

# Uncertain Supply Chain Management

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## The impact of green human resource management on green pharmaceutical supply chain management practices

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### ABSTRACT

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Today's competition is among supply chains rather than enterprises as independent actors. Additionally, the success of the actors within the SC network, through the improvement of the global performance, depends on how well they handle the growing environmental problems. For this reason, much attention is given to the greening concept. This paper aims to investigate the Green Human Resource Management (GHRM) impact on Green Supply chain Management (GSCM) in a strategic sector, namely the pharmaceutical sector. Our interest to deal with this issue was aroused by the fact that there are no studies exploring the causality relationships in the pharmaceutical sector in Saudi Arabia. Based on deductive methodology, a questionnaire has been developed. A research sample included 109 pharmaceutical companies operating in KSA. The results highlight a significant impact of GHRM on GSCM practices. In other words, training and performance appraisal, recruitment, and eco-behavior-based rewards influence GSCM practices positively. Based on the results, the study provides new theoretical insights and practical suggestions.

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### 1. Introduction

Due to the nature and variety of decisions involved, the concept of SCM may seem straightforward, but it is actually very complex (Sanders, 2012, p.03). Since there have been as many definitions of SCM as there have been of SC, both in the literature and in professional and consulting organizations, its definition and what it can be used for are still somewhat nebulous (Quayle, 2006). SCM can be seen as the planning and control of the financial, informational, and material flows via the SC. To do this, all SC operations must be managed and coordinated (Reid & Sanders, 2010; Russell & Taylor, 2010; Sanders, 2012; Laghouag & Sahli, 2021). The SC is an organizational structure or a hierarchical (i.e., power and value creation), dynamic (i.e., change of configuration due to the environment and capabilities), and sequential network (i.e., from the extraction of raw material to the delivery of final product to the customer) of independent businesses (i.e., autonomy of making decision) ranging from the primary provider to the end customer. To satisfy the client through a balance between integration and coordination but also by greater flexibility and responsiveness, these are connected by upstream and downstream flows (physical, information, financial, and knowledge), cross-functional processes, as well as relationships (simple cooperation or advanced or conflicting collaboration) of various levels (strategic, tactical, or operational) (Zouaghi & Laghouag, 2021). A unique supply chain called the pharmaceutical supply chain (PSC) is where medications are made, delivered, and consumed (Xie & Breen, 2012). Any healthcare system must involve the pharmaceutical industry, whose responsibilities include the creation, production, and marketing of pharmaceutical products. The main process flow for the

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modern pharmaceutical industry starts with drug discovery and continues through preclinical and clinical testing, drug manufacturing, and market entry through R&D in science. (Lipsky & Sharp, 2001; Taylor, 2015; Tawfik et al., 2022).

The PSC is of utmost importance for several reasons, including the fact that it is a source of supply chain surplus and competitiveness, and that firms cannot be competitive without considering supply chain management (SCM) activities (Papageorgiou, 2009). (2) The PSC is useful. To increase access to affordable medicine, it has been found that drug prices in developing countries might rise by as much as 650 percent above the acceptable international level. This is in addition to the small number of affordable treatments available on the market. The shortage of accessible, affordable medicines that are essential for the primary healthcare sector has been exacerbated by a variety of factors, including inadequate funding, erroneous forecasts, a lack of incentives for maintaining stocks, inefficient distribution strategies, and theft of medications for private resale (WHO, 2016).

According to Duarte et al. (2022), one of the biggest problems facing pharmaceutical supply chains today is maintaining the accessibility and availability of pharmaceutical items. (3) A strong PSC improves readiness for impending crises and outbreaks and could guarantee national drug security. The COVID-19 outbreak made it difficult for people to acquire drugs worldwide, threatening many people's lives. High medication consumption rates and insufficient domestic pharmaceutical production continue to be significant obstacles for the pharmaceutical supply chain and healthcare system (Badreldin & Atallah, 2021; Shuman et al., 2020; Tawfik et al., 2022).

The fact that pharmaceutical businesses frequently operate in both domestic and international markets, where they are subject to laws and regulations governing the development, testing, marketing, and distribution of drugs, presents another challenge for these businesses (Kashyap et al., 2013, Tawfik et al., 2022). Alruthia et al. (2018) and Tawfik et al. (2022) are two researchers who investigated the primary causes of Saudi Arabia's medication shortages. The findings indicate that supply chain management is the primary contributor to drug shortages in the KSA, followed by a lack of government regulations requiring prompt notification of shortages, a government procurement strategy that is out of step with changes in the pharmaceutical market, low profit margins for some essential medications, insufficient and ineffective legal sanctions against pharmaceutical companies and authorized drug importers and distributors, and finally, a lack of government regulations requiring prompt notification of shortages.

The environmental concerns that control the pharmaceutical business should not be disregarded, in addition to the difficulties related to Supply Chain activities and processes (Jia et al., 2018). Because of escalating restrictions, resource limitations, and changes in scientific and public opinion, there is an increasing need for corporations and academic institutions to work together on greener and more sustainable methods. Making sure that the next generation of scientists in the pharmaceutical sector has the knowledge and skills necessary to do so, specifically taking sustainability issues into consideration, is of utmost importance (Clark, 2016).

Human resources are one of the most important resources to make sure that growing environmental and ecological requirements are met. By encouraging employees to behave sustainably in the framework of an effective strategy for social and environmental responsibility, green human resource management (GHRM) assists in highlighting the features of HRM practices toward the protection of the environment and the ecological influence of the businesses. Through a set of HRM practices (including green recruitment and selection, green training, green performance management, green pay and reward, and green involvement), GHRM encourage employees to participate in green activities and to develop green ideas that can address the specific challenge of managing environmental concerns (Tang et al., 2018; Jia et al., 2018). Considering that Saudi Arabia's pharmaceutical industry is crucial to safeguarding the nation's healthcare system and enhancing the Kingdom's preparedness for potential epidemics beyond COVID-19, it seems relevant to evaluate the maturity of green practices related to the pharmaceutical supply chain in Saudi Arabia based on the discussion below (Tawfik et al., 2022). Saudi Food & Drug Authority participates in the National Industrial Development and Logistics Program (NIDLP) to accomplish this goal through the following projects: Encourage the local production of generic drugs, and increase domestic pharmaceutical production based on biology, genetics, and cutting-edge therapies. (3) Develop a cutting-edge, technical import surveillance system.

After considering the ideas above, the research question might take the form of: **How much do green human resource practices in the Saudi Arabian pharmaceutical industry advance the maturity of green supply chain practices?** Several theoretical frameworks have been put forth to establish research hypotheses and a model to address this research subject. The research methodology was then explained. The data were then assessed for validity and reliability, and a hypothesis test was conducted.

A discussion of the findings was then provided. This research gives several helpful conclusions, including the following: The first advantage is that it provides managers in KSA with a comprehensive overview of the state of Green Human Resource Management as it pertains to leveraging Green Supply Chain Management. The first investigation into the association between the level of maturity in the Saudi Arabian pharmaceutical industry's green supply chain management and human resource management is also presented as part of this paper's conclusion.

## 2. Research Model and Hypotheses Development

### 2.1. Impact of Green Human Resource Management on green pharmaceutical Supply Chain Management

Green human resource management includes green hiring, training, and development, as well as performance evaluations and remuneration that are based on green practices. Environmental hiring and selection criteria, such as environmental competencies and/or personal orientation, are referred to as “green selection and recruitment”. Green training and involvement refer to the growth of green competencies, which boosts organizational performance and capability, underlines the importance of the company's dedication to environmental initiatives, and encourages employee participation in green processes by providing them with the opportunity to contribute to internal discussions about environmental development. According to Longoni et al. (2018), “green performance management and compensation” is a tracking and incentive system used to motivate employees to practice environmental management. The numerous facets of green supply chain management (GSCM) practices are as follows. According to Zhu et al. (2008), there are multiple levels of implementation for GSCM practices, ranging from straightforward green purchasing to the complete management of flows, starting with the supplier and product design and continuing through production and packaging to the consumer and after-sale support. There are five (05) GSCM practices for the researchers, which are as follows: (1) Internal environmental management; (2) Green purchasing; (3) Cooperation with customers, including consideration of environmental concerns; (4) Eco-design techniques; and (5) Investment recovery.

In earlier GSCM empirical investigations (such as Gonzalez et al., 2022, Fang and Zhang, 2018, Gopal and Thakkar, 2016, Choi and Hwang, 2015), these five practices have been thoroughly examined. Huo et al.'s (2021) categorization of GSCM practices is an additional one. According to these experts, GSCM may be broken down into three major procedures while still adhering to the rationale behind strategic alignment with all participants in the supply chain network. These procedures are: (1) Alignment of supplier and internal green strategies; (2) Alignment of customer and internal green strategies. A composition based on a perspective of performance measurement was proposed by Hervani et al. (2005). Their definition of GSCM includes the following practices: (1) Green Purchasing, (2) Green Manufacturing/Materials Management, (3) Green Distribution/Marketing, and (4) Reverse Logistics. In 2022, Rizki and Augustine suggested a mixed. An amalgamated typology was put forth by Rizki and Augustine (2022) and included the following elements: (1) Green Purchasing, (2) Green Manufacturing, (3) Green Marketing, (4) Green Distribution, (5) Eco Design, (6) Internal Environment Management, (7) Environmental education, (8) Investment Recovery, (9) Cooperation with Customer, (10) Green Information Systems.

According to a process view, Zaid et al. (2018) identified three categories of GSCM practices: (1) internal GSCM practices, which comprise eco-design and internal environmental management. (2) External GSCM techniques including reverse logistics, environmental collaboration, and green purchasing. All the prior models are compared to one another for the current study, and four key practices are ultimately identified: Internally regulated processes include green manufacturing, maintenance, inventory management, etc. in (1) ecological and environmental design and (2) internal supply chain management. (3) Customer relationship management includes all strategies for marketing, distribution, and post-purchase support. (4) The term “supplier relationship management” applies to all procedures involving transportation, green purchasing, etc. Three categories of GSCM practices were identified by Zaid et al. (2018) based on a process view: (1) internal GSCM practices, which include eco-design and internal environmental management. (2) External GSCM strategies including green buying, reverse logistics, and environmental partnership. For the current study, all previous models are contrasted with one another, and four crucial practices are ultimately discovered: Internally regulated processes in (1) ecological and environmental design and (2) internal supply chain management include green manufacturing, maintenance, inventory management, etc. (3) All marketing, distribution, and customer service initiatives go under the umbrella of customer relationship management. (4) All processes involving transportation, environmentally friendly purchasing, etc. fall under the umbrella of “supplier relationship management”.

Both academics and practitioners are interested in the connection between green human resource management and sustainable supply chain management. The role of green SCM as a mediator between GHRM bundle practices and sustainable performance (i.e., environmental, social, and economic performance) was researched by Zaid et al. (2018). In fact, according to the study's results, green supply chain management strategies mitigate the direct influence of green human resource management strategies on long-term performance. While external green supply chain management practices only serve to mediate the relationship between GHRM bundle practices and environmental performance, internal green supply chain management practices serve as a positive intermediary between green human resources management practices and sustainable performance, suggesting that manufacturers are unaware of the advantages of these GSCM practices for increased economic performance. According to Albahussain et al. (2016), HRM practices influence how successfully the Supply chain and business work. The findings of this study show that human resource management strategies have an impact on the performance of the supply chain and, as a result, on business performance. The findings indicate that in Saudi Arabian companies, supply chain performance may function as a mediator between HRM practices and company performance. GHRM has a favorable impact on supply chain organizational learning and supply chain performance, according to Muafi and Kusumawati, (2021). Supply Chain Performance and Business Processes are significantly benefited by supply chain organizational learning. Furthermore, the link between GHRM and Supply Chain Performance is mediated through supply chain organizational

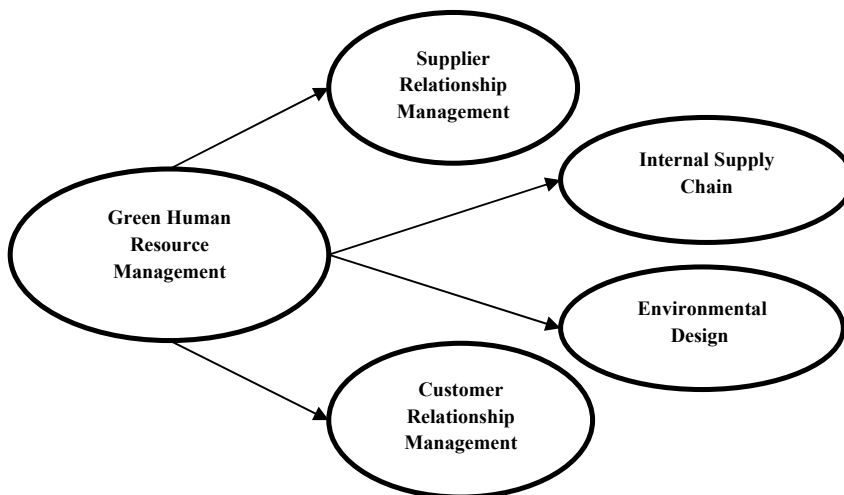
learning. Additionally, the relationship between GHRM and Business Process is mediated by organizational learning in the Supply Chain.

By examining their interaction, it may be possible to better comprehend how GHRM and GSCM impact financial and environmental performance. Concentrating on the mediating function that efficient supply chain management techniques, procedures, and results play in the connection between efficient management of human resources and performance. An increasing amount of theoretical and empirical research in human resource management has focused on this phenomenon (e.g., Shub & Stonebraker 2009; Lengnick-Hall et al. 2013). Jabbour and Jabbour (2016) have pushed for empirical study of the HRM-SCM mediation relationship, especially considering environmental issues. Some GHRM behaviors are associated with the adoption of GSCM, according to earlier empirical investigations (Sarkis et al. 2010; Lin & Ho 2011). The adoption of GSCM techniques would be hampered by issues relating to traditional organizational culture and change management in the absence of GHRM practices, as would the lack of personnel who are environmentally competent, motivated, and engaged (Jabbour & Jabbour, 2016; Longoni et al., 2018; Sarkis et al., 2010).

According to Longoni et al. (2018), based on the RBV, it has been proposed that human resource management practices have an impact on organizational performance by making employees into a special, valuable resource that supports the goals of the company through their use in business processes, including internal and external supply chain processes. When this viewpoint is applied to the field of environmental management, GHRM may be crucial for promoting environmental values and principles as well as for providing environmentally responsible and competent workers who incorporate environmental principles into important SC business processes (Fernandez et al. 2003; Jackson & Seo, 2010; Bon et al., 2018). We explicitly propose that the GHRM bundle has a positive effect on the adoption of GSCM practices, which mediates the association between GHRM and performance. Finally, Jabbour and Jabbour (2016) and Ellinger and Ellinger (2013) both stressed how strongly HRM principles and practices encourage the adoption of supply chain practices.

Based on the above discussion, the following hypotheses are developed:

- H<sub>1</sub>:** *Green human resource management practices positively influence supplier relationship management.*
- H<sub>2</sub>:** *Green human resource management practices positively influence internal supply chain management.*
- H<sub>3</sub>:** *Green human resource management practices positively influence environmental design.*
- H<sub>4</sub>:** *Green human resource management practices positively influence customer relationship management.*



**Fig. 1.** Research Model

### 3. Research Methodology

#### 3.1. Research Instrument Design

The table below lists the research variables, constructs, and associated studies that were used to create the items for each variable.

**Table 1**  
Questionnaire Variables and Constructs

Variables	Constructs	Items	Scales	Related research
<b>Green Human Resource Management</b>		4 items		Chen & Wu (2022), Peng et al., (2020), Jabbour & Jabour (2016), Bon et al., (2018), Zaid et al., (2018), Longoni et al., (2018). Singh et al., (2020).
<b>Green Supply Chain Management</b>	Supplier Relationship Management	5 items	Likert 1-5	Hervani, et al., (2005), Zhu et al., (2008), Rizki & Augustine (2022), Gonzalez et al., (2022), Choi & Hwang (2015) Gopal & Thakkar (2016), Jabbour & Jabour (2016), Bon et al., (2018), Zaid et al., (2018).
	Internal Supply Chain	5 items		
	Customer Relationship Management	4 items		
	Ecological Design	4 items		
<b>Total of items</b>		22 items		

Source: Own compilation

### 3.2. Sampling & Data Collection

This research intends to address the effects of Green Transformational Leadership on Green Supply Chain practices through the mediation variable of Green human resource management in the pharmaceutical sector in KSA. The theoretical model, presented in (Fig.1), illustrates the interrelationships between the framework constructs, considering the proposed hypotheses above in the literature review. Selecting the appropriate respondents is an important step for accessing accurate data to test the specific relationships between all the corresponding variables of the research model. This study targets managers from the three managerial levels in pharmaceutical companies operating in KSA. The study's scope covers all zones in Saudi Arabia. The population of the study is 1221 registered in Saudi Food and Drug Authority (<https://www.sFDA.gov.sa/ar/sFDA-nidlp>, accessed in November 2022). Only 109 completed surveys were gathered with complete data, representing about 9% of the population. To achieve a high response rate, the questionnaire was also sent in the regional tongue. To make sure the items are genuine and have high-quality content, the study conducts a pilot study. Therefore, two professional managers employed by pharmaceutical companies as well as three academic experts in supply chain and human resources management research were invited by the researchers. The questionnaire's final draft was then created after expert input. Before sending out the survey to the respondents, the final version was created. A five-point Likert scale was used to evaluate the constructs, with "1" standing for "strongly disagree" and "5" for "strongly agree". Companies and respondents' backgrounds are shown in Table 2 below.

**Table 2**  
Background of respondents

	Frequency	%
<b>Management level</b>		
• Top Management	27	24.8 %
• Middle Management	36	33 %
• Operative Management	46	42.2 %
<b>Educational Level</b>		
• Bachelor	88	80.7 %
• Master	17	15.6 %
• PHD and more	4	3.7 %
<b>Years of experience</b>		
• 1-5 Years	49	45 %
• 5-10 Years	29	26.6 %
• More than 10 years	31	28.4 %
<b>Gender</b>		
• Male	81	74.3 %
• Female	28	25.7 %
<b>Total</b>	<b>109</b>	<b>100 %</b>

Source: Own compilation

## 4. Data Analysis

The Partial Least Square Structural Equation Modeling (PLS-SEM) method is now used to forecast and assess the measurement and structural model in order to test the study hypotheses (Henseler et al., 2015). Complex relationships between variables can be modeled using this method. For this investigation, Smart-PLS software was employed. Two procedures will be used to validate the research hypotheses: (1) validation of the measurement model (Outer Model) and (2) validation of the structural model (Inner Model). The first one is about validating the latent variables (constructs), which include top management support, intellectual capital, technical environment, e-entrepreneurship orientation, competitiveness, financial performance, and customer service. The associations between the latent variables are important for the structural model's validation (hypotheses).

### 4.1. Validity And Reliability Analysis

Internal consistency, convergent validity, and discriminant validity are all examined in this section. As a result of the findings (Fig. 2), which demonstrate that all item loadings for all constructs are more than 0.50, all items were kept for coming steps

of this research. To evaluate the reliability of internal consistency, the Alpha Cronbach coefficient, Rho A, and Composite Reliability (CR) were computed. As seen in Table 2 below, all constructs have good reliability because the values are greater than the cutoff of 0.70. The value AVE was also calculated to evaluate convergent validity. The construct explains more than 50% of the variance of the items when all values are over 0.50.

**Table 3**  
Reliability and Validity Analysis

	$\alpha$	Rho A	CR	AVE
Customer Relationship Management	0.927	0.928	0.948	0.821
Ecological Design	0.928	0.931	0.949	0.823
Green Human Resource Management	0.964	0.964	0.974	0.902
Internal Supply Chain Operations	0.938	0.938	0.953	0.800
Supplier Relationship Management	0.898	0.902	0.925	0.712

Source: Own compilation

Cross-load comparisons were performed between the dimensions to evaluate discriminant validity and demonstrate that the measures of the constructs are not substantially correlated. The findings demonstrate that the AVE of each latent variable (construct) is greater than the construct's highest squared correlation with another latent variable. This ensures discriminant validity.

**Table 4**  
Discriminant Analysis

	CRM	ECO.D	GHRM	IN.SC.OP	SRM
Customer Relationship Management					
Ecological Design	<b>0.908</b>				
Green Human Resource Management	0.785	<b>0.925</b>			
Internal Supply Chain Operations	0.907	0.850	<b>0.804</b>		
Supplier Relationship Management	0.835	0.778	0.707	<b>0.948</b>	

Source: Own compilation

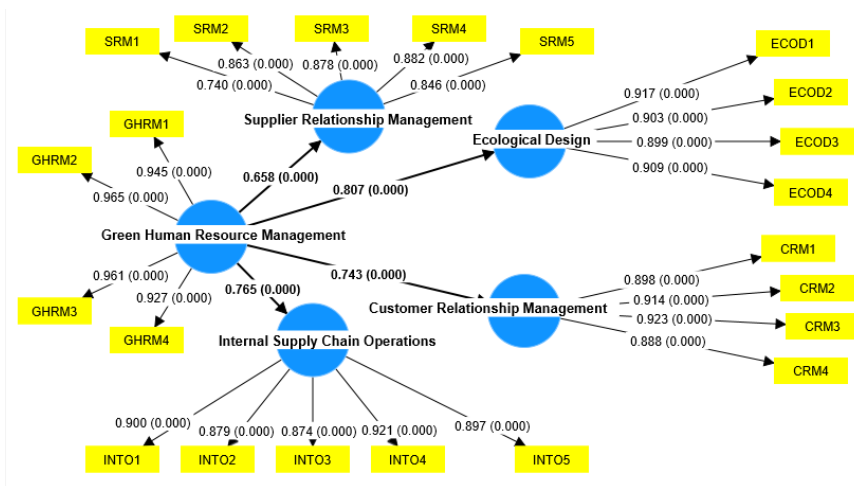
4.2. Testing Hypotheses

Testing the structural model (Inner Model) comes next after testing the measurement model (outer model). The relationship between each construct's route coefficient is shown in Fig. 2 and Table 5.

**Table 5**  
Hypotheses Testing Results

Effect	$\beta$	T-Value	Sig	Decision
H1	0.658	10.575	P < 0.000	Supported
H2	0.765	13.756	P < 0.000	Supported
H3	0.807	18.178	P < 0.000	Supported
H4	0.743	13.539	P < 0.000	Supported

Source: Own compilation



**Fig. 2.** Path Coefficient Results  
Source: Own compilation

Performing hypothesis testing involves examining two dimensions: (1) The examination of the path coefficient ( $\beta$ ) shows how much the dependent variable has changed overall for each change in the independent variable. (2) The t-value test makes up the second dimension. Regardless of the value of ( $\beta$ ), the t-value must be superior to 2 for this coefficient to be significant.

Table 5 shows that all the hypotheses are supported i.e. the results show that green transformational leadership in pharmaceutical companies in KSA significantly and positively influences green human resource management (H1). Also, GHRM significantly and positively influences customer relationship management, Internal Supply chain practices, Ecological and environmental design as well as Supplier relationship management (H2a, H2b, H2c, H2d).

## 5. Results Discussions

The above findings show a considerable level of maturity of pharmaceutical companies operating in KSA regarding green supply chain management practices as well as the key success factors of GSCM, namely green human resources practices (GHRM). It is observed that pharmaceutical companies are striving to meet the requirements of the ambitious Vision 2030 in terms of improving the health system and achieving drug security's objectives. The results demonstrate the importance attached to environmental issues as well as the regulations that support this trend, which strongly supports and obliges pharmaceutical companies towards green and sustainable practices. Based on the theory of RBV, leaders and employees at all levels in the hierarchy can provide pharmaceutical companies with the necessary capabilities to develop outstanding green practices, enabling them to develop a sustainable competitive advantage. The results also show the influence of green human resource management practices; through supporting and encouraging green selection, recruitment, performance appraisal and eco-behavior-based rewards, training to acquire new competencies related to green practices; on green supply chain practices. These results are in line with the findings of Zaid et al., (2018), longoni et al., (2018), Bon et al., (2018), Jabbour and Jabbour (2016). In other words, green human resource management (GHRM) has a significant positive impact on customer relationship management (CRM), supplier relationship management (SRM), ecological design (ECOD), and internal supply chain operations (INTO).

**Table 5**

Determinant coefficients

Dependent Variable	R <sup>2</sup>
Customer Relationship Management	0.553
Ecological Design	0.652
Internal Supply Chain Operations	0.585
Supplier Relationship Management	0.434

Source: Own compilation

This research gives a number of helpful conclusions, including the following: The first advantage is that it provides managers in KSA with a comprehensive overview of the state of current Green Human Resource Management methods designed to leverage Green Supply Chain Management. The first investigation into the association between the level of maturity in the Saudi Arabian pharmaceutical industry's green supply chain management and human resource management is also presented as part of this paper's conclusion.

## 6. Conclusion

The main objective of this study is to examine the relationship between green human resource management practices and how it positively affects green supply chain practices which is a challenge for all pharmaceutical companies in KSA. This study is the first of its kind in Saudi Arabia and aims to diagnose GSCM by exploring and analyzing its roots, namely the GHRM.

The health system and drugs security in Saudi Arabia represents the building block for the success of Saudi Vision 2030. By supporting the various sectors that KSA aims to develop, such as tourism, healthcare, global supply chains, renewable energy, petrochemicals, etc. pharmaceutical companies consider the vision as an unprecedented opportunity to reinforce their position in the market and ensure their sustainable survival through an effective supply chain management. As the objective of this study is to examine the maturity level of GSCM and measure the support given by GHRM, a study model and questionnaire were created in accordance with the research methodology after a thorough literature analysis. Data were then gathered in addition to a sizable sample that included pharmaceutical businesses operating in KSA. The analysis reveals that a key factor, namely green human resource management, is being given significant attention in terms of maturity. The findings also demonstrate that executives, managers, and staff at pharmaceutical firms are ready to acknowledge the significance of green practices and how they may enhance their supply chains and ultimately their sustainable performance metrics.

As for the practical implications of this study, firstly, it provides pharmaceutical firms' leaders and managers with a clear understanding of the status quo of various measures to promote green practices in pharmaceutical companies operating in KSA. Moreover, the study reflects no shortcomings in adopting green supply chain practices, namely customer relationship management (CRM), supplier relationship management (SRM), ecological design (ECOD), and internal supply chain operations (INTO).

However, relying only on GHRM doesn't give a sustainable competitive advantage. Other organizational determinants, such as leadership and top Management support, as well as personal aspects, such as an employee's environmental mindset, may also have an impact on an employee's capacity, motivation, and chances for green practices (Hülshager et al., 2009. Zhou & Shalley, 2011, Zhou et al., 2018; Jia et al., 2018).

Finally, the research presents an initial study on the maturity of GHRM and GSCM in the pharmaceutical industry in the Kingdom of Saudi Arabia. Further research can, for instance, link the green supply chain practices with sustainable performance dimensions such as environmental, economic, and social performance since it is argued that HRM concretizes the RBV criteria for generating lasting higher performance and sustainable competitive advantage. Also, the study considered the GHRM as one global construct while it seems relevant to test GHRM dimensions on GSCM to give more insights about the dimension that has the most impact on GSCM practices. It is also relevant to develop a decision framework for GSCM practices to assess alternatives of partnership with suppliers and customers regarding their influence on environmental performance.

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