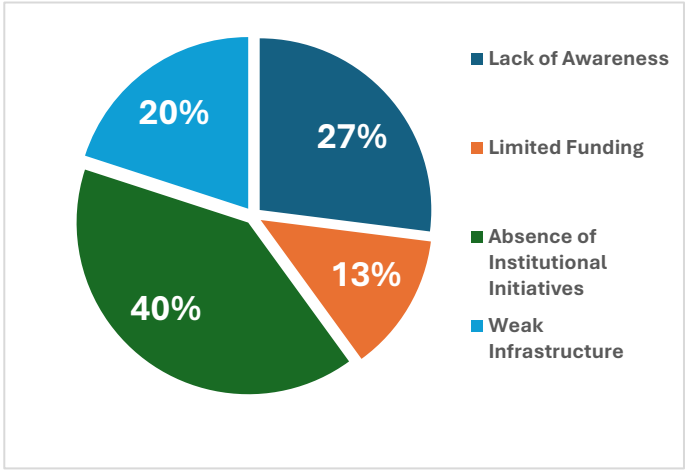
Figure 1: Awareness of GHRM among participants

2) Institutional Barriers

Figure 2 highlights key institutional obstacles perceived by participants. The most prominent barrier was the lack of sustainability initiatives within the organization (40%), followed by weak infrastructure (20%). Additional challenges included limited funding (13%) and insufficient awareness (27%).

Interpretation:

These barriers point to both structural and resource-based challenges within the university. The absence of established sustainability programs and weak supporting infrastructure suggest that institutional commitment and resource allocation



are currently inadequate. Furthermore, limited funding and awareness issues compound these difficulties, creating a multifaceted challenge that requires comprehensive strategic planning.

Figure 2: Institutional Barriers

3) Comparative Analysis of Practices

Table 1 compares UST's current HR practices with global best practices in GHRM. The gaps identified are critical:

Table1: comparing gaps between global best practices and UST practices

Practice	Global Best Practices	UST Current Status
Sustainable Recruitment	Green skills embedded in job descriptions	No environmental criteria in hiring
Green Training	Mandatory sustainability workshops	Limited or no training programs
Paperless HR Systems	Fully digital HR operations	Partial implementation
Sustainability KPIs	Environmental metrics included in appraisals	No clear sustainability indicators
Employee Engagement	Active participation in green programs	Low engagement levels

Interpretation:

The comparison underscores significant shortcomings in the university's approach to integrating environmental sustainability into HR. The absence of environmental criteria in recruitment processes and the lack of mandatory green training reveal foundational weaknesses. Moreover, the partial digitalization of HR systems limits operational efficiency, and the lack of sustainability-focused performance indicators reduces accountability and motivation among employees. Low engagement further weakens institutional commitment to green initiatives.

4) Digital Module Development

Building on these findings, a tailored digital module was proposed to address performance gaps through a user-centered, data-driven solution

5) System Architecture and Technical Prototype:

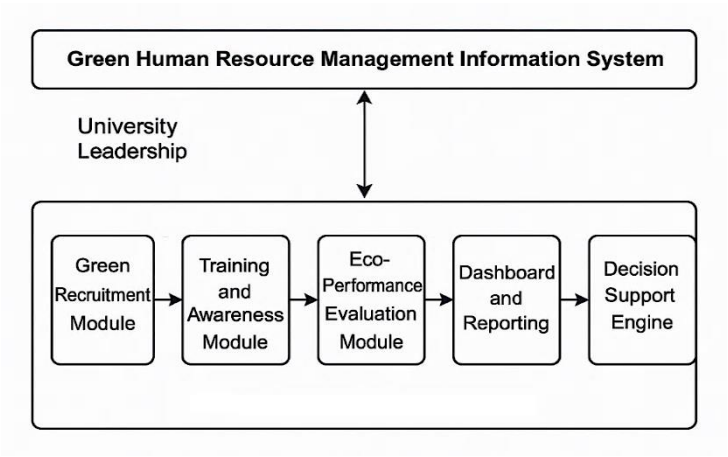


Figure3: System Architecture for GHRM Implementation

Figure 3 illustrates the proposed system architecture for GHRM implementation at higher education institutions. The architecture is modular, encompassing five interconnected components:

1. **Green Recruitment Module:** Integrates environmental criteria into job descriptions and recruitment processes, facilitating energy conservation training.
2. **Training and Awareness Module:** Delivers and tracks participation in sustainability training programs.
3. **Eco-Performance Evaluation Module:** Monitors employees' environmental performance through green KPIs.
4. **Dashboard and Reporting Module:** Provides real-time analytics for policy monitoring, compliance tracking, and sustainability reporting.
5. **Decision Support Engine:** Analyzes system data to generate evidence-based recommendations for management decisions, including policy adjustments and training needs.

Interpretation:

This comprehensive architecture not only supports HR operational functions but also empowers strategic decision-making through integrated environmental performance data. The seamless interaction between modules enhances data accuracy and facilitates organizational alignment with sustainability goals.

6) Technical Contribution

This study presents a hybrid contribution by combining managerial insights with a technical framework aligned with information systems research. The proposed GHRM information system architecture offers a practical, scalable solution for universities in developing countries aiming to digitalize and green their HR operations simultaneously. This integration reflects the interdisciplinary nature of sustainability, HR management, and digital innovation.

7) Prototype of the Eco-Performance Evaluation Module

Figure 4 displays the prototype user interface for the Eco-Performance Evaluation Module, designed for simplicity and usability:

- **Employee Information Section:** For evaluator input of employee identification and evaluation period.
- **Green Performance Criteria:** Ratings for energy efficiency, waste reduction, and sustainable practices, standardized on a 1–3 scale.
- **Submission Control**: Enables evaluators to submit and store assessments.

Interpretation:

This prototype exemplifies how information systems can operationalize sustainability within HR by enabling objective, consistent evaluation of employee contributions to environmental goals. It provides a foundation for automating green HR assessments, promoting transparency, and fostering continuous improvement.

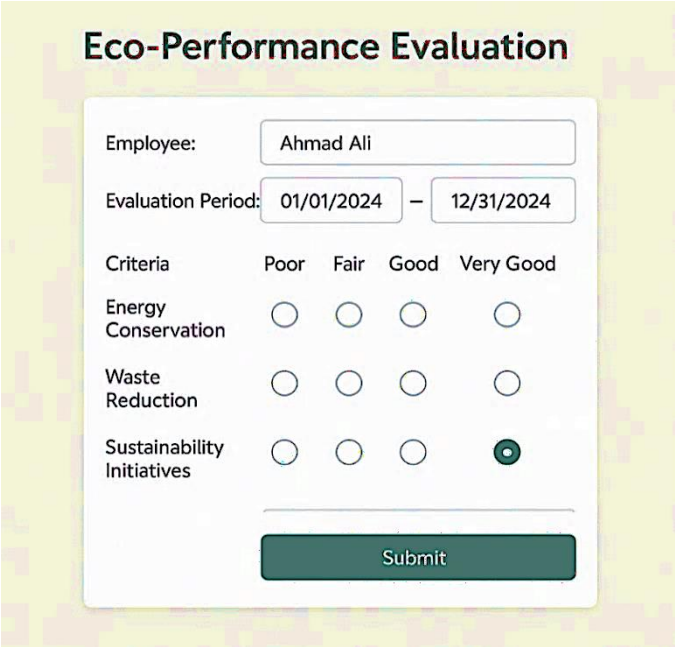


Figure 4: User Interface Prototype

8) System Design and Prototype:

The proposed Green Human Resource Management Information System (GHRMIS) was designed as a modular and scalable architecture, specifically designed for higher education institutions. The system consists of five integrated modules, as described previously, with the goal of effectively integrating sustainability into HR processes.

Technical Specifications and Development Tools

The prototype was developed using Google Forms. The system architecture follows a client-server model with secure API endpoints to ensure data integrity and confidentiality. The user interface was designed with a focus on usability and accessibility, utilizing modern UI/UX principles.

Prototype Testing and Validation

Although the prototype was developed and demonstrated internally within this study, it has not yet undergone formal user testing. However, it was piloted and validated by the

researcher through a pilot application of several simple inputs and review of automatically generated reports and statistical graphs generated by Google Forms. Future work includes conducting usability tests with the target users—HR staff and sustainability officers—to gather feedback on functionality, ease of use, and effectiveness in real-world scenarios. In addition, iterative development based on user feedback will help improve the system's features and performance.

System Testing and Evaluation Methods

Planned testing methods include heuristic evaluation, knowledge walkthroughs, and pilot deployments in selected university departments. These evaluations will assess technical reliability, user satisfaction, and the system's impact on the adoption of green HR practices. Incorporating these validation steps will enhance the system's readiness for wider implementation and provide practical evidence of its effectiveness.

V. Discussion:

The findings of this study align strongly with established theoretical frameworks that explain the dynamics of sustainability adoption within organizations. Institutional theory, for instance, underscores how formal organizational policies and structures critically shape the ability to integrate sustainability practices. At the University of Science and Technology (UST), the absence of clearly defined Green Human Resource Management (GHRM) policies manifests as a structural rigidity that impedes alignment with global sustainability trends, a challenge commonly observed in higher education institutions within developing regions.

Furthermore, transformational leadership theory sheds light on the vital role of committed and visionary leadership in driving cultural change towards sustainability. The low employee participation rate in green initiatives (only 27% aware and actively engaged) can be attributed partly to a leadership gap in promoting environmental responsibility and motivating stakeholders, which parallels findings in other MENA-region universities where leadership commitment often dictates the pace of green adoption (Hiba & Muhammed, 2023; Shameel, 2024).

From the resource-based view (RBV) perspective, UST's limited financial and infrastructural resources pose significant constraints on adopting advanced GHRM practices. This aligns with regional studies highlighting similar barriers in resource-scarce settings, where budget limitations and outdated infrastructure hamper the integration of innovative HR and sustainability processes.

Despite these challenges, the study identifies promising opportunities. Digital transformation of HR systems emerges as a strategic enabler that can streamline processes, reduce operational costs, and foster environmental innovation. Targeted awareness and training programs tailored to university staff and faculty could address knowledge gaps, while engagement of students in sustainability initiatives—an approach successfully adopted by universities in developed countries—could nurture a campus-wide culture of environmental stewardship.

The contextual uniqueness of UST, such as conflating GHRM adoption with broader digitalization efforts, suggests that interventions must be sensitive to local institutional realities. Leveraging partnerships for funding, incremental policy reforms, and leadership development can progressively align UST's HR strategies with sustainability objectives.

Technically, the prototype Eco-Performance Evaluation Module developed in this study exemplifies the shift from conceptual GHRM models towards actionable, technology-driven implementations. This aligns with contemporary green HRM research emphasizing the critical role of digital tools integrated with organizational culture and leadership support (e.g., [14], [16]). The module's decision-support capabilities further enable data-driven management, enhancing both employee engagement and policy effectiveness.

Overall, the system architecture and practical tools proposed can serve as foundational models for universities in developing countries seeking to bridge the gap between sustainability aspirations and operational realities, thus contributing valuable insights both regionally and globally.

Aligning Study Outcomes with Digital GHRM Trends

These findings not only confirm theoretical insights but also highlight practical implications, especially in the context of digital transformation in Green Human Resource Management. In particular, the technical component of this study—developing a prototype for an Eco-Performance Evaluation Module—aligns well with contemporary trends in green HRM research. As emphasized by [16], higher education institutions significantly benefit from digitalizing HR practices, especially when these systems are supported by transformational leadership and embedded within a green organizational culture.

By presenting a practical, user-centered tool to assess environmental performance, this study moves beyond conceptual green HRM models toward actionable, system-based implementations. Moreover, the inclusion of a decision-support function within the proposed system echoes the findings of [14] and [16], who argue that data-driven platforms enhance both employee behavior and management effectiveness in advancing environmental goals. This system architecture can thus serve as a foundational model for universities aiming to bridge the gap between green policy aspirations and operational realities.

Integrating these technological insights with the institutional and leadership challenges identified earlier provides a comprehensive perspective on how the University of Science and Technology can leverage digital innovation to overcome barriers and promote sustainable HRM practices.

VI. Conclusion:

This study highlights significant systemic challenges hindering the adoption of Green Human Resource Management (GHRM) at the University of Science and Technology (UST), Yemen. The findings indicate that 73% of stakeholders are unfamiliar with GHRM concepts, and the absence of formal institutional policies severely limits its implementation. This gap reflects a misalignment between UST's current HR practices and global sustainability standards, emphasizing the urgent need for targeted interventions.

Despite these challenges, several key opportunities have been identified to advance GHRM adoption at UST, including:

- **Leveraging digital HR systems** by fully implementing integrated Human Resource Information Systems (HRIS) to streamline sustainability tracking and reporting.
- **Developing structured, mandatory training programs** focused on environmental awareness and green HRM practices for all staff and faculty.
- **Establishing clear institutional policies** that embed sustainability criteria into recruitment, performance evaluation, and employee engagement frameworks.
- **Promoting leadership commitment** to champion sustainability initiatives and foster a supportive organizational culture.

This study contributes both theoretically and practically by assessing institutional readiness and designing a prototype Eco-Performance Evaluation Module, which operationalizes sustainability assessment within HR functions.

Recommendations for future action include:

- Conducting pilot testing and iterative refinement of the proposed digital module with real users to ensure usability and effectiveness.
- Expanding research to include comparative studies with other universities in the MENA region to share best practices and lessons learned.
- Securing funding and partnerships to support the gradual rollout of green HRM initiatives and related digital infrastructure.
- Monitoring and evaluating the long-term impact of these initiatives on organizational performance and sustainability outcomes.

Ultimately, these steps will help UST and similar institutions transition toward environmentally responsible HR management, aligning with global sustainability agendas while improving organizational efficiency and stakeholder engagement.

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