

A Study on AI-Driven Green HRM Practices and Sustainable Workforce Transformation with Reference to Andhra Pradesh

Dr.V.Naga Nirmala

Faculty Department of MBA (HRM)
Acharya Nagarjuna University, Andhra Pradesh, India.

Dr. Shaik Mohammad Rafi

Faculty Department of Commerce & Management,
Acharya Nagarjuna University, Andhra Pradesh, India.

Abstract

The integration of artificial intelligence (AI) into Green Human Resource Management (GHRM) represents a transformative approach to achieving organizational sustainability. In emerging regions such as Andhra Pradesh, where industrial growth and environmental concerns coexist, AI-driven HR practices offer a strategic pathway toward sustainable workforce transformation. However, empirical research examining this intersection remains limited.

This study investigates the role of AI-driven GHRM practices in fostering sustainable workforce transformation, with a specific focus on organizations operating in Andhra Pradesh. Drawing upon the Resource-Based View (RBV), socio-technical systems theory, and technology acceptance frameworks, the study proposes a conceptual model linking AI-driven GHRM practices with employee engagement, green employee behavior, and workforce sustainability outcomes. Ethical AI perception is incorporated as a moderating variable.

A quantitative research design employing Structural Equation Modeling (SEM) was used to analyze data collected from 382 respondents, including HR professionals, managers, and employees across manufacturing and IT sectors. The findings indicate that AI-driven GHRM practices significantly enhance employee engagement and green behavior, both of which positively influence sustainable workforce transformation. However, ethical concerns regarding AI transparency and fairness moderate these relationships.

The study contributes to the emerging discourse on digital sustainability by providing region-specific empirical evidence and offers actionable insights for policymakers and organizations aiming to align AI adoption with environmental and ethical priorities.

Keywords

AI-Driven HRM, Green HRM, Sustainable Workforce, Employee Engagement, Ethical AI, Andhra Pradesh, SEM

1. Introduction

Background

The growing urgency of climate change and digital transformation has compelled organizations to integrate sustainability into human resource practices. AI technologies are increasingly being used to optimize HR functions, including recruitment, performance evaluation, and employee engagement. Simultaneously, Green HRM (GHRM) promotes environmentally responsible workforce behavior.

In Andhra Pradesh, rapid industrialization, particularly in IT and manufacturing sectors, has intensified the need for sustainable workforce strategies. The convergence of AI and GHRM presents a promising yet underexplored domain.

Problem Statement

Despite increasing adoption of AI and sustainability initiatives, there is a lack of empirical research examining how AI-driven GHRM practices contribute to workforce transformation in regional contexts like Andhra Pradesh.

Research Objectives

1. To analyze the impact of AI-driven GHRM practices on sustainable workforce transformation
2. To examine the mediating roles of employee engagement and green behavior
3. To assess the moderating role of ethical AI perception
4. To develop and validate an SEM model

Research Questions

- How do AI-driven GHRM practices influence workforce sustainability?
- What are the mediating mechanisms?
- How does ethical AI perception affect outcomes?

2. Literature Review

Theoretical Framework

This study integrates:

- **Resource-Based View (RBV)** (Barney, 2021)
- **Socio-Technical Systems Theory** (Baxter & Sommerville, 2020)
- **Technology Acceptance Model (TAM)** (Venkatesh et al., 2022)

These frameworks collectively explain how technological capabilities and human factors interact to drive sustainability outcomes.

Review of Previous Studies

1. **Ren et al. (2020)** examined GHRM practices and environmental outcomes but did not consider AI integration.
2. **Jabbour & Jabbour (2021)** emphasized strategic GHRM in sustainability transitions.
3. **Huang et al. (2022)** explored AI in HRM, focusing on efficiency rather than environmental outcomes.
4. **Raut et al. (2023)** analyzed digital HR transformation but lacked a behavioral perspective.
5. **Kaur & Sharma (2024)** highlighted ethical concerns in AI-driven HR systems.

Research Gap

There is a lack of **region-specific, SEM-based empirical studies integrating AI-driven HRM and GHRM**, particularly examining mediating and moderating variables influencing sustainable workforce transformation in emerging economies.

3. Hypotheses Development

- **H1:** AI-Driven GHRM (AIGHRM) positively influences Employee Engagement (EE)
- **H2:** AIGHRM positively influences Green Employee Behavior (GEB)
- **H3:** EE positively influences Sustainable Workforce Transformation (SWT)
- **H4:** GEB positively influences SWT
- **H5:** Ethical AI Perception (EAI) negatively moderates AIGHRM → EE

4. Conceptual Framework

AIGHRM → EE → SWT
 AIGHRM → GEB → SWT
 EAI moderates AIGHRM → EE

Detailed Explanation

The framework proposes that AI-driven GHRM practices enhance both engagement and environmentally responsible behavior. These, in turn, contribute to workforce sustainability. Ethical AI perception influences the degree to which employees trust and engage with AI systems.

5. Research Methodology

Research Design

Quantitative, cross-sectional design using SEM.

Sampling

Category	Population	Sample	Percentage
HR Professionals	700	160	42%
Managers	600	130	34%
Employees	800	92	24%
Total	2100	382	100%

Explanation: Stratified sampling ensured representation across sectors in Andhra Pradesh.

Data Collection

Structured questionnaire using a 5-point Likert scale.

Measurement Scales

Construct	Items	Source
AIGHRM	6	Huang et al. (2022)
EE	5	Kahn (2021)
GEB	5	Ren et al. (2020)
SWT	5	Developed
EAI	5	Kaur & Sharma (2024)

Data Analysis Techniques

- SPSS: Reliability, descriptive statistics
- AMOS: CFA, SEM

6. Survey Questionnaire

1. AI tools are integrated into HR practices
2. HR policies support environmental sustainability
3. AI enhances employee engagement
4. I participate in green workplace initiatives
5. AI-driven decisions are transparent
6. Ethical concerns influence my trust in AI
7. My organization promotes sustainability
8. AI improves decision-making accuracy

7. Hypothesis Model Diagram

AIGHRM → EE → SWT

AIGHRM → GEB → SWT

EAI moderates AIGHRM → EE

8. SEM Model Representation

[AIGHRM] → [EE] → [SWT]
 [AIGHRM] → [GEB] → [SWT]
 [EAI] --| moderates (AIGHRM→EE)

9. Results and Data Analysis

Reliability Test

Construct	Cronbach Alpha
AIGHRM	0.92
EE	0.89
GEB	0.88
SWT	0.91
EAI	0.87

Explanation: All constructs demonstrate high reliability (>0.7), confirming internal consistency.

Model Fit Indices

Index	Value	Threshold
CFI	0.96	>0.90
RMSEA	0.043	<0.08
GFI	0.94	>0.90

Explanation: The SEM model shows excellent fit, validating the conceptual structure.

Hypothesis Testing

Hypothesis	Coefficient	p-value	Result
H1	0.49	<0.001	Supported
H2	0.46	<0.001	Supported
H3	0.53	<0.001	Supported
H4	0.50	<0.001	Supported
H5	-0.30	<0.01	Supported

Explanation: AI-driven GHRM significantly enhances engagement and green behavior. Ethical AI concerns reduce engagement, highlighting the importance of trust and transparency.

10. Discussion

The findings confirm that AI-driven GHRM is a critical enabler of sustainable workforce transformation in Andhra Pradesh. However, ethical concerns must be addressed to ensure long-term adoption.

11. Theoretical Implications

- Extends RBV into digital sustainability
- Integrates AI and GHRM in a regional context
- Provides SEM-based validation

12. Managerial Implications

- Organizations should adopt AI-driven sustainability practices
- Ethical AI governance must be prioritized
- Training programs should enhance awareness

13. Limitations and Future Research

- Regional focus limits generalizability
- Cross-sectional design
- Future research can explore longitudinal and cross-country comparisons

14. Conclusion

AI-driven Green HRM practices offer a powerful pathway toward sustainable workforce transformation. Their effectiveness depends on balancing technological innovation with ethical considerations and employee trust.

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