



An-Najah National University

Faculty of Graduate Studies

**THE NEXUS BETWEEN GREEN HUMAN
RESOURCE MANAGEMENT, GREEN
INNOVATION, AND DIGITAL
TRANSFORMATION TOWARD
SUSTAINABILITY IN THE PALESTINIAN
MANUFACTURING SECTOR**

By

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**This Thesis is Submitted in Partial Fulfillment of the Requirements for the Degree of
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Dedication

To my beloved parents, for their endless love, support, and prayers,

To my dear husband, whose patience and unwavering support have been my strength
throughout this journey,

To my precious sons, Rushdi and Yazan, whose smiles have given me the
motivation and determination to persevere,

To my resilient Palestinian people,

And to all who believe that knowledge is the path to progress and change,

I dedicate this work with all my heart and gratitude.

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Lastly, I dedicate this thesis to the steadfast people of Palestine, whose strength and resilience in adversity continue to inspire me.

Declaration

I, the undersigned, declare that I submitted the thesis entitled:

**THE NEXUS BETWEEN GREEN HUMAN RESOURCE MANAGEMENT,
GREEN INNOVATION, AND DIGITAL TRANSFORMATION TOWARD
SUSTAINABILITY IN THE PALESTINIAN MANUFACTURING SECTOR**

I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's Name: **Sajida Mustafa Ali Ahmad**

Signature:

Sajida 

Date: **08/01/2025**

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THE NEXUS BETWEEN GREEN HUMAN RESOURCE MANAGEMENT, GREEN INNOVATION, AND DIGITAL TRANSFORMATION TOWARDS SUSTAINABILITY IN THE PALESTINIAN MANUFACTURING SECTOR

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Abstract

Green human resource management is an important concept introduced and studied in recent decades due to the increasing interest in the environment and the pursuit of sustainability through protecting available natural resources and reducing the risks of environmentally harmful practices. Therefore, the level of implementation of these practices was evaluated in the manufacturing sector to achieve the desired goal of this study. The researcher proposed eighteen hypotheses and used the AMO, RBV, and TBL theories. A review of the relevant literature was conducted to enrich the research on the nature of GHRM and its relationship to different variables. Then, the Comprehensive inventory method was used to collect data from specific manufacturing sectors through electronic questionnaires, where 125 population size and 95 people responded to the questionnaire responded to the questionnaire, distributed between the general manager, executive manager, human resources manager, quality manager, production manager, and others. The Smart-PLS software was used to analyze the collected data.

The results indicated that green human resource management practices positively impacted environmental performance. They do not influence social and economic performances. Moreover, green innovation completely mediated the relationship between the GHRM and social performance. On the other hand, digital transformation completely mediates the relationships between GHRM and economic performance and completely mediates the relationships between GHRM and social performance, partially mediates the relationship between GHRM and environmental performance. This study added empirical evidence and influenced the literature on GHRM issues in the manufacturing sector. The researcher recommends that the Palestinian manufacturing sector pay attention to environmental initiatives, in addition to supporting the senior management of factories

for any environmental initiative and supporting green innovation and digital transformation, which contribute to sustainability in a very positive way. It is essential to raise awareness of environmental issues among employees, workers, and management.

Keywords: Green Human Resources Management (GHRM), Green Innovation (GI), Digital Transformation (DT), Economic Performance (EcP), Environmental Performance (EP), Social Performance (SP), Sustainable Organizational Performance (SOP), Manufacturing Sector.

Chapter One

Introduction and Literature Review

1.1 Chapter Overview

This chapter briefly introduces the research subject and the study's theoretical background. The sections of this chapter include a general background, the problem statement and the research questions, the significance of the research, the objectives of the research, the research hypotheses, and the structure of the thesis. Furthermore, the chapter reviews the literature related to the thesis topic, which aims to provide a comprehensive background and knowledge about green human resource management (GHRM), green innovation, digital transformation (DT), and sustainable organizational performance “Economic Performance (EcP), Environmental Performance (EP), Social Performance (SP)”. The chapter also presents the relationships between these variables and how to measure each in the Palestinian manufacturing context (i.e., chemical, pharmaceutical, food, metal & engineering). Proposed hypotheses were developed to investigate and confirm the expected relations between research variables based on the existing literature related to these variables.

1.2 General Background

Environmental degradation has become a very worrying, negatively affecting the entire world. From this standpoint, the world, including developing and developed countries, has adopted environmentally friendly practices to confront these concerns, whether in manufacturing or services. Therefore, several organizations seek to create and disseminate an official environmental management system (EMS) (Masri & Jaaron, 2017)

Researchers agreed that GHRM includes certain practices implemented by employees to achieve sustainable environmental goals to preserve the environment (Ahmad et al., 2023), and the employee who acts these practices is called a “green employee” (Li et al., 2023). GHRM is defined as “to reinforce environmentally sustainable practices and increase employees’ commitment to the issues of environmental sustainability” (Masri & Jaaron, 2017). Despite the different definitions, it revolves around one meaning, which is integrating environmental issues with human resources (Mwita, 2019).

GHRM includes several practices, including green recruitment and selection, green job analysis and design, green training and development, green performance management, and green reward management. Every GHRM practice contributes in one way or another to the greenness of an organization and its success as a green body when implemented effectively. It stimulates employees environmentally, from job design, training, and performance to the expected green reward. Accordingly, GHRM is closely linked to the environmental aspect through the five practices that serve the environment and sustainability. On the one hand, it creates environmentally friendly employees. Moreover, it includes greenness in its current and future strategies, plans, and policies, reducing employee turnover due to its conviction and loyalty to protecting the environment (Faisal, 2023).

Recently, researchers worldwide are rushing to study GHRM benefits, importance, and their connection to the economic, social, environmental, and health, as they realize the importance of this in protecting the earth from the dangers of desertification, shrinking vegetation, emissions, and vast amounts of waste. Companies must give equal priority to their corporate growth and their commitment to preserving and protecting the environment (Roscoe et al., 2019). This requires that the state be strong and cohesive, have a large economy, and have political stability in contrast to wars, displacement, social unrest, and poverty. This contradicts the reality in developing countries, so the application of GHRM in developing countries is usually minimal (Kodua et al., 2022; Mousa & Othman, 2020).

Moreover, Kodua et al. (2022) stated that there are critical barriers that prevent the implementation of GHRM practices, and they identified seventeen barriers that were classified into five main ones, which are (management, technical, economic, cultural, and educational, political and regulatory). Although the study added knowledge to decision makers to confront the practices of environmental innovation in light of the existing challenges, it is essential to study the impact of these practices on several variables, including green innovation (GI) or DT and SOP.

At the level of GI, the results of a unique exploratory study (Kanan et al., 2023) on manufacturing companies in Palestine revealed a direct relationship between GHRM practices and GI. It also provides valuable information about GI in the manufacturing sector. The study served as an information base for decision-makers and researchers; the

researcher recommends conducting other studies with a larger sample and in other developing countries to confirm the results. Through studies, it was found that there is a positive relationship between “GI” and “green culture” (Wang, 2019). Sharma et al. (2021) confirmed a close relationship between innovation and adaptation to green culture. It helps to create a green culture by linking it to GI and green performance by raising environmental awareness among employees, which will reduce pollution.

On the other hand, DT, or digitalization, provides an opportunity to exploit massive, untapped data, which allows for improving the environment and society (Xu et al., 2022). In a study conducted by Brenner and Hartl (2021), the results showed that perceptions of environmental and economic sustainability are affected by the extent of DT, unlike social sustainability, and indicate the need for future research into a more accurate vision of sustainability, precisely the social dimension and its relationship to DT. The results of the study (Wang & Shao, 2023) in the field of manufacturing industries showed an impact of DT on improving product quality and improving industrial collaborative innovation by using big data through smart manufacturing.

Finally, concerning previous studies and their results, it was concluded that there is an apparent lack of studies on green human resources in Palestine and their relationship with other “green” variables. Therefore, the study aims to understand the relationship between GHRM and SOP and investigate the mediating effect of GI and DT.

1.2.1 Problem Statement and the Research Questions

The studies in the previous section highlight the critical role of green human resources management (GHRM) in enhancing the sustainability and competitiveness of institutions (Aburahma et al., 2020). Sustainability is crucial for the success of both industrial and service sectors. Historically, even before the Industrial Revolution, environmental issues such as desertification and air pollution existed (Caradonna, 2022). However, the Industrial Revolution exacerbated environmental pollution, causing significant climate change and threatening life on Earth. In previous decades, ecological issues received inadequate attention (Adamo et al., 2021). The importance of addressing environmental concerns has been recognized, leading to increased efforts to find solutions to mitigate factory pollution and climate-related problems.

The importance of the environment has been realized after many fears have arisen globally. Addressing environmental issues and seeking green solutions and technologies to mitigate factory pollution and climate problems has become imperative (Mwita, 2019). Although the results of some studies have shown the impact of GHRM on SOP in the Palestinian manufacturing sector (Kanan et al., 2023), other studies still need to examine several variables that help improve and increase the strength of the impact.

Some studies have found an impact of GHRM on GI (Song et al., 2018). Furthermore, based on other research, the impact of GI on SOP has been studied (Zhao & Huang, 2022), meaning that there is an intermediate relationship that needs a more in-depth study in terms of impact and importance. As for DT, several studies have found that GI positively impacts it (Liu et al., 2023), and DT affects SOP (Broccardo et al., 2023). There must be an intermediary relationship to DT that must be studied more.

In Palestine, interest in environmental and sustainability issues is still emerging, and not in all fields, as it is a developing country (Mousa & Othman, 2020). It suffers from various issues, the most important of which are economic and political problems. Therefore, we decided to study and evaluate the impact of GHRM practices on SOP through the mediating roles of GI and DT. In other words, this research aims to answer the main questions and sub-questions:

RQ 1: What is the extent of implementation of GHRM, DT, GI practices, and SOP in the Palestinian manufacturing sector

RQ 2: How does GHRM impact SOP in the Palestinian manufacturing sector?

RQ 2.1: How does GHRM impact the EP in the Palestinian manufacturing sector?

RQ 2.2: How does GHRM impact the EcP in the Palestinian manufacturing sector?

RQ 2.3: How does GHRM impact the SP in the Palestinian manufacturing sector?

RQ 3: How does GHRM impact GI in the Palestinian manufacturing sector?

RQ 4: How does GHRM impact DT in the Palestinian manufacturing sector?

RQ 5: How does DT impact GI in the Palestinian manufacturing sector?

RQ 6: Does GI mediate the relationship between GHRM and SOP?

RQ 7: Does DT mediate the relationship between GHRM and SOP?

1.2.2 The Objectives of Research

The main goal of this study is to provide an effective theoretical contribution to the field of GHRM by filling the research gap in studying the mediating roles of GI and DT in the relationship between GHRM and SOP in Palestinian organizations. In addition, the practical contribution will help decision-makers and stakeholders overcome the barriers that hinder the implementation of GHRM practices that affect GI and sustainability.

Specific objectives of this study:

1. To assess the extent of implementation of GHRM, DT, GI practices, and SOP in the Palestinian manufacturing sector
2. To investigate the impact of GHRM practices on SOP (environmental, economic, and social) in the Palestinian manufacturing sector.
3. To investigate the impact of GHRM on GI in the Palestinian manufacturing sector.
4. To investigate the impact of GHRM on DT in the Palestinian manufacturing sector.
5. To study the relationship between DT and GI in the Palestinian manufacturing sector.
6. To determine the mediating role of GI between GHRM and SOP.
7. To determine the mediating role of DT between GHRM and SOP.

1.2.3 The Significance of Research

Interest in environmental issues has increased in both developing and developed countries. As it has a role in enhancing competitiveness, without it, organizations cannot succeed (Ahmed et al., 2021), so researchers rushed to study the reality of GHRM and its relationship with several variables. Therefore, the importance of this research is, firstly, its contribution to understanding GHRM and its relationship with sustainability. Second, understand the impact of GHRM practices on GI. Third, to investigate the mediating role of GI and DT and its impact on SOP. It explains the relationships among different variables that enhance the implementation of GHRM practices and measures the extent of implementing GI in Palestinian organizations and its impact on SOP. This study adds

valuable insights to organizations, decision-makers, and stakeholders in developing future strategic plans and development plans to help implement GHRM practices, strive towards DT, and raise the application level of GI to achieve sustainable performance in companies.

1.2.4 The Research Hypotheses

Based on the problem statement and the previous discussion, and to achieve and answer the research questions, these hypotheses are developed:

H1a: GHRM positively affects EP.

H1b: GHRM positively affects EcP.

H1c: GHRM positively affects SP.

H2: GHRM positively affects GI.

H3: GHRM positively affects DT.

H4a: GI positively affects EP.

H4b: GI positively affects EcP.

H4c: GI positively affects SP.

H5a: DT positively affects EP.

H5b: DT positively affects EcP.

H5c: DT positively affects SP.

H6: DT positively affects GI.

H7a: GI mediates the relationship between GHRM and EP.

H7b: GI mediates the relationship between GHRM and EcP.

H7c: GI mediates the relationship between GHRM and SP.

H8a: DT mediates the relationship between GHRM and EP.

H8b: DT mediates the relationship between GHRM and EcP.

H8c: DT mediates the relationship between GHRM and SP.

1.2.5 The Structure of the Thesis

The thesis includes four chapters. The first chapter consists of a general overview and background of the study, the research problem statement and the research questions, and the significance and objectives of the research. The chapter also demonstrates a theoretical background and literature review about GHRM practices, GI, DT, SOP, and their relationship. Also, it provides a proposed conceptual model for the study containing the formulated hypotheses. The second chapter outlines the methodology used in the research, the research types and approaches addressed, data collection and sampling techniques, measurement development, and data analysis techniques discussed in chapter sections. Chapter three presents the data analysis, descriptive statistics, and assessment of the proposed model. The study hypotheses are tested, and the results are tabulated in chapter sections. Finally, the fourth chapter discusses the results obtained and highlights the implications. Furthermore, the chapter includes the conclusion, recommendations, limitations, and the expected future research directions.

1.3 Theoretical Background

Growth is restricted when resources are insufficient, as Penrose says in 1959, besides Wernerfelt, who called in 1984 for the importance of focusing on resources rather than products as the primary source of value. As a result, Barney summarized in 1991 the theory of the resource-based view (RBV) that has become one of the most critical theories in the world of management in the past thirty years (Cuthbertson & Furseth, 2022). For companies to remain sustainable, they must have unique competitive advantages over their competitors, and to remain so, they must be able to innovate; the resource-based view (RBV) is an internal way to create a competitive advantage (Lubis, 2022). Likewise, Slaper and Hall (2011) discussed the Triple Bottom Line (TBL) framework, which John Elkington developed. Sustainability is like other emerging phenomena, as there is no agreement among scientists and researchers on a specific term or how to measure it (Alshehhi, 2018). There is a gradual increase in support for the TBL approach, although multiple studies range from pros and cons to its adoption (Kanan et al., 2023). The Ability-Motivation-Opportunity (AMO) model is a critical framework that understands the relationship between HRM and performance, as it emphasizes the importance of employees' capabilities and motivations (Marin-Garcia & Tomas, 2016). It is divided into three categories: ability, motivation, and opportunity, and it provides a clearer

understanding of the greening of human resources management. The listed literature contains studies that combine more than one theory as RBV and AMO in the same study, such as (Sobaih et al., 2020) study, and some of them include a single theory as AMO (Faisal, 2023) study. This study combines the RBV theory, TBL, and AMO approaches to clarify the relationships between the various variables.

1.4 GHRM

Green expresses the natural environment and its preservation (Faisal, 2023). The concept of GHRM involves a strategic approach (Bombiak, 2020; Islam et al., 2019); GHRM differs from HRM by its interest in sustainability and the environment, which integrates environmental sustainability with human resources functions in organizations (Kodua et al., 2022).

This concept highlights the role of human resource management practices in promoting a culture of environmental responsibility, starting from recruitment to performance management and the environmental responsibilities that fall under it (Memon et al., 2022), such as forming awareness of employees through training them and aligning individuals' goals with sustainability goals (Bataineh et al., 2023), in addition to creating policies that reflect a commitment to environmental care (Ye et al., 2023).

Finally, GHRM seeks to exploit human resources to achieve a tangible environmental impact so that these efforts combine to make the organization successful in gaining a green, responsible, sustainable future (Kanan et al., 2023).

1.5 GHRM Practices

GHRM is essential for achieving organizational goals and enhancing the company environment (Aftab et al., 2022). GHRM has several integrated practices to balance the needs of the company and the environment, as it is part of the company's social responsibility to achieve sustainable development (Chaudhary, 2020). Integrating these practices is vital to achieving sustainable development and building a more sustainable and stable future.

Using a set of coherent and consistent GHRM practices, which is considered to have major impacts on company environmental performance, is defined as a GHRM bundle (Longoni et al., 2018; Renwick et al., 2013), which improves ecological

performance by spreading environmental values and principles within the company. These are: a) Green Hiring, b) Green Training and Involvement, and c) Green performance management and compensation.

1.5.1 Green Hiring

Many companies around the world are constantly keeping pace with changes, whether technological or administrative, and to achieve this at the recruitment level, they apply green hiring, which combines the process of attracting new qualified candidates with being environmentally conscious (Khattak & Khalid, 2022), and it's an adoption of environmental criteria in selection and hiring procedure (Renwick et al., 2013).

This, in turn, allows the best employee, a "green candidate," to join the company with the least harm to the environment, where job applications are collected online, for example, and then telephone or video interviews are held to avoid physical pollution from papers and harmful emissions from travel (Mwita, 2019).

1.5.2 Green Training and Involvement

Green training and Involvement mean transferring knowledge and skills to employees about environmental sustainability and using environmentally friendly methods in training programs (Mwita, 2019), and it also boosts reward and competencies system, which reinforce organizational performance and enhance the commitment to environmental initiatives, thus providing employees the opportunity to participate with the environmental progress debate within the organization (Daily et al., 2012). This prepares and enhances the capabilities of employees to adapt to any future environmental situation (Iftikhar et al., 2022). Therefore, the organization's interest in green training produces environmentally friendly employees (Faisal, 2023).

1.5.3 Green performance management and compensation

As for green performance management, it links performance evaluation with green goals and tasks. Moreover, it is facilitated by a green job description, which makes it an essential tool for enhancing individual, group, and organizational performance to achieve

green goals (Mwita, 2019). In addition, it stimulates employees' green passion (Muisyo & Qin, 2020; Pellegrini et al., 2018).

Green rewards management is a systematic process for rewarding employees and work teams. Those who engage in environmental initiatives in the workplace receive financial or appreciation rewards, contributing to the organization's environmental success by achieving green goals (Mwita, 2019). Das and Dash (2023) explained in their study that recruiters rarely use GHRM practices as a recruitment strategy. Mwita (2019) pointed out that recruiting people with environmental awareness is necessary to promote green environmental behaviors. Green training contributes positively to green production (Zhang & Teng, 2023). In a study conducted by Singh et al. (2021) about the analysis of barriers to green lean practices, twelve barriers were identified in terms of cause and effect, the most obvious of which was "lack of employee training." This barrier resulted from two other main barriers: "Lack of top management support," with the highest effect, then with a lower impact than before, and "Insufficient government support". Similarly, the study's results (Abbas et al., 2021) proved a close relationship between green training and senior management's commitment to sustainability. Likewise, a survey conducted by Gardas et al. (2019) on India's oil and gas sector confirms that the "lack of training programs" was an essential barrier to implementing GHRM.

In a study conducted by (Roscoe et al., 2019), it was confirmed that there is a close relationship between GHRM and green performance management. In another study conducted by Mousa and Othman (2020) in the healthcare sector in Palestine, the results revealed the least used practice, "green performance management and compensation," which does not support improving environmental culture and environment behavior among employees.

1.6 Sustainable Organizational Performance

The idea of sustainability began due to growing concerns about the impact of economic growth and technology on the environment and natural resources. This idea began long ago, but systematic efforts started several decades ago. Sustainability highlights the importance of balancing human needs and their ability to meet their current and future needs without exhausting natural resources (Mensah, 2019). Sustainability includes economic, social, and environmental dimensions, which are the pillars of sustainability that fall under the term "Triple Bottom Line" (TBL), launched by John Elkington in 1994

to describe business sustainability. More precisely, the environmental dimension was added alongside the social and economic dimension in business operations and was defined by TBL as a sustainable framework that examines a company's social, environmental, and financial impact (Zaharia & Zaharia, 2021).

When an organization can achieve its strategic goals sustainably and long-term, this is called SOP. Key performance indicators linked to the organization's strategic goals can measure organizational success, including striking a balance between sustainability's economic, social, and environmental dimensions. SOP also includes factors that affect sustainability, such as innovation, leadership, human resources management, and others (Hossin et al., 2021).

Economic sustainability, one of the pillars of sustainability, is considered one of the factors affecting the company's long-term economic growth, which became apparent after the Corona pandemic (Štefko et al., 2021). Jiang et al. (2020) defined economic sustainability as implementing profitable strategies and practices that improve the rational use of resources while maximizing the benefits companies use. In other words, economic sustainability means managing resources efficiently to achieve maximum economic effectiveness through companies seeking to reduce their losses and increase surpluses to support the company's strategic goals. (Maynard et al., 2020). Economic sustainability has impacts on several sectors, including the manufacturing sector. For example, García-Alcaraz et al. (2021) found in their study examining the impact of lean manufacturing tools on economic sustainability that a close relationship links lean manufacturing tools with economic sustainability and has direct and overall effects on it in the maquiladora industry (MI).

Munny et al. (2019) defined social sustainability as a moral rule of conduct for human longevity. That is, social sustainability means emphasizing achieving balance and justice in the distribution of resources and opportunities, providing social services such as education, health, and gender justice, and improving the quality of life in a way that achieves a balance between the individual and society (Janker & Mann, 2020; Cooper et al., 2018). Social sustainability has not received the same attention as economic and environmental sustainability (Govindan et al., 2021; Amrutha & Geetha, 2020; Anisul Huq et al., 2014). Besides, using GHRM practices is significantly more associated with

economic performance than social performance, but it does not substantially affect environmental performance (Suleman et al., 2024).

1.7 Green Innovation

Organizations adopt innovation to achieve changes and ensure continuity and prosperity when facing challenges and unstable circumstances. It accepts the idea of change at the level of individuals, institutions, and even comprehensive systems (Edwards-Schachter, 2018). Therefore, it is one of the main aspects that contribute to developing societies and achieving economic and social progress, as the ability to think creatively and apply new ideas is the basis for achieving change and improvement in various fields.

Over the years, several researchers have developed terms that express environmentally friendly innovation, including “eco, environmental, sustainability, and green,” all of which revolve around preserving the environment and reducing organizations’ pollution of the environment (Albort-Morant et al., 2017). Since “innovation” is comprehensive and diverse for many contexts and concepts, it denotes dimensions beyond technology to social, cultural, institutional, green, environmental, eco, and transformative (Edwards-Schachter, 2018). In their study, Chen et al. (2006) defined GI as “hardware or software innovation that is related to green products or processes, including the innovation in technologies that are involved in energy-saving, pollution-prevention, waste recycling, green product designs, or corporate environmental management” and divided it into green product innovation and green process innovation, While Aguilera-Caracuel & Ortiz-de-Mandojana (2013) defined GI “hardware or software innovation that is related to the use of green products or processes”.

According to Edwards-Schachter (2018), the types of innovation are divided into technological innovation, product innovation, process innovation, service innovation, business model innovation, disruptive innovation, radical innovation, design-driven innovation, social innovation, and responsible innovation.

1.8 Digital Transformation

DT is a “process aimed at improving an entity by bringing about significant changes in its characteristics, through combinations of information, computing, communication and technologies” (Vial, 2021). It contributes to addressing significant problems in social, economic, and energy relations, enhancing social well-being, mitigating the effects of

climate change, and others (Xu et al., 2022). Individuals with good self-awareness, digital literacy, preparation, skills, and awareness are effective agents of positive change and sustainable societal progress (Xu et al., 2022).

On the economic level, DT is considered a pivotal factor in developing the economy and enhancing economic growth and competitiveness, and this requires a response by governments and companies to keep pace with rapid development (Afonasova et al., 2019). When economic growth is promoted, DT is enhanced, which in turn helps improve the high-quality development of the manufacturing industry (Wang & Shao, 2023).

In Brenner & Hartl (2021) study, the results proved that environmental and economic sustainability perceptions, not social sustainability, are affected by the extent of DT. The recommendations favored intensifying research on the relationship of DT to social sustainability.

Gupta et al. (2020) presented a research tool, the “Digitization and Sustainability Matrix,” to fill the research gap, which is the intersection of digitization and sustainable development, as it will help measure the viability of digitization for sustainable development goals and will be a research tool in revealing technical and social needs when applying artificial intelligence and DT. Finally, there is an apparent lack of empirical evidence related to how to conceptualize the relationship between DT and environmental, economic, and social sustainability (Brenner & Hartl, 2021), which indicates the necessity of conducting more studies and research to understand the impact of DT on the three aspects of sustainability, and this can help guide development policies and strategies more effectively and achieve a balance between technological progress and sustainability.

1.9 GHRM Practices and SOP

The ultimate goal of human resource management is to enhance sustainable performance (Arulrajah et al., 2016). Although implementing human resources management in Palestinian healthcare organizations was moderate, it positively impacted sustainable performance (Mousa & Othman, 2020). In addition, Sult et al. (2024) showed that severe and well-designed training is well-linked to the three dimensions of sustainability (environmental, social, and economic) and positively affects corporate sustainability. Aboramadan (2022) shows that employees are more

likely to adopt positive ecological behaviors when organizations adopt clear environmental management practices, provide environmental training, evaluate performance, and provide ecological reward systems. Green recruitment, selection, training, and development directly impact organizational commitment and create an environmental policy to promote green practices in the workplace (Shoaib et al., 2021). So, GHRM leads to GI and ultimately enhances the company's environmental performance (Fang et al., 2022). Organizations increasingly embrace green, sustainable practices to foster a greener corporate culture, aiming to enhance efficiency, reduce costs, and improve employee engagement (Margaretha & Saragih, 2023). This approach also leads to better sales and further cost reductions (Mehta & Chugan, 2015).

Rezaei-Moghaddam (2016) highlights that manufacturing firms investing in social programs strengthen GHRM, focusing on employee health and safety to reduce exposure to harmful emissions. So, these green initiatives enhance sustainability performance.

Investigating the relationship between green human resources management and SOP in other contexts, such as the manufacturing sector and other countries such as Palestine, will help generalize the results and form a more comprehensive picture of the nature of the relationship, in addition to the fact that studies examining the effect of the three sustainability pillars on sustainable performance are still insufficient. Based on what was discussed, the following hypothesis was proposed:

H1a: *GHRM positively affects EP.*

H1b: *GHRM positively affects EcP.*

H1c: *GHRM positively affects SP.*

1.10 GHRM and Green Innovation

Previous studies have shown that HRM may improve workers' knowledge, skills, and abilities, which supports the corporation's product and process innovation (Seeck & Diehl, 2017). For instance, in their study, Song et al. (2020) found that green HRM can positively influence GI. Likewise, (Shah & Soomro, 2023) found a positive and significant effect of Green HRMPs on GI. More so, Al-Swidi et al. (2022) reported that

Green HRMPs positively relate to GI; furthermore, Mousa and Othman (2020) provide that GHRM significantly influences GI. In furtherance, it is evident from several studies that implementing Green HRM augments GI's capability in its employed context (Saudi et al., 2019). In Palestine, especially in the manufacturing sector, few studies investigate the relationship between GHRM practices and GI. Based on the above studies, the following hypothesis can be proposed:

H2: *GHRM positively affects GI.*

1.11 GHRM and DT

GHRM and DT are among the most important things organizations can implement to improve workplace performance, gain a competitive advantage, and increase environmental awareness (Sidique & Pereira, 2023). DT has significantly affected individuals' behavior (Adhjarso et al., 2019). OECD Report 2019 indicates that it is necessary to focus on emotional and social skills to benefit fully from digital technologies (OECD, 2019). The results showed that DT significantly impacts human resource management (Khatib & Alshawabkeh, 2022). In a study conducted in the healthcare sector, the role of variables, dimensions, and indicators in GHRM and the quality of services provided was confirmed, as it showed a strong impact in supporting the achievement of DT in the hospital environment and the practice of GHRM will be easier to implement with the presence of digitization (Saifudin et al., 2021). Finally, DT imposes a new reality in human resource management to maintain its strategic role and functions instead of focusing on routine administrative tasks (Khatib & Alshawabkeh, 2022). Based on what was discussed, the following hypothesis was proposed:

H3: *GHRM positively affects DT.*

1.12 Green Innovation and Sustainable Performance

Green innovation includes technological improvements that save energy, prevent pollution, or enable waste recycling, as well as environmentally friendly product design and corporate management (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013). This innovation contributes to business sustainability, positively impacting companies' financial, social, and environmental performance (Kanan et al., 2023). In a study conducted on companies that adopt green innovation and others that do not, it was found that environmentally innovative companies do not necessarily achieve better financial

performance than non-environmentally innovative companies; this requires time and appropriate capabilities, but companies that intensify green innovation may improve their financial performance due to reduced costs and unique products (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013). Implementing green innovation in manufacturing companies will maximize financial savings and social performance and appeal to environmentally conscious customers (Kanan et al., 2023).

H4a: *GI positively affects EP.*

H4b: *GI positively affects EcP.*

H4c: *GI positively affects SP.*

1.13 Digital Transformation and Sustainable Performance

The Fourth Industrial Revolution relies on digitization rather than automation, making future manufacturing flexible, customizable, and linked to fully connected smart devices (Oztemel & Gursev, 2020). Achieving sustainable development goals and improving organizational performance is vital (Jayashree et al., 2021). From an environmental perspective, Fulan pointed out that digital transformation contributes effectively to examining and monitoring carbon dioxide emissions, environmental efficiency, and assessing the environmental impacts arising from production and manufacturing processes. Also, adopting this technology reduces energy consumption, waste, and emissions, thus enhancing environmental performance (Kumar et al., 2021). As for the social aspect, (Wagner, 2013) pointed out that this technology helps to increase awareness of social responsibility, such as employee and customer satisfaction and recruiting distinguished employees.

H5a: *DT positively affects EP.*

H5b: *DT positively affects EcP.*

H5c: *DT positively affects SP.*

1.14 Digital Transformation and Green Innovation

Based on listed Chinese manufacturing companies from 2007 to 2020, the study found that DT improves the innovation of green companies and that DT enhances GI by increasing the investment of innovation resources and reducing the cost of debt so DT can sustainably improve the level of GI also DT has a continuously positive impact on GI and increase its quality (Liu et al., 2023). Also, a similar study in China conducted on manufacturing companies between 2008 and 2019 found that the digitization of institutions can positively affect GI (Ning et al., 2023). In Chinese companies with shares, a study was conducted between 2012 and 2018 on annual reports, and it was concluded that DT could improve GI (Li & Shen, 2021). Also, in China, 3,547 Chinese companies were selected between 2014 and 2019 as samples, and it has already been found that DT drives GI in business (Fan et al., 2023). Studies linking DT and GI are still few and insufficient, and they do not study the internal mechanism of this connection (Ning et al., 2023). Based on the above studies, the following hypothesis can be proposed:

H6: DT positively affects GI.

1.15 Green Innovation as a Mediator between GHRM and Sustainable Performance

GHRM positively influences GI (Song et al., 2021). Also, GI has a positive and clear impact on sustainable performance (Asadi et al., 2020). In their study, Suleman et al. (2024) point out that GI, considered weak in the Ghanaian mining industry, can be strengthened by implementing GHRM strategies. In addition, a study conducted by Astuti et al. (2023) in local government organizations in Semarang – Indonesia, proved that GHRM and green service innovation, directly and indirectly, affect the improvement of SOP in city governance, as GSI mediates the relationship between GHRM and SOP. Green HRM practices can also promote environmentally responsible innovation in the hospitality industry, contributing to overcoming sustainability-related challenges in this sector (Alyahya et al., 2023).

Shahzad et al. (2020) showed that social corporate responsibility in manufacturing industries in Pakistan affects GI and environmentally sustainable development. Furthermore, Rakin et al. (2020) reported in their study in the Bangladeshi banking sector that GI has a mediating role in the relationship between socially responsible HRM practices and sustainable performance. Also, Al-Shammari et al. (2022) provided

evidence that GHRM practices positively impact sustainable performance measured by the Triple Bottom Lines "environmental, social, and economic performance", and GI positively impacts sustainable performance. GI mediated the link between GHRM practices and sustainable performance in 335 SME manufacturing firms in Saudi Arabia. In addition, GI mediated the relationship between GHRM and SOP, and the effect was positive (Fang et al., 2022).

Finally, a bibliometric analysis was conducted on a group of studies, and an apparent increase in research in the field of sustainability was observed. This indicates the great importance of the topic. It was found that GHRM practices play a pivotal role in GI and are a significant driver. The study highlighted the necessity of conducting other contextual studies further to clarify GHRM practice's impact on GI (Faheem et al., 2023). In conclusion, the results of a study revealed that GI partially mediated the relationship between GHRM practices and both social performance and environmental performance but fully mediated the association between green HRM practices and environmental performance (Suleman et al., 2024). Based on the findings of these studies, the following hypothesis can be proposed to investigate whether GI mediates the relationship between GHRM and SOP.

H7a: GI mediates the relationship between GHRM and EP.

H7b: GI mediates the relationship between GHRM and EcP.

H7c: GI mediates the relationship between GHRM and SP.

1.16 Digital Transformation as a mediator between GHRM and SOP

In research conducted on 19 state-owned hospitals in Indonesia, the impact of GHRM on the quality of service in light of the DT of hospitals was investigated, and it was concluded that there is a strong impact of GHRM on the quality of service in light of the DT of hospitals in the industrial era 4.0 (Saifudin et al., 2021). In a review conducted on a group of articles and topics, green HR practices were divided into four categories, one of which was "GHRM processes with a focus on DT." Studies related to this highlighted the need for HR processes to be compatible with centralized digital methods in small and medium-sized enterprises (SMEs), which naturally lack knowledge of DT (Abedin et al., 2024).

On the other hand, Broccardo et al. (2023) found in a study conducted in the Italian context that there is a strong relationship between digital transformation, sustainability, and performance. Research was conducted on 450 Chinese manufacturing companies on the impact of DT on environmental, social, and economic sustainable development performance with implications for GHRM and green supply chain management GSCM; results showed that GHRM and green supply chain management act as partial mediators in the relationship between DT and sustainable development performance. The effects of mediators are also crucial in benefiting from the advantages of DT in improving SOP (Ma et al., 2023). In addition, a study conducted on 207 Colombian manufacturing companies using the Hierarchy of Dynamic Capabilities investigated the effects of digital technologies and GHRM on economic and environmental performance. It was found that digital technologies mediate the relationship between GHRM and the green supply chain and work to improve sustainable performance in companies (Trujillo-Gallego et al., 2022).

However, in (SMEs) in the textile sector, it was found that DT positively impacts perceived organizational performance (Chen et al., 2016). As for (Widyarini & Darma, 2024), the results of their study showed that the use of digital technology has positive effects on the DT strategy, organizational capacity, and company performance, as increasing the use of digital technology improves the performance of companies. GHRM and DT are two main strategies for improving companies' performance, gaining a competitive advantage, and increasing environmental awareness. Also, obtaining the best results lies in implementing GHRM practices and GI. (Sidique & Pereira , 2023) Based on the findings of these studies, the following hypothesis can be proposed to investigate whether DT mediates the relationship between GHRM and SOP.

H8a: *DT mediates the relationship between GHRM and EP.*

H8b: *DT mediates the relationship between GHRM and EcP.*

H8c: *DT mediates the relationship between GHRM and SP.*

1.17 The Reality of GHRM, GI, DT, and Sustainability in Palestine

In Palestinian manufacturing companies, specifically in the food, chemical, and pharmaceutical industries, Masri and Jaaron (2017) conducted an exploratory study to explore and evaluate the extent of the application of green human resources practices in the West Bank. The results indicated that GHRM practices are not implemented to the extent that they make employees environmentally concerned. The researchers recommended going beyond implementing policies and regulations to putting environmental considerations at the forefront by creating an eco-advantage culture. In addition, Kanan et al. (2023) conducted a study in the manufacturing industries in Palestine to investigate the impact of GI as a mediator in the relationship between the GHRM practices and sustainable performance, in addition to evaluating the level of implementation of each of them separately. The results revealed that GHRM practices, GI, and sustainable performance are implemented moderately, and GI mediates the relationship moderately. The results confirmed that GHRM practices and GI positively affect sustainable performance.

On the other hand, Mousa and Othman (2020) measured the level of implementation of GHRM practices in Palestinian healthcare institutions and studied the relationship between GHRM practices and sustainable performance. The results revealed moderation in implementing GHRM practices in Palestinian healthcare institutions, and the effect of GHRM practices was positive on sustainable performance. Also, Ziyadeh et al. (2024) investigated the mediation of corporate social responsibility and organizational citizenship behavior for the environment in the relationship between GHRM and organizational sustainability. The results showed that GHRM practices positively affected social responsibility and organizational citizenship behavior for the environment and ultimately affected the operating system.

In small and medium-sized hotels in Palestine, Aboramadan and Karatepe (2021) conducted a study to explore the mediating role of perceived green organizational support on the impact of GHRM on job performance and organizational citizenship behavior toward the organization. The results revealed that GHRM enhances hotel employees' perceptions of the green operating system, stimulating job performance and organizational citizenship behavior toward their organization. The green operating system also mediates the relationship.

Khatib and Alshawabkeh (2022) show DT and human resources management's positive impact on strategic supremacy. In her study, Salameh (2021) found that software and databases have the most significant impact on all components of technological development, digitization of the insurance sector, digital marketing, and online security.

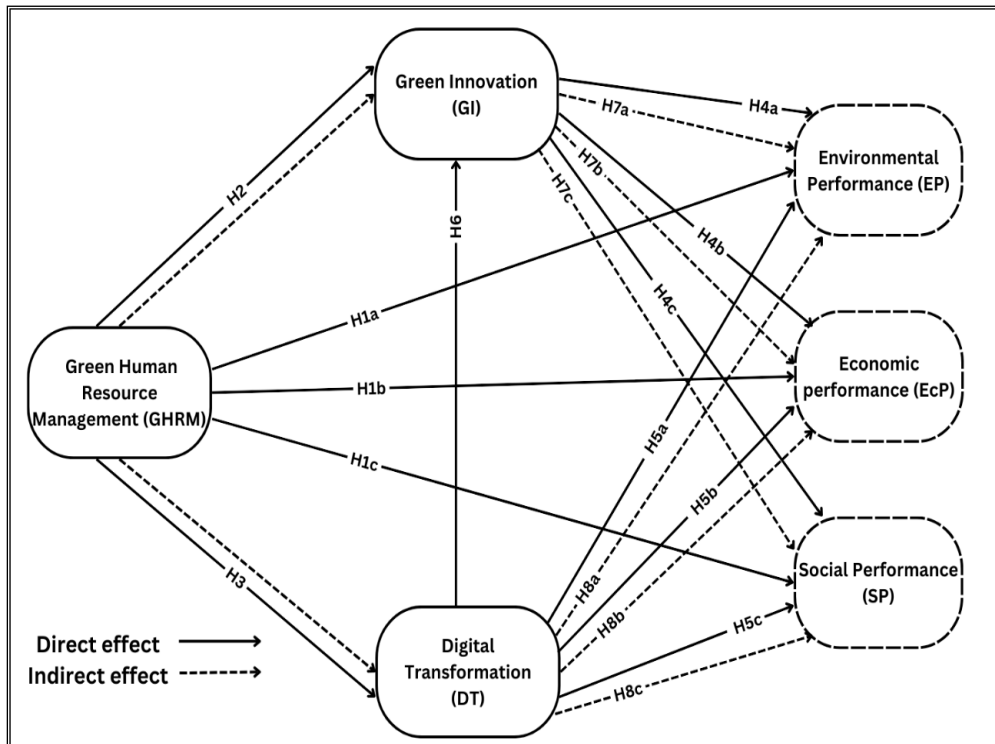
The literature review supports the relationship between green human resources management (GHRM) practices and their impact on SOP. On the other hand, some studies support the mediating role of GI (Kanan et al., 2023; Iftikhar et al., 2022; Fang et al., 2022; Al Doghan et al., 2022), and others examine its relationship with DT (Liu et al., 2023; Afonasoova et al., 2019). On the other hand, several studies examined the effects of DT on sustainability (Xu et al., 2022; Brenner & Hartl, 2021; Gupta et al., 2020). Based on the previous review, no study has examined the mediating effect of two combined variables, GI and DT, specifically in the Palestinian manufacturing sector, so this study is considered the first of its kind in this field.

1.18 Conceptualization of the Proposed Model

Based on the problem statement and the previous discussion, a proposed model was developed to answer the research questions raised, as shown in Figure 1. The model consists of four primary constructs: GHRM, GI, DT, and SOP. In addition, the model includes the hypotheses mentioned above to test the impact of these constructs on each other as follows:

Figure 1

The conceptual model and proposed hypotheses



Chapter Two

Research Methodology

2.1 Chapter Overview

This chapter showed the methodology used in the thesis, starting with defining the types of research and the uses of each type, then the methodology flow chart was discussed. Furthermore, the data collection strategy and sampling techniques are explained. Finally, data analysis techniques are presented to test the model constructs' relationships.

2.2 Research Types

Research has been defined as “a systematic process of collecting, analyzing, and interpreting information (data) to increase our understanding of a phenomenon about which we are interested or concerned” (Leedy & Ormrod, 2010)

The type or design of research refers to the conceptual scheme within which the research is conducted. A good research design should be theory-grounded, situational, feasible, redundant, and efficient (Akhtar, 2016). Accordingly, research is classified into three main categories: exploratory, descriptive, and causal. Exploratory research is used when information is scarce or outdated and aims to discover new relationships and ideas. It begins with a literature review and often relies on qualitative techniques, although quantitative methods may be used (Hair Jr et al., 2023; Akhtar, 2016). In this research, the quantitative type was used to explore the relationship between the impact of green human resources on sustainable organizational performance.

Studies related to the manufacturing sector in Palestine show a lack of information on implementing green practices in human resource management, innovation practices, digital transformation, and sustainable performance. Therefore, according to (Hair Jr et al., 2023), exploratory research is the most appropriate design for this study when there is little information about a particular issue. This type of research contributes to a better understanding of business problems and can be conducted with a qualitative or quantitative approach. In addition, the literature review helps in developing the questionnaire to collect data and investigate relationships. Therefore, exploratory research was chosen as the appropriate research type for this study.

2.3 Research Approach

According to Creswell (2014), a research approach is the procedures and plans that include all the steps from assumptions to data collection methods, analysis, and interpretation. There are three research approaches: quantitative, qualitative, and mixed. The researcher chooses the research approach based on the nature of the research problem and the questions contained therein (Creswell, 2012). Quantitative methods are used if the research requires numerical data and investigates the relationships between variables representing a characteristic or feature of the target community (Creswell, 2012; Saunders et al., 2009). The qualitative approach seeks to explore and understand the conditions of the targeted phenomenon in the research problem and generates non-numerical data (Creswell, 2012; Saunders et al., 2009). Finally, for this research, the quantitative approach method was chosen, questionnaires are the tool used to collect data from the target sample to provide a clearer picture of the research problem.

2.4 Research Methodology

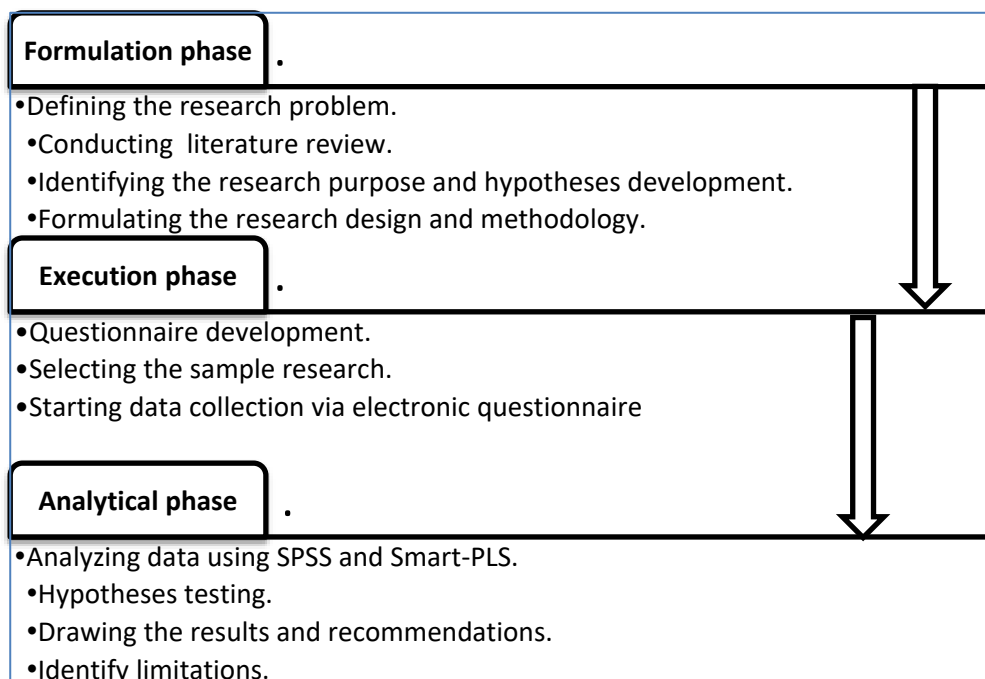
The research methodology is the general approach followed by the researcher to conduct the research project by choosing a specific research strategy or mechanism for collecting data, called the research tool (Leedy & Ormrod, 2010). The research process includes three main stages: formulation, implementation, and analysis. The research problem is identified in the formulation stage, followed by an in-depth review of the relevant literature. Then, the research questions are developed, objectives are set, hypotheses are determined, and the research design is formulated. The implementation stage includes selecting the sample, designing the tool, starting data collection, and storing the obtained data. The analytical stage includes analyzing and interpreting the data, testing the hypotheses, and drawing conclusions and recommendations. (Hair Jr et al., 2023)

In this study, the research flow chart was presented in Figure 2 below, which was based on the three general stages mentioned above, which begins with identifying the study problem, which is the need to investigate the role of GHRM practice in SOP in manufacturing companies in Palestine, and the mediating role of GI and DT in this relationship. After that, the literature review begins on the four main concepts, and the research gap is noted. Based on the literature, hypotheses were developed, and a quantitative approach was adopted.

The next stage begins with academic experts designing and evaluating the questionnaire. This stage also includes selecting a sample of Palestinian manufacturing companies (i.e., chemical, pharmaceutical, food, metal, and engineering industries) representing the study population. The questionnaire is distributed electronically via email, followed by phone calls. After collecting data, SPSS is used to analyze and filter the descriptive data, then smart-PLS is used to analyze data and test hypotheses. The results, discussion, and recommendations are then presented.

Figure 2

Research Methodology Flow Chart



2.5 Research population and sample size

After communicating with the Palestinian Federation of Industries PFI (the national institution representing the industrial sector in Palestine) which includes several specialized federations, and the research targets the federations (i.e., chemical, pharmaceutical, food, metal & engineering), The comprehensive enumeration method was used to collect data since the names and number of manufacturing companies registered in the federation were obtained. One hundred and twenty-five active registered companies were obtained based on the federation's information. That's after applying the conditions of the study community, including the desire to participate, apply digital practices, implement green innovation, and others, as shown in the following table:

Table 1*The number of manufacturing firms*

Industries union	Members
Palestinian federation of chemical industries	38
Union of Palestinian Pharmaceutical Manufacturers	5
Palestinian Food Industries Union	50
Metal and Engineering Industries union	32
Total	125

To generalize the results to the study community, a minimum sample size must first be determined to achieve a statistically representative sample (Saunders et al., 2009). However, we have provided the following setting in the G*Power software (Faul et al., 2009): $f^2 = 0.15$ (Cohen, 1988), $\alpha = 0.05$, and number of predictors = 3, and the power was set at 0.8% (Gefen et al., 2011). The sample size required to achieve the desired confidence level (with a 95% confidence level) is 77 participants. 125 electronic questionnaires were distributed to executive directors, general managers, quality managers, production managers, quality managers, and related employees, and 95 valid responses were obtained. Therefore, the response rate is 76%.

2.6 Data collection

Primary and secondary data were used to enrich this study. Primary data were based on questionnaires with managers, human resources employees, quality managers, and others. Secondary data were represented by the information contained in the literature review and information from the Palestinian Central Bureau of Statistics PCBS, the Palestinian General Federation of Industries PFI, and other websites, magazines, and publications, which are considered essential sources in research and support the strength of primary data (Creswell, 2012).

2.6.1 Questionnaire Instrument

The questionnaire is the most widely used data collection method for a large sample because of its simplicity and rapidity with less effort and time (Saunders et al., 2009). After identifying the basic concepts of the study and based on the literature review, scale items were developed for each concept. Data can be distributed in different ways, such as in

person, by mail, or electronically, where participants answer the same questions while remaining anonymous.

2.6.2 Questionnaire Design

The questionnaire was designed through previous literature reviews and academic articles, in addition to considering the comments and modifications of experts and referees. A five-point Likert scale was used to assess the level of application of the practices of the GHRM, GI, DT, sustainable organizational performance, and the extent of their application within the organization. The questionnaire contains five sections, as shown:

- Section One (11 items): It contains general information about the respondent and general information about the company. This section was designed to collect data describing the company and the respondent, such as the gender of the participants, their years of experience, their positions, the company's geographical location, etc.
- Section Two (11 items) GHRM practices contain GHRM practices. The main question was, "To what extent does your organization rely on the following methods to motivate employees to behave in an environmentally friendly manner?" The bundle was divided into green hiring, green training and involvement, and green performance management and compensation. Each item was assigned to a five-point Likert scale ranging from 1, "not at all," to 5, "very much".
- Section Three (11 items) GI: Section Three contains a central question, "To what extent is GI applied in your organization?" It was divided into four categories: green product innovation, process innovation, administrative innovation, and marketing innovation. Each item was assigned to a five-point Likert scale ranging from 1 "not at all" to 5 "to a considerable extent."
- Section Four (7 items) DT. This section collected information about the level of DT implementation within the organization. A central question was directed to the respondents, summarizing the items raised: "To what extent is DT implemented in your organization?" Each item was assigned to a five-point Likert scale ranging from 1 "not at all" to 5 "to a very large extent."
- Section Five (10 items) Sustainable Organizational Performance. This section collected information about the impact of environmental commitment on SOP. It is

divided into three categories: “environmental performance, economic performance, and social performance.” Respondents were asked a leading question summarizing the items: “Please evaluate the extent of the company’s commitment to SOP within the company so far.” Each item was assigned to a five-point Likert scale ranging from 1 “not at all” to 5 “to a very large extent.”

The questionnaire was reviewed by a group of experts in the field of study to judge its validity and ensure that it would answer the main study questions and be consistent with the proposed hypotheses. All comments related to the structure of the questionnaire, such as “length, language, and number of sentences,” were considered, and the necessary modifications were made. The questionnaire was written in English, which is the language of the research (Appendix A), and Arabic, which is the language of the target community. The questionnaire will be distributed in this language (Appendix B).

The questionnaire was distributed electronically via the Internet, a simple and easy way to collect information (Scholl et al., 2002) and to avoid wasting time manually distributing and collecting the questionnaire between multiple factories.

The questionnaire was distributed via the Internet using Google Drive forms, allowing users to create surveys and collect data quickly and cheaply.

Two months were spent distributing and collecting the surveys, including a cover letter and an HTML link addressed to each company's CEO, HR managers, and quality manager. When the respondents responded, their data was automatically stored in a database, making it easy to collect and analyze the responses. It also reminded non-respondents to complete the survey and provide their opinions.

2.7 Data Analysis Approach

Two main programs were used to analyze the study data: The Statistical Package for the Social Sciences (SPSS) and Structural Equation Modeling and Partial Least Squares (PLS). The data collected from manufacturing companies were analyzed using SPSS version 22, which was used to analyze the descriptive data of the respondents, as well as to examine the mean and standard deviation of each construct and the degree of implementation of human resource management practices, GI and DT in Palestinian manufacturing companies.

Moreover, partial least squares structural equation modeling (PLS-SEM) was used to test the study model's relationships and investigate the results of the proposed hypotheses. Smart PLS (v.4.1.0) was used as one of the popular software tools for Partial Least Squares Structural Equation Modeling. It is a reliable analytical tool based on prediction criteria and performs excellently with complex predictive models. (Sarstedt et al., 2021) The research model and relationships between variables were drawn using this program, and the study hypotheses were tested.

Chapter Three

Data Analysis and Results

3.1 Chapter Overview

This chapter presents the results of the data collected from the questionnaires, including demographic statistics, reliability, validity, and hypothesis testing results. Two programs were used for analysis, SPSS and Smart PLS, with 95 questionnaires collected from different governorates of the West Bank. This chapter also included respondents' response rate and demographic distribution, followed by data examination, analysis, and other details about the sample. Finally, it included testing the main and sub-hypotheses, impact coefficients, coefficients of determination, effect size, and predictive significance.

3.2 Response Rate

The study data was collected from general managers, executives, human resources managers, quality and production managers, and other related employees, with a total of 95 questionnaires collected from various manufacturing companies in different governorates of the West Bank and from several targeted sectors "food sector, pharmaceutical sector, chemical sector, engineering, and mining sector". First, after obtaining the supervisor's approval of the electronic questionnaire and testing it, it was distributed to the required sample by sending it personally to each factory with an email to the concerned person within the company and a phone call to each of them. As a result of the weak response under the current circumstances, the email was resent to remind the companies of the need to respond to the questionnaire, and the phone call was returned. An attempt was made to convince them that the information was confidential and for scientific purposes only. The number of returned questionnaires was 95 out of 125 that were supposed to be obtained, but due to the current circumstances in the West Bank and the difficulty of reaching many manufacturing companies or closing their doors for several days or weeks, only 95 questionnaires were obtained from the total sample, so the response rate for this study was 76%.

3.3 Testing of Non-Respondent Bias

The GHRM category included 23 questions, while the non-GHRM category included 72. We separated the sample into two categories: GHRM respondents and non-GHRM respondents. The t-test was used to compare the mean, standard deviation, and standard error mean, and Levene's test was also used to distinguish between respondents who belong to GHRM and those who do not. After running descriptive and Levene's tests, all of the values in the significant column in (Appendix C) show that all of the values exceeded the cut-off value of 0.05, indicating that the variances were virtually equal across all variables. The two-tailed test showed no differences between GHRM and non-GHRM respondents. Taking into consideration the primary variables ($P < 0.05$), it can be noticed that there are no differences between the GHRM and non-GHRM respondents. This is because the study revealed that both groups were from the same community, indicating no significant differences.

3.4 Demographic Distribution of the Respondents

The study questionnaire was collected from August 2024 to October 2024. The 95 completed surveys, the participants, and their position in the Palestinian Manufacturing Sector are shown in Table (2). This shows that the demographic analysis of the study sample indicates that male participants make up 76.8% of the sample, while female participants make up 23.2%. Most participants hold a bachelor's degree 66.3%, followed by those with a master's degree or higher at 26.3%, and a smaller proportion, 7.4%, have a diploma or less. The data indicates that most respondents possess significant work experience: 34.7% have 6–10 years, 32.6% exceed 15 years, and 9.5% have 0–5 years of experience. The predominant job positions are human resources managers at 24.2%, production managers at 22.1%, and general managers or CEOs at 21.1%.

The distribution of industries among respondents is diverse, with 35.8% representing the food manufacturing sector, 24.2% from engineering and mining, and 18.9% from the chemical industry. Most respondents are located in Nablus at 29.5% and Hebron at 16.8%, with smaller percentages from additional areas, including Jenin at 6.3% and Jerusalem at 1.1%. Most companies in the sample employ 20–49 individuals, 32.6% or 50–99 individuals 26.3%, while a smaller percentage indicates very small or very large firms.

Regarding environmental practices, 54.7% of companies have adopted environmental management practices, whereas 20% have no implementation intentions. A smaller group, 17.9%, indicates engagement in certain environmental practices, albeit lacking a defined strategy. Of the subjects examined, 22.1% possess formal environmental certifications, whereas 32.6% indicate no intention to acquire them. The production process significantly influences ecological programs, as 73.7% of respondents acknowledge its direct impact. 70.5% of respondents believe that human resource management significantly influences environmental programs.

3.4.1 Summary of Demographic Analysis

Most research participants are male, have bachelor's degrees, and have over 6 years of job experience. I worked in food manufacturing, engineering, and the metal sector, and most responders worked in human resources, production, or general management. Most participants are from Nablus and Hebron. The sample includes medium-sized companies with 20–99 workers. Though formal environmental certifications are rare, over half of organizations have incorporated ecological management practices. Most respondents think production and HR management affect their company's environmental efforts.

3.5 Dimension of questionnaire variables

This part aims to collect data on the relationship between GHRM, GI, and DT toward sustainability in the Palestinian manufacturing sector. This part consists of 38 items.

Finally, it is worth mentioning that a five-point Likert scale, ranging from “Strongly Disagree” (1) to “Strongly Agree” (5), is used in the second, third, and fourth parts of the questionnaire. In these parts, all items are positively phrased. Thus, no items need to be reversed. Higher scores (i.e., moving from “Strongly Disagree” to “Strongly Agree”) reflect better levels. It was used based on the evidence of many researchers in its usefulness. The levels of these three variables are qualitatively evaluated according to Table (3).

Table 2

Scoring Range of Likert Scale

Range	Description of Range
1.00-1.80	Very Low
1.81-2.60	Low
2.61-3.40	Medium
3.41-4.20	High
4.21-5.00	Very High

A copy of the questionnaire is available in Appendix A&B.

3.5.1 Green Human Resource Management Criteria

The descriptive statistics for the GHRM Criteria are shown in Table (4). The descriptive study of green HRM underscores disparate degrees of implementation across many domains, indicating both strengths and opportunities for improvement. The data reveals that several features are doing comparatively better, with a mean value classified as "medium." The company's emphasis on environmental standards is evident in job descriptions and requirements ($M = 2.93$), and the organization makes sure to orient new workers towards ecological considerations throughout their onboarding process ($M = 2.93$).

Table 3*Descriptive Statistics for Green HR Management*

	Item	Mean	SD	% DOI	DOA
GH1	The job description and requirements reflect the company's concern for environmental standards.	2.93	1.084	58.5%	Medium
GH2	The employee recruitment process includes environmental commitment criteria.	2.67	1.096	53.5%	Medium
GH3	Applicants for positions at the organization are subject to interviews that include environmental issues.	2.37	1.022	47.4%	Low
GH4	Applicants for vacant positions are selected from those with sufficient environmental knowledge.	2.42	1.078	48.4%	Low
GT1	The organization provides environmental training to employees on a wide scale.	2.47	1.060	49.5%	Low
GT2	Environmental training is a priority for the company compared to other types of training.	2.35	1.070	46.9%	Low
GT3	The company is keen to direct new employees to environmental aspects and the necessity of applying them during their work.	2.93	1.034	58.5%	Medium
GT4	The company provides all training materials on the company's networks to be a role model in preserving resources.	2.65	0.987	53.1%	Medium
GPMC1	Managers and employees have specific environmental goals.	2.91	1.063	58.1%	Medium
GPMC2	Employees know the company's environmental goals and their environmental responsibilities towards them.	2.81	1.065	56.2%	Medium
GPMC3	Employees who meet or exceed the organization's environmental goals are rewarded with non-cash bonuses or other cash awards.	2.21	1.051	44.2%	Low
GHRM	Green HR Management	2.61	0.841	52.2%	Medium

Furthermore, the company designates specific environmental objectives for management and workers (M = 2.91), and employees reasonably understand the company's environmental goals and responsibilities (M = 2.81). Delivering training materials via the company's network infrastructure to enhance sustainability demonstrates reasonable performance (M = 2.65).

Conversely, some regions demonstrate diminished levels of accomplishment, necessitating more focus. Insufficient development occurs when environmental concerns are incorporated into the interview process (M = 2.37), and applicants are evaluated based on their expertise (M = 2.42). The company inadequately offers extensive environmental training (M = 2.47) and fails to prioritize it above other training types (M = 2.35). The employee reward system for achieving or surpassing environmental objectives is inadequate (M = 2.21), indicating insufficient incentives.

The average score for Green HR Management in all categories is 2.61, reflecting a reasonable performance level. The firm is committed to environmental objectives through its job descriptions, onboarding procedures, and goal-setting initiatives; however, significant enhancements are required in recruitment, training, and incentive systems. Fortifying these deficient areas might augment the overall efficacy of the company's green HR programs and provide more consistency with environmental aims.

3.5.2 Green Innovation Criteria

The descriptive statistics for the GI Criteria are shown in Table (5).

Table 4

Descriptive Statistics for GI

	Item	Mean	SD	% DOI	DOA
GP1	The company uses low-polluting materials.	3.61	1.024	72.2%	High
GP2	The company uses materials that consume less energy.	3.46	1.019	69.3%	High
GP3	The company uses materials to design environmentally friendly products.	3.32	1.055	66.3%	Medium
GP4	The company uses materials that are easy to recycle, use, and decompose.	3.24	1.108	64.8%	Medium
GPP1	The company's manufacturing processes reduce waste and hazardous materials.	3.53	0.988	70.5%	High
GPP2	The company's manufacturing processes reduce coal, oil, electricity, and water use.	3.33	1.106	66.5%	Medium
GMa1	The company is working on establishing green supply chain management.	2.63	1.167	52.6%	Medium
GMa2	The company is working on implementing environmental control.	2.87	1.113	57.5%	Medium
GM1	The company uses recyclable containers (bottles, wrappers, bags, etc.)	2.99	1.153	59.8%	Medium
GM2	The company has containers designed in an environmentally friendly manner that are easy to clean and empty to meet environmental requirements.	3.13	1.123	62.5%	Medium
GM3	The company refers to quality certificates when marketing its products.	3.18	1.246	63.6%	Medium
GI	Green Innovation	3.21	0.848	64.2%	Medium

The analysis of GI indicates performance variations across various domains, identifying strengths and areas needing enhancement. Multiple items exhibit elevated levels of implementation, reflecting robust environmental initiatives. The company has efficiently utilized less polluting and energy-efficient materials (M = 3.61) (M = 3.46). The

company's manufacturing processes demonstrate a significant commitment to minimizing waste and hazardous materials (M = 3.53), consistent with sustainable production objectives.

Nevertheless, certain areas exhibit only moderate performance, indicating potential for enhancement. The organization employs environmentally friendly materials in product design (M = 3.32) and strives to minimize resource consumption, including coal, oil, and water (M = 3.33); however, these initiatives lack robustness. Green supply chain management (M = 2.63) and environmental control initiatives (M = 2.87) are in developmental stages, indicating moderate progress. The implementation of recyclable containers (M = 2.99) and environmentally designed packaging (M = 3.13) reflects a moderate level of adoption. The company utilizes quality certificates in its product marketing (M = 3.18); however, this aspect presents opportunities for performance improvement.

The mean score for GI is 3.21, reflecting a moderate level of achievement overall. The company demonstrates strength through using sustainable materials and waste-reducing manufacturing processes; however, improvements are necessary for green supply chain management, environmental control, and the adoption of recyclable packaging. By enhancing these deficient areas, the company can adopt a more uniform and thorough strategy for GI, ensuring that all facets of its operations align with environmental sustainability objectives.

3.5.3 DT Criteria

The descriptive statistics for the DT Criteria are shown in Table 6.

Table 5

Descriptive Statistics for DT

	Item	Mean	SD	% DOI	DOA
DT1	Plans and procedures are in place to ensure the long-term sustainability of digital transformation efforts.	2.98	1.158	59.6%	Medium
DT2	Technology systems and digital infrastructure are constantly updated within the company.	3.24	1.039	64.8%	Medium
DT3	Automation is an application in the company's manufacturing and production processes.	3.36	1.071	67.2%	Medium
DT4	There are control and management systems for industrial processes based on digital technology.	3.36	0.978	67.2%	Medium
DT5	The company collects and analyzes data to improve its operations, performance, and decision-making.	3.42	0.996	68.4%	High
DT6	There is training for employees on the use of new digital technologies.	3.21	0.988	64.2%	Medium
DT7	There are procedures followed within the company to maintain the security of information and digital data, i.e., to address cyber threats and deal with security incidents.	3.26	1.160	65.3%	Medium
DT	Digital Transformation	3.26	0.897	65.2%	Medium

The analysis of DT indicates varied performance across distinct areas, with most indicators reflecting moderate achievement, whereas a select few exhibit superior performances. The company's significant strength lies in its collection and analysis of data to enhance operations, performance, and decision-making, as evidenced by its mean score of 3.42, which is classified as high. This demonstrates that the company utilizes data analytics to improve strategic and operational results.

Nonetheless, various facets of DT exhibit only moderate levels of implementation. Automation in manufacturing and production processes (M = 3.36) and implementing control and management systems utilizing digital technology (M = 3.36) indicate moderate advancement. Efforts to maintain updated technology systems and digital infrastructure (M = 3.24) and to implement cybersecurity measures addressing threats and security incidents (M = 3.26) are advancing steadily, yet they have not achieved optimal levels. The medium range categorizes employee training on new digital technologies (M = 3.21), suggesting additional investment is needed to enhance digital skills across the workforce.

The aspect with the lowest score pertains to the company's plans and procedures for ensuring the long-term sustainability of DT efforts (M = 2.98), suggesting that this area is less developed relative to others.

The mean score for DT is 3.26, indicating moderate achievement. The company demonstrates proficiency in data analytics but must improve its sustainability planning, automation, and cybersecurity initiatives. Enhancing these areas will facilitate a more thorough and sustainable DT, enabling the company to attain enduring technological progress and resilience.

3.5.4 Sustainable Performance Criteria

The descriptive statistics for the Sustainable Performance Criteria are shown in Table (7).

Table 6

Descriptive Statistics for Sustainable Performance

	Item	Mean	SD	% DOI	DOA
EP1	Improve the company's environmental reputation	3.53	1.009	70.5%	High
EP2	Reducing waste in the production process	3.67	1.005	73.5%	High
EP3	Reducing the risk of environmental accidents such as waste leakage, poisoning, or radiation emissions.	3.65	1.039	73.1%	High
EP4	Increased purchase of environmentally friendly goods	3.47	1.050	69.5%	High
EP	Environmental Performance	3.58	0.930	71.6%	High
EcP1	Reduce material purchasing costs	3.65	0.931	73.1%	High
EcP2	Reduce energy costs	3.68	0.937	73.7%	High
EcP3	Achieve average profit growth	3.57	0.996	71.4%	High
EcP	Economic performance	3.64	0.881	72.7%	High
SP1	Improving the relationship with the community and stakeholders	3.82	1.021	76.4%	High
SP2	Reducing the negative impact of the institution's waste on the local community	3.63	1.011	72.6%	High
SP3	Develop and design better service with the help and participation of employee initiatives in management decisions.	3.51	1.030	70.1%	High
SP	Social Performance	3.65	0.938	73.1%	High
SOP	Sustainable Performance	3.62	0.854	72.5%	High

The analysis of sustainable performance demonstrates consistently high achievement across environmental, economic, and social dimensions, reflecting robust overall performance. The company exhibits practical efforts in the environmental performance dimension (M = 3.58), enhancing its environmental reputation (M = 3.53), decreasing production waste (M = 3.67), and mitigating environmental risks, including waste leakage, poisoning, and radiation emissions (M = 3.65). The heightened acquisition of environmentally friendly products (M = 3.47) underscores the company's dedication to sustainability.

In the economic performance dimension (M = 3.64), the company demonstrates proficiency in minimizing material purchasing costs (M = 3.65) and energy costs (M = 3.68), thereby achieving cost-efficiency alongside sustainability objectives. Furthermore, an average profit growth of M = 3.57 indicates a balanced strategy that integrates environmental responsibility with financial profitability.

The company's active engagement in enhancing relationships with the community and stakeholders (M = 3.82), the highest score among all dimensions, demonstrates significant achievement in the social performance dimension (M = 3.65). Initiatives aimed at mitigating the adverse effects of waste on the local community (M = 3.63) and engaging employees in management decisions to enhance service design (M = 3.51) exemplify a proactive stance on social responsibility.

The company exhibits a mean score of 3.62 for overall sustainable performance, indicating high achievement across all areas. Social engagement and community relations demonstrate the highest performance, while the marginally lower scores in environmental initiatives, like the procurement of environmentally friendly goods (M = 3.47), suggest potential areas for improvement. The consistently high scores across dimensions indicate the company's effective integration of sustainability principles into its operations, resulting in favorable environmental, economic, and social outcomes.

3.5.5 Summary of the study criteria

The comparative analysis of green HR management, GI, DT, and sustainable performance reveals differing degrees of implementation and effectiveness. Green HR management exhibits moderate performance (M = 2.61), demonstrating strengths in environmental standards while necessitating improvements in recruitment, training, and incentives. GI

demonstrates superior performance ($M = 3.21$), characterized by advancements in sustainable materials and waste reduction; however, further development is required in green supply chain management and recyclable packaging. DT demonstrates moderate achievement ($M = 3.26$), especially in data analytics, yet shows insufficient progress in automation and cybersecurity. Sustainable performance is characterized by high scores ($M = 3.62$) in environmental, economic, and social dimensions, indicating effective waste reduction and community relations; however, there remains potential for enhancement in environmental initiatives. In summary, green HR management, innovation, and DT exhibit moderate advancement, whereas sustainable performance stands out as the most developed area, indicating a unified strategy for sustainability. Improving HR practices, encouraging innovation, and developing digital capabilities are crucial for aligning operations with sustainability objectives and facilitating holistic development.

3.6 Data Screening and Preliminary Analysis

Data screening and preliminary analysis are essential before advanced statistical analysis (Hair et al., 2010). This ensures that the data are clean, organized, and ready for further advanced examination. The study data were screened using PLS to assess the quality of the standard and structural models and test the hypotheses.

3.6.1 Reasons for using PLS SIM

PLS-SEM is an important marketing and commercial research method that is highly effective in testing hypotheses (Hair et al., 2011). (Vinzi et al., 2010) describe PLS-SEM as a modeling and statistical technique for complex multivariate correlation analysis involving observable and latent variables. Structural Equation Modeling (SEM) is essential for examining the causation of latent variables (Hair et al., 2011). Furthermore, PLS-SEM route modeling offers precise and reliable confirmatory factor analysis (Asyraf & Afthanorhan, 2013). Academic and social sciences, particularly business studies, have utilized PLS-SEM as a statistical technique (Hair Jr et al., 2014). The domain includes management information systems, marketing, and family businesses. PLS-SEM provides multiple benefits when addressing limited sample sizes, non-normal data, and predictive requirements (Sarstedt et al., 2014)

Unlike other covariance-based approaches, PLS-SEM does not restrict the interaction methods used in moderation testing, making it suitable for examining moderation effects

(Vinzi et al., 2010). Finally, PLS-SEM can produce complex models that include effect chains, such as mediation and various interactions (Lowry & Gaskin, 2014). We computed the inner and outer models using Smart PLS 3.0 (Ringle et al., 2015)

3.6.2 Missing Data

In quantitative studies, one of the most complicated issues for many researchers is the missing data that could negatively affect the results (Cavana et al., 2001). This issue will also negatively impact PLS-SEM; it will not run at a reasonable level without any missing values. Regarding the data, it is evident that all variables are valid and have no missing values.

3.6.3 Multi-Collinearity Test

It is crucial to determine whether or not the independent variables are multi-collinear (Hair et al., 2020) before testing the proposed model. A problem arises in the matrix when two independent variables exhibit a strong relationship. The VIF value indicates multicollinearity when it is greater than 5. (See Appendix C).

3.7 Evaluation of PLS-SEM Results

This section presents the results of the factor analysis. This study examines the reliability and validity of concepts related to measurement. After verifying the constructs' reliability and validity, the structural models investigated the relationships between the latent variables.

After the data verification and screening outlined in the previous section, we assess the outer and inner models (Vinzi et al., 2010). This study applied PLS-SEM to examine the outer model (measurement model) and the inner model (structural model). This study analyzed the outer model (measurement model) and the inner model using PLS-SEM (structural model). The study utilized PLS-SEM to examine the mediation and the direct and indirect effects. Ringle et al. (2015) declare that Smart PLS 4.1 is an effective instrument for identifying causal relationships among the components in theoretical models. The model must be comprehensible when implementing the PLS-SEM analysis.

The study comprises three exogenous latent variables, one independent variable, GHRM, and two mediator variables, GI and DT. The dependent variable in this study is Sustainable Performance (SOP). The original study model has 39 reflecting assessment

items (manifest variables or indicators) for six variables (latent variables), with six connections between them based on the study hypothesis. It includes one independent variable, two mediator variables, and three dependent variables (see Figure 1).

3.7.1 The Measurement Model

This model is an integral component of the structural equation model that addresses the variables under investigation, their indicators, and the relationships that exist between them. The main criteria for evaluating the measurement model are validity and reliability. The degree of consistency a measuring instrument exhibits in measuring the concept it aims to evaluate is known as reliability, while validity assesses an instrument's effectiveness in measuring the specific concept it seeks to determine (Sekaran, 2003). This study followed the criteria suggested by (Hair et al., 2011) and (Götz et al., 2010) in evaluating the reflective measuring items. This study measured validity, including both convergent and discriminant validity. Then, reliability analysis was assessed.

3.7.2 Construct Validity

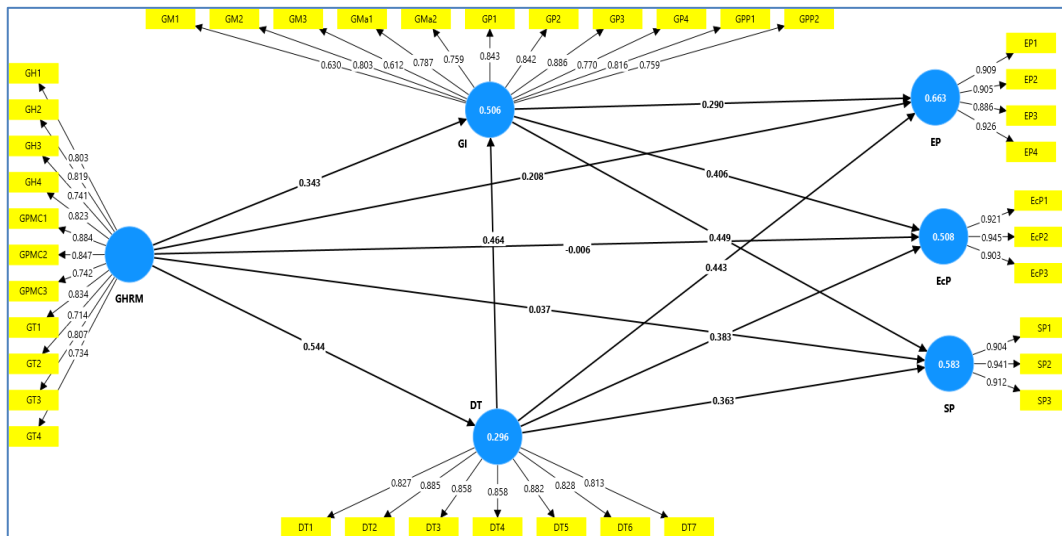
Sekaran and Bougie, in their 2009 paper, say that construct validity checks whether the results of a test are relevant to the ideas used to make the test. The instrument must utilize the theoretical framework proposed by (Ramayah et al., 2011). The analysis of loadings and cross-loadings can achieve convergence and discriminant validity. Hair et al. (2011) state that indicator or factor loadings must exceed an acceptable limit of 0.70. Similarly, (Valérie, 2012) noted that Academic research commonly uses the correlation coefficient, also known as loadings, as an indication. If the correlation coefficient surpasses 0.70, the shared variance between the construct and its measure surpasses the error-attributed variance. The construct explains more than fifty percent of the variation in the observed variable. If the correlation falls below 0.70, it is essential to interpret the findings cautiously, as it could suggest a poorly constructed item or low reliability. An incorrect item indicates low content validity or a flawed transformation between the context and the item.

According to Hair et al. (2017), we typically remove indicators with outer loadings ranging from 0.40 to 0.70 from the scale only if doing so improves the composite reliability or average variance extracted (AVE). The prior discussion established this research's appropriate cut-off value of 0.70 for factor loadings. We did not eliminate any loadings because they all exceeded the 0.70 threshold. Figure 3 and Table C.4 clearly

show these loadings. All items evaluating a specific construct demonstrated high loadings on that construct and low loadings on alternative constructs, indicating construct validity.

Figure 3

Organizational Study Model



3.7.2.1 Convergent Validity

Convergent validity is the degree to which a measure correlates positively with other measures of the same construct. Studies can evaluate convergence validity using the following tests: factor loadings, composite reliability (CR), and average variance extracted (AVE).

The entire set of latent variables satisfied the threshold value and was considered to have achieved the criteria for convergent validity. Cronbach's alpha and composite reliability (CR) were reported for all constructs and indicators in the study model, as shown in Table C.4 in the appendices. Cronbach's alpha is traditionally used to assess internal consistency, with a recommended threshold of 0.7 or higher, and all constructs in this study meet or exceed this threshold.

The higher outer loading means that the indicators have much in common on a construct; a common rule of thumb is that the outer loadings should be 0.708 or higher (Hair et al., 2011). All items loading meet the criteria and agree with the suggested values. CR indicates the degree to which construct indicators show the asset under consideration variable; it should exceed 0.70 (Hair et al., 2011). Table 8 presents the composite reliability for all values in this study, ranging from 0.784 to 0.957, indicating high

convergent validity. Finally, AVE is used to examine the difference between measurement error indicators; a value higher than 0.50 is needed to prove the concept's use (Hair et al., 2011). We deemed the AVEs for this research, with all results over (0.50) acceptable. (Lam, 2012) asserts that when the AVE falls below 0.50 in specific scenarios, the internal reliability of the measurement items is considered satisfactory if the composite reliability surpasses the acceptable 0.60 threshold.

Table 7

Measurement model outcomes for the constructs

Model Construct	Measurement Item	Loading	Cronbach's alpha	CR (rho_a)	CR (rho_c)	AVE
GHRM	GH1	0.784	0.942	0.950	0.950	0.635
	GH2	0.802				
	GH3	0.752				
	GH4	0.828				
	GT1	0.822	0.927	0.931	0.943	
	GT2	0.730				
	GT3	0.794				
	GT4	0.715				
	GPMC1	0.868	0.948	0.953	0.957	
	GPMC2	0.838				
GPMC3	0.770					
GI	GP1	0.903	0.939	0.942	0.948	0.648
	GP2	0.900				
	GP3	0.917				
	GP4	0.846				
	GPP1	0.820	0.763	0.784	0.863	
	GPP2	0.906				
	GMa1	0.915	0.891	0.893	0.932	
	GMa2	0.897				
	GM1	0.820	0.808	0.825	0.874	
	GM2	0.854				
GM3	0.794					
DT	DT1	0.857	0.936	0.938	0.948	0.724
	DT2	0.805				
	DT3	0.825				
	DT4	0.849				
	DT5	0.821				
	DT6	0.830				
	DT7	0.853				
SOP	EP1	0.891	0.928	0.945	0.948	0.821
	EP2	0.908				
	EP3	0.916				
	EP4	0.890	0.913	0.933	0.945	
	EcP1	0.885				
	EcP2	0.917				
	EcP3	0.921				
	SP1	0.903				
	SP2	0.925	0.908	0.912	0.942	
SP3	0.900					

3.7.2.2 Discriminant Validity

The square root of the AVE for green HR management stands at 0.797, outperforming its correlations with all other constructs, including GI (0.595), DT (0.544), EP (0.622), EcP (0.444), and SP (0.503). This demonstrates that the Green HR Management construct possesses adequate discriminant validity. The square root of the AVE for GI is 0.778, surpassing its correlations with DT (0.650), EP (0.702), EcP (0.651), and SP (0.708). Consequently, GI exhibits satisfactory discriminant validity within the model.

The integration of digital technology into all aspects of a business, which fundamentally alters operations and delivers value to customers, is known as DT. It encompasses a cultural shift that requires organizations to continually challenge the status quo, experiment, and become comfortable with failure. This process is essential for organizations to remain competitive.

The square root of the AVE for DT is 0.851, exceeding its correlations with EP (0.745), EcP (0.644), and SP (0.676). This validates the discriminant validity of the DT construct. The square root of the AVE for EP is 0.907, surpassing its correlations with EcP (0.764) and SP (0.825). Consequently, EP demonstrates robust discriminant validity, signifying its distinction from other constructs within the model.

The square root of the AVE for EcP is 0.923, exceeding its correlations with all other constructs, although the correlation with SP is notably high at 0.815. Even though there is a strong link, the Fornell-Larcker criterion says that EcP is still discriminately valid because its square root AVE is greater than the correlation. The square root of the average variance extracted (AVE) for SP is 0.919, surpassing its correlations with all other constructs, including EcP (0.815). The correlation between SP and EcP is relatively high; however, the Fornell-Larcker criterion indicates that discriminant validity remains sufficient.

The Fornell-Larcker criterion says that most of the constructs in the model have enough discriminant validity if the square root of their AVE is higher than the sum of their correlations with other constructs (Fornell & Larcker, 1981). The high correlation between EcP and SP (0.815) indicates a close relationship between these constructs, suggesting potential overlap. Nonetheless, the constructs demonstrate acceptable

discriminant validity, confirming the distinctiveness of the measured variables within the model. (see Appendix C)

Analysis of the Heterotrait-Monotrait Ratio (HTMT)The heterotrait-monotrait (HTMT) ratio serves as an indicator for evaluating discriminant validity within structural equation modeling (SEM). In this study, heterotrait correlations (which involve different constructs) are compared to monotrait correlations (which involve the same construct). This is done to see how different latent variables are (Henseler et al., 2015). Studies establish discriminant validity when HTMT values are less than 0.85, with some studies suggesting an upper limit of 0.90, depending on the model and discipline (Voorhees et al., 2016)

The HTMT values for Green HR Management in relation to other constructs are below the threshold of 0.85, ranging from 0.451 (associated with EcP) to 0.647 (associated with EP). This suggests that Green HR Management exhibits sufficient discriminant validity concerning all other constructs, given that its correlations remain within acceptable thresholds (Henseler et al., 2015).

GI: The HTMT values fall below the 0.85 threshold, showing the highest correlation with SP (0.764) and the lowest with Green HR Management (0.614). This demonstrates that GI is distinct from other latent variables, confirming discriminant validity.

DT: The HTMT values for DT are below 0.85, ranging from 0.564 (associated with Green HR Management) to 0.794 (linked to EP). The values indicate that DT maintains adequate discriminant validity from other constructs (Hair et al., 2020).

The HTMT values for EP are higher than those of other constructs, recorded at 0.899 (with SP) and 0.647 (with GHRM). The close relationship among EP, EcP, and SP indicates that these constructs may exhibit greater similarities than others (Voorhees et al., 2016). Further investigation may be necessary to maintain discriminant validity in future model iterations.

EcP exhibits higher HTMT values than EP (0.830) and SP (0.895). The observed values, although acceptable, exceed the typical range and indicate a possible overlap between the constructs. However, the HTMT values are consistent with the established thresholds, confirming the attainment of discriminant validity (Henseler et al., 2015).

SP exhibits HTMT values of 0.899 when compared with EP and 0.895 concerning EcP. The elevated values observed suggest a strong association between the variables while remaining within the acceptable limits for discriminant validity (Hair et al., 2020).

The model has sufficiently established discriminant validity, as all HTMT values for the constructs fall below the 0.90 threshold. The higher values observed between EP, EcP, and SP indicate a stronger correlation among these constructs, suggesting a need for further examination in future studies to maintain their conceptual distinction. Hair et al. (2020) emphasize the importance of maintaining discriminant validity to ensure the distinctiveness of latent constructs in SEM. Future research may investigate potential refinements in the measurement model. (see Appendix C)

3.7.2.3 Reliability Analysis

Cronbach's alpha with composite reliability ratings was used to analyze the measuring items' inter-item consistency. To accept Cronbach's alpha and composite reliability (CR), they should be more than 0.70 (Hair et al., 2011). (Appendix C) displays both Cronbach's alpha and composite reliability for this study construction; these values exceed 0.70, which is acceptable. Both Cronbach's Alpha and Composite Reliabilities of Constructs for GHRM are 0.942 and 0.950. For GI are 0.933 and 0.943. For DT are 0.936 and 0.948. For EP are 0.928 and 0.949. For EsP, 0.913 and 0.945, and for SP, are 0.908 and 0.942. It is evidence that the construct's dependability was proven.

3.8 Structural Model

The causal relationships between the study's variables are illustrated by the structural model (the inner model), which shows the nature of the relationship between the independent and dependent factors. The findings of the study hypotheses and the significance and indication of the associations (positive or negative) may all be made clearer by the structural model's outcomes.

The data analysis was conducted in two phases based on the fundamental steps of statistical analysis using the (SEM-PLS) software. The first stage ensured that the obtained data met the requirements of the measurement model, and the second stage evaluated the structural model to achieve this study's objectives. Additionally, there are some tests to assess the structural model, such as the coefficient of determination. R^2 values, effect size f^2 , model predictive significance, and goodness of fit (GoF). The route

coefficient level, significance, and bootstrapping were utilized to evaluate the study's hypotheses.

3.8.1 R-Square (R²)

The coefficient of determination (R²) is the most widely used metric to assess the structural model's performance, indicating its predictive accuracy. R² values range from 0 to 1, where a higher value suggests greater predictive accuracy. (Hair et al. 2011), as a general guideline, R² values of 0.75, 0.50, and 0.25 for endogenous latent variables can be interpreted as high, moderate, and weak, respectively. However, this classification is only a rough estimate, as the complexity of the research model influences the R² value. The R² value of GI was 0.506, suggesting that GHRM and DT can explain 50.9% of the variation in GI, which was in the suitable range. Then, the R² of DT was 0.296, meaning that GHRM can illustrate 29.6% of the variation in DT extent. Because the R² score was greater than 25%, it was in the moderate range. The R² of EcP was 0.508, EP was 0.663, and SP was 0.583. (see Appendix C).

3.8.2 Effect Size (f²)

The effect size expresses the effect of excluding a specified exogenous construct on the endogenous constructs and can be calculated as follows in equation 1:

$$F^2 = \frac{R^2_{included} - R^2_{excluded}}{-R^2_{included}} \quad 1$$

Cohen1988 showed that the values of F² equal to 0.02, 0.15, and 0.35, respectively, represent small, medium, and large effects of the exogenous latent variable. Table 8 shows that GHRM has a substantial impact size of 0.421, underscoring its pivotal role in facilitating digital transformation projects. The influence of (GHRM) on Environmental Performance (EP) is minimal (0.077), indicating a restricted direct impact on environmental results. Economic Performance (EcP): GHRM demonstrates no significant effect (0.000), indicating no direct influence on financial performance. Social Performance (SP): The effect is small (0.002), indicating limited direct impact on social outcomes.

Green Innovation (GI): GI favorably impacts all three performance aspects. GI has a medium impact size (0.123), indicating a modest influence on the advancement of environmental sustainability. The impact size (0.165) suggests that GI influences

economic results. Social Performance (SP), with an effect size of 0.239, GI has a significant impact on social sustainability, underscoring its relevance in tackling social issues.

Digital transformation has a significant and beneficial impact on several performance outcomes: Environmental Performance (EP): DT has a substantial effect size (0.313), indicating a meaningful impact on enhancing environmental sustainability economic performance (EcP): DT has a medium effect size (0.161), indicating a modest impact on financial and economic results. Green Innovation (GI): With a substantial impact size (0.306), DT is a crucial facilitator of green innovation, promoting sustainable progress. Social Performance (SP): Digital Transformation (DT) significantly improves social performance, as evidenced by its impact size of 0.170, contributing to social sustainability. (see Appendix C)

3.8.3 Predictive Relevance of the Model

The Q^2 value (Stone-Geisse Q^2) indicates the importance of the model's predictive relevance in the structural model. When Q^2 value greater than 0 for a specific reflective endogenous latent variable suggests how important the path model's prediction is for that construct. (Hair et al., 2013) used the Q^2 criteria to evaluate the effectiveness of the model's ability to predict data from excluded examples. The blindfolding procedure was used to obtain the value of Q^2 . The cross-validated replication values obtained for DT, GI, EP, EcP, and SP were 0.278, 0.329, 0.371, 0.181, and 0.239, respectively, as shown in the following table; these results confirm the model's assertion of adequate prediction quality. (see Appendix C).

3.8.4 Goodness of Fit (GoF) of the Model

Tenenhaus et al. (2005, p. 176) described GoF in PLS Structural Equation Modeling as the global fit measure, a geometric mean of the average variance extracted, and the endogenous variables' average R^2 . GOF can be determined by using a unique formula, which is:

$$GoF = \sqrt{AVG(R^2).AVG(AVE)}$$

$$GoF = \sqrt{0.844 .0.583}$$

The GoF value of 0.701 was larger than the (Watzelset al., 2009) baseline values.

- a) If the goF value is less than 0.1, there is no fit.
- b) GoF between 0.1 and 0.25, there is a small fit.
- c) GoF values between 0.25 and 0.36, the fit is medium.
- d) There is a large fit if the GoF values are larger than 0.36.

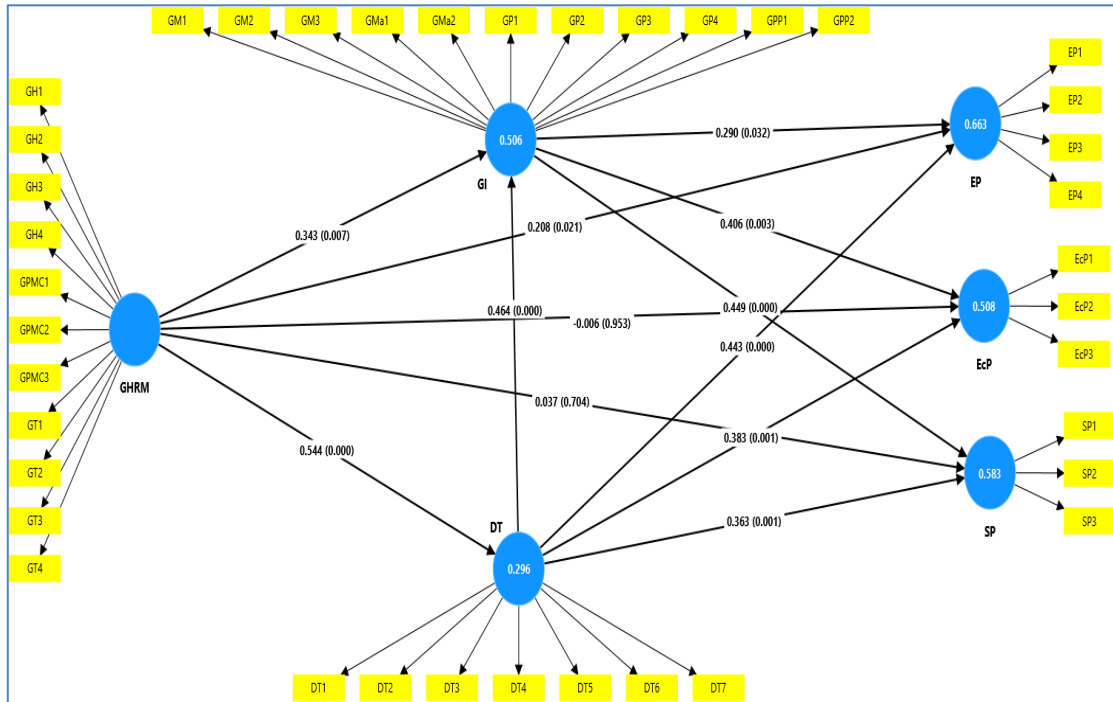
The results indicated that the model's goodness of fit was higher than the global PLS model's adequate validity

3.9 Hypotheses Testing

The structural model was estimated after running the PLS algorithm to test the relationships between the study models. Although path coefficients are important in PLS, the hypothesis being tested should not be neglected if the paths are significant or show indicators consistent with the expected trend (Hair et al., 2011). The researchers also noted that the significance of each path coefficient and the weights and loadings of the indicators can be determined using the resampling approach. To estimate path coefficients using the resampling method, at least 5000 resamples will be needed, with the number of cases equal to the number of observations in the original sample (Hair et al., 2011). Furthermore, for the two-tailed test, the critical t values are 1.65 (at 10% significance level), 1.96 (at 5% significance level), and 2.58 (at 1% significance level). To calculate the standard errors and t statistics, the researcher used 5000 resampling with a replacement number of retest cases equal to the original number of samples (95). Figure (5) shows the hypothesized associations' path coefficient and retest results.

Figure 4

PLS bootstrapping (p-value, R²) for the study model A



H1a: Green HR Management and Environmental Performance (EP)

The statistical analysis indicates a significant positive impact of Green HR Management on Environmental Performance, evidenced by a t-statistic of 9.922 and a p-value of 0.000. The confidence interval (0.499 to 0.747) suggests a stable positive effect. This hypothesis is thus confirmed.

H1b: Green HR Management and Economic Performance (EcP)

The findings demonstrate that Green HR Management significantly impacts Economic Performance, as indicated by a t-statistic of 0.059 and a p-value of 0.953. The confidence interval of 0.292 to 0.594 indicates a statistically negative effect, not supporting the hypothesis.

H1c: Green HR Management and Social Performance (SP)

Statistical evidence supports the hypothesis that Green HR Management positively impacts Social Performance. The t-statistic is 0.379, and the p-value is 0.704, indicating no relationship. The confidence interval (0.362 to 0.634) indicates no stability of this effect, thereby non-confirming the hypothesis.

H2: Green Human Resource Management and Green Innovation

The statistical analysis indicates a positive correlation between Green HR Management and GI, evidenced by a t-statistic of 3.122 and a p-value of 0.002. The p-value is below the 0.05 threshold, indicating a statistically significant relationship. The confidence interval spans from 0.134 to 0.614, suggesting that the effect is substantial and positive. Consequently, the hypothesis receives support.

H3: Green Human Resource Management and Digital Transformation

The results indicate that Green HR Management significantly influences Digital Transformation. The p-value of 0.000 and a t-statistic of 7.776 indicate a strong relationship. The confidence interval [0.407, 0.681] supports the assertion of a positive influence. Therefore, this hypothesis is accepted.

H4a: Green Innovation and Environmental Performance (EP)

The statistical analysis indicates a significant positive impact of Green Innovation on Environmental Performance, evidenced by a t-statistic of 2.151 and a p-value of 0.032. This hypothesis is thus confirmed.

H4b: Green Innovation and Economic Performance (EcP)

The findings demonstrate that Green Innovation significantly impacts Economic Performance, as indicated by a t-statistic of 3.007 and a p-value of 0.003, supporting the hypothesis.

H4c: Green Innovation and Social Performance (SP)

Statistical evidence supports the hypothesis that Green Innovation positively impacts Social Performance. The t-statistic is 3.627, and the p-value is 0.000, indicating a highly significant relationship, confirming the hypothesis.

H5a: Digital Transformation and Environmental Performance (EP)

The statistical analysis indicates a significant positive impact of Digital Transformation on Environmental Performance, evidenced by a t-statistic of 3.523 and a p-value of 0.000. This hypothesis is thus confirmed.

H5b: Digital Transformation and Economic Performance (EcP)

The findings demonstrate that Digital Transformation significantly impacts Economic Performance, as indicated by a t-statistic of 3.294 and a p-value of 0.001, supporting the hypothesis.

H5c: Digital Transformation and Social Performance (SP)

Statistical evidence supports the hypothesis that Digital Transformation positively impacts Social Performance. The t-statistic is 3.343, and the p-value is 0.001, indicating a highly significant relationship, confirming the hypothesis.

H6: Digital Transformation and GI

The analysis indicates that Digital Transformation significantly impacts GI. The t-statistic of 3.781 and the p-value of 0.000 indicate the statistical significance of this relationship. The confidence interval (0.203 to 0.642) indicates a positive impact, thereby supporting the acceptance of this hypothesis.

Table 8

Results of hypotheses testing

Hyp. #		Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values	Supported?
H1a	GHRM → EP	0.208	0.210	0.090	2.309	0.021	Yes
H1b	GHRM → EcP	-0.006	-0.012	0.108	0.059	0.953	No
H1c	GHRM → SP	0.037	0.031	0.098	0.379	0.704	No
H2	GHRM → GI	0.343	0.346	0.126	2.717	0.007	Yes
H3	GHRM → DT	0.544	0.549	0.070	7.757	0.000	Yes
H4a	GI → EP	0.290	0.308	0.135	2.151	0.032	Yes
H4b	GI → EcP	0.406	0.425	0.135	3.007	0.003	Yes
H4c	GI → SP	0.449	0.468	0.124	3.627	0.000	Yes
H5a	DT → EP	0.443	0.422	0.126	3.523	0.000	Yes
H5b	DT → EcP	0.383	0.366	0.116	3.294	0.001	Yes
H5c	DT → SP	0.363	0.347	0.109	3.343	0.001	Yes
H6	DT → GI	0.464	0.462	0.117	3.958	0.000	Yes

3.10 Testing Mediation Relationship

The mediator variable accounts for all or part of the link between a predictor and an outcome. (Baron & Kenny, 1986). Quantitative research analysis suggests two mediating variable analysis methods. Sobel and bootstrapping are two types of tests that are recommended. The first method necessitates the consideration of certain conditions before implementing the technique. These are: Since the indirect impact deviates from the distribution assumption, we require an unstandardized route coefficient. Avoid having a small sample size for statistical power.

Thus, Sobel's test requires a normal data distribution and a large sample size. However, bootstrapping is not dependent on normal data distribution (Chin, 2010). However, bootstrapping works with both big and small samples. This study employed bootstrapping to evaluate the significance of the mediating link, given the soft distributional assumption of PLS-SEM and the limited sample size. Bootstrapping, a nonparametric resampling approach, is more rigorous and dependable for mediating influence evaluation.

In addition, Hair et al. (2013) advised, "When testing mediating effects, researchers should rather follow (Preacher & Hayes, 2008) and bootstrap the sampling distribution of the indicator effect, which works for simple and multiple mediator models." Bootstrapping is highly effective for PLS-SEM since it does not need variable form or sample distribution assumptions. It may also utilize small sample sizes, making it beneficial (Hair et al., 2013; Preacher & Hayes, 2008). Without the mediator, it is not necessary to link exogenous and endogenous variables (Preacher & Hayes, 2008). Different research shows different outcomes.

This study's model suggests that GHRM predicts EP. However, we observed the effects independently through various mediators, including GI and DT. SEM programs frequently estimate total and indirect effects. The indirect effects represent the total indirect impact for both mediators. Memon et al. (2018) suggested that researchers should evaluate individual indirect effects instead of calculating overall indirect effects in research involving multiple mediators. This feature offers measurements of a particular indirect impact for each mediator functioning through GI, DT, or any other combination of mediators. Therefore, it streamlines the evaluation of models incorporating multiple mediators (Memon et al., 2018).

This work contributes to the exploration of mediated interactions. Table 10 presents the findings regarding the indirect impact on the mediating variable. Preacher and Hayes (2008) identify two prerequisites for conducting mediator analysis. 1. The relationship between the independent variable (IV) and the dependent variable (DV) through the mediator must be statistically significant. 2. Bootstrap the confidence interval for the total effect, excluding zero between the lower limit (LL) and upper limit (UL)—the mediation outcome report in Table 10.

The study used structural equation modeling (SEM) with partial least squares (PLS) to look at how GI and DT affect the connections between GHRM and different levels of sustainable performance, such as EP, EcP, and SP. The findings indicate clear mediation patterns, with GI exhibiting variable results and DT showing consistent significance across all assessed outcomes. The role of GI as a mediator in the link between GHRM and SP was statistically significant (H7c: $\beta = 0.154$, STDEV = 0.077, $T = 1.993$, $P = 0.046$, 95% CI = [0.032, 0.338], Supported). However, it was not significant for EP (H7a: $\beta = 0.099$, STDEV = 0.057, $T = 1.754$, $P = 0.079$, 95% CI = [-0.012, 0.209], Not Supported) and was marginally significant for EcP (H7b: $\beta = 0.139$, STDEV = 0.073, $T = 1.905$, $P = 0.057$, 95% CI = [0.035, 0.339], Not Supported). The findings suggest that GI's mediating role is especially significant for social performance outcomes, while its consistency regarding environmental and economic outcomes is less pronounced. In contrast, DT demonstrated robust and statistically significant partially mediating effects in the relationships between GHRM and EP (H8a: $\beta = 0.241$, STDEV = 0.066, $T = 3.632$, $P = 0.000$, 95% CI = [0.121, 0.379], Supported); completely mediated GHRM and EcP (H8b: $\beta = 0.209$, STDEV = 0.063, $T = 3.300$, $P = 0.001$, 95% CI = [0.054, 0.303], Supported); and completely mediated GHRM and SP (H8c: $\beta = 0.198$, STDEV = 0.059, $T = 3.367$, $P = 0.001$, 95% CI = [0.074, 0.287], Supported). This highlights the essential function of digital transformation in connecting green HR practices to improved organizational performance in environmental, economic, and social areas.

Organizations should prioritize digital transformation initiatives to enhance the performance benefits of green HR practices. Efforts in green innovation should prioritize improving its influence on social performance, whereas its contributions to economic and environmental outcomes necessitate additional investigation. In the future, researchers should look into what makes GI better mediate these relationships and other possible mediating or moderating variables. They should also use longitudinal designs to learn

how these mediation effects change over time. These findings enhance our understanding of sustainable management practices and their effects on organizational performance.

Table 2

Mediation results

Hyp #		Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values	Supported?
H7a	GHRM → GI → EP	0.099	0.102	0.057	1.754	0.079	No
H7b	GHRM → GI → EcP	0.139	0.148	0.073	1.905	0.057	No
H7c	GHRM → GI → SP	0.154	0.164	0.077	1.993	0.046	Yes
H8a	GHRM → DT → EP	0.241	0.229	0.066	3.632	0.000	Yes
H8b	GHRM → DT → EcP	0.209	0.198	0.063	3.300	0.001	Yes
H8c	GHRM → DT → SP	0.198	0.188	0.059	3.367	0.001	Yes

3.11 Summary of the Findings

The conclusions of this investigation are published in this chapter. Also, it prints the data on the response rate and features, measurement refinement procedures, and the implemented tests to analyze the survey validity and reliability with other tests. Generally, the finding revealed that Green HR Management positively affects GI with a statistically significant relationship ($p = 0.002$). Green HR Management substantially impacts digital transformation and environmental, economic, and social performance, with all hypotheses indicating p-values of less than 0.05, signifying robust and reliable effects. Digital transformation positively affects GI, as indicated by a significant t-statistic and p-value.

The study also investigates mediation effects. GI and digital transformation mediate the relationship between green HR management and SOP. Bootstrapping statistical tests show that these mediation effects are real, as shown by positive beta values, high t-statistics, and confidence intervals that don't include zero. The findings underscore the significance of integrating green HR practices with digital strategies to improve sustainable performance.

Chapter Four

Discussion, Conclusion, and Recommendations

4.1 Chapter Overview

This chapter provided a comprehensive analysis of data obtained via questionnaires to assess the impact of GHRM, GI, and DT on several aspects of SOP, including environmental, economic, and social performance. The study used SPSS and Smart PLS 4.1 to evaluate 95 responses from the manufacturing sector in the West Bank, focusing on demographic patterns, hypothesis testing, and the mediating effects of GI and DT. The findings revealed precise performance levels across many parameters, illustrating strengths and areas needing development.

4.2 Summary of the Study

This study examines the relationship between GHRM, GI, and DT towards sustainability in the Palestinian manufacturing sector. This study was conducted with Palestinian factories in the food, pharmaceutical, chemical, engineering, and mining sectors. The variables were identified according to the literature review: the green human resource practices, SOP, and the mediating factors of GI and DT. The AMO, RBV, and TBL theories explained the study framework. Ninety-five questionnaires were received for this survey, and the response rate was 76%. The study passed the necessary tests of "reliability and validity", so the hypotheses were tested accordingly. The following sections will discuss the results.

4.2 Discussion of Results

The results indicate that the level of implementation of GHRM practices in Palestinian manufacturing companies is medium level ($M = 2.61$) on a scale of 5, which is confirmed by the results of other studies conducted in Palestine in manufacturing organizations (Zaid et al., 2018; Masri & Jaaron 2017) and healthcare organizations (Mousa & Othman, 2020).

The level of implementation meets environmental guidelines well but needs to improve hiring, training, and rewards. Improvements in using sustainable materials and lowering trash demonstrate the better performance of GI ($M = 3.21$). However, we should still invest more in green supply chain management and reusable packaging. The levels of

implementation of green HRM practices ranged from low for green recruitment and green training to moderate for green performance appraisal and rewards. These results differ from those of a study (Mousa & Othman, 2020) conducted in healthcare organizations, presenting findings that the most influential green practice was green recruitment and the lowest was green performance management and compensation. The difference may be because the study was applied in the healthcare sector, while ours was applied in the manufacturing sector. Therefore, this indicates that manufacturing companies in Palestine should invest more time, effort, and money in adequately implementing GHRM practices, as they can move the implementation level from medium to high. However, most companies in the study sample are small and medium; financial needs and environmental awareness are necessary to maximize the benefits of the implemented environmental programs. For example, as stated in one of the responses to the questionnaire by one of the managers in the last open question for comment on the research questionnaire, he believes that chemicals can often be replaced with less harmful or green materials, but harmful chemicals cannot be dispensed with because there are no other alternatives at present, as the materials allowed to enter Palestine are very limited. In addition, the current situation in the West Bank does not allow for further development and progress in the field of environment and sustainability because it requires economic, political, and social stability.

One of the most important contributions for which this study was implemented is measuring the extent of implementing GI practices and investigating the mediating effect of GI in the relationship between GHRM practices and SOP, as well as the effect of GHRM on GI and the effect of GI on SOP.

The results showed a high level of implementation for green product innovation and green process innovation $M= 3.410$, $M= 3.430$, respectively, and moderate for green administrative innovation and green marketing innovation $M= 2.75$, $M= 3.10$ respectively, with a moderate overall rate of $M= 3.210$. However, the company demonstrates strength through using sustainable materials and waste-reducing manufacturing processes; however, improvements are necessary for green supply chain management, environmental control, and the adoption of recyclable packaging. By enhancing these deficient areas, the company can adopt a more uniform and thorough

strategy for GI, ensuring that all facets of its operations align with environmental sustainability objectives.

On the other hand, the DT analysis indicates diverse performance across distinct areas, with most indicators reflecting moderate achievement, while only one shows superior performance. The company's great strength lies in its collection and analysis of data to enhance operations, performance, and decision-making, as evidenced by its average score of 3.42, rated as high. This shows that manufacturing companies use data analytics to improve strategic and operational performance. The average score for DT was 3.26, indicating a moderate level. The company demonstrates proficiency in data analytics but must improve sustainability planning, automation, and cybersecurity initiatives. Strengthening these areas would facilitate more comprehensive and sustainable digital development, enabling a company to achieve technological progress and organizational resilience.

The results of the data analysis showed consistently high levels of implementation in the three pillars of SOP: environmental, economic, and social, reflecting strong overall performance. The results showed that the overall level of implementation of sustainable performance was $M= 3.62$, which is a high level. Specifically, the level of implementation of the pillars of sustainable performance (i.e., environmental, economic, and social dimensions) was $M= 3.58$, $M= 3.64$, and $M= 3.65$, respectively, which is considered a high level. Social participation and community relations show the highest performance, while slightly lower scores in environmental initiatives, such as purchasing environmentally friendly materials, $M = 3.47$, indicate potential areas for improvement. Consistently high scores across dimensions indicate that the company effectively integrates sustainability principles into its operations, leading to favorable environmental, economic, and social outcomes.

To sum up, green HR management, innovation, and DT are all progressing slowly. Conversely, sustainable performance has experienced the most significant growth, indicating the existence of a unified strategy for sustainability. We must improve HR practices, encourage new ideas, and build digital skills to align processes with sustainability goals and foster overall growth.

4.2.1 Discussion on Hypothesis Testing

Based on the hypotheses studied (H1a, H2a, H3a) as explained in Figure 1, the results showed a strong relationship between GHRM and environmental performance, which supported hypothesis H1a. This finding aligns with (Aftab et al.; 2023; Ahmad et al.; 2023; Trujillo-Gallego et al., 2022). It was found that GHRM does not affect economic performance, therefore, H1b was not supported. This finding aligns with (Jawaad et al., 2024; Trujillo-Gallego et al., 2022). Additionally, it was found that GHRM does not affect social performance, therefore, H1c was not supported. This finding aligns with Zihan and Makhbul (2024). The social pillar of sustainability is less frequently explored and remains less understood (Khaskhely et al., 2022). The direct influence of GHRM practices on social performance is less noticeable and perhaps agile organization culture improves the GHRM-SP relationship (Gazi et al., 2024). From the researcher's point of view, the rejection of H1b and H1c hypotheses could be due to several reasons, including lack of awareness in the industrial sector and failure to implement green human resources practices in a correct and organized manner. Therefore, the presence of a mediator in this relationship (green innovation and digital transformation), makes the relationship more positive.

Furthermore, the findings showed a positive and significant relationship between the GHRM practices and GI, which aligns with previous studies' results (Kanan et al., 2023; Aftab et al., 2023; Hussain et al., 2021). Hence, H2 is supported. The results showed that GHRM significantly impacts digital transformation, hence H3 is supported and aligned with Ma et al. (2023). DT is crucial in attaining sustainability objectives across environmental, economic, and social dimensions. The relationship between green innovation and sustainable performance was positive and significant, which is consistent with Asadi et al. (2020). So, H4a, H4b, H4c were supported. As for the impact of digital transformation on the three dimensions of environmental, economic, and social sustainability in H5a, H5b, and H5c, the hypotheses were supported. In addition, Brenner and Hartl (2021) stated that digital transformation impacts the environmental and economic dimensions, not the social dimension, as they did not find a link between digital transformation and the social dimension. As for the impact of digital transformation on green innovation and its characteristics, DT significantly improves GI. Therefore, H6 was supported.

The impact of GI and DT on the links between green HRM and different levels of sustainable organizational performance (environmental, economic, and social) was studied. The results suggest that the mediating role of GI is significant for social performance outcomes, while its consistency concerning environmental and economic outcomes is less clear. GI mediates between GHRM and SP (H7c), supported by some studies (Suleman et al., 2024; Kanan et al., 2023). H7a and H7b were weakly and marginally confirmed. In contrast, DT demonstrated strong and statistically significant mediating effects in the relationships between GHRM and all three performance dimensions, as hypothesized in H8a, H8b, and H8c. Some studies demonstrated a relationship between DT and GHRM (Ma et al., 2023), and another study (Brenner & Hartl, 2021) demonstrated the effect of digital transformation on sustainable performance, suggesting the possibility of a mediating relationship for digital transformation.

Integrating environmental objectives into HR practices enables organizations to enhance innovation, accelerate digital transformation, and achieve improved environmental, economic, and social performance. Digital transformation acts as a critical facilitator, enhancing innovation and enhancing the impact of green HRM on sustainability. The mediating effects of green initiatives and technological advancements underscore the relationship between these factors and sustainable organizational success. This study highlights the need to integrate green HR practices with digital strategies to enhance sustainability initiatives and deliver lasting organizational value.

4.3 Theoretical Implications

This study contributes to a growing understanding of GHRM practices, GI, and DT and their impact on SOP in the Palestinian manufacturing sector. The findings highlight the crucial importance of GHRM in promoting environmental performance. Moreover, the influence of GI on SP underscores its capacity to tackle societal issues. To the researcher's knowledge, this study is the first to examine DT as a mediating variable in the relationship between GHRM and sustainable performance alongside GI. By introducing DT and GI as mediating variables, this research extends existing literature and underscores their mediating roles in these relationships. DT is a vital facilitator for linking GHRM practices to overarching sustainability objectives. DT's significant mediating function highlights the need to combine digital tactics with HR practices to get lasting results. On the other hand, GI acts as a full mediator between GHRM and SP. The findings provide a

foundation for leveraging the integration of these constructs to enhance SOP development within the Palestinian manufacturing sector. This research confirms the substantial impact of GHRM, GI, and DT in improving sustainable organizational performance.

4.4 Practical Implications

Several practical implications of GHRM on sustainable performance in manufacturing companies in Palestine can be inferred, manifesting through several aspects, especially when integrating the elements of GI and DT as mediators. The most prominent implications are: Enhancing environmental efficiency: By recruiting and retaining individuals with environmental awareness and digital skills, GHRM improves the company's environmental efficiency. This enables companies to reduce environmental impact through innovative technologies and support digital transformation, leading to more sustainable production practices.

To stimulate green innovation through GHRM, employees can be motivated to participate in environmental and digital initiatives, encouraging them to innovate digital environmental solutions that contribute to developing environmentally friendly products and processes. This enhances the company's competitiveness in markets that focus on sustainability.

In addition to raising operational efficiency with digital transformation as a mediator, GHRM contributes to improving the company's operations by automating environmental activities, analyzing environmental data more deeply, and finding new ways to reduce the consumption of natural resources and energy. This digital approach helps reduce operating costs and enhance efficiency.

This is in addition to improving the company's reputation and enhancing social responsibility, as linking GHRM to green innovation and digital transformation enhances the company's reputation as an environmentally responsible entity committed to digital sustainability. This attracts a wider segment of customers, especially those who care about the environment, and contributes to attracting employees who appreciate the values of sustainability and innovation.

Finally, sustainable growth can be supported through data and environmental analysis, thanks to digital transformation, as companies can collect and analyze accurate data on

the environmental impact of their businesses. This data helps make informed decisions to improve sustainable performance and accurately measure the impact of GHRM practices, which supports green innovation and increases the company's economic and social value.

These implications combine GHRM practices and digital innovation to create a more sustainable industrial environment, leading to comprehensive performance that protects the environment and achieves long-term company growth.

4.5 Conclusions

Environmental concerns and issues have become common recently. Accordingly, companies have adopted green technologies and tools that help them continue improving their environmental capabilities to protect it, reduce waste and energy consumption, and strive towards sustainability. The research focused on a primary objective, which is to explore the impact of the GHRM practices on the sustainable performance of manufacturing companies in Palestine, in addition to investigating the mediating effect of green innovation and digital transformation in the context of Palestinian manufacturing companies. In addition, this study aims to measure the level of implementation of the GHRM practices, green innovation, digital transformation, and the pillars of sustainable performance.

According to the results obtained from the study, green HR management positively affects the EP. This is important regarding interest in green human resource practices, their role in enhancing environmental performance, and their significant impact on the industrial work environment. The results indicate that the mediating role of GI is particularly important for social performance outcomes. In contrast, DT showed strong and statistically significant mediating effects in the relationships between GHRM and all three performance dimensions. This highlights the essential function of digital transformation in linking green HR practices to improved sustainable performance in the environmental, economic, and social domains.

Therefore, the manufacturing sector must realize the value of GI and DT, as the study's results confirmed their importance and impact on the three pillars of sustainable performance. Therefore, those interested in the environment will be attracted to and support these companies, and thus, the environmental performance of companies will increase. As for the economic aspect, the savings in money, profits, and market share will

increase significantly if sustainable performance is achieved. Finally, socially, customers will recognize the value these companies provide, enhancing their belonging to and loyalty to the company. Thus, the results obtained here play an essential role in understanding the GHRM field more deeply and explain how green innovation and digital transformation act as mediating variables in the manufacturing industry.

4.6 Recommendations

Based on the results of the study, and even though environmental management concepts are still in the process of growth and development in developing countries such as Palestine, for political and economic reasons in particular, practical steps and recommendations must be taken to enhance the environmental programs followed in the Palestinian manufacturing sector, such as:

- Increased focus by senior management on applying environmental management concepts and not limiting them to written regulations and laws only. For example, ecological values should be included when writing the job description, which enhances the recruitment of green capabilities.
- Use digital tools to identify inefficiencies, utilize resources, and optimize processes for sustainability.
- Focus on selecting applicants with environmental knowledge and ensuring this during the selection process.
- Establish a green organizational culture that supports environmental issues by integrating environmental management into the corporate vision, mission, and values. It is also necessary to ensure that senior management is committed to adopting and modifying environmental standards and beliefs.
- Promote employee awareness of environmental and digital issues and provide training programs to equip employees with the digital skills necessary to work with advanced technologies effectively.
- Ensure greater efforts to reduce its dependence on traditional energy sources such as coal and oil and incorporate renewable energy systems, waste recycling technologies, and energy-efficient machinery in manufacturing operations.

4.7 Research Limitations

As with all research, this thesis has some limitations. The limitations of our thesis are as follows: First, political restrictions prevent access to many companies and factories and create challenges throughout the data collection phase. Second, the weakness of the infrastructure, whether in energy, transportation, or water, and the lack of natural sources for manufacturing. Third, manufacturing companies in Palestine are limited, so the data collected from them cannot be generalized except with caution, in addition to the lack of precise and updated records of active manufacturing companies. Finally, data collected using a cross-sectional study design includes a typical limitation associated with this type of research methodology: difficulty in identifying the causal relationship.

4.8 Future Research Directions

This study forms a solid basis for launching other studies to enhance and generalize the results. First, the scope of the study should be expanded to include other sectors such as construction and service sectors. Second, this study should be re-implemented in other developing and developed countries to confirm the results. Third, variables other than GI and DT, such as green organizational culture and supply chain resilience, can be studied. Fourth, circular economy models should be integrated with the current system to enhance recycling and waste reduction while also studying the social and economic impacts. Fifth, further research should be conducted by studying the impact of artificial intelligence, the Internet of Things, and big data to improve sustainability practices in industry.

List of Abbreviations

Abbreviation	Meaning
TBL	Triple Bottom Line
AMO	Ability, Motivation, and Opportunity
RBV	Resource Based View
GHRM	Green Human Resource Management
HRM	Human Resource Management
GI	Green Innovation
DT	Digital Transformation
SOP	Sustainable Organizational Performance
SP	Social Performance
EP	Environmental Performance
EcP	Economic Performance
ISO	International Organization of Standards
PFI	The Palestinian Federation of Industries
SPSS	Statistical Package for the Social Sciences
PLS-SEM	Partial Least Squares Structural Equation Modeling
GSI	Green service Innovation
PCBS	Palestinian Central Bureau of Statistics
CEO	chief executive officer
IV	independent variable
DV	dependent variable
LL	lower limit
UL	upper limit

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Appendices

Appendix A

Research Questionnaire in English



**An-Najah National University Faculty of Graduate
Studies Engineering Management Program**

Questionnaire about the nexus between green human resource management, green innovation, and digital transformation toward sustainability in the Palestinian Manufacturing sector

Dear respondent,

Thank you for taking the time to fill out this questionnaire. This study will target the manufacturing sector in Palestine, which aims to assess the green human resource management practices (GHRM), green innovation, digital transformation, and effects on sustainable organizational performance, as well as the relation between them in this vital industry sector. The questionnaire collects information for scientific research to complete the requirements for obtaining a master's degree in engineering management at An-Najah National University.

The questionnaire includes two parts. The first one aims to gather general information about the respondent, the company, and the company's current environmental management status.

The second part consists of four sections. The first section assesses how GHRM bundles are applied in industrial companies in Palestine.

The second section aims to know the impact of the GHRM bundle on green innovation and the impact of these aspects on sustainable organizational performance. The third section also aims to measure the impact of this bundle on green innovation and the impact of GI on SOP. The final section also aims to measure the impact of these factors (GHRM bundle, GI, DT) on sustainable organizational performance.

It will take 10 minutes to answer the questionnaire. Please read all parts carefully and choose the appropriate answer accurately and impartially. I fully appreciate your participation.

Regards,

Sajida Mustafa Ali Ahmad

Researcher, Master of Engineering Management Email: eng.sajida19@gmail.com

Part one: General information

Please answer the following questions by putting an (X) in the answer that suits you.

Gender	Male			Female		
Your education degree	Diploma or less	Bachelor degree	Higher education			
Your job experience	0 – 5 years		6 -10 years		11 – 15 years	More than 15 rears
Your current position in the company	General Manager/CEO	HR manager	Production manager	Quality manager	other	
Your organization sector	Chemical industry	Pharmaceutical industry	Food industry	Metal and Engineering industry	other	
Your location	Jenin	Tulkarm	Nablus	Ramallah	Jerusalem	Hebron
	Bethlehem	Salfit	Qalqilya	Jericho	Tubas	
Number of employees in the company	1-9	10-19	20-49	50-99	100-249	250 and more

Does your organization engage environmental management practices in business operations	Currently exists	currently, there are no plans to implement	Plan to implement within 12 months	Plan to implement within a period of more than 12 months	There are some practices through activities without a clear plan	Not sure	
Does your organization have a formal certificate related to environmental issues or environmental management system such as ISO14001	Currently exists	currently, there are no plans to implement	Plan to implement within 12 months	Plan to implement within a period of more than 12 months	There are some practices through activities without a clear plan	Not sure	
Do you think that the production process, which includes product, process, managerial, or marketing, has direct involvement in green programs					Yes	No	Not sure
Do you think that human resource management has a direct involvement in green programs?					Yes	No	Not sure

Part two

Section 1: Green Human Resource Management GHRM Practices assessment:

The GHRM bundle includes a set of policies and practices to protect the environment, such as green recruitment and selection, green training, green performance management, and green wages and rewards.

This section aims to reveal to what degree the manufacturing industries apply green human resource management practices. Please choose how much your organization uses each item by marking the appropriate column with an (x) sign.

No.	Green Hiring	Not at all	To a slight degree	To a moderate degree	To a great degree	To a very great degree
	Statement					
1	Job description and requirements reflect the company's concern for environmental standards.					
2	The recruitment process includes environmental compliance standards.					
3	Applicants for positions in the organization undergo interviews that include environmental issues.					
4	Applicants for vacant positions are selected from those sufficiently familiar with environmental aspects.					
No.	Green involvement and training	Not at all	To a slight degree	To a moderate degree	To a great degree	To a very great degree
	Statement					
6	The company provides environmental training for employees on a broad scale					
8	Environmental training is a priority for the company compared to other types of training.					
9	The company directs new employees to environmental aspects and the necessity of applying them during their work.					
10	The company provides all training materials on the company's networks to be a role model in preserving resources.					
No.	Green performance and rewards	Not at all	To a slight degree	To a moderate degree	To a great degree	To a very great degree
	Statement					
12	Managers and employees have specific environmental goals.					

14	Employees know the company's environmental goals and their environmental responsibilities to the company.					
18	Employees who have achieved or exceeded the objectives of the environmental institution are rewarded with non-cash equivalents or other cash prizes.					

Section 2: Green Innovation Assessment

Green innovation refers to innovation that can reduce environmental impacts while achieving the company's environmental goals and achieving environmental benefits through green product innovation, process innovation, management innovation, and marketing innovation. This section aims to reveal to what degree the manufacturing industries apply green innovation practices. For each item, please choose to what extent your organization uses it by marking the appropriate column with a (x) sign.

No.	Green product innovation	Not at all	To a slight degree	To a moderate degree	To a great degree	To a very great degree
	Statement					
1	The company uses fewer polluting materials.					
2	The company uses materials that consume less energy.					
3	The company uses materials to design environmentally friendly products.					
4	The company uses materials that are easy to recycle, use, and decompose.					
No.	Green process innovation	Not at all	To a slight degree	To a moderate degree	To a great degree	To a very great degree
	Statement					

5	The company's manufacturing processes reduce waste and hazardous materials.					
6	The company's manufacturing processes reduce coal, oil, electricity, and water use.					
No.	Green managerial innovation	Not at all	To a slight degree	To a moderate degree	To a great degree	To a very great degree
	Statement					
9	The company is working on establishing green supply chain management.					
10	The company is working on implementing environmental control.					
No.	Green marketing innovation	Not at all	To a slight degree	To a moderate degree	To a great degree	To a very great degree
	Statement					
12	The company uses recyclable containers (packs, wrappers, bags, etc.)					
13	The company has green-designed containers that are easy to clean and empty to meet environmental requirements.					
14	The company mentioned that it obtained quality certificates when marketing its products.					

Section Three: Digital Transformation

Digital Transformation: Using digital technologies and technological innovations to improve production processes, increase efficiency, and enhance competitiveness.

This section aims to reveal the extent to which industrial companies apply digital transformation in their operations. Please choose the degree of its application in your organization by placing an X in the appropriate column.

No.	Digital Transformation	Not at all	To a slight degree	To a moderate degree	To a great degree	To a very great degree
	Statement					
1	Plans and procedures are in place to ensure the long-term sustainability of digital transformation efforts.					
2	Technological systems and digital infrastructure are constantly updated within the company.					
3	Automation is applied to manufacturing and production processes within the company.					
4	There are control and management systems for industrial processes based on digital technology.					
5	The company collects and analyzes data to improve its operations, performance, and decision-making.					
7	There is training for employees on the use of new digital technologies.					
8	There are procedures followed within the company to maintain the security of information and digital data, i.e., to address cyber threats and deal with security incidents.					

Section Four: Sustainable Organizational Performance

Sustainable Performance: Sustainable performance consists of three main pillars: environmental, financial, and social performance. Environmental sustainability means that businesses take their environmental impact into account. Economic sustainability means the financial success of the organization. Finally, social sustainability means factors related to the human element. This section aims to reveal the extent to which industrial companies apply the pillars of environmental sustainability (environmental, economic, and social). Please indicate the extent to which you agree with the following statements as they relate to the changes in your organization's performance in the last two years caused by current practices.

No.	Environmental performance	Not at all	To a slight degree	To a moderate degree	To a great degree	To a very great degree
	Statement					
1	Improved the company's environmental reputation.					
2	Reduced waste in the production process.					
5	Reduced the risk of environmental accidents such as waste leakage, poisoning, or radiation emissions.					
4	Increase the purchase of environmentally friendly goods.					
No.	Economic performance	Not at all	To a slight degree	To a moderate degree	To a great degree	To a very great degree
	Statement					
6	Reduce the costs of purchasing materials.					
7	Reduce the cost of energy consumption.					
9	A growth in average profits has been achieved.					
No.	Social performance	Not at all	To a slight degree	To a moderate degree	To a great degree	To a very great degree
	Statement					

11	Improving the relationship with the community and stakeholders					
14	Reducing the negative impact of the institution's waste on the local community					
15	Developing and designing a better service with the help and participation of employee initiatives in management decisions					

Notes:

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Thank you

Appendix B

Questionnaire in Arabic

جامعة النجاح الوطنية

الدراسات العليا

برنامج ماجستير الإدارة الهندسية

العنوان (العلاقة بين إدارة الموارد البشرية الخضراء والابتكار الأخضر والتحول الرقمي نحو الاستدامة في قطاع التصنيع الفلسطيني)

عزيزي القارئ/ عزيزتي القارئة

تحية طيبة وبعد..

شكرا على تخصيصكم وقت للإجابة على هذا الاستبيان، تستهدف الدراسة قطاع التصنيع الفلسطيني والذي يسعى للكشف عن العلاقة بين إدارة الموارد البشرية الخضراء والابتكار الأخضر والتحول الرقمي نحو الاستدامة في هذا القطاع الحيوي. إن الاستبيان هو وسيلة لجمع المعلومات للبحث العلمي لاستكمال متطلبات الحصول على درجة الماجستير في الإدارة الهندسية من جامعة النجاح الوطنية.

يتكون الاستبيان من قسمين:

القسم الأول: يهدف إلى جمع معلومات عامة حول المجيب/ة والمؤسسة والوضع الحالي للإدارة البيئية في المؤسسة.

القسم الثاني: يتكون هذا القسم من أربعة أقسام ويهدف إلى قياس مدى تطبيق ممارسات إدارة الموارد البشرية الخضراء في الشركات الصناعية المسجلة في اتحاد الصناعات في فلسطين، ومدى تطبيق جوانب الابتكار الأخضر والأداء التنظيمي المستدام والتحول الرقمي والعلاقة بينهم.

سوف يستغرق تعبئة الاستبانة 15 دقيقة، يرجى قراءة جميع الأجزاء واختيار الإجابة المناسبة بدقة وحيادية، مع التقدير الكامل لمشاركاتكم معنا.

الباحثة / ساجدة مصطفى علي أحمد

ماجستير الإدارة الهندسية

Email: eng.sajida19@gmail.com

القسم الأول: معلومات عامة

يرجى التكرم بالإجابة على الأسئلة التالية بوضع إشارة X في المكان المناسب:

الجنس		ذكر		أنثى	
الدرجة العلمية		دبلوم أو أقل		بكالوريوس	
خبرتك في العمل		0 - 5 سنوات		6 - 10 سنوات	
الموقع الوظيفي الحالي في الشركة		مدير عام/ الرئيس التنفيذي للشركة		مدير الموارد البشرية	
قطاع المؤسسة		الصناعات الكيميائية		الصناعات الدوائية	
الموقع		جنين		طولكرم	
		بيت لحم		سلفيت	
		أريحا		قليلية	
		رام الله		نابلس	
		القدس		الخليل	
		طوباس والأغوار الشمالية			
عدد العاملين في الشركة		1 - 9		10 - 19	
		20 - 49		50 - 99	
		100 - 249		أكثر من 250	
هل تدمج مؤسستك ممارسات الإدارة البيئية في أنشطتها اليومية؟		نعم موجود حالياً		حاليا لا توجد خطط للتنفيذ	
		يوجد خطة للتنفيذ في غضون 12 شهراً		يوجد خطة للتنفيذ في غضون فترة تزيد عن 12 شهراً	
		هناك بعض الممارسات في النشاطات بدون خطة واضحة		لست متأكدا	
هل تمتلك مؤسستك شهادة رسمية تتعلق بالقضايا البيئية أو نظام إدارة البيئة مثل أيزو 14000؟		نعم موجود حالياً		حاليا لا توجد خطط للتنفيذ	
		يوجد خطة للتنفيذ في غضون 12 شهراً		يوجد خطة للتنفيذ في غضون فترة تزيد عن 12 شهراً	
		لست متأكدا		لا يوجد	
هل تعتقد أن عملية الإنتاج التي تشمل المنتج أو العملية أو إدارة التسويق تؤثر بشكل مباشر في البرامج البيئية في المؤسسة؟		نعم		لا	
		لا		لست متأكد	
هل تعتقد أن إدارة الموارد البشرية تؤثر بشكل مباشر في البرامج البيئية في المؤسسة؟		نعم		لا	
		لا		لست متأكد	

القسم الثاني: (الجزء الأول: تقييم حزمة ممارسات إدارة الموارد البشرية الخضراء)

يهدف هذا القسم إلى الكشف عن مستوى تطبيق الشركات الصناعية لممارسات إدارة الموارد البشرية الخضراء والمتمثلة في (التوظيف والاختيار الأخضر، التدريب والمشاركة الخضراء، إدارة الأداء والمكافآت الخضراء)، لذلك يرجى اختيار درجة تطبيقها في مؤسستك بوضع إشارة X في العمود المناسب.

يشير الرقم واحد إلى "درجة قليلة جدا" والرقم 5 إلى "درجة كبيرة جدا"

					تقييم ممارسات إدارة الموارد البشرية الخضراء	
5 درجة كبيرة جدا	4 درجة كبيرة	3 درجة متوسطة	2 درجة قليلة	1 درجة قليلة جدا	التوظيف والاختيار الأخضر	درجة
					الجملة	
					يعكس وصف ومتطلبات الوظيفة اهتمامات الشركة بالمعايير البيئية	1
					تتضمن عملية استقطاب الموظفين معايير الالتزام البيئي	2
					يخضع المتقدمون لشغل وظائف في المؤسسة لمقابلات تشمل القضايا البيئية	3
					يتم اختيار المتقدمين للوظائف الشاغرة من هم على دراية كافية بالجوانب البيئية	4
5 درجة كبيرة جدا	4 درجة كبيرة	3 درجة متوسطة	2 درجة قليلة	1 درجة قليلة جدا	التدريب والمشاركة الخضراء	درجة
					الجملة	
					توفر المؤسسة التدريب البيئي للموظفين على نطاق واسع	5
					يعتبر التدريب البيئي أولوية لدى الشركة مقارنة بأنواع التدريب الأخرى	6
					تحرص الشركة على توجيه الموظفين الجدد إلى الجوانب البيئية وضرورة تطبيقها أثناء عملهم	7
					توفر الشركة كافة المواد التدريبية على شبكات الشركة لتكون قدوة في المحافظة على الموارد	8
5 درجة كبيرة جدا	4 درجة كبيرة	3 درجة متوسطة	2 درجة قليلة	1 درجة قليلة جدا	إدارة الأداء والمكافآت الخضراء	درجة
					الجملة	
					يوجد لدى المدراء والموظفين أهداف بيئية محددة	9
					يعرف الموظفون أهداف الشركة البيئية ومسؤولياتهم البيئية تجاهها	10
					يُكافأ الموظفون الذين حققوا أو تجاوزوا أهداف المؤسسة البيئية بمكافآت غير نقدية أو جوائز نقدية أخرى	11

(الجزء الثاني: الابتكار الأخضر)

تعريف الابتكار الأخضر: ابتكار الأجهزة أو البرامج المرتبط باستخدام المنتجات أو العمليات الخضراء.

* (Aguilera-Caracuel & Ortiz-de-Mandojana (2013))

يهدف هذا القسم إلى الكشف عن مدى تطبيق الابتكار الأخضر في المؤسسات الصناعية لذلك يرجى اختيار درجة تطبيقها في مؤسستك بوضع إشارة X في العمود المناسب.

يشير الرقم واحد إلى "درجة قليلة جدا" والرقم 5 إلى "درجة كبيرة جدا"

5 درجة كبيرة جدا	4 درجة كبيرة	3 درجة متوسطة	2 درجة قليلة	1 درجة قليلة جدا	ابتكار المنتجات الخضراء	5 4 3 2 1
					الجملة	
					تستخدم الشركة مواد أقل تلويثا	1
					تستخدم الشركة مواد تستهلك طاقة أقل	2
					تستخدم الشركة مواد لتصميم منتجات صديقة للبيئة	3
					تستخدم الشركة مواد سهلة التدوير والاستخدام والتحلل	4
5 درجة كبيرة جدا	4 درجة كبيرة	3 درجة متوسطة	2 درجة قليلة	1 درجة قليلة جدا	ابتكار العمليات الخضراء	5 4 3 2 1
					الجملة	
					تعمل عمليات التصنيع في الشركة على تقليل النفايات والمواد الخطرة	5
					تعمل عمليات التصنيع في الشركة على تقليل استخدام الفحم أو النفط أو الكهرباء أو الماء	6
5 درجة كبيرة جدا	4 درجة كبيرة	3 درجة متوسطة	2 درجة قليلة	1 درجة قليلة جدا	الابتكار الإداري الأخضر	5 4 3 2 1
					الجملة	
					تعمل الشركة على انشاء إدارة سلاسل توريد خضراء	7
					تعمل الشركة على تنفيذ رقابة بيئية	8
5 درجة كبيرة جدا	4 درجة كبيرة	3 درجة متوسطة	2 درجة قليلة	1 درجة قليلة جدا	ابتكار التسويق الأخضر	5 4 3 2 1
					الجملة	
					تستخدم الشركة حاويات قابلة لإعادة التدوير (عبوات، أغلفة، أكياس، إلخ)	9
					تمتلك الشركة حاويات مصممة بشكل صديق للبيئة وسهلة التنظيف والتفريغ لتلبية المتطلبات البيئية	10
					تشير الشركة إلى شهادات الجودة في تسويقها لمنتجاتها	11

(الجزء الثالث: التحول الرقمي)

(التحول الرقمي: عملية استخدام التقنيات الرقمية والابتكارات التكنولوجية لتحسين العمليات الإنتاجية، وزيادة الكفاءة، وتعزيز القدرة التنافسية)

يهدف هذا القسم إلى الكشف عن مدى تطبيق الشركات الصناعية للتحول الرقمي في عملياتها، يرجى اختيار درجة تطبيقها في مؤسستك بوضع إشارة X في العمود المناسب.

يشير الرقم واحد إلى "درجة قليلة جدا" والرقم 5 إلى "درجة كبيرة جدا"

رقم	التحول الرقمي					
	درجة 1 قليلة جدا	درجة 2 قليلة	درجة 3 متوسطة	درجة 4 كبيرة	درجة 5 كبيرة جدا	
1						يوجد خطط وإجراءات لضمان استدامة جهود التحول الرقمي على المدى الطويل
2						يتم تحديث الأنظمة التكنولوجية والبنية التحتية الرقمية باستمرار داخل الشركة
3						يوجد تطبيق للأتمتة في عمليات التصنيع والإنتاج داخل الشركة
4						يوجد أنظمة تحكم وإدارة للعمليات الصناعية تعتمد على التكنولوجيا الرقمية
5						يتم جمع وتحليل البيانات داخل الشركة لتحسين عملياتها والأداء واتخاذ القرارات
6						يوجد تدريبات للموظفين على استخدام التقنيات الرقمية الجديدة
7						يوجد إجراءات متبعة داخل الشركة للحفاظ على أمن المعلومات والبيانات الرقمية، أي للتصدي للتهديدات السيبرانية والتعامل مع الحوادث الامنية

(الجزء الرابع: الأداء المستدام)

(الأداء المستدام: يتكون الأداء المستدام من ثلاثة ركائز أساسية وهي الأداء البيئي والمالي والاجتماعي، أما عن الاستدامة البيئية فتعني أن الأعمال تضع تأثيرها البيئي في الاعتبار، أما الاستدامة الاقتصادية تعني النجاح المالي للمنظمة وأخيرا الاستدامة الاجتماعية وتعني العوامل المتعلقة بالعنصر البشري)

يهدف هذا القسم إلى الكشف عن مدى تطبيق الشركات الصناعية لركائز الاستدامة البيئية (البيئية والاقتصادية والاجتماعية). يرجى الإشارة إلى مدى موافقتك على العبارات التالية فيما يتعلق بالتغييرات التي طرأت على أداء مؤسستك في العامين الماضيين بسبب الممارسات الحالية.

يشير الرقم واحد إلى "درجة قليلة جدا" والرقم 5 إلى "درجة كبيرة جدا"

5 درجة كبيرة جدا	4 درجة كبيرة	3 درجة متوسطة	2 درجة قليلة	1 درجة قليلة جدا	الأداء البيئي	
					الجملة	رقم
					تحسين سمعة الشركة البيئية	1
					تقليل النفايات في عملية الإنتاج	2
					تقليل مخاطر الحوادث البيئية مثل تسرب النفايات أو التسمم أو انبعاثات الإشعاع.	3
					زيادة شراء السلع الصديقة للبيئة	4
5 درجة كبيرة جدا	4 درجة كبيرة	3 درجة متوسطة	2 درجة قليلة	1 درجة قليلة جدا	الأداء الاقتصادي	
					الجملة	رقم
					خفض تكاليف شراء المواد	5
					خفض تكاليف استهلاك الطاقة	6
					تحقيق نمو في متوسط الأرباح	7
5 درجة كبيرة جدا	4 درجة كبيرة	3 درجة متوسطة	2 درجة قليلة	1 درجة قليلة جدا	الأداء الاجتماعي	
					الجملة	رقم
					تحسين العلاقة مع المجتمع وأصحاب المصلحة	8
					تقليل الأثر السلبي لنفايات المؤسسة على المجتمع المحلي	9
					تطوير وتصميم خدمة أفضل بمساعدة ومشاركة مبادرات الموظفين في القرارات الإدارية	10

ملاحظات

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شكرا لتعاونكم

Appendix C

Tables

Table C1

Current job position in the company Human Resources Manager

Group Statistics

		N	Mean	Std. Deviation	Std. Error Mean
GHRM	yes	23	2.8972	0.74680	0.15572
	no	72	2.5189	0.85382	0.10062
GI	yes	23	3.2885	0.52414	0.10929
	no	72	3.1818	0.92948	0.10954
DT	yes	23	3.5901	0.52277	0.10901
	no	72	3.1567	0.96628	0.11388
EP	yes	23	3.9130	0.52010	0.10845
	no	72	3.4757	1.00716	0.11869
EcP	yes	23	3.8116	0.57583	0.12007
	no	72	3.5787	0.95435	0.11247
SP	yes	23	3.9130	0.57925	0.12078
	no	72	3.5694	1.01543	0.11967
SOP	yes	23	3.8792	0.43709	0.09114
	no	72	3.5413	0.93676	0.11040

Table C2*Independent Samples Test*

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
										Lower	Upper
GHRM	Equal variances assumed	0.586	0.446	1.903	93	0.060	0.37829	0.19874	-0.01636	0.77295	
	Equal variances are not assumed.			2.040	41.943	0.048	0.37829	0.18540	0.00413	0.75246	
GI	Equal variances assumed	6.256	0.014	0.523	93	0.602	0.10672	0.20388	-0.29814	0.51158	
	Equal variances are not assumed.			0.690	67.344	0.493	0.10672	0.15474	-0.20211	0.41555	
DT	Equal variances assumed	6.887	0.010	2.052	93	0.043	0.43332	0.21119	0.01393	0.85270	
	Equal variances are not assumed.			2.749	70.284	0.008	0.43332	0.15764	0.11894	0.74770	
EP	Equal variances assumed	7.938	0.006	1.994	93	0.049	0.43735	0.21931	0.00184	0.87285	
	Equal variances are not assumed.			2.720	73.566	0.008	0.43735	0.16078	0.11696	0.75774	
EcP	Equal variances assumed	6.083	0.015	1.105	93	0.272	0.23289	0.21069	-0.18549	0.65127	
	Equal variances are not assumed.			1.416	62.610	0.162	0.23289	0.16452	-0.09591	0.56169	
SP	Equal variances assumed	5.555	0.021	1.541	93	0.127	0.34360	0.22296	-0.09916	0.78636	
	Equal variances are not assumed.			2.021	66.529	0.047	0.34360	0.17003	0.00418	0.68302	
SOP	Equal variances assumed	11.046	0.001	1.668	93	0.099	0.33795	0.20255	-0.06427	0.74016	
	Equal variances are not assumed.			2.361	80.333	0.021	0.33795	0.14316	0.05307	0.62282	

Table C3*VIF table*

	VIF
DT1	2.659
DT2	3.409
DT3	3.253
DT4	2.849
DT5	3.631
DT6	2.558
DT7	2.612
EP1	3.340
EP2	3.567
EP3	2.941
EP4	4.057
EcP1	3.468
EcP2	4.196
EcP3	2.620
GH1	2.852
GH2	3.604
GH3	2.971
GH4	3.035
GM1	2.022
GM2	2.909
GM3	1.940
GMa1	3.155
GMa2	2.821
GP1	3.847

	VIF
GP2	3.810
GP3	4.999
GP4	2.563
GPMC1	4.117
GPMC2	3.250
GPMC3	2.267
GPP1	3.632
GPP2	2.117
GT1	3.248
GT2	2.523
GT3	2.863
GT4	2.187
SP1	2.655
SP2	3.965
SP3	3.072

Table C4

Fornell-Larcker Correlation through construct and discriminant validity

	GHRM	GI	DT	EP	EcP	SP
GHRM	0.797					
GI	0.595	0.778				
DT	0.544	0.650	0.851			
EP	0.622	0.702	0.745	0.907		
EcP	0.444	0.651	0.644	0.764	0.923	
SP	0.503	0.708	0.676	0.825	0.815	0.919

Note: GHRM = Green HR Management, GI = Green Innovation, DT = Digital Transformation, EP = Environmental Performance, EcP = Economic Performance, SP = Social Performance.

Table C5*Heterotrait-monotrait ratio (HTMT) – Matrix*

	GHRM	GI	DT	EP	EcP	SP
GHRM						
GI	0.614					
DT	0.564	0.694				
EP	0.647	0.749	0.794			
EcP	0.451	0.699	0.693	0.830		
SP	0.518	0.764	0.728	0.899	0.895	

Table C6*The outputs of R2 values for endogenous variables*

	R-square	R-square adjusted
DT	0.296	0.289
EP	0.663	0.651
EcP	0.508	0.492
GI	0.506	0.495
SP	0.583	0.569

Table C7*The Effect Size of the Exogenous Constructs*

	GHRM	GI	DT	EP	EcP	SP
GHRM						
GI	0.167					
DT	0.421	0.306				
EP	0.077	0.123	0.313			
EcP	0.000	0.165	0.161			
SP	0.002	0.239	0.170			

Table C8*Effect size rating*

Variables			f ²	Effect size rating
GHRM	-	GI	0.167	medium
GHRM	-	DT	0.421	large
GHRM	-	EP	0.077	small
GHRM	-	EcP	0.000	none
GHRM	-	SP	0.002	none
GI	-	EP	0.123	smale
GI	-	EcP	0.165	medium
GI	-	SP	0.239	medium
DT	-	GI	0.306	medium
DT	-	EP	0.313	medium
DT	-	EcP	0.161	medium
DT	-	SP	0.170	medium

Table C9*Prediction Relevance of the Model*

	Q ² predict	RMSE	MAE
DT	0.278	0.874	0.694
GI	0.329	0.839	0.602
EP	0.371	0.812	0.619
EcP	0.181	0.927	0.712
SP	0.239	0.895	0.689

Table C10*Model Fit*

	Saturated model	Estimated model
SUMMER	0.077	0.087
d_ULS	4.653	5.847
d_G	3.397	3.638
Chi-square	1418.813	1490.655
NFI	0.671	0.654

Table C11*Participant Demographic Information*

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Males	73	76.8%
	Females	22	23.2%
Education	Diploma or below	7	7.4%
	Bachelor	63	66.3%
	Master's degree or higher	25	26.3%
Work experience	0 – 5 years	9	9.5%
	6-10 years	33	34.7%
	11-15 years	22	23.2%
	More than 15 years	31	32.6%
Current job position in the company	General Manager/CEO	20	21.1%
	Human Resources Manager	23	24.2%
	Production Manager	21	22.1%

	Quality Manager	14	14.7%
	Other	17	17.9%
Enterprise sector	Chemical industries	18	18.9%
	Pharmaceutical industries	3	3.2%
	Food manufacturing sector	34	35.8%
	Engineering and Mining Industries	23	24.2%
	Other	17	17.9%
Area	Jenin	6	6.3%
	Tulkarm	10	10.5%
	Nablus	28	29.5%
	Ramallah & Al-Bireh	11	11.6%
	Jerusalem	1	1.1%
	Hebron	16	16.8%
	Bethlehem	7	7.4%
	Qalqiliya	5	5.3%
	Jericho & Al-Aghwar	10	10.5%
	Tubas & Northern Valleys	1	1.1%
Number of employees	1 – 9	8	8.4%
	10 – 19	16	16.8%
	20 – 49	31	32.6%
	50 – 99	25	26.3%
	100 -249	11	11.6%
	More than 250	4	4.2%
Integrate environmental management practices	Yes, currently available	52	54.7%
	There are currently no plans for implementation.	19	20.0%
	There is a plan for implementation within 12 months.	2	2.1%
	There is a plan for implementation within more than 12 months.	1	1.1%
	There are some practices in activities without a clear plan.	17	17.9%
	I'm not sure	4	4.2%
having a formal certification related to environmental issues	Yes, currently available	21	22.1%
	There are currently no plans for implementation.	31	32.6%
	There is a plan for implementation within 12 months.	9	9.5%
	There is a plan for implementation within more than 12 months.	6	6.3%
	There are some practices in activities without a clear plan.	17	17.9%
	Nothing	11	11.6%
the production process, including product, process, or marketing management, directly affects the	Yes	70	73.7%

environmental programs in the organization	No	10	10.5%
	I'm not sure	15	15.8%
human resource management directly affects environmental programs in the organization	Yes	67	70.5%
	No	17	17.9%
	I'm not sure	11	11.6%



جامعة النجاح الوطنية

كلية الدراسات العليا

العلاقة بين إدارة الموارد البشرية الخضراء والابتكار الأخضر
والتحول الرقمي نحو الاستدامة في قطاع التصنيع الفلسطيني

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إشراف

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قدمت هذه الرسالة استكمالاً لمتطلبات الحصول على درجة الماجستير في الإدارة الهندسية من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس - فلسطين.

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الملخص

تعتبر إدارة الموارد البشرية الخضراء مفهوما مهما تم تقديمه ودراسته في العقود الأخيرة نتيجة للاهتمام المتزايد بالبيئة والسعي لتحقيق الاستدامة من خلال حماية الموارد الطبيعية المتاحة وتقليل المخاطر الناتجة عن الممارسات الضارة بالبيئة. طرحت هذه الدراسة سؤالاً أساسياً وهو: "كيف ستؤثر ممارسات إدارة الموارد البشرية الخضراء كحزمة على الأداء التنظيمي المستدام في ظل وجود الابتكار الأخضر والتحول الرقمي كمتغيرات وسيطة في شركات التصنيع الفلسطينية؟" لذلك تم تقييم مستوى تطبيق هذه الممارسات ميدانياً في العديد من قطاعات التصنيع لتحقيق الهدف المنشود من هذه الدراسة. طرحت الباحثة ثمانية عشر فرضية واستخدم نظريات AMO و RBV و TBL. وتم إجراء مراجعة للأدبيات ذات الصلة لإثراء البحث حول طبيعة إدارة الموارد البشرية الخضراء وعلاقتها بمتغيرات مختلفة. ثم تم استخدام الأسلوب الكمي لجمع البيانات من قطاعات تصنيع محددة، حيث استجاب 95 شخصاً للاستبيان، موزعين بين مدراء عامين ومدراء تنفيذيين ومدراء الموارد البشرية ومدراء الجودة ومدراء الإنتاج وغيرهم. وتم استخدام برنامج Smart-PLS لتحليل البيانات المجمعة. أشارت النتائج إلى أن إدارة الموارد البشرية الخضراء أثرت بشكل إيجابي جزئياً على الأداء التنظيمي المستدام، وعلاوة على ذلك، توسط الابتكار الأخضر العلاقة جزئياً وإيجابياً وتوسط التحول الرقمي العلاقة بشكل كامل وإيجابي. أضافت هذه الدراسة أدلة تجريبية وأثرت على الأدبيات الموجودة حول القضايا المتعلقة بإدارة الموارد البشرية الخضراء في قطاع التصنيع.

أوصت الدراسة بضرورة اهتمام قطاع التصنيع الفلسطيني بالمبادرات البيئية، بالإضافة إلى دعم الإدارة العليا للمصانع لأي مبادرة بيئية ودعم الابتكار الأخضر والتحول الرقمي، مما يساهم في الاستدامة بشكل إيجابي للغاية. كما توصي برفع الوعي بالقضايا البيئية بين الموظفين والعمال والإدارة على حد سواء. وأخيراً، اختتمت الباحثة دراستها بعدة توصيات رأت أنها مفيدة، ووضعت حدود الدراسة والتطلعات المستقبلية للدراسات التي يمكن أن تفيدها نفس المجال.

الكلمات المفتاحية: إدارة الموارد البشرية الخضراء (GHRM)، الابتكار الأخضر (GI)، التحول الرقمي (DT)، الأداء الاقتصادي (ECP)، الأداء البيئي (EP)، الأداء الاجتماعي (SP)، الأداء التنظيمي المستدام (SOP)، قطاع التصنيع.