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Green human resource practices and digital transformation in public forest services: Evidence from an empirical survey in Greece

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Abstract

This study explores the convergence of Green Human Resource Management (Green HRM) and Digital Transformation (DT) in the Greek public sector, with a specific focus on the Forest Services. The aim is to understand how green human resource practices and digital maturity influence employees' attitudes, commitment, and organizational culture. The research was based on 232 questionnaires and analyzed using descriptive statistics, correlations, t-tests, ANOVA, and exploratory factor analysis. The reliability of the scales was confirmed (Cronbach's $\alpha > 0.70$). The results supported all hypotheses: knowledge and positive attitudes enhance readiness for change (H_1); Green HRM practices increase employee commitment and eco-friendly behavior (H_2); while digital maturity acts as a catalyst for strengthening these practices (H_3). In contrast, obstacles and resource limitations hinder implementation (H_4), whereas demographic differences shape distinct perceptions and responses (H_5).

Keywords: Green Human Resource Management (Green HRM), digital transformation, public sector innovation, organizational culture, employee commitment, sustainable administration

1. Introduction

In recent decades, the global debate on sustainability and digitalization has intensified, reshaping the way organizations operate. Sustainability has become a fundamental pillar of public governance, emphasizing environmental responsibility, efficient use of resources, and the creation of long-term value (Renwick *et al.*, 2013; Amrutha and Geetha, 2020) ^[35, 3]. At the same time, the Fourth Industrial Revolution and digital technologies are redefining processes, decision-making, and service delivery (Vial, 2019; Verhoef *et al.*, 2021) ^[43, 42].

The European Green Deal and the Digital Compass 2030 highlight the necessity of simultaneously integrating environmental and digital strategies (European Commission, 2021) ^[15]. Within this context, Green Human Resource Management (Green HRM) and Digital Transformation (DT) emerge as complementary strategies: the former incorporates environmental objectives into human resource policies, while the latter introduces digital tools, skills, and a culture of innovation (Gong & Ribiere, 2021; OECD, 2020) ^[18, 32].

This convergence is particularly critical in the public sector, which not only regulates the implementation of sustainability and digitalization policies but is also expected to act as a role model. In Greece, public administration faces persistent challenges of bureaucracy, resource shortages, and low adaptability (Featherstone, 2020) ^[16]. The Forest Services, responsible for the management and protection of ecosystems, are at the core of environmental governance (Karanikola *et al.*, 2014) ^[23], yet are characterized by understaffing, outdated structures, and insufficient digital infrastructure (Karadonta *et al.*, 2025) ^[22]. Recent studies highlight the "sustainability paradox": organizations with a high environmental mission often lack the mechanisms for consistent green and digital transition.

The international literature on Green HRM has primarily focused on the private sector (Renwick *et al.*, 2013; Dumont, Shen, & Deng, 2017; Saeed *et al.*, 2019) ^[35, 13, 38], while studies on DT in the public sector remain limited (Mergel *et al.*, 2019; OECD, 2020) ^[29, 32]. Few works examine the intersection of the two fields, although an increasing body of research suggests that integrating sustainability and digitalization is a prerequisite for resilience (Susanti *et al.*, 2023; Hameed *et al.*, 2022) ^[39, 19].

Particularly underexplored are studies that investigate employees' perceptions, as employees

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constitute key agents of change. Their attitudes, knowledge, and commitment determine the success or failure of transformations (Weiner, 2009; Ababneh, 2021; Ribeiro *et al.*, 2022) ^[45, 1, 36]. Demographic characteristics such as gender, age, and education also play a significant role in shaping the acceptance of change (Venkatesh *et al.*, 2003; Vicente-Molina *et al.*, 2018) ^[41, 44].

This study aims to address these gaps by examining the knowledge, attitudes, and perceptions of employees in the Greek Forest Services regarding Green HRM and DT. Specifically, it investigates: (a) the level of awareness and attitudes towards these strategies, (b) the effects of Green HRM on commitment, satisfaction, and behavior, (c) the role of digital maturity, (d) the obstacles to implementation, and (e) demographic differentiations.

The study contributes in three ways: (1) theoretically, by bridging two research streams in the public sector, (2) empirically, by providing primary data from a scarcely studied field, and (3) practically, by offering policy and managerial implications for more sustainable and digitally mature governance.

2. Literature Review

This section outlines the theoretical and empirical framework of the study, focusing on Green Human Resource Management (Green HRM), which serves as a key lever for embedding environmental strategy into organizations (Renwick *et al.*, 2013; Amrutha & Geetha, 2020) ^[35, 3], and Digital Transformation (DT), which represents a critical condition for the restructuring of public services and the enhancement of their efficiency (Vial, 2019; OECD, 2020) ^[43, 32]. At the same time, it examines the barriers that limit the implementation of green and digital strategies, as well as the variations arising from employees' demographic characteristics and hierarchical positions.

International experience shows that the convergence of these two strategies is strongly shaped by the institutional and political context. In the EU, the European Green Deal and the Digital Compass 2030 act as key drivers, urging member states to simultaneously integrate sustainability and digitalization objectives. However, in the public sector, implementation often encounters obstacles related to bureaucracy, resource scarcity, and institutional inertia (Mergel *et al.*, 2019; Karadonta *et al.*, 2025) ^[29, 22]. The Greek Forest Services are a typical example: although their mission is directly linked to environmental protection, they face persistent shortages of human resources, outdated infrastructures, and organizational cultures that hinder the adoption of Green HRM and DT practices (Liaskopoulou & Papadopoulos, 2024a) ^[26].

The literature review is organized around five main axes (2.1-2.5), which lead to the formulation of the research hypotheses (H₁-H₅). Finally, section 2.6 presents the conceptual model, which synthesizes the relationships between the core variables and provides the theoretical basis for the empirical investigation.

2.1. Knowledge and Attitudes toward Green Management and Digital Transformation

Green Human Resource Management (Green HRM) has emerged over the past two decades as a key mechanism for embedding environmental strategy into organizational functioning (Renwick *et al.*, 2013) ^[35]. Its practices, such as green recruitment, environmental training, performance

appraisal with ecological criteria, and eco-friendly rewards, foster a culture of environmental awareness and enhance employee commitment (Amrutha & Geetha, 2020) ^[3].

Research indicates that employees' knowledge and attitudes are critical determinants of adopting pro-environmental behaviors. Saeed *et al.* (2019) ^[38] demonstrate that Green HRM promotes such behaviors through "green psychological capital," while Ribeiro *et al.* (2022) ^[36] found that positive perceptions of green practices strengthen organizational identity. Likewise, a supportive green psychological climate directly encourages workplace green behavior (Dumont *et al.*, 2017) ^[13].

Similarly, in the domain of Digital Transformation (DT), employee acceptance is largely determined by perceived usefulness and ease of use of technologies, as emphasized in the classical and foundational Technology Acceptance Model (Davis, 1989) ^[12] and the more comprehensive Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al.*, 2003) ^[41]. The theory of organizational readiness for change (Weiner, 2009) ^[45] further highlights that successful implementation of digital strategies requires understanding and acceptance by employees. In the public sector, Mergel *et al.* (2019) ^[29] show that technological investments fail without staff engagement, while the OECD framework (2020) ^[32] underscores that awareness and strategic acceptance are essential for digitally mature services.

In the Greek public administration, and particularly in the Forest Services, this phenomenon is pronounced: although they have a strong environmental mission, they often lack the knowledge, attitudes, and tools required to adopt green and digital strategies (Liaskopoulou & Papadopoulos, 2024b) ^[27]. This "green paradox" emerges when organizations with an environmental mandate display low internal readiness to implement the very changes needed for sustainability.

Taken together, the literature converges on the conclusion that awareness (knowledge) and positive attitudes are prerequisites for the acceptance and support of Green HRM and DT. We therefore hypothesize that:

H₁: Higher levels of knowledge and positive attitudes towards Green Management and Digital Transformation are associated with greater acceptance and readiness for green and digital change.

2.2. Green HRM and Employee Outcomes

Green Human Resource Management (Green HRM) refers to human resource practices that integrate environmental objectives, such as green recruitment and selection, environmental training, performance appraisal based on ecological criteria, green rewards, and participation in environmental initiatives (Renwick *et al.*, 2013; Amrutha & Geetha, 2020) ^[35, 3]. It is grounded in the Ability-Motivation-Opportunity (AMO) framework, which posits that training (ability), incentives (motivation), and opportunities for participation (opportunity) jointly enhance employees' pro-environmental behaviors.

Empirical evidence shows that Green HRM practices improve both environmental and work-related outcomes. Dumont *et al.* (2017) ^[13] highlighted the role of a "green psychological climate" in reinforcing ecological behaviors, while Saeed *et al.* (2019) ^[38] emphasized the contribution of "green psychological capital" in promoting pro-environmental attitudes. Similarly, Ababneh (2021) ^[1] and

Rubel *et al.* (2021) ^[37] demonstrated that Green HRM increases employee commitment and job satisfaction, while meta-analytical studies (Katz, 2022) ^[24] confirmed its positive influence on attitudes, performance, and retention intentions.

Mediating mechanisms such as organizational identification and personal values can strengthen or attenuate these effects (Chen *et al.*, 2021; Tandon *et al.*, 2023) ^[9, 40]. However, in the public sector, the implementation of Green HRM is often fragmented due to limited resources and training. In the Greek Forest Services, the absence of systematic green HRM policies leads to lower employee trust and engagement, generating what has been described as the “green gap” (Liaskopoulou & Papadopoulos, 2024b; Renwick *et al.*, 2013) ^[27, 35]. When consistently applied, however, Green HRM fosters organizational trust and enhances employees’ willingness to participate in sustainability initiatives (Pinzone *et al.*, 2016) ^[34].

Overall, the literature confirms that Green HRM positively influences employee attitudes (e.g., commitment, satisfaction, organizational identification) and behaviors (e.g., ecological practices, performance). We therefore hypothesize that:

H2: Green HRM practices positively influence employees’ attitudes (commitment, satisfaction, organizational identification) and behaviors (ecological practices, performance).

2.3. Digital Maturity, Green HRM and Organizational Outcomes

Digital Transformation (DT) is not limited to technological adoption but represents a profound cultural and strategic change that reshapes organizational value, services, and relationships with employees and citizens (Vial, 2019; Gong & Ribiere, 2021) ^[43, 18]. The concept of digital maturity describes the level of readiness of an organization in terms of technology, skills, culture, and innovation processes (Verhoef *et al.*, 2021) ^[42].

In the public sector, the development of digital maturity is considered a strategic priority. The OECD (2020) ^[32] identifies six key dimensions of digital readiness (data, skills, participation, leadership, etc.), highlighting that the absence of these dimensions results in low efficiency (Mergel, *et al.*, 2019) ^[29]. In Greece, and particularly within the Forest Services, insufficient infrastructure and skills have been documented as major obstacles to modernization (Karadonta *et al.*, 2025) ^[22].

International research emphasizes that digital capabilities reinforce Green HRM practices. Hameed *et al.* (2022) ^[19] demonstrated that digital tools facilitate the evaluation of green practices, while Susanti *et al.* (2023) ^[39] showed that a digital culture enhances commitment and the integration of ecological policies.

High digital maturity is associated with a culture of innovation, collaboration, and continuous learning (Gong & Ribiere, 2021) ^[18], as well as the capacity to integrate sustainability and digitalization within a digital sustainability framework (Verhoef *et al.*, 2021) ^[42]. This enables Green HRM to function more effectively by incorporating ESG indicators, performance tracking, and participatory communication.

In the Greek Forest Services, low digital maturity hinders the implementation of green policies. Conversely, where digital infrastructures and skills exist, the implementation of

Green HRM is facilitated, leading to greater employee commitment and pro-environmental behavior.

Overall, digital maturity is not merely a technological indicator but a critical factor of organizational change and a catalyst for strengthening Green HRM. We therefore hypothesize that:

H3: Digital maturity and the use of digital tools enhance the effectiveness of Green HRM practices and are associated with improvements in organizational culture and functions.

2.4. Barriers, Resources and Employee Commitment

The implementation of Green HRM and Digital Transformation (DT) in the public sector often encounters obstacles related to resources, infrastructure, skills, and resistance to change (Jackson *et al.*, 2011; Jabbour, 2011; Barann *et al.*, 2021) ^[21, 20, 6].

The green gap describes the discrepancy between strategic commitments and actual implementation. It arises from a lack of training, incentives, and communication (Renwick *et al.*, 2013; Dumont *et al.*, 2017) ^[35, 13]. The absence of leadership commitment exacerbates the problem, particularly in resource-constrained organizations such as the Greek Forest Services (Karadonta *et al.*, 2025) ^[22].

Similarly, DT faces barriers including low availability of technological infrastructure, limited innovation culture, and a lack of digital skills (Mergel *et al.*, 2019; OECD, 2020) ^[29, 32]. Beyond technology, a decisive obstacle is organizational resistance and fear of disrupting established processes (Vial, 2019; Verhoef *et al.*, 2021) ^[43, 42].

Organizational support theory suggests that when employees perceive a lack of investment, their commitment decreases (Eisenberger *et al.*, 1986) ^[14]. Conversely, adequate resources and training foster trust and willingness to support change (Weiner, 2009) ^[45].

In the public sector, the green and digital gaps often coexist: without sufficient infrastructure, strategies remain dormant, fostering cynicism and reducing commitment (Dumont *et al.*, 2017; Barann *et al.*, 2021) ^[13, 6]. In the Forest Services, the shortage of resources and technology acts as a dual barrier, reducing the effectiveness of both green and digital initiatives.

Overall, deficiencies in resources and leadership support constrain the success of green and digital strategies and weaken organizational commitment. We therefore hypothesize that:

H4: Barriers and lack of infrastructure limit the implementation of green and digital practices and reduce employee commitment.

2.5. Demographic Differences in Perceptions

Attitudes toward Green HRM and Digital Transformation (DT) vary according to demographic and professional characteristics such as gender, age, education, and job position.

Research shows that women demonstrate greater environmental sensitivity and more positive attitudes toward sustainable practices than men (Vicente-Molina *et al.*, 2018; Zibarras & Coan, 2015) ^[44, 46]. In the Greek Forest Services, this translates into stronger support for Green HRM initiatives among female employees.

Age also influences openness to change: younger employees tend to be more receptive to digital technologies, whereas older employees are more cautious (Venkatesh *et al.*, 2003) ^[41]. However, older employees often express a stronger

sense of environmental responsibility (Pinzone *et al.*, 2016) [34].

Employees with higher educational attainment demonstrate a deeper understanding of green and digital strategies and show greater readiness to engage in DT initiatives (Mergel *et al.*, 2019; OECD, 2020) [29, 32].

Managerial staff are generally more willing to adopt green innovations, as they are directly involved in strategic planning, while frontline employees focus more on the practical challenges of implementation (Jabbour, 2011; Renwick *et al.*, 2013) [20, 35]. Similarly, employees with fewer years of service appear more open to DT, whereas managers tend to express greater concern about resource constraints.

Overall, demographic differences directly shape the acceptance of green and digital practices. Understanding these differences is critical for designing targeted interventions in the Forest Services. We therefore hypothesize that:

H₅: Attitudes and perceptions toward Green HRM and Digital Transformation differ according to employees' demographic characteristics and job position.

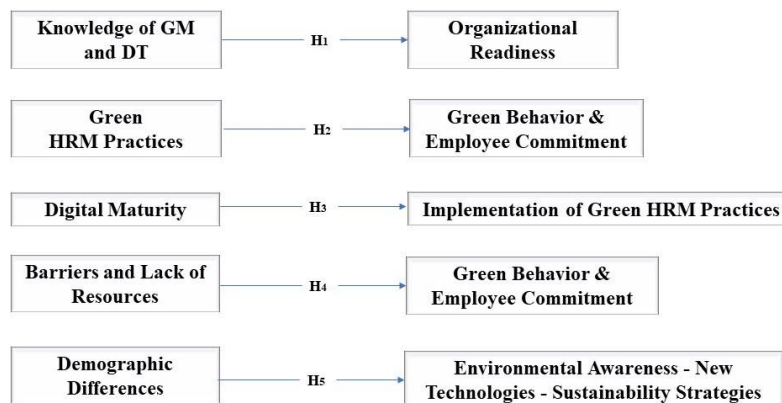
2.6. Summary and Conceptual Framework

The literature demonstrates that the implementation of Green Human Resource Management (Green HRM) and

Digital Transformation (DT) in the public sector depends on interacting factors related to employees' knowledge, attitudes, practices, available resources, and individual characteristics.

First, the Theory of Planned Behavior (Ajzen, 1991) [2] and the Technology Acceptance models (Davis, 1989; Venkatesh *et al.*, 2003) [12, 41] highlight that employees' knowledge and attitudes determine the acceptance and adoption of change. Second, Green HRM practices, grounded in the Ability-Motivation-Opportunity (AMO) framework, are associated with positive attitudes (commitment, satisfaction) and behaviors (green practices, performance), which are further reinforced by digital maturity, providing the necessary tools and skills for integrating green strategies (Vial, 2019; Susanti *et al.*, 2023) [43, 39]. Third, the lack of resources and infrastructures creates "green" and "digital" gaps, limiting organizational commitment (Jackson *et al.*, 2011; Barann *et al.*, 2021) [21, 6]. Finally, demographic characteristics shape the acceptance of strategies, with studies showing significant differences based on gender, age, and education (Vicente-Molina *et al.*, 2018; Zibarras & Coan, 2015) [44, 46].

Overall, Figure 1 illustrates the proposed research framework, which summarizes the five hypotheses (H₁-H₅) and provides the theoretical foundation for the empirical investigation.



Source: Authors' Own

Fig 1: Initial Conceptual Framework: Linking Knowledge and Attitudes on Green Management and Digital Transformation with Green HRM Practices, Digital Maturity, Barriers, Demographic Characteristics, and Employee/Organizational Outcomes (Commitment, Satisfaction, Performance, Green Behaviors).

3. Methodological Approach

3.1. Aim and Research Hypotheses

The primary aim of this study is to investigate how the convergence of Green Human Resource Management (Green HRM) and Digital Transformation (DT) influences the functioning, culture, and sustainability outcomes of the Forest Services in Greece. To achieve this aim, the study focuses on five key areas of inquiry, which are reflected in five research hypotheses (H₁-H₅) related to knowledge, attitudes, green HRM practices, digital maturity, implementation barriers, and demographic differentiations.

3.2. Research Philosophy and Design

The study adopts a pragmatic research paradigm, which is suitable for investigating complex phenomena in the public sector, emphasizing applied outcomes and problem-solving (Creswell & Plano Clark, 2018) [11]. Conceptually, it is

linked to a post-positivist epistemological approach, which acknowledges the existence of an objective reality while also recognizing the role of social context and individual perceptions (Lincoln *et al.*, 2011) [28].

The methodology was based on a quantitative survey using a structured questionnaire, complemented by preliminary qualitative exploration (focus groups) to ensure the clarity and appropriateness of the questions.

3.3. Sample and Population

The population of the study consisted of all senior forestry employees (forest scientists and forest technicians) working in the Forest Services of Greece, regardless of rank or administrative position. To ensure representativeness, stratified sampling was applied to cover different geographical regions, hierarchical levels, and types of services.

The final sample comprised 232 employees, a number considered sufficient for statistical analyses and meeting the requirements of representativeness for the specific public organization. The geographical distribution is presented in Table 1, showing that the largest participation came from Thessaly (33.2%), followed by Central Greece (15.5%) and Central Macedonia (12.5%). Representation covered nearly all administrative regions of the country, allowing for comparisons across different areas.

Table 1: Forestry Services by Region that participated in the survey

District	N.	Percentage%
Thessaly	77	33.2
Stereia Ellada	36	15.5
Central Macedonia	29	12.5
Attiki	23	9.9
Peloponnese	21	9.1
Creta	16	6.9
West Macedonia	9	3.9
Epirus	8	3.4
North Aegean	6	2.6
East Macedonia - Thrace	4	1.7
Ionia Island	2	0.9

Table 2: The frequency distribution of socio-demographic characteristics of the sample (N=232)

Gender	Percentage%	Education	Percentage%
Men	44.0	Bachelor	58.6
Women	56.0	Postgraduate	36.6
		Phd	4.7
Age	Percentage%	Work Experience	Percentage%
<25	0.9	<1 year	14.2%
26-35	4.3	1-5 years	19.0%
36-45	17.2	6-10 years	10.8%
46-55	47.4	11-15 years	14.7%
55-65	27.6	16-20 years	10.8%
>65	2.6	>20 years	30.6%

Source: Authors' Own

3.4. Development of the Research Instrument

The research instrument was developed in two phases. First, focus groups were conducted with staff from ten (10) Forest Services in order to identify critical issues and ensure clarity in the understanding of key terms. Based on the insights obtained, a preliminary version of the questionnaire was drafted. In the second phase, a pilot test was carried out with a smaller sample of employees, and the necessary revisions were made to finalize the instrument.

The final questionnaire consisted of three main sections:

- Green HRM and organizational dimension: attitudes, practices, and perceptions regarding green administrative strategies.
- Digital Transformation: level of implementation, applications, perceived effects, and barriers.
- Demographic characteristics: gender, age, education, work experience, and hierarchical position.

A five-point Likert scale was primarily employed, complemented by dichotomous and multiple-choice questions. Several items were adapted from established organizational maturity models (Andersen & Jessen, 2003; Backlund *et al.*, 2015) [4, 5], with modifications to suit the Greek public administration context.

Content validity was ensured through the focus group phase

West Greece	1	0.4
total	232	100.0

Source: Authors' Own

Regarding the demographic characteristics, the majority of participants were women (56%), while men represented 44% of the sample. The dominant age group was 46-55 years old (47.4%), reflecting the mature and experienced profile of the human resources in the Forest Services. In terms of education, 58.6% of the respondents held a university degree, 36.6% a postgraduate degree, and a smaller proportion (4.7%) a doctoral diploma. Concerning work experience, approximately 30.6% of employees had more than 20 years of service, highlighting both the accumulated expertise within the organization and the simultaneous need for workforce renewal. These details are presented in Table 2.

The analysis of the sample's characteristics highlights the combination of substantial professional experience, relatively high educational attainment, and broad geographical distribution. This diversity provides a reliable basis for drawing conclusions regarding employees' knowledge, attitudes, and perceptions toward Green HRM and Digital Transformation.

and expert review, while the pilot study confirmed the clarity and consistency of the items. Reliability was subsequently assessed in the main survey through Cronbach's alpha, with all scales exceeding the accepted threshold of 0.70, indicating satisfactory internal consistency.

3.5. Data Collection

Data were collected through both electronic distribution and direct personal contact, in collaboration with regional and central Forest Services. Anonymity and voluntary participation were fully ensured throughout the process. In cases of low response rates, reminder messages were sent, particularly to participants located in remote areas.

3.6. Statistical Analysis

The statistical analysis was performed using SPSS v.26 and included multiple steps. First, descriptive statistics were applied (frequencies, means, standard deviations, and charts). The research hypotheses were then tested using t-tests, One-Way ANOVA, and Pearson/Kendall correlations, depending on the type of variables (Pallant, 2020) [33]. Reliability of the scales was assessed using Cronbach's alpha, with values above 0.70 considered acceptable (Nunnally & Bernstein, 1994) [31]. Factor analysis was subsequently conducted, including KMO and Bartlett's

tests, with factor extraction based on Kaiser's criterion (eigenvalues > 1) (Costello & Osborne, 2005) [10]. Finally, post-hoc tests were performed to identify differences between demographic groups.

This analytical approach enables the empirical validation of the conceptual framework (H₁-H₅) and the examination of interrelationships among Green HRM, Digital Transformation, organizational barriers, culture, and employee outcomes.

3.7. Justification of the Analytical Approach

The methodological choices of this study are grounded in established research practices in public administration and organizational innovation (Miles & Huberman, 1994; Bryman, 2016) [30, 8]. The combination of a robust theoretical framework (Green HRM, Digital Transformation, organizational readiness) with empirical analysis through factor analysis ensures both validity and reliability.

The conceptual model (Figure 1) maps the relationships among knowledge, attitudes, HRM practices, digital maturity, barriers, and outcomes. The analysis confirms the structure of the model and provides a strategic planning tool for public organizations that are required to integrate environmental and digital strategies (Fitzgerald *et al.*, 2014;

Bibri & Krogstie, 2020) [17, 7].

4. Results

4.1. Introduction

The analysis of data from the 232 completed questionnaires provides important insights into how employees of the Forest Services in Greece perceive and adopt Green Human Resource Management (Green HRM) practices and Digital Transformation (DT). This section presents the main results of the statistical analysis, focusing on three axes: (a) the level of knowledge and attitudes, (b) Green HRM practices and their impact on employee behaviors, and (c) the influence of digital maturity, barriers, and demographic factors on perceptions of organizational transformation.

The statistical processing included descriptive analysis, Pearson correlations, hypothesis testing through t-tests and ANOVA, as well as factor analysis to confirm the internal consistency of the conceptual model. The descriptive statistics of the main variables are presented in Table 3, while the reliability indicators of the scales in Table 4 confirm their internal consistency with Cronbach's $\alpha > 0.70$, which is considered acceptable in the international literature (Nunnally & Bernstein, 1994) [31].

Table 3: Descriptive statistics of the study's main variables (N=232).

Variable	Mean (M)	Standard Deviation (SD)	% Agreement (Likert 4-5)
Knowledge of Green Management	2.44	0.91	44%
Attitudes toward Digital Transformation	3.78	0.84	67%
Implementation of Green HRM Practices	3.21	0.77	54%
Digital Maturity (Technology)	3.05	0.89	49%
Digital Maturity (Strategy)	3.32	0.82	58%
Digital Maturity (Culture)	3.45	0.79	61%
Barriers - Lack of resources	3.98	0.72	78%
Barriers - Lack of technological infra.	3.86	0.75	72%
Barriers - Lack of training	3.72	0.81	69%

Table 4: Reliability of Key Scales (Cronbach's Alpha). All scales show values > 0.70, which are considered acceptable for research purposes (Nunnally & Bernstein, 1994) [31].

Scale / Factor	Number of Items	Cronbach's α
Green HRM (training, incentives, appraisal)	8	0.82
Digital Maturity - Technology	6	0.79
Digital Maturity - Strategy	5	0.83
Digital Maturity - Culture	5	0.86
Barriers & Resource Shortages	7	0.81
Organizational Culture (collaboration, transparency, innovation)	6	0.84

4.2. Knowledge and Attitudes toward Green Management and Digital Transformation

The results show that only 44% of employees reported being familiar with the term Green Management, while 56% stated that they did not have a clear understanding of its content (see Table 3). However, a strong correlation was observed between knowledge of Green Management and familiarity with the European Green Deal ($r = 0.685$, $p < 0.001$, see Table 6). This suggests that employees who are more informed about international sustainability policies tend to show higher acceptance of related strategies (Renwick *et al.*, 2013; Saeed *et al.*, 2019) [35, 38].

At the same time, knowledge and positive attitudes toward Digital Transformation were positively correlated with indicators of organizational readiness, such as improved transparency and process efficiency (Venkatesh *et al.*, 2003; OECD, 2020) [41, 32]. Employees who reported higher

understanding of digital strategies expressed greater willingness to adopt new tools and processes, confirming the hypothesis that knowledge and attitude are critical factors for change acceptance (Weiner, 2009) [45].

Overall, H₁ is supported by the empirical findings: the higher the level of knowledge and positive attitude toward Green Management and Digital Transformation, the greater the readiness to adopt green and digital practices.

4.3. The Impact of Green HRM Practices on Attitudes and Behaviors

The data analysis revealed that Green HRM practices are directly associated with positive employee attitudes and behavioral indicators. Specifically, employees who reported that their services implement training policies on environmental issues and incentives for green practices indicated higher levels of job satisfaction and organizational

commitment. Factor analysis (see Table 5) confirmed that items related to green training, performance appraisal based on environmental criteria, and incentives loaded on a

common factor with high internal consistency (Cronbach's $\alpha = 0.82$, see Table 4).

Table 5: Results of the Exploratory Factor Analysis (EFA) for the key dimensions of Green HRM and Digital Transformation.

Factor / Items	Loadings	Eigenvalue	Explained Variance (%)
Factor 1: Strategy	0.72-0.84	4.15	18.3%
Factor 2: Technology	0.69-0.81	3.62	15.7%
Factor 3: Operations	0.66-0.79	2.85	13.4%
Factor 4: Organizational Culture	0.70-0.83	2.41	9.8%
Factor 5: Citizen Relations	0.65-0.77	1.96	8.5%
Total Explained Variance			62.0%
Bartlett's Test of Sphericity			$\chi^2 = 1267.45$, $p < 0.001$

Moreover, Pearson correlations showed a positive relationship between the implementation of Green HRM practices and employees' reported pro-environmental behavior ($r = 0.56$, $p < 0.001$, see Table 6). Employees who

participated in relevant programs were more likely to state that they adopted eco-friendly practices in their daily work (e.g., reducing paper consumption, promoting recycling).

Table 6: Pearson correlations among key variables (N=232). Positive correlations are observed between knowledge, attitudes, Green HRM practices, digital maturity, and employee commitment, while perceptions of barriers/lack of resources show negative correlations with all indicators.

Variables	1	2	3	4	5	6
1. Knowledge of Green Management	1	0.52**	0.46**	0.50**	-0.41**	0.48**
2. Attitudes toward DT	0.52**	1	0.49**	0.58**	-0.38**	0.51**
3. Green HRM Practices	0.46**	0.49**	1	0.55**	-0.44**	0.56**
4. Digital Maturity	0.50**	0.58**	0.55**	1	-0.47**	0.61**
5. Barriers / Lack of Resources	-0.41**	-0.38**	-0.44**	-0.47**	1	-0.47**
6. Commitment & Satisfaction	0.48**	0.51**	0.56**	0.61**	-0.48**	0.61**

Note: $p < 0.01$ (two-tailed).

At the same time, the analysis of variance (ANOVA) showed that employees working in services with a more systematic implementation of Green HRM practices reported significantly higher mean scores in productivity and organizational identification indicators ($F = 5.21$, $p <$

0.01, see Table 7).

Overall, H_2 is strongly supported: the implementation of Green HRM practices enhances both pro-environmental behaviors and indicators of employee satisfaction, commitment, and performance within the Forest Services.

Table 7: Demographic differences in perceptions of Green HRM and Digital Transformation

Variable / Group	Green HRM Attitudes (M)	DT Acceptance (M)	Statistical Test
Gender			
Men	3.52	3.74	t = 2.41*, p < 0.05
Women	3.87	3.82	
Age			
< 40 years	3.71	4.05	F = 4.33*, p < 0.05
40-49 years	3.62	3.85	
≥ 50 years	3.58	3.62	
Education			
Secondary	3.41	3.55	F = 6.12**, p < 0.01
University	3.79	3.88	
Postgraduate	3.92	4.12	
Work Experience			
< 10 years	3.84	3.96	F = 3.45*, p < 0.05
10-20 years	3.63	3.78	
> 20 years	3.55	3.69	
Position			
Employees	3.62	3.77	t = 2.17*, p < 0.05
Managers	3.91	3.94	

Note: $*p < 0.05$, $**p < 0.01$.

4.4. The Role of Digital Maturity

The factor analysis of the items related to Digital Transformation revealed four main dimensions of digital maturity: technology, strategy, operations, and organizational culture (see Table 5). The factors demonstrated high internal consistency (Cronbach's $\alpha =$

0.79-0.86, see Table 4) and explained 62% of the total variance, confirming the validity of the model.

The results showed that higher levels of digital maturity are positively associated with the implementation of Green HRM practices. Specifically, organizations that had adopted more digital tools (e.g., electronic document management

systems, collaboration platforms) reported higher mean scores in green training practices and the evaluation of environmental objectives (t-test, $p < 0.01$, see Table 7). This finding indicates that digital capabilities act as enablers of Green HRM practices, facilitating their application in daily operations (Hameed *et al.*, 2022; Susanti *et al.*, 2023)^[19, 39]. At the same time, the Pearson correlation between digital maturity and organizational culture indicators was significant ($r = 0.61$, $p < 0.001$, see Table 6). Employees who perceived a higher level of digital adaptation also reported a stronger sense of collaboration, transparency, and innovation within their organization. This finding is consistent with international literature, which emphasizes that Digital Transformation does not only involve technological changes but also brings about deeper cultural and organizational transformations (Vial, 2019; Verhoef *et al.*, 2021)^[43, 42].

Overall, H_3 is confirmed: digital maturity strengthens the implementation of Green HRM practices and contributes positively to shaping organizational culture within the Forest Services.

4.5. Barriers and Resource Constraints

The analysis of the responses revealed that employees of the Forest Services identify significant barriers in the implementation of both Green HRM practices and Digital Transformation. The main obstacles reported were: (a) insufficient financial resources (78% of participants), (b) lack of adequate infrastructure and technological equipment (72%), and (c) insufficient training and staff skills (69%).

Statistical analysis showed a negative correlation between the perception of barriers and indicators of work engagement ($r = -0.48$, $p < 0.001$, see Table 6). Employees who perceived that their work environment lacked the necessary resources or leadership support reported significantly lower levels of engagement and satisfaction. This finding is consistent with previous studies showing that the absence of organizational support and resources creates a “green gap” between strategy and daily practice (Jackson *et al.*, 2011; Dumont *et al.*, 2017)^[21, 13].

In addition, the analysis of variance (ANOVA) indicated that services with rudimentary digital infrastructures exhibited statistically lower mean scores in Green HRM implementation indicators ($F = 6.14$, $p < 0.01$; see Table 7). This suggests that the absence of basic technological tools limits not only the progress of Digital Transformation but also the implementation of green policies, reinforcing a vicious cycle of reduced employee engagement (Mergel *et al.*, 2019; OECD, 2020)^[29, 32].

Overall, H_4 is confirmed: the existence of barriers (resources, infrastructure, training) significantly constrains the implementation of green and digital practices and leads to lower employee engagement.

4.6. Demographic Differences in Perceptions

The analysis of variance highlighted that employees' perceptions of Green HRM and Digital Transformation differ according to specific demographic and professional characteristics.

- **Gender:** Female employees reported higher environmental sensitivity and more positive attitudes toward the implementation of Green HRM practices ($M = 3.87$) compared to male employees ($M = 3.52$), a difference that was statistically significant ($t = 2.41$, $p <$

0.05). This finding is consistent with international studies showing greater ecological sensitivity among women (Vicente-Molina, *et al.*, 2018)^[44].

- **Age:** Younger employees (<40 years) were more receptive to digital technologies and the adoption of DT tools ($M = 4.05$) compared to older employees (>50 years, $M = 3.62$), a statistically significant difference ($F = 4.33$, $p < 0.05$). This result confirms that age influences technological acceptance (Venkatesh *et al.*, 2003)^[41].
- **Education:** Employees with a university or postgraduate degree demonstrated higher understanding of both green and digital strategies compared to those with lower educational attainment ($F = 6.12$, $p < 0.01$), a finding consistent with prior research (Pinzone *et al.*, 2016)^[34].
- **Work experience and position:** Employees with less than 10 years of experience showed greater willingness to participate in new digital initiatives and more positive attitudes toward Green HRM ($F = 3.45$, $p < 0.05$), whereas those with more years of service reported lower mean scores. This finding aligns with international literature suggesting that longer work experience can increase resistance to change (Jabbour, 2011)^[20].

The detailed results are presented in Table 7.

Overall, H_5 is confirmed: attitudes and perceptions of Green HRM and Digital Transformation differ significantly according to gender, age, education, work experience, and hierarchical position.

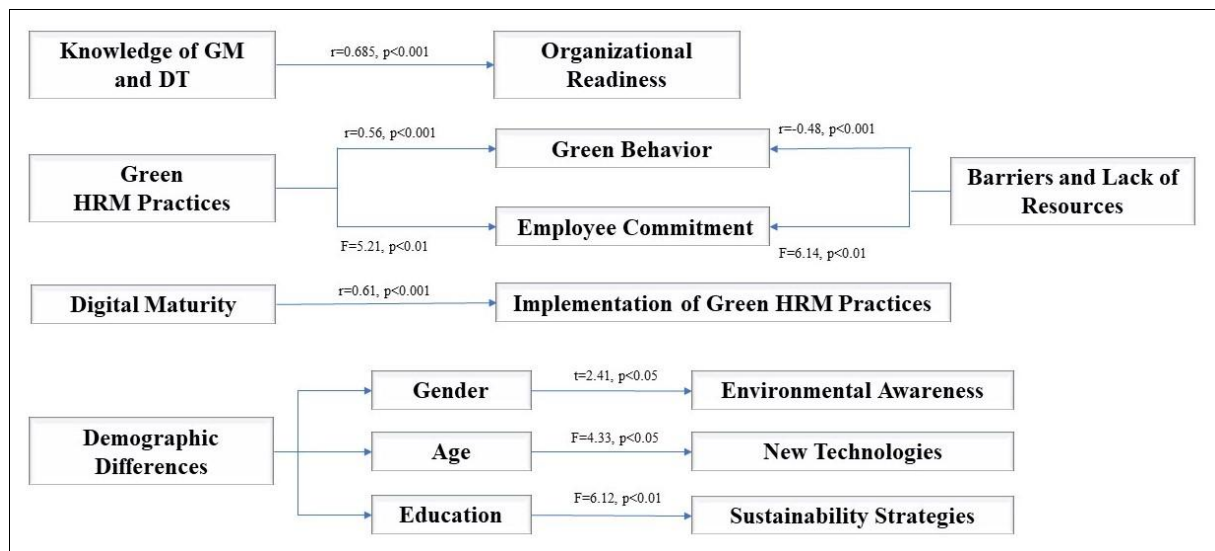
Figure 2 presents the empirical framework of hypotheses (H_1 - H_5), illustrating the core dimensions of the study and their associations with employee outcomes and organizational culture.

- **H₁:** Knowledge and Attitudes: Knowledge of Green Management and positive attitudes toward Digital Transformation are strongly associated with organizational readiness ($r = 0.685$, $p < 0.001$). This indicates that well-informed and positively oriented employees act as key agents of change.
- **H₂:** Green HRM Practices: Green training, incentives, and performance evaluation based on environmental criteria are linked to increased pro-environmental behavior ($r = 0.56$, $p < 0.001$) and higher commitment ($F = 5.21$, $p < 0.01$). Green HRM practices are proven catalysts for fostering positive attitudes.
- **H₃:** Digital Maturity: Organizations with advanced digital infrastructures and culture show a strong positive correlation with the implementation of Green HRM ($r = 0.61$, $p < 0.001$), confirming that digital capabilities act as enablers of environmental practices.
- **H₄:** Barriers and Lack of Resources: The perception of insufficient resources, infrastructure, and training is negatively associated with employee commitment ($r = -0.48$, $p < 0.001$), while organizations with limited digital infrastructure demonstrate lower levels of Green HRM implementation ($F = 6.14$, $p < 0.01$). This highlights the “green gap” between strategy and everyday practice.
- **H₅:** Demographic Differences: Attitudes vary significantly by gender ($t = 2.41$, $p < 0.05$), age ($F = 4.33$, $p < 0.05$), and educational level. Women and

younger employees exhibit greater environmental sensitivity and acceptance of new technologies,

whereas more educated employees report a deeper understanding of sustainability strategies.

Overall, the framework demonstrates that the convergence of Green HRM and Digital Transformation is shaped by multiple factors, knowledge, practices, digital maturity, barriers, and demographics, that interact to enhance employee commitment, pro-environmental behavior, and organizational culture.



Source: Authors' Own

Fig 3: Final framework and validated hypotheses (H₁-H₅) of Green HRM and Digital Transformation

The empirical analysis confirmed all research hypotheses (H₁-H₅), highlighting that knowledge and attitudes, Green HRM practices, digital maturity, barriers, and demographic factors are directly linked to employee outcomes and the functioning of Forest Services. These findings provide a comprehensive picture of the dynamics of integrating environmental and digital strategies in the public sector.

5. Discussion - Conclusions and Recommendations

5.1 Discussion of Findings

This study revealed critical insights into how the convergence of Green HRM and Digital Transformation (DT) shapes the functioning and culture of the Greek Forest Services. The findings are discussed below in relation to the research hypotheses (H₁-H₅), in light of international literature.

The confirmation of H₁ highlights that knowledge and attitudes are decisive factors for organizational readiness. The fact that fewer than half of employees were familiar with the term Green Management demonstrates a substantial knowledge gap that hinders the acceptance of strategic change. This finding is consistent with the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Davis, 1989; Venkatesh *et al.*, 2003) [12, 41], as well as the theory of organizational readiness for change (Leontis *et al.*, 2025; Weiner, 2009) [25, 45], all of which emphasize that understanding and perceived usefulness strongly influence the adoption of new practices. It also supports the arguments of Renwick *et al.* (2013) [35] and Saeed *et al.* (2019) [38] that environmental awareness is a prerequisite for the development of pro-environmental behaviors.

The findings also support H₂, namely that Green HRM practices are directly linked to positive employee attitudes and behaviors, enhancing work commitment, satisfaction,

and pro-environmental actions. This aligns with prior research on the role of the “green psychological contract” (Dumont *et al.*, 2017; Ababneh, 2021; Rubel *et al.*, 2021) [13, 1, 37]. In the Greek context, where Forest Services are characterized by highly formalized administrative routines, the introduction of green training and incentive systems can serve as a lever for cultural renewal and for strengthening the employee-organization relationship.

H₃ is also confirmed, demonstrating that digital maturity is closely related to the effectiveness of Green HRM practices and the development of a collaborative culture. Organizations with more advanced digital infrastructures exhibited more positive organizational functioning and a stronger orientation toward transparency. This aligns with the view that DT is not merely a technological upgrade but primarily an organizational and cultural transformation (Vial, 2019; Verhoef *et al.*, 2021) [43, 42]. In bureaucratic contexts, however, the introduction of digital solutions without an accompanying strategy of cultural and organizational change often results in fragmented implementations with limited transformative impact.

The results for H₄ underscore the critical role of constraints: lack of resources, infrastructure, and training act as major impediments to the implementation of green and digital strategies. This finding resonates with the concept of the “green gap” in the international literature (Jackson *et al.*, 2011; Dumont *et al.*, 2017; Barann *et al.*, 2021) [21, 13, 6], while in the Greek case it is exacerbated by institutional inertia and chronic underfunding of the public sector (Karadonta *et al.*, 2025) [22]. The result is a vicious cycle of stagnation that hinders both environmental and digital innovation.

Finally, H₅ was confirmed, showing that attitudes and perceptions differ by gender, age, and education. Women and younger employees tend to adopt more positive

attitudes toward green and digital strategies, while those with higher educational levels demonstrate stronger comprehension of policies. These findings align with research showing that demographic factors significantly influence the acceptance of change (Vicente-Molina *et al.*, 2018; Pinzone *et al.*, 2016) ^[44, 34]. For Greek public administration, this implies that policies should be tailored to the differentiated needs of employees rather than applying uniform, “one-size-fits-all” approaches.

Overall, the analysis suggests that the convergence of Green HRM and DT in the Forest Services is not a linear process but depends on a combination of factors: knowledge and attitudes, green HR practices, digital maturity, institutional and financial support, and demographic differentiations. The study demonstrates that without internal awareness and institutional reinforcement, even the most innovative policies risk remaining declarative intentions without substantive implementation.

5.2 Conclusion

This study highlighted that the convergence of Green Human Resource Management (Green HRM) and Digital Transformation (DT) constitutes a central factor for the modernization of the Greek Forest Services, combining the challenges of environmental governance with those of technological restructuring. The results demonstrated that employees’ knowledge and attitudes form a critical foundation for the acceptance of new strategies. The finding that only 44% were familiar with the term Green Management points to a significant knowledge gap, which constrains organizational readiness. This relationship aligns with the theories of Planned Behavior and Technology Acceptance, which emphasize that attitudes and perceived usefulness influence the willingness to embrace change (Davis, 1989; Venkatesh *et al.*, 2003; Liaskopoulou & Papadopoulos, 2024a) ^[12, 41, 26]. Furthermore, the observation that employees with stronger knowledge of European strategies (e.g., the EU Green Deal) displayed more positive attitudes towards DT confirms that awareness and understanding are prerequisites for change (Renwick *et al.*, 2013; Saeed *et al.*, 2019; OECD, 2020) ^[35, 38, 32].

The implementation of Green HRM practices, such as training, performance evaluation based on environmental criteria, and incentive schemes, was found to be positively associated with employee commitment, satisfaction, and pro-environmental behaviors. This finding corroborates international evidence suggesting that Green HRM enhances the sense of a “green psychological contract” and strengthens employees’ environmental awareness (Dumont *et al.*, 2017; Ababneh, 2021; Rubel *et al.*, 2021) ^[13, 1, 37]. Within the Forest Services, characterized by traditional administrative structures, the adoption of such practices could serve as a driver of cultural renewal.

The results also revealed that digital maturity acts as a catalyst for the effective implementation of Green HRM practices. Services with more advanced digital infrastructures reported higher levels of green training and evaluation, as well as a stronger organizational culture of transparency and collaboration. This finding supports the international perspective that DT is not merely a technological upgrade but primarily an organizational and cultural transformation (Vial, 2019; Verhoef *et al.*, 2021; Susanti *et al.*, 2023) ^[43, 42, 39]. It suggests that public organizations can leverage digital maturity as an “amplifier”

of their green strategy.

Nevertheless, significant barriers limiting progress were identified. The lack of resources, infrastructural deficits, and insufficient employee skills were negatively associated with organizational commitment, confirming the literature on the “green gap” (Jackson *et al.*, 2011; Barann *et al.*, 2021) ^[21, 6]. In the Greek context, these obstacles are linked to longstanding institutional weaknesses and limited financial support (Karadonta *et al.*, 2025) ^[22], restricting the capacity of Forest Services to act as role models of green and digital governance.

Finally, demographic differentiations were shown to be critical for the acceptance and adoption of strategies. Women and younger employees displayed greater environmental sensitivity, while more educated staff demonstrated a deeper understanding of green and digital strategies. These results are consistent with studies indicating that gender, age, and education significantly influence attitudes toward environmental and technological change (Vicente-Molina *et al.*, 2018; Pinzone *et al.*, 2016) ^[44, 34].

Overall, the findings reinforce the argument that the convergence of Green HRM and DT can serve as a driver of institutional modernization in the public sector. At the same time, they reveal that success depends not only on the presence of positive attitudes and practices but also on institutional support, available resources, and the targeted utilization of demographic characteristics. By providing primary data from a critical yet under-researched sector, this study contributes to the theoretical debate on green and digital public administration, while also offering practical guidance for the design of sustainable and digitally mature governance policies.

5.3 Policy and Practical Implications

Based on the findings of this study, there is a clear need for an integrated policy framework that combines Green HRM with Digital Transformation (DT). The first priority concerns the development of comprehensive training and capacity-building programs that enhance employees’ knowledge of green strategies and foster positive attitudes toward new technologies. Systematic training can serve as a catalyst for change acceptance, while simultaneously strengthening employees’ confidence and active engagement.

The second direction relates to the institutionalization of Green HRM practices. Embedding environmental criteria in performance evaluation, introducing incentives for pro-environmental behaviors, and establishing mechanisms for monitoring environmental performance can lead to a deeper integration of sustainability within organizational operations. Such practices not only contribute to reducing the environmental footprint but also create a new organizational culture that promotes commitment and job satisfaction.

The third dimension emphasizes the need for investments in digital infrastructure and systems. The adoption of modern tools, such as e-government platforms, electronic document management systems, and collaborative applications, can significantly enhance efficiency and transparency. However, investments in technology must be accompanied by equivalent investments in human capital, ensuring that employees acquire the necessary skills to fully leverage these tools.

At the same time, particular attention must be given to addressing existing barriers. Securing adequate funding, strengthening technical infrastructure, and providing opportunities for continuous training are essential preconditions for bridging the “green gap” between strategy and day-to-day practice. The leadership of the Forest Services is expected to play a pivotal role, not only by ensuring the availability of resources but also by fostering a culture of participation, collaboration, and innovation.

Finally, policies should be sensitive to demographic diversity. Greater environmental awareness among women, stronger acceptance of technology among younger employees, and deeper strategic understanding among highly educated staff represent factors that can be harnessed in the design of targeted programs. In this way, workforce diversity becomes an opportunity rather than a challenge, enabling more effective and sustainable implementation of policies.

Overall, these recommendations highlight that the successful transition of the Forest Services to a green and digital model requires a combination of political will, institutional support, technological investments, and targeted interventions in human resources. Only through such a coordinated effort can substantial change be achieved, one that enhances efficiency, reduces the environmental footprint, and fosters a new culture of sustainability within the public sector.

5.4 Limitations of the Study

Despite the contribution of this study to the investigation of the convergence between Green Human Resource Management (Green HRM) and Digital Transformation (DT) in the public sector, several limitations should be acknowledged when interpreting the findings. First, the study employed a cross-sectional research design, which does not allow for the identification of causal relationships but only correlations. Second, the sample was limited to employees of the Greek Forest Services (N=232), which restricts the generalizability of the results to other public organizations or different national contexts.

Moreover, data collection relied on a self-reported questionnaire, which may have been affected by social desirability bias or response bias. Although validated scales were used and their reliability was tested, the inclusion of qualitative data (e.g., interviews, case studies) could provide a deeper understanding of the phenomena under investigation. Finally, the dynamic nature of Digital Transformation implies that employees’ perceptions may change rapidly with the introduction of new tools and policies, which limits the longitudinal validity of the findings.

5.5 Directions for Further Research

Future research could extend the findings of this study to other public organizations beyond the Forest Services, in order to examine whether the results hold across different institutional and cultural contexts. A cross-national comparative study within European Union countries would be particularly valuable, as it could capture the influence of varying administrative systems, sustainability frameworks, and levels of digital maturity.

In addition, longitudinal research designs would allow for a deeper understanding of how employees’ attitudes and behaviors evolve over time, especially as digital

technologies and green strategies continue to advance. Incorporating qualitative methods (e.g., interviews, focus groups) alongside quantitative analysis could provide richer insights into the mechanisms through which Green HRM practices and digital initiatives influence organizational culture and employee outcomes.

Emerging research opportunities also lie in the exploration of Artificial Intelligence (AI) applications in HRM, such as predictive analytics for green talent management, as well as the integration of ESG frameworks into HR and digital governance practices. Furthermore, future studies could examine how resilience-oriented strategies, combining environmental, social, and digital dimensions, shape the adaptability of public organizations.

Finally, particular attention should be devoted to the role of leadership and organizational culture as mediators or moderators in the relationship between Green HRM, Digital Transformation, and organizational outcomes. Such a focus could advance the theoretical development of the field while providing more targeted and future-oriented policy recommendations for the public sector.

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