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Identification of green human resource management practices in the digital transformation era in SMEs

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ABSTRACT

This study aims to identify green human resource management (GHRM) practices in small and medium-sized enterprises (SMEs) during the digital transformation era. As organizations increasingly adopt digital technologies, integrating environmentally sustainable practices into HRM becomes crucial. This research investigates the specific GHRM practices SMEs implement and explores their alignment with the digital transformation initiatives. This research is done through a comprehensive review of 26 articles and a thematic analysis of them in the qualitative part (meta-synthesis) and a fuzzy Delphi method to screen and confirm the findings of the meta-synthesis in the quantitative part. This is a kind of mixed method that is used in this study. Based on the findings, GHRM practices in the age of digital transformation were identified in 64 concepts. The findings contribute to understanding how SMEs can effectively incorporate sustainable HRM practices in the context of digital transformation, promoting environmental stewardship and enhancing organizational sustainability.

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1. Introduction

In recent years, digital transformation has created profound changes and many opportunities in different sectors. Small and medium enterprises (SMEs) have since recognized great an excellent opportunity to invest in digital technologies in order to boost operational effectiveness, enhance customer engagement, and gain a competitive advantage. On the other hand, developing nations have acknowledged play as a powerful economic engine. However, these businesses are not exempt from difficulties brought on by technological advancements and outside pressures from governmental regulations, legal requirements, stakeholder concerns, and customer expectations. SMEs must navigate the digital business environment while maintaining their sustainability and competitiveness.

According to Tajeddini et al. (2020), human resources are the key that brings other resources into play and are seen as integral tools companies use to elicit certain behaviors. This recognition has rise to the emergence of a novel concept known as green human resource management (GHRM) (Trujillo-Gallego, Sarache, & de Sousa Jabbour, 2022; Zaid & Jaaron, 2023). Green practices in HRM develop employees' green skills and knowledge, fostering organizational commitment to environmental sustainability. This encompasses green job descriptions, recruitment, training, and reward systems (Gupta et al., 2020). Similarly, in the era of inevitable digital transformations, researchers adopt it to enhance SMEs's decision-making and adaptability to environmental changes (Adisa et al., 2022). Digital HRM facilitates data collection, analysis, and utilization, promoting innovative ideas and exploring environmental opportunities (Bag et al., 2021). Integrating GHRM practices in SMEs during the digital transformation era sustainable business practices, competitiveness, and a greener future (Jani et al., 2021; Kuzior, Kettler, & Rąbl, 2022). However, there is still an insufficient understanding of GHRM methods compatible with digital technologies (Kuzior et al., 2022; Paulet et al., 2021; Gupta et al., 2020).

Based on the literature review, it has been observed that while numerous studies exist on GHRM practices (Zaid & Jaaron, 2023; Napathorn, 2022; Khan et al., 2021) and digital transformation in human resources (Jani, Muduli, & Kishore, 2021; Kuzior et al., 2022) individually. So, research has approached these concepts from various perspectives, yet there is a lack of a comprehensive conceptual framework for GHRM practices in the digital era. There is no firm consensus on GHRM practices in the age of digitalization (Kuzior et al., 2022). Indeed, as Dabić et al. (2023) noted, there is a "lack of empirical research dealing with the antecedents of GHRM practices in the age of digital transformation." Moreover, most of the research on digital transformation in HRM has been conducted in the United States and other advanced European countries, with limited studies conducted in developing Asian countries (Jani et al., 2021; KaregarShurki, 2022). There is a theoretical gap in the scarcity of research evidence specifically focused on SMEs. SMEs often face resource constraints, including financial, human, and knowledge limitations, which pose challenges to of implementing GHRM practices in the digital transformation era. This issue is more prominent in developing countries due to their complex and uncertain business environment structural and socio-economic factors such as corruption, poverty, and inequality. The aforementioned gaps highlight the necessity of addressing this topic, particularly in emerging economies. Hence, more empirical research is needed to identify the antecedents of GHRM practices in the age of digital transformation. Achieving these antecedents in SMEs of an emerging economy like Iran is the contribution of the present research.

The main objective of this study is to advance the understanding and implementation of GHRM practices within the context of SMEs in the digital transformation era. By focusing on the unique circumstances of SMEs, this research aims to contribute to the existing theoretical knowledge in the field. The findings of this study have the potential to address the challenges and issues that SMEs encounter in a competitive business environment and under stakeholders' pressures for sustainable development. Moreover, the outcomes of this research can facilitate the identification of potential market opportunities and contribute to the country sustainable economic growth. This research aims to address this gap by answering this question: What are the GHRM practices in the digital transformation era in SMEs?

This research has a two-fold contribution. First, this research sheds light on current knowledge by integrating existing research. This study adds to the growing scholarly literature on sustainability that three areas of expertise: GHRM, digital transformation, and SMEs in emerging economies. It also makes a new contribution to the literature by assessing the factors from experts' points of view and

discovering new factors. Second, this study provides insights into these controversial factors by offering guidelines for policy actions to facilitate sustainability in emerging economies. It also includes a future research agenda.

To gain this purpose, in the first step, the research uses the provides meta-synthesis approach to incorporate the studies and improve the knowledge related to the subject, provides a meta-synthesis approach to integrate the studies and improve the knowledge related to the subject, providing a deeper understanding of the research subject. In the second step, the fuzzy Delphi method makes it possible to localize the issue in SMEs in Iran as an emerging economy. The article is organized as follows; The second part reviews the research literature. The third part describes the research methodology. The fourth part presents the findings of the research. Finally, the fifth section describes the discussion and conclusion and presents the theoretical and practical contribution of the study.

2. Theoretical Background

2.1. what is Green human resource management?

GHRM is closely tied to environmental and trade performance. Adopting these practices improves employees' , ecological expertise and knowledge, fostering greater,more outstanding organizational commitment (Benevene & Buonomo, 2020). Emphasizing this concept improves green competitive advantage by differentiating, reducing costs, building an environmental reputation, and promoting pro-environmental behaviors among employees, ensuring organizational sustainability (Khan et al., 2021).

2.2. GHRM in the era of digital transformation

Recently, there has been a significant amount of discussion surrounding concepts like "digitization" and "digital transformation." The term "digital technologies" refers to a diverse and intelligent collection of technologies that enable connectivity, digitization, and automation (Trujillo-Gallardo et al., 2022: 3). Overall, these concepts signify the growing utilization of technology and the consequential fundamental changes in various business and societal domains. Digitalization has the potential to be applied to a wide range of operational goals, from salary and wage processing to cycle management (Stromer, 2020: 346). Digital Human Resource Management (DHRM) initiatives involve the use of digital technologies and appropriate data processes to improve the efficiency and effectiveness of HRM activities (Wang, Zhou, & Zheng, 2022: 1).

Companies must employ soft capabilities to address technology and sustainability challenges, leveraging HR to monitor environmental changes and utilize digital transformation. This fosters innovation, data analysis, and informed decision-making for exploring environmental opportunities (Trujillo-Gallego et al., 2022). DHRM enhances decision-making and organizational adaptation, providing a competitive advantage through efficient information flow and strengthened organizational structure. This facilitates compliance with environmental standards and regulations (Wang et al., 2022). Gupta et al. (2020) establish a connection between Industry 4.0-based HR planning and sustainable organizational performance. Despite uncertainties, organizations may hesitate to invest in technology; however, it is crucial to understand the actions that empower HRM to achieve environmental performance.

2.3. Empirical reviews

In the dynamic environment of contemporary organizations, green human resource management (GHRM) has emerged as a crucial component in defining sustainable practices and operational performance. We explore a narrative that weaves together key themes found in earlier research, drawing on a tapestry of studies, to reveal the multifaceted nature of GHRM and its profound implications for organizational sustainability and success.

At the forefront, the work of Zaid and Jaroon (2023) resonates and highlights the strategic motivation for GHRM practices in manufacturing organizations. Their study illustrates the prioritization of green practices - green recruitment and selection, green training, green performance evaluation, and green reward systems. These strategic issues suggest that GHRM not only enhances operational performance but also brings competitive advantage, a strong product that fosters both sustainability and advantage. The following study discusses deeper, more profound concepts of GHRM. Bahguna et al. (2023) expanded on related concepts by promoting the expansion of the

GHRM management domain to include a more comprehensivebroader range of human resource practices, such as labor relations. This study addresses issues where the influence of GHRM transcends conventional lines. This study presents a fascinating perspective and fosters a deeper understanding of the dynamic tapestry of GHRM by tracing the lines of keywords, authors, journals, and conceptual constructs.

Faisal (2023) completes a synthesis by identifying and introducing GHRM factors and tools. depicted as green recruitment and selection, green training and development, green reward management, green performance management, green employee empowerment and participation, and green employee relations. useful handbook.

Papademetriou et al. (2023)stated that research opens a new perspective on small and medium enterprises (SMEs). This study mentions the factors that fuel GHRM, such as green competencies and motivations. It also states how small and medium companies can improve their operations through GHRM practices. For example, we can mention the issue of green organizational citizenship behavior, which creates harmony between sustainability and the ideals of SMEs.

In another study, Mehdi et al. (2023) emphasizes the necessity of using GHRM. They emphasize GHRM as a critical issue for the survival and maintenance of organizations. The results of their study provide an in-depth look at global environmental concerns. In continuation of these studies, Murillo-Ramos et al.'s (2023) research shows a combination of drivers and barriers to GHRM adoption in the organization. They divide these factors into organizational factors and individual factors.

Studies in the field of GHRM continue with the research of Khan and Faisal (2023), who explore the intersection where GHRM and sustainability are in a postdocs. Their study depicts new opportunities and promises fresh perspectives on how the achievements of GHRM implementation lead the organization toward sustainability.

Esthi & Setiawan (2023) illuminate a story of empowerment in the realm of micro-enterprises and digital transformation. According to him, GHRM increases job satisfaction, employee performance, and corporate culture, leading the company to sustainability. Adisa et al. (2022) conducted their study in the digital domain, revealing the challenges and opportunities in adopting digital HRM. Here, GHRM is transformed in the face of digital transformation and paves the way for sustainability to be achieved. Following these studies, Trujillo-Gallego et al. (2022) discuss how GHRM, digital technology, and supply chain management work together. They show how these three things connect and improve the way organizations work.

Finally, Kargar and Shorki (2022) focus on health and talent management in GHRM. They show how GHRM helps employees and aligns with sustainability goals. Bagg et al. (2021) discussing how electronic HRM systems and performance go hand in hand.

All these studies come together to paint a picture of the GHRM journey. From strategy inception inception to communication with sustainability and digital transformation, GHRM guides organizations to succeed while being kind to the environment.

Through reviewing the research background, the following research gaps can be identified: Firstly, despite the increasing trend of research conducted in the field of GHRM and the development of concepts such as digitalization of human resource management and digital transformation of human resource management in recent publications, this concept has not been well-established and thoroughly investigated. Researchers such as Adisa et al. (2022), Bag et al. (2021), and Paulet et al. (2021) have called for examining this concept within the context of digital transformation in line with the future agenda of GHRM. However, there is still a lack of clear understanding of GHRM practices in the context of digital transformation in the literature, and existing studies have separately addressed each of these concepts, which does not seem sufficient for the current needs and requirements.

Secondly, existing literature lacks research on integrating GHRM practices in SMEs during the digital era (Adisa et al., 2022; Trujillo-Gallego et al., 2022; Gupta et al., 2020). The focus has been primarily on larger organizations, neglecting the unique challenges SMEs face (Amrutha and Geetha, 2020). Understanding how digital transformation impacts the adoption and effectiveness of GHRM practices in SMEs remains limited. While general frameworks and guidelines exist for GHRM, they may not cater to SMEs' specific needs and constraints (Zaid and Jaaron, 2023; Napathorn, 2022). Practical frameworks and guidelines tailored to SMEs in the digital age are necessary for successful implementation.

Thirdly, research production is dominated by developed countries, while the role of Latin American and Asian countries is limited (Jani et al., 2021; KaregarShurki, 2022). However, the complexity of the business environment, uncertainty, and socio-economic factors such as corruption, poverty, and inequality in emerging economies create unique challenges that require context-compatible practices.

These literature gaps highlight the need for further research to address the integration of GHRM practices and digital transformation in SMEs, explore the adoption and implementation challenges, and investigate the role of technology in supporting GHRM initiatives.

3. Research Methodology

This study employs a mixed-method approach, combining qualitative (meta-synthesis) and quantitative (fuzzy Delphi) phases. The meta-synthesis method involves a comprehensive review of qualitative studies to extract GHRM indicators in the digital transformation era. Additional expert opinions were gathered using the fuzzy Delphi method to address the limited research focusing on SMEs. This localized examination was conducted within small and medium companies in Iran, a developing country.

3.1. Methodology of the qualitative part

The study used meta-synthesis to identify GHRM practices in SMEs during the digital transformation era. Relevant English and Persian articles published after 2000 were selected from reputable databases and journals. The qualitative phase combined and interpreted findings from various sources, following specific criteria for sample selection. The study followed the seven-stage meta-synthesis method proposed by Sandelowski and Barroso (2007), involving research question identification, literature review, study selection, data extraction, analysis and synthesis of qualitative findings, quality control, and presentation of findings. The reliability of the research data in the meta-synthesis section was assessed using measurement method agreement at two different time points.

3.2. Methodology of the quantitative part

The quantitative phase employed the fuzzy Delphi method to validate and refine the components identified in the qualitative phase (meta-synthesis). A panel of experts, including senior HR managers and SME experts, provided their opinions on the extracted indicators. The researcher analyzed and refined these opinions through the fuzzy Delphi stages, resulting in a final list of factors related to GHRM practices in the digital transformation era for SMEs. The panel members, totaling 30 experts, were selected based on criteria such as having a master's degree in HR management, a minimum of five years of management experience in SMEs, and familiarity with sustainability and digital transformation concepts. HR management experts assessed the validity of the Delphi questionnaire.

4. Research findings

4.1. Meta-synthesis findings

In order to perform meta-synthesis in this research, Sandelowski and Barroso's seven-stage meta-synthesis methods (2007) were used.

The first step- Setting the research question: The first step in meta-synthesis is setting the research questions. Research questions were raised in this step, which are presented in Table (1).

Table 1. Research questions

indicator	Question	Answer
What	What are the practices of GHRM in the era of digital transformation in SMEs?	Extracting components from the subject literature
Who	Who is the intended population?	All reliable domestic and foreign scientific databases
When	When is the search period?	All articles from 2000 to 2023
How	How the research data collection methods are reviewed?	Using secondary data, including all articles related to the research question

The second step involved a systematic literature review using reliable scientific databases such as Science Direct, Emerald Insight, Wiley, Springer, and internal databases. Keywords like "GHRM," "DHRM," "GHRM in the digital age," and "digital transformation in human resources" were used for the search. The keyword search found 491 articles in English and Farsi from 2000 to 2023.

The relevant information was searched and selected from the 491 articles in the third step. After removing articles with repetitive titles (82), unrelated titles and abstracts (126), unrelated content (181), and articles using quantitative methods (75), a final set of 26 articles was selected.

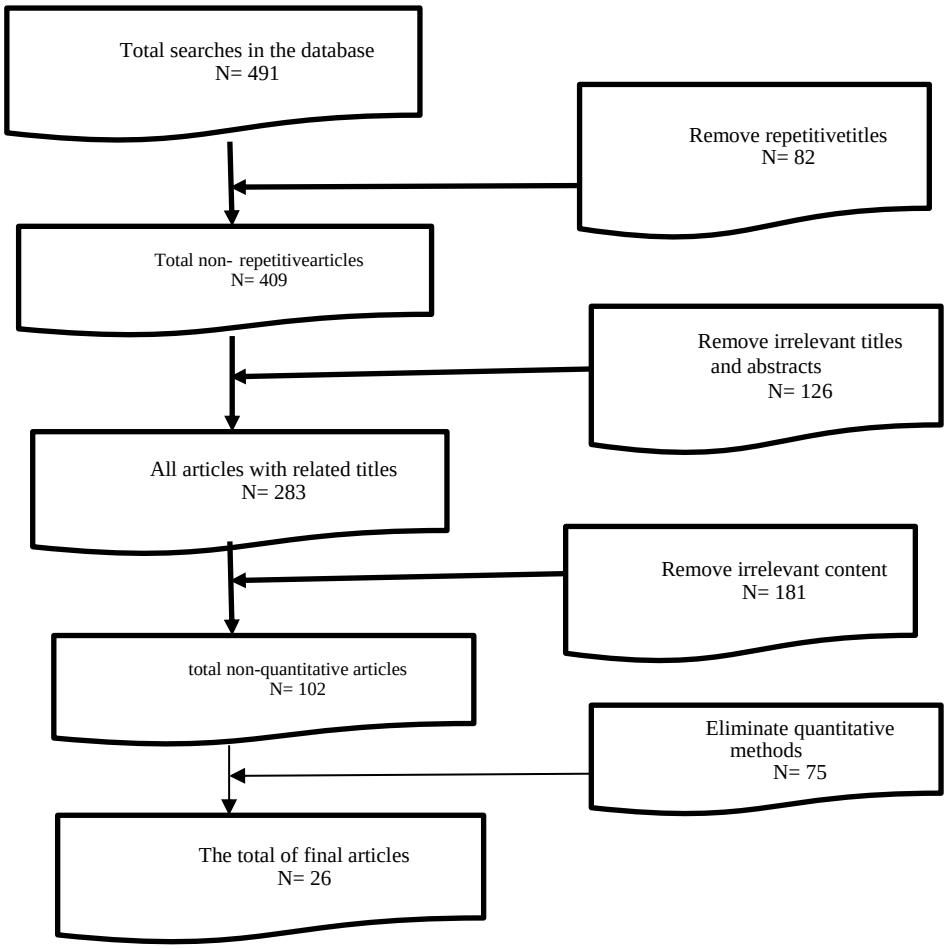

Fig. 1. Review process for selection of final articles

The final articles are presented in table (2).

Table 2. final articles in meta-synthesis

No	Researcher (year)	title	method
1	(Zaid & Jaaron, 2023)	The impact of green human resource management practices with sustainable and operational performance: a conceptual model	content analysis
2	(Lin & Wang, 2022)	Talent Retention of New Generations for Sustainable Employment Relationships in Work 4.0 Era—Assessment by Fuzzy Delphi Method	Mixed (systematic review and fuzzy Delphi)
3	(Adisa et al., 2022)	The acceptance and practicality of digital HRM in Nigeria	Qualitative - theme analysis
4	(Subramanian & Suresh, 2022)	The contribution of organizational learning and green human resource management practices to the circular economy: a relational analysis – evidence from manufacturing SMEs	Mixed (interview and interpretive structural modeling)
5	(Napathorn, 2022)	The implementation of green human resource management bundles across firms in pursuit of environmental sustainability goals	Qualitative-theme analysis

Table 2.

No	Researcher (year)	title	method
6	(Sithambaram & Tajudeen, 2022)	Impact of artificial intelligence in human resource management: a qualitative study in the Malaysian Context	Qualitative-theme analysis
7	(Cooke, Dickmann, & Parry, 2022)	Building sustainable societies through human-centered human resource management: emerging issues and research opportunities	Content analysis
8	(Hulla et al., 2021)	Towards digitalization in production in SMEs – A qualitative study of challenges, competencies and requirements for training	Qualitative-Theme analysis
9	(Waldkirch, Bucher, Schou, & Grünwald, 2021)	How HRM activities take shape on digital work platforms in the gig economy	Qualitative content analysis
10	(Hernita, Surya, Perwira, Abubakar, & Idris, 2021)	Economic Business Sustainability and Strengthening Human Resource Capacity Based on Increasing the Productivity of Small and Medium Enterprises (SMEs) in Makassar City, Indonesia	mixed
11	(Hronová & Špaček, 2021)	Sustainable Human resource management practices in reporting	Qualitative content analysis
12	(Khan et al., 2021)	Exploring Themes of Sustainable Practices in the Manufacturing Industry: Using Thematic Networks Approach	Qualitative-theme analysis
13	(Dahlbom, Siikanen, Sajasalo, & Jarvenpää, 2020)	Big Data and HR Analytics in the Digital Era	theme analysis
14	(Cabral & Lochan Dhar, 2019)	Green competencies: Construct development and measurement validation	mixed
15	(Njoku, Ruël, Rowlands, Evans, & Murdoch, 2019)	An Analysis of the Contribution of e-HRM to SustainingSustaining BusinessSustaining Business Performance	content analysis
16	(Masri & Jaaron, 2017)	Assessing green human resources management practices in Palestinian manufacturing context: An empirical study	mixed
17	(Mishra, 2017)	Green human resource management: A framework for sustainable organizational development in an emerging economy	mixed
18	Kargar Shouraki, 2022	The impact of sustainable/digital human resource management on business Sustainability	mixed
19	Nazimi et al., 2022	Designing a human resources performance management model in Tehran municipality according to the requirements of the digital city	Qualitative-theme analysis
20	Esmaieli Tarsi et al., 2022	Explanation and evaluation of green human resources management activities based on AMO perspective in Kerman Coal Mines Company (synthesis approach)	mixed
21	Eskandari and Taheri, 2022	Identifying the requirements affecting the implementation of green human resources management;selection and recruitment;Education,performance appraisal;Reward and compensation plan (a case study of hospitals of Qom province)	Qualitative-theme analysis
22	Saiedi Taleb et al., 2021	Identification and analysis of factors affecting green human resources management in the resistance-Islamic economy in small and medium companies	mixed
23	Boodlaie et al., 2021	is an approach to creating organizational agility in the public sector in the digital economy.	Qualitative-theme analysis
24	Bazian et al., 2021	Identifying the necessary platforms for the digitization of human resource management processes	Qualitative-theme analysis
25	Imani et al., 2020	Presenting the structural equation model of the dimensions and components of green human resource management in the companies of Birjand Industrial Town	mixed
26	Farokhi et al., 2017	Providing a green human resource management framework in the steel industry	mixed

, and summarized data from the selected articles was extracted and summarized. The content of the articles was thoroughly reviewed, resulting in the extraction of 239 codes related to GHRM practices in the digital transformation era for SMEs. The fifth step involved the analysis and synthesis of the qualitative findings. The Indicators derived from the research literature were conceptually categorized. The outcome of this step is presented in Table (3), which includes 61 concepts, 15 sub-categories, and four main primary categories defining the GHRM practices of SMEs in the digital transformation era.

Table 3. GHRM practices in the era of digital transformation in SMEs

The main category	Sub-category	Concept	References
Green HR processes centered on digitalization	Green recruitment and selection centered on digitization	Selection of employees based on digital skills	(Zaid & Jaaron, 2023); (Lin & Wang, 2022); (Subramanian & Suresh, 2022); (Khan et al., 2021); (Masri & Jaaron, 2017);(Mishra, 2017); (Imani et al., 2020); (Saeedi-Talab et al., 2021); (Bazian et al., 2021); (IsmailiTarzi et al., 2022)
		Recruitment of employees based on environmental commitment	(Zaid & Jaaron, 2023); (Eskandari and Taheri, 2022)
		Using Social Networks to recruit recruit recruitRecruit HR	(Mishra, 2017)
		Online recruitment portals	(Mishra, 2017); (Eskandari and Taheri, 2022), (Farokhi et al., 2017)
	Green education and development centered on digitization	Providing online environmental training for employees	(Zaid & Jaaron, 2023); (Napathorn, 2022); (Khan et al., 2021); (Masri & Jaaron, 2017; Mishra, 2017); (Cabral & Lochan Dhar, 2019)
		Educational needs assessment by an electronic system	(Sithambaram & Tajudeen, 2022); (Subramanian & Suresh, 2022); (Waldkirch et al., 2021); (Nazimi et al., 2022); (Imani et al., 2020); (Bazian et al., 2021)
		Environmental educational software	(Eskandari and Taheri, 2022)
		Informal learning in social networks	(Mishra, 2017)
	Green job description centered on digitization.	Determining online work responsibilities	(Subramanian & Suresh, 2022); (Imani et al., 2020); (IsmailiTarzi et al., 2022)
		Green Indicators in performance performance performanceevaluation evaluation performance Evaluation	(Mishra, 2017); (Hronová & Špaček, 2021); (Waldkirch et al., 2021);); (IsmailiTarzi et al., 2022)
	Green performance evaluation centered on digitization	Performance evaluation indicators proportional to digital requirements	(Subramanian & Suresh, 2022); (Nazimi et al., 2022)
		Data-driven performance evaluation	(Nazimi et al., 2022)
		Performance evaluation proportional to environmental indicators	(Mishra, 2017); (Masri & Jaaron, 2017); (Waldkirch et al., 2021); (Bazian et al., 2021); (Farokhi et al., 2017); (Saeedi-Talab et al., 2021)
		Online feedback mechanisms	(Lin & Wang, 2022)
		Online scoring system	(Lin & Wang, 2022)
	Green compensation centered on digitization	Financial rewards	(Lin & Wang, 2022); (Zaid & Jaaron, 2023);(Sithambaram & Tajudeen, 2022); (Subramanian & Suresh, 2022); (Khan et al., 2021); (IsmailiTarzi et al., 2022)
		Non-financial rewards	(Napathorn, 2022)
		Promotion and growth opportunities for employees with digital skills	(Lin & Wang, 2022)
Capacity building of green HR with a focus on digitization	Digital capabilities of green HR	Developing digital skills	(Hulla et al., 2021); (Adisa et al., 2022); (Hernita et al., 2021)
		Development of creativity and initiative	(Cooke et al., 2022); (Saeedi-Talab et al., 2021); (Imani et al., 2020)
		Technology design and programming skills	(Cooke et al., 2022)
		Critical thinking and analysis	(Cooke et al., 2022)
		Complex problem solving	(Cooke et al., 2022)
		Emotional Intelligence	(Cooke et al., 2022)
		Analysis and evaluation of systems	(Cooke et al., 2022)
	Digital opportunities for green HR	Encouraging employees to make ethical decisions	(Hronová & Špaček, 2021)
		Voluntary programs for employees	(Napathorn, 2022)
		Employee participation in digital infrastructure design	(Napathorn, 2022)

Table 3.

The main category	Sub-category	Concept	References
	The digital motivation for green HR	Paying attention to the welfare of employees	(IsmailiTarzi et al., 2022)
		Encouraging disclosure of ethical issues related to digital HRM	(IsmailiTarzi et al., 2022)
		Ensuring employee job security in the digital environment	(Lin & Wang, 2022)
		Confronting violations of ethical standards when using digital platforms	(Mishra, 2017)
Laying the foundation for green HR with a focus on digitization	Aligning HR strategies with digital goals	Alignment of norms and values of HR with green goals	(Lin & Wang, 2022); (Saeedi-Talab et al., 2021)
		Digital strategy roadmap	(Hulla et al., 2021); (Kargar Shouraki, 2022)
		Adapting to the Needs of HR	Boudlaei et al., 2021
		Transparency of digital HR objectives	(Njoku et al., 2019)
		Updating organizational values with digital values	(Boudlaei et al., 2021)
		Green policies and statements	(Mishra, 2017)
	Digitized green culture	Collaborative decision making	(Lin & Wang, 2022); (IsmailiTarzi et al., 2022)
		Flexible work arrangements	(Lin & Wang, 2022)
		Encouraging intra-group cooperation	(Napathorn, 2022)
		Non-discrimination and equality	(Lin & Wang, 2022); (Hronová & Špaček, 2021)
	Digitized green leadership	Having a digital mindset	(Adisa et al., 2022)
		Support of senior management	(Njoku et al., 2019); (Kargar Shouraki, 2022); (Saeedi-Talab et al., 2021); (Nazimi et al., 2022)
		Effective leadership	(Lin & Wang, 2022); (IsmailiTarzi et al., 2022)
		Ability to manage change	(Imani et al., 2020)
	Communication development	Face-to-face communication between managers and employees	(Njoku et al., 2019)
		Facilitating communication between employees	(IsmailiTarzi et al., 2022); (Nazimi et al., 2022)
		Communication through online tools	(Nazimi et al., 2022)
	Digitization infrastructure	Having information systems	(Dahlbom et al., 2020)
		Quality of digital information	(Njoku et al., 2019)
		Designing the digital hardware department of HR	(Hulla et al., 2021); (Boudlaei et al., 2021)
		Financial funds	(Saeedi-Talab et al., 2021)
Green ecosystem based on digitization	Digitization of business	The company's digital activity environment	(Saeedi-Talab et al., 2021)
		The global trend of digitization of business	(Saeedi-Talab et al., 2021)
		Identifying the potential of digitization	(Hulla et al., 2021)
		Type of company and industry	(Saeedi-Talab et al., 2021)
		Customers' pressure on green practices	(Imani et al., 2020)
		Interest group pressure	(Hronová & Špaček, 2021); (Imani et al., 2020); (Farokhi et al., 2017)
	Support Digital laws	Legislative institutions	(Saeedi-Talab et al., 2021); (Farokhi et al., 2017); (Eskandari and Taheri, 2022)
		Approving digital laws about HR	(Boudlaei et al., 2021)

In the sixth step, quality control measures were implemented to ensure the study's quality and verify the extracted concepts. The researcher compared their coding at different time intervals and measured the results using Cohen's Kappa index. The obtained value in this research was 0.758, which is considered ideal.

The seventh step involved presenting the results, specifically a recommended framework. In this stage of the meta-synthesis method, the findings from the previous steps were systematically and quantitatively described. The fuzzy Delphi method was utilized to screen and validate the meta-synthesis findings.

4.2. Fuzzy Delphi findings

In this section, the findings of the fuzzy Delphi method are presented in two stages. The first stage involved preparing a questionnaire based on the indicators extracted from the meta-synthesis method. The respondents were then asked to rate the importance of these indicators using a five-point scale. After collecting the expert opinions, the fuzzy values for each question were calculated. For calculating the fuzzy value of each of the estions, assuming that the fuzzyvalue of each of eqons is displayed as $\widetilde{A}_j \left(m_j \ . \ \alpha_j \ . \ \beta_j\right)$, SoSo that m_j is the lower limit, α_j is the midpoint, and β_j is the upper limit of this fuzzy number, we will have:

$$A_i = (mi, \alpha i, \beta i) \quad (1)$$

$$A_{ave} = \frac{\sum m}{n}; \frac{\sum \alpha}{n}; \frac{\sum \beta}{n}) \quad (2)$$

After determining the number of answers given to each factor and averaging the triangular fuzzy numbers for the factors, the final fuzzy numbers are calculated for each component.

$$\frac{\alpha + \beta + m}{3} \quad (3)$$

while while in this study, a threshold value of 0.7 was setThis study set a threshold value of 0.7, where values higher than 0.7 were considered essential criteria. In contrast, lower values were deemed insignificant and removed from the questionnaire. The first stage of the study involved using the questionnaire to calculate the fuzzy average for each practice of GHRM in the digital transformation era for SMEs. The results of this calculation are presented in Table 4. Additionally, the experts suggested three factors: government financial support, utilization of experienced consultants, and development of electronic ethical brochures. These factors were categorized appropriately and included in the second questionnaire provided to the experts.

Table 4. Fuzzy Delphi findings

Sub-category	concept	Fuzzy value (first round)			Defuzzification	Fuzzy value (second round)			Defuzzification
		β	α	m		β	α	m	
Green recruitment and selection centered on digitization	Selection of employees based on digital skills	0.983	0.925	0.675	0.861	0.992	0.942	0.692	0.875
	Recruitment of employees based on environmental commitment	0.992	0.933	0.683	0.869	1.000	0.942	0.692	0.878
	Using a social network to recruit HR	0.992	0.925	0.675	0.864	0.992	0.933	0.683	0.869
	Online recruitment portals	1.000	0.942	0.692	0.878	1.000	0.942	0.692	0.878
Green education and development centered on digitization	Providing online environmental training for employees	1.000	0.942	0.692	0.878	1.000	0.950	0.700	0.883
	Educational needs assessment by an electronic system	1.000	0.933	0.683	0.872	1.000	0.942	0.692	0.878
	Environmental educational software	0.992	0.925	0.675	0.864	1.000	0.933	0.683	0.872

Table 4.

Sub-category	concept	Fuzzy value (first round)			Defuzzification	Fuzzy value (second round)			Defuzzification
		β	α	m		β	α	m	
	Informal learning in social networks	0.983	0.925	0.675	0.861	0.992	0.933	0.683	0.869
	Development of electronic ethical brochures	–	–	–	-	0.983	0.925	0.675	0.861
Green job description centered on digitization	Determining online work responsibilities	0.967	0.883	0.633	0.828	0.975	0.892	0.642	0.836
	Green indicators in performance evaluation	1.000	0.950	0.700	0.883	1.000	0.958	0.708	0.889
Green performance evaluation centered on digitization	Performance evaluation indicators proportional to digital requirements	0.992	0.942	0.692	0.875	1.000	0.950	0.700	0.883
	Data-driven performance evaluation	0.981	0.904	0.654	0.846	0.983	0.900	0.650	0.844
	Performance evaluation proportional to environmental indicators	0.992	0.933	0.683	0.869	0.992	0.942	0.692	0.875
	Online feedback mechanisms	0.992	0.942	0.692	0.875	1.000	0.950	0.700	0.883
	Online scoring system	1.000	0.950	0.700	0.883	1.000	0.967	0.717	0.894
Green compensation centered on digitization	Financial rewards	0.983	0.908	0.658	0.850	0.983	0.917	0.667	0.856
	Non-financial rewards	0.975	0.908	0.658	0.847	0.983	0.925	0.675	0.861
	Promotion and growth opportunities for employees with digital skills	0.992	0.942	0.692	0.875	0.992	0.950	0.700	0.881
Digital capabilities of green HR	Developing digital skills	1.000	0.958	0.708	0.889	1.000	0.967	0.717	0.894
	Development of creativity and initiative	0.983	0.933	0.683	0.867	0.992	0.950	0.700	0.881
	Technology design and programming skills	1.000	0.958	0.708	0.889	1.000	0.967	0.717	0.894
	Critical thinking and analysis	0.983	0.933	0.683	0.867	0.983	0.933	0.683	0.867
	Complex problem solving	0.983	0.917	0.667	0.856	0.992	0.933	0.683	0.869
	Emotional Intelligence	0.992	0.933	0.683	0.869	0.992	0.942	0.692	0.875
	Analysis and evaluation of systems	1.000	0.958	0.708	0.889	1.000	0.967	0.717	0.894
Digital opportunities for green HR	Encouraging employees to make ethical decisions	0.992	0.933	0.683	0.869	1.000	0.942	0.692	0.878

Table 4.

Sub-category	concept	Fuzzy value (first round)			Defuzzification	Fuzzy value (second round)			Defuzzification
		β	α	m		β	α	m	
	Voluntary programs for employees	0.983	0.900	0.650	0.844	0.992	0.917	0.667	0.858
	Employee participation in digital infrastructure design	1.000	0.942	0.692	0.878	1.000	0.942	0.692	0.878
The digital motivation of green HR	Paying attention to the welfare of employees	0.983	0.908	0.658	0.850	0.992	0.925	0.675	0.864
	Encouraging disclosure of ethical issues related to digital HRM	1.000	0.950	0.700	0.883	1.000	0.958	0.708	0.889
	Ensuring employee job security in the digital environment	0.992	0.950	0.700	0.881	0.992	0.958	0.708	0.886
	Confronting violations of ethical standards when using digital platforms	0.992	0.950	0.700	0.881	1.000	0.967	0.717	0.894
Aligning HR strategies with digital goals	Alignment of norms and values of HR with green goals	0.983	0.950	0.700	0.878	0.992	0.958	0.708	0.886
	Digital strategy roadmap	0.975	0.925	0.675	0.858	0.975	0.933	0.683	0.864
	Adapting to the needs of HR	0.983	0.933	0.683	0.867	0.983	0.942	0.692	0.872
	Transparency of digital HR objectives	0.967	0.900	0.650	0.839	0.983	0.917	0.667	0.856
	Updating organizational values with digital values	0.992	0.908	0.658	0.853	0.992	0.925	0.675	0.864
	Green policies and statements	0.983	0.933	0.683	0.867	0.983	0.942	0.692	0.872
	Using experienced consultants	–	–	–	-	0.967	0.908	0.685	0.844
Digitized green culture	Collaborative decision making	0.975	0.900	0.650	0.842	0.975	0.917	0.667	0.853
	Flexible work arrangements	0.975	0.925	0.675	0.858	0.983	0.942	0.692	0.872
	Encouraging intra-group cooperation	0.983	0.933	0.683	0.867	0.983	0.950	0.700	0.878
	Non-discrimination and equality	0.967	0.908	0.658	0.844	0.975	0.925	0.675	0.858
Digitized green leadership	Having a digital mindset	0.992	0.950	0.700	0.881	1.000	0.967	0.717	0.894
	Support of senior management	1.000	0.958	0.708	0.889	1.000	0.967	0.717	0.894
	Effective leadership	1.000	0.950	0.700	0.883	1.000	0.958	0.708	0.889
	Ability to manage change	0.975	0.917	0.667	0.853	0.975	0.925	0.675	0.858

Table 4.

Sub-category	concept	Fuzzy value (first round)			Defuzzification	Fuzzy value (second round)			Defuzzification
		β	α	m		β	α	m	
Communication development	Face-to-face communication between managers and employees	0.992	0.925	0.675	0.864	0.992	0.950	0.700	0.881
	Facilitating communication between employees	0.983	0.900	0.650	0.844	0.983	0.925	0.675	0.861
	Communication through online tools	0.983	0.933	0.683	0.867	0.992	0.950	0.700	0.881
Digitization infrastructure	Having information systems	0.992	0.942	0.692	0.875	0.992	0.958	0.708	0.886
	Quality of digital information	1.000	0.942	0.692	0.878	1.000	0.950	0.700	0.883
	Designing the digital hardware department of HR	1.000	0.950	0.700	0.883	1.000	0.958	0.708	0.889
	Financial funds	0.992	0.942	0.692	0.875	0.992	0.958	0.708	0.886
Digitization of business	The company's digital activity environment	0.983	0.933	0.683	0.867	0.983	0.950	0.700	0.878
	The global trend of digitalization of business	1.000	0.958	0.708	0.889	1.000	0.967	0.717	0.894
	Identifying the potential of digitization	0.983	0.933	0.683	0.867	1.000	0.950	0.700	0.883
	Type of company and industry	0.992	0.925	0.675	0.864	0.992	0.933	0.683	0.869
	Customers pressure on green practices	0.967	0.900	0.650	0.839	0.983	0.933	0.683	0.867
	Interest group pressure	0.992	0.933	0.683	0.869	1.000	0.950	0.700	0.883
Support digital laws	Legislative institutions	0.992	0.950	0.700	0.881	0.992	0.967	0.717	0.892
	Approving digital laws about HR	1.000	0.958	0.708	0.889	1.000	0.958	0.708	0.889
	Government financial support	–	–	–	-	0.992	0.950	0.700	0.881

5. Discussion and conclusion

GHRM practices were categorized into four main categories based on the research findings. The category of "GHRM processes with a focus on digitization" highlights the need for HR processes to align with digital-centric approaches, especially in SMEs lacking knowledge in digitization. Integrating green practices with digitization becomes crucial for cultivating competent HR. As evidenced by the literature, the process of digitization necessitates a sufficient level of human skills to effectively transform resources into capabilities (Trujillo-Gallego et al., 2022). However, Hulla et al. (2021) point out that SMEs often lack the necessary knowledge and expertise to successfully implement digitization initiatives. Consequently, it is crucial to ensure that green practices, with a focus on digitization, are up-to-date and effectively integrated into all HRM processes. This integration is necessary to foster the development of competent HR.

Based on the findings of the fuzzy Delphi process, experts have included the development of electronic ethical brochures as a significant component of green education with a specific emphasis on digitization. This addition addresses the concern of potential ethical breaches associated with using

digital platforms in SMEs. The organizational structure of these companies often relies on informal monitoring procedures, and the lack of alignment between ethical standards and employee performance in utilizing digital platforms may contribute to the limited success of SMEs in achieving digital maturity.

The "capacity building of GHRM focused on digitization" category emphasizes enhancing employee capabilities, motivation, and opportunities for performance improvement in digitization, with specific considerations for SMEs. As Skare et al. (2023) acknowledged, unlike large companies, SMEs do not have an independent department or unit for digitization. Given the resource limitations in SMEs, strengthening HR capacities is significant.

The "Laying the foundation for GHRM with digitization focus " category highlights the importance of aligning strategies, culture, leadership, and communication the need for digitization infrastructures in SMEs. In this context, Adisa et al. (2022) acknowledged that doesn'tNigeria's HRM don't have entirely digitized their operations. In this context, the findings of fuzzy Delphi show that experts added the factor of using experienced consultants. This issue can be due to the lack of experience and sufficient knowledge of SMEs in implementing GHRM in the digital age, which makes it necessary to use the experiences of external consultants. In this context, Fard et al. (2019) also mentioned the factor of using external consultants to develop digital entrepreneurship in knowledge-based SMEs. Hulla et al. (2021) also acknowledged that the lack of strategy/roadmap, various IT software, and hardware and organizational structures in SMEs is evident.

The "green ecosystem" category emphasizes the role of business digitization and support from digital laws in driving the adoption of GHRM practices. Stakeholder pressures, customer demands, and government support are crucial in shaping the green ecosystem. According to Napathorn (2021), it is country. This adaptation can propel companies towards improved environmental performance and the achievement of sustainability goals in the digital age. Trujillo-Gallego et al. (2022) highlight that implementing GHRM practices in developing countries faces additional challenges due to structural deficiencies and socioeconomic factors such as corruption, poverty, and inequality. In this context, the role of the government and supportive digital laws becomes prominent. Experts have also emphasized the importance of government financial support in digital law support. The lack of financial resources among SMEs can hinder their motivation to undertake digital-oriented GHRM practices. Adisa et al. (2022) also noted the budgetary constraints companies face in their digitization efforts.

Research implications

Despite a growing body of empirical research on GHRM and many studies showing the importance of the digitization of human resources in the digital economy (Kuzior et al., 2022; Dabić et al., 2023), there is little consensus on what its antecedents are. Through a review of existing literature, this research paper attempted to add to the knowledge and understanding of GHRM in the digital age and respond to existing research needs. Although previous research has been fragmented, our findings provide empirical evidence regarding these antecedents, thus strengthening the debate on the antecedents of GHRM practices in the digital age. As a result, this research contributes to expanding the existing literature within the organizational field. By synthesizing the existing literature on GHRM, DHRM, and HRM in digital transformation, this research offers a comprehensive and coherent understanding of the research subject. Additionally, through expert surveys and validation of factors identified in the literature, this study unveils localized factors that provide valuable insights for researchers and practitioners. Therefore, the theoretical contributions of this research lie in integrating fragmented findings from previous studies while introducing novel elements to the literature that consider the characteristics of emerging economies.

Furthermore, this research holds practical implications. The study suggests a strategic approach for practitioners in SMEs to integrate Green Human Resource Management (GHRM) practices into their organizational strategies. By incorporating eco-friendly HRM strategies, such as green performance indicators and online scoring, organizations can promote sustainable behaviors among employees, fostering an environmentally conscious culture that aligns with business goals. For emerging economies, practitioners can customize GHRM practices using localized factors, considering unique challenges and opportunities. Tailored initiatives resonate better with the workforce, enhancing the effectiveness of sustainability efforts. The research underscores the use of motivational tools like

green performance indicators and online scoring to improve employee engagement and motivation. These tools connect sustainable actions with recognition and incentives, boosting commitment to eco-friendly practices.

Practitioners can develop training programs based on research insights, empowering employees with knowledge and skills for adopting and promoting green practices. Capacity building enables the workforce to contribute to sustainability.

The study also advocates benchmarking and continuous improvement. Practitioners can assess the impact of green HRM initiatives over time, refining strategies based on measured adoption and effects. This iterative approach ensures the ongoing alignment of HRM practices with sustainability goals.

In conclusion, the present research has limitations that warrant further investigation in future studies. Firstly, the use of expert opinions in the fuzzy Delphi method to localize the factors identified from the meta-synthesis method while providing valuable insights in this field does not allow for checking the goodness of fit of the model. Therefore, it is recommended that future research employs structural equation modeling methods to assess the model fit. Additionally, this research examined SMEs without considering their industry sectors. Hence, it is suggested that future researchers explore the factors identified in this study among different industrial clusters of SMEs to obtain supplementary findings. By addressing these limitations, future research can enhance the robustness and applicability of the research findings.

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