South Asian Journal of Operations and Logistics
Vol. 3, No. 2, pp. 265-281
DOI: 10.57044/SAJOL.2024.3.2.2441
ISSN: 2958-2504

The role of supply chain practices on sustainability performance in the pharmaceutical sector: a case from developing economy

Hira Habib [1*]

[*1]*Faculty of Business Administration, Iqra University, Pakistan*

**Corresponding email: hira.habib44694@Iqra.edu.pk*

Article History

Received: 15 January 2023
Revised: 10 March 2024

JEL Classification
Q56
R41
G14

ABSTRACT

The aim of this research is to broadly identify the sustainable influence of green practices to cope with the problems caused by pharmaceutical manufacturing, purchasing and distribution, which have insignificant effects on the environment, well-being, animals, ocean, and water; in this regard, the significance of the supply chain practices on sustainable performance examined. In this quantitative study, the researcher will use a cross-sectional research design and a structured questionnaire for data collection to find out the research problem from professionals of supply chain managers. In this study, a random sampling technique will be considered to get the actual data from the experience of supply chain managers. The research scope is limited to the Karachi region to discover Supply Chain Practices on Sustainability performance in the Pharmaceutical Sector in Karachi. Thereby potentially restricting generalizability. The findings are based on a sample of 105 pharmaceutical companies in Karachi.

Keywords: *Green manufacturing, Green purchasing, Green distribution, Sustainable performance, Pharmaceutical, Karachi*

Citation of this article:

Habib, H. (2024). The role of supply chain practices on sustainability performance in the pharmaceutical sector: a case from developing economy. *South Asian Journal of Operations and Logistics, 3*(2), 265-281. https://doi.org/10.57044/SAJOL.2024.3.2.2441

The role of supply chain practices on sustainability performance in the pharmaceutical sector: a case from developing economy

1. Introduction

Azevedo et al. (2011) emphasize the importance of environmental performance measures in business practices and their role in promoting sustainability. In line with current global trends, organizations have shifted their focus towards environmental requirements, emphasizing organizational performance. While organizations traditionally prioritized financial strength, they now recognize the significance of environmental and social performance in fostering sustainability and achieving economic success (Rashid et al., 2024a). Social responsibility, in particular, plays a crucial role in promoting sustainability and is directly linked to corporate strategy. Additionally, organizational sustainability requires environmental and societal credibility to attain a sustainable competitive advantage in the long term. Consequently, businesses should prioritize long-term profitability to mitigate social and environmental risks simultaneously (Rashid et al., 2024b).

Green Supply Chain Management is critical in enhancing sustainability performance by addressing social and environmental concerns. Rao and Holt (2005) suggest that Green supply chain management should involve early supplier engagement in product design and conduct seminars to raise awareness about eco-friendly practices among suppliers. Efficient and effective supply chain management (SCM) plays a pivotal role in ensuring the smooth flow of raw materials from suppliers to manufacturing firms, ultimately producing final goods. Therefore, organizations must focus on the supplier side to achieve sustainability goals (Rashid et al., 2024c).

Sarkis (2003) observes that companies increasingly integrate environmental practices into their strategic plans. Moreover, sustainability performance has become a crucial variable with significant implications for business activities (Chin & Sulaiman, 2015). It has been indicated that sustainability performance plays a significant role in the supply chain field (Pagell, 2009; Rashid & Rasheed, 2024). In the evolution of sustainability in the supply chain, research has shown a preference for focusing on specific areas within the supply chain rather than the entire process (Zhu, 2008). It has been noted that an increasing number of companies are paying more attention to their sustainability performance, but this is often driven by a few individuals who are conscious of the importance.

With the widespread adoption of technology globally, organizations often work with the same suppliers and workforce (Kumar & Goswami, 2019). This facilitates the alignment of values across different resources (Kumar & Goswami, 2019). However, military and private organizations must innovate to gain a competitive advantage (Kumar & Goswami, 2019). Therefore, supply chain sustainability presents opportunities for organizations to enhance performance through trust and goodwill. It is also helpful in measuring supply chain performance (Markley, 2007). Novartis, a pharmaceutical company recognized as a multinational firm, has taken significant steps internationally to adopt environmental sustainability standards in cooperation with the World Business Council for Sustainable Development. The Global Environmental Management Initiative has standardized various practices among pharmaceutical companies.

1.1 Research Problem

The environment significantly impacts business operations due to factors such as toxic gases, waste packaging materials, discarded materials, and other forms of pollution generated by industries (Albhirat et al., 2024; Chin & Sulaiman, 2015). Ecological problems like contamination and climate change result in resource depletion and ecosystem degradation, leading to environmental instability (Çankaya & Sezen, 2019; Rashid & Rasheed, 2023). Given the increasing severity of these environmental issues, organizations, governments, and individuals must take action to promote environmental sustainability (Walker et al., 2008). Aqueous organic waste stream mixing poses a challenge for the pharmaceutical industry, as adequate water for mixing may not always be available,

leading to increased energy consumption. In the future, access to drinkable water is expected to become an even more significant concern globally.

Industries like pharmaceuticals directly impact the environment throughout their lifecycle, from production to usage and disposal. This connection extends to drinking water sources, marine life, and agricultural produce. Pharmaceutical residues in oceans, landfills, soil, and other environmental components pose health risks. Research indicates that inadequate attention to pharmaceutical production significantly affects plants and animals, leading to kidney failure in predators, impaired fish reproduction, and harm to other aquatic species (Swan et al., 2006; Nash et al., 2004). Uncontrolled pharmaceutical manufacturing waste harms water bodies, humans, and animals due to resistant bacteria contamination, contributing to pharmaceutical pollution and environmental degradation. Additionally, European patients often need more awareness of pharmaceutical supply chain management processes and their environmental implications, including packaging and labelling. The location where medicine packaging is finalized also matters regarding environmental considerations.

1.2 Research Questions

The existing study contends with the following research questions:

a. Does Green Purchasing have a positive relationship with Sustainable Performance?
b. Does Green Manufacturing have a positive relationship with Sustainable Performance?
c. Does Green Distribution have a positive relationship with Sustainable Performance?

1.3 Research Objectives

The aim of this research is based on the problem statement and will broadly identify the sustainable influence on green practices. Green practices play a crucial role in the manufacturing industry; therefore, it is necessary for the pharmaceutical industry to follow green practices.

a. To determine the relationship between Green Purchasing and Sustainable Performance.
b. To determine the relationship between Green Manufacturing and Sustainable Performance
c. To determine the relationship between Green Distribution and Sustainable Performance

1.4 Significance of the Study

Green implementation in the pharmaceutical sector is to develop and secure participants, the forceful interconnection, and the flow of material among them to achieve sustainability (Roschangar et al., 2017). Social and environmental safety helps create innovation and a competitive edge in preference of cost (Porter, 2006; Matlin et al., 2016; Kessel, 2014). Additionally, Green chemistry aims to deliver the stated benefits (Rashid et al., 2023). In the supply chain, manufacturing is a visible activity that enhances the focus on green manufacturing. Supply chain management has a significant impact on manufacturing waste. In this response, the manufacturing cost of the drug is interrelated with the quantity of waste generated, its effects on the environment, economic morale, and overall supply chain management to gain efficiency (Ward, 2014; Rasheed & Rashid, 2023). As a result, the pharmaceutical industry participants in the past few years have forced pharmaceutical organizations to implement sustainable manufacturing and the overall supply chain (Roschangar et al., 2017).

1.5 Key Terms

1.5.1 Green purchasing

Green purchasing is defined as environmentally conscious procurement activities aimed at reducing and eliminating the procurement of high-risk items. It also involves promoting reprocessing, reusing, and minimizing resources in the procurement process.

1.5.2 Green manufacturing

Green Manufacturing is defined as reducing raw material costs by reusing waste instead of purchasing new materials. It also involves achieving manufacturing efficiency by minimizing energy and water consumption, lowering environmental costs, refining bureaucratic compliance expenses, and enhancing the corporate image with minimal environmental impact (Porter & Linde, 1995). The Green Manufacturing process involves using materials that require minimal inputs, resulting in minimal environmental impact and reduced waste or impurities.

1.5.3 Green distribution

Green Distribution refers to environmentally friendly packaging practices aimed at reducing packaging, utilizing green packaging materials, promoting reprocessing and reuse activities, standardizing packaging in coordination with suppliers, promoting the development of reuse processes and procedures, and minimizing material consumption and repackaging time (Chin & Sulaiman, 2015).

2. Literature Review

2.1 Theoretical Background

A literature review demonstrates the author's expertise in a specialized field of study, encompassing research vocabulary, theories, variables, phenomena, processes, and procedures (Randolph, 2009). It also enlightens new researchers and groups of researchers in the relevant field. Ultimately, a literature review is a document that adapts legitimate and published scholarly works (Boote & Beile, 2005). Writing a literature review aims to ensure expertise, document publication, and explain the researcher's identity, with multiple aims for conducting empirical literature (Randolph, 2009).

Various components of companies' interests are necessary to promote green supply chain management, including ministry, economics, team members, and ecosystems (Min & Galle, 1997; Zhu et al., 2007). An increasing number of companies are embracing green initiatives and implementing green supply chain practices to fulfil their social responsibility (Salam, 2009). For example, the well-known furniture manufacturing company IKEA seeks sustainable means of transportation to reduce ecological consequences (Kafa et al., 2013). Other renowned companies such as L'Oreal, HP, IBM, GE, and Dell prioritize green practices for their day-to-day business operations and cultivating an eco-friendly environment for a reputable public image (Kafa et al., 2013). Implementing green initiatives requires firms to employ reinforced strategies to enhance their supply chains.

Primarily, producers categorize green manufacturing into four dimensions: impurity anticipation resulting in conformity, impurity anticipation for competitive advantage, impurity control estimation, and desirability strategies. Resources are the sole element that distinguishes green manufacturing processes, with implications of automation (Russo & Fouts, 1997; Klassen & McLaughlin, 1996). These variables are significant components of product reengineering processes aimed at reducing waste and moving towards sustainability (Russo & Fouts, 1997).

Past research indicates that organizations primarily focus on developing prosperity regarding assets, liabilities, and other wealth-related strengths. However, the world's demands have shifted towards environmental, social, and economic aspects to achieve high-priority sustainability performance (Carter & Rogger, 2008). Sustainability is examined as a business strategy closely

intertwined with social responsibility (Chin & Sulaiman, 2015). Additionally, the environment and society are variables with a common goal towards win-win outcomes for long-term competitive advantages. Thus, firms' sustainability requires cooperation across economic, societal, and social performance (Chin & Sulaiman, 2015).

2.2 Green Purchasing and Sustainability

Green purchasing involves environmentally friendly activities such as selecting suppliers based on ISO environmental certification and collaborating with them on environmental matters (Kafa et al., 2013). According to the literature, green purchasing activities encompass proficiency in high-tech and ecological design, environmental compatibility, and achieving organizational goals related to producing eco-friendly goods (Chin & Sulaiman, 2015). Green purchasing can also be determined by ensuring that purchased materials meet environmental considerations as assessed by organizations (Min & Galle, 1997). During green purchasing, buyers must consider the environmental compliance of suppliers, conduct thorough audits, and assess both internal and external environmental factors (Chin & Sulaiman, 2015). However, selecting the right kind of supplier positively impacts the environmental objectives set by the company (Çankaya & Sezen, 2019). Once an appropriate supplier is chosen, the supplier carries out further procedures with mutual understanding (Çankaya & Sezen, 2019). Moreover, after selecting the supplier and the activities they manage, it is essential to continually assess whether the supplier is meeting the organization's environmental objectives (Paulraj, 2011).

2.3 Green Manufacturing and Sustainability

Green Manufacturing is a concept that examines the proper utilization of raw materials in manufacturing processes, aiming to minimize the environmental impact (Baloch & Rashid, 2022). Green manufacturing aims to reduce material costs, minimize environmental pollutants, and mitigate environmental damage to enhance reputation through eco-friendly technology and optimal use of raw materials (Deif, 2011; Rashid et al., 2022a). By implementing green manufacturing, non-toxic manufacturing is promoted, resulting in the absence of unwanted environmental impurities (Deif, 2011). Additionally, green manufacturing provides an eco-friendly environment for individuals and fosters a competitive environment (Pal, 2002). It is an important initiative within the green supply chain (Çankaya & Sezen, 2018). Moreover, the execution of green manufacturing protects organizations committed to preserving the environment by revamping business operations to comply with environmental legislation (Afum et al., 2020). Furthermore, green manufacturing leads to the "6 Rs," which include redesigning, recycling, reusing, remanufacturing, reducing, and recovering (Rehman et al., 2016). In recent years, there has been increasing awareness of sustainable manufacturing and a growing consciousness about climate-friendly practices, which have played a significant role in adopting green practices (Bortolini et al., 2016).

The literature on green manufacturing in the business sector is diverse, indicating that it has prompted changes in many business strategies (Sharma & Vredenburg, 1998). This includes guiding the alteration and development of new product designs (Porter & Linde, 1995), reengineering business processes, and defining new methods and technologies (Pujari, 2006), such as waste reduction activities, minimizing waste products, reducing energy and water consumption, and increasing the use of sustainable materials to promote a healthy and safe environment for people and organizations (Hashmi, 2022; Lin & Huang, 2012). Many large companies have planned to address environmental issues for the well-being of their human resources and office staff, leading to significant impacts on environmental practices. However, the implementation of standards and procedures promotes sustainability, even as many companies aim to minimize investment expenses, reallocate resources, and reengineer production processes to mitigate the environmental impact of business operations and safeguard human health (Hashmi, 2023)

2.4 Green Distribution and Sustainability

Green distribution aims to reduce packaging issues, utilize eco-friendly packaging, encourage reprocessed manufacturing, promote reusable packaging procedures, and apply energy-saving methods in storage houses (Chin & Sulaiman, 2015; Rashid et al., 2022b). Green Distribution is a crucial variable that significantly impacts green supply chain performance (Çankaya & Sezen, 2019). It consists of activities to reduce destruction and unwanted waste during transportation (Rashid et al., 2020). The green distribution also affects the environment in terms of packaging characteristics, transportation distance, and fuel usage, all of which have an insignificant impact on green distribution performance (Sarkis, 2003; Hashmi et al., 2021a). It is a process interlinked with environmental concerns from packaging to transportation (Rao & Holt, 2005; Hashmi et al., 2020a). Sustainable distribution execution refers to implementations that reduce carbon dioxide emissions, are reasonably executable, and consequently promote a healthier life for future generations on the planet (Hutomo et al., 2018; Hashmi et al., 2021b). Green Distribution execution aims to transform distribution facility processes into sustainable distribution procedures that demonstrate viable transparency towards the community (Chin & Sulaiman, 2015; Hashmi et al., 2020b). However, past literature has examined that Green Distribution comprises eco-friendly product labelling, packaging, and transportation (Chin & Sulaiman, 2015; Masoumik et al., 2015). Conversely, storage facility issues are also considered essential problems of Green Distribution (Rashid & Rasheed, 2022).

2.5 Hypothesis Development

In this response, the current study aims to examine the aspects and exploratory conditions by combining three variables, Green Manufacturing, Green Purchasing and Green Distribution, concerning sustainable practices in the pharmaceutical industry of Karachi. Therefore, the hypotheses are given as follows:

H1: Green Manufacturing has a significant relationship with sustainable practices.

H2: Green Purchasing has a significant relationship with sustainable practices.

H3: Green Distribution has a significant relationship with sustainable practices.

2.6 Research Framework

Figure 1 below represents the framework of the research.

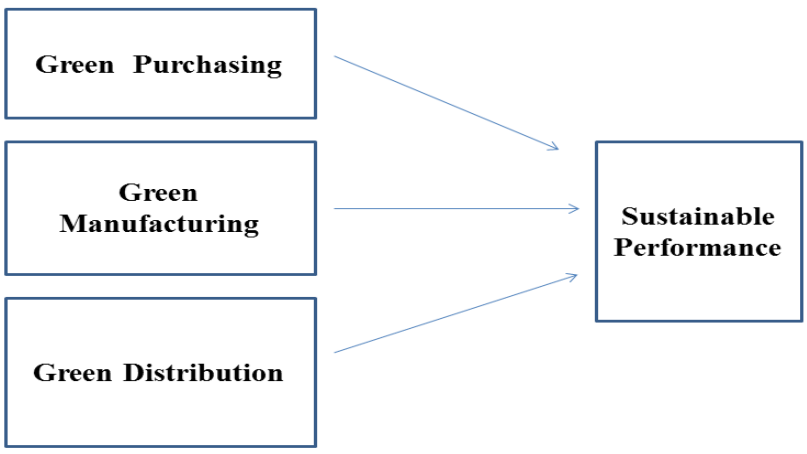

Figure 1: Research Framework

Source: Author's work

3. Methodology

The research method is the most essential part of the study, as it describes its methodology

related to the statistical tests used (Rashid et al., 2021). The research method includes details that involve the research design, data collection procedure, sample size, sampling technique, development of the research model, and statistical technique applied to interpret the study. This research will use a cross-sectional and quantitative research design (Alrazehi et al., 2021; Hashmi & Mohd, 2020). Therefore, constructive assumptions will not be examined due to the study's cross-sectional design. However, the survey will be conducted by an experienced and recognized person to ensure the Reliability and validity of the data collection through the statistical test to get an accurate result from a sufficient sample size (Amirah et al., 2024; Sezen et al., 2012; Rashid et al., 2019) as this study used quantitative method rather than the qualitative method. The qualitative method poses a trustworthiness issue (Haq et al., 2023). Therefore, the quantitative technique was deemed appropriate to test the hypotheses. A survey will be conducted to collect primary data. Data was collected through a questionnaire (Rashid & Amirah, 2017; Khan et al., 2022). Both genders are involved in collecting data. Respondents are the supply chain managers of the pharmaceutical industry based in Karachi.

3.1 Targeted Population

The targeted population of this study will be the Supply Chain Managers and purchasing Managers of the pharmaceutical Industry based in Karachi. The names of a few pharmaceutical industries are mentioned below:

1. Chas.A.Mendoza,Karachi
2. Herbion Pharmaceuticals
3. Master International Limited
4. AGP Pharmaceuticals
5. Searle Pakistan Limited
6. Adamjee Pharmaceuticals (Pvt) Limited, Karachi
7. Alina Combine Pharmaceuticals, Karachi
8. Alkemy Pharmaceuticals Laboratories (Pvt) Limited, Karachi
9. Allied Medical Supplies, Karachi
10. Ankaz Pharmex (Pvt) Ltd., Karachi
11. Asian Continental (Pvt) Limited, Karachi
12. ATCO Laboratories Ltd., Karachi
13. Barret Hodgson Pakistan, Karachi
14. Bosch Pharmaceuticals, Karachi
15. Brooks Pharmaceutical Laboratories Pakistan, Karachi
16. Delux Chemical Industries, Karachi
17. Abbott Laboratories Pakistan Limited
18. Ankaz Pharmex Pvt Ltd
19. Apex Pharmaceuticals Pvt Ltd
20. Apex Pharmaceuticals Pvt Ltd
21. Zephyr Pharmatec Pvt Ltd
22. Zafa Pharmaceutical Laboratories Pvt Ltd
23. Tarbos Pharma
24. Abbott Laboratories Pakistan Limited

25. Ankaz Pharmex Pvt Ltd
26. Apex Pharmaceuticals Pvt Ltd
27. Asian Continental Pvt Ltd
28. Zephyr Pharmatec Pvt Ltd
29. Zafa Pharmaceutical Laboratories Pvt Ltd
30. Tarbos Pharma

The researcher used random sampling in this study to collect accurate information about the variables (Khan et al., 2023a; 2023b). The questionnaire was adopted from previous studies (Çankaya & Sezen, 2019; Khan et al., 2021). The total sample size would be 105 respondents from the total unit 368 of the pharmaceutical industry based in Karachi, including national and multinational.

3.2 Instrument of Data Collection

As per Table 1, a closed-ended questionnaire based on the Likert scale was used for the data collection (Rashid, 2016).

Table 1:

Variables	Sources	Measurement
Green Purchasing	(Çankaya & Sezen, 2019)	Providing design specifications to suppliers that include environmental requirements for purchased item Cooperation with suppliers for environmental objectives is highly considerable. Choice of suppliers by environmental criteria is mandatory Suppliers are ISO14000 certification
Green Manufacturing	(Çankaya & Sezen, 2019)	The manufacturing process will reduce noise pollution to the minimum Substitution must be available for polluting and hazardous materials/parts Filters and controls are required for emissions and discharges Our production planning and control focused on reducing waste and optimizing materials exploitation Our design process focused on reducing energy and natural resources consumption in operations.
Green Distribution	(Çankaya & Sezen, 2019)	Recyclable or reusable packaging/containers in logistics minimize wastage of resources. The selection of cleaner transportation methods helps minimize pollution from the environment. Effective shipment consolidation and total vehicle loading determine the optimum utilization of resources.
Sustainable Performance	(Çankaya & Sezen, 2019)	Eco A decrease in the cost of materials purchased is beneficial for the company. A decrease in the cost of energy consumption is beneficial for the company A decrease in fee for waste discharge is beneficial for the company Improvement in earnings per share is positive for the company Improvement in return on investment benefits the company Improvement in customer satisfaction depicts higher profit Socio Improvement in its image in the eyes of its customers affects the business Improvement in investments in social projects (education, culture, sports) gains trust Improvement in relations with community stakeholders, e.g., nongovernmental organizations (NGOs) and community activists, build accountability in the society Improvement in employee training and education helps to build team Improvement in occupational health and safety of employees increases the company's credibility Improvement in overall stakeholder welfare or betterment determines the satisfactory relationship Environmental Improvement of an enterprise's environmental situation benefits the living

	things.
	Reduction in waste (water and solid) determines the effective use of resources.
	Reduction in air emission safety from carbon dioxide
	Decrease in consumption of hazardous/harmful/toxic materials causes an eco-friendly environment
	A decrease in the frequency of environmental accidents causes a healthy environment.

Source: Literature

3.3 Ethical Considerations

The use of hostile, oppressive, or other inadmissible language should be avoided in the Interview/Focus bunch questions plan. Maintaining the highest level of objectivity in discussions and investigations throughout the research is crucial. Deliberate cooperation of respondents in the study is essential. Besides, members have the right to withdraw from the investigation at any stage if they wish to do so. Respondents ought to take an interest based on educated assent. The guideline of educated assent includes specialists giving adequate data and confirmations about partaking to permit respondents to comprehend the ramifications of cooperation and to arrive at a completely educated, considered and uninhibitedly given choice about whether to do as such, without the activity of any pressing factor or pressure.

4. Result Analysis

4.1 Reliability of the Model

The given model of green purchasing, green manufacturing, and green distribution factors is a good fit, as they have an influential influence on sustainable performance. The Cronbach alpha shown inside consistency means that items are correlated. Therefore, we are testing the Reliability of each variable, which can be seen in Table 2.

Table 2: Construct reliability and validity.

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Green Distribution	0.798	0.809	0.881	0.712
Green Manufacturing	0.801	0.805	0.87	0.626
Green Purchasing	0.794	0.804	0.866	0.618
Sustainable Performance	0.831	0.833	0.876	0.542

Source: SPSS output

4.1.1 Reliability and validity of green distribution

As per the above-given reliability statistics in Table 2, Cronbach's alpha table shows that there is 0.798, which is 79.8%, which means the green distribution variable data is 79.8% reliable (Agha et al., 2021).

4.1.2 Reliability and validity of green manufacturing

As per the reliability statistics given in Table 2, Cronbach's alpha table shows that there is 0.801, which is 80.1%, which means the green manufacturing variable data is 80.1% reliable.

4.1.3 Reliability and validity of green purchasing

As per the above reliability statistics table 2, Cronbach's alpha table shows that there is 0.794, which is 79.4%, which means the green purchasing variable data is 0.794% reliable.

4.1.4 Reliability and validity of sustainable performance

As per the above reliability statistics table 2, Cronbach's alpha table shows that there is 0.831, 83.1%, which means the sustainable performance variable data is 83.1% reliable.

4.2 Demographic Frequency Table

Table 3 below represents the demographic of respondents.

Table 3: Age Group

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid		1	1.0	1.0	1.0
	26-35	62	59.0	59.0	60.0
	36-50	10	9.5	9.5	69.5
	Above 51	3	2.9	2.9	72.4
	Below 25	29	27.6	27.6	100.0
	Total	105	100.0	100.0	

Gender

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Female	28	26.7	26.7	26.7
	Male	77	73.3	73.3	100.0
	Total	105	100.0	100.0	

Work experience

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	10 to 15 years	13	12.4	12.4	12.4
	5 to 10 years	27	25.7	25.7	38.1
	Less than five years	56	53.3	53.3	91.4
	More than 15 years	9	8.6	8.6	100.0
	Total	105	100.0	100.0	

Education

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Graduate	35	33.3	33.3	33.3
	M.Phil	5	4.8	4.8	38.1
	Masters	48	45.7	45.7	83.8
	Others	5	4.8	4.8	88.6
	Under Graduate	12	11.4	11.4	100.0
	Total	105	100.0	100.0	

Source: SPSS output

4.3 Descriptive Profile and Data

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Standard. Error of the Estimate
1	.732[a]	.535	.521	2.32869

a. Predictors: constant, green distribution, green purchasing, and green manufacturing

Source: SPSS output

The above model summary table 7 shows that the value of R^2 is 0.535, which means that the variation in the organization's commitment is 53.5% concerning green manufacturing, green purchasing, and green distribution (Das et al., 2021; Haque et al., 2021). The adjusted R square in the model summary illustrates the fitness of the multiple regression models. It explicates the extent to which independent variables vary with the dependent variable. The adjusted R square calculated is 0.521, showing that three independent variables (green purchasing, green manufacturing, and green distribution) explain 52.1% of the variation with the dependent variable (sustainable performance). The remaining 47.9% is influenced by other variables not considered part of the research study.

Table 8: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	630.834	3	210.278	38.777	.000[b]
	Residual	547.703	101	5.423		
	Total	1178.537	104			

a. Dependent Variable: Sustainable Performance

b. Predictors: constant, green distribution, green purchasing, and green manufacturing

Source: SPSS output

As per the above-given ANOVA table 8, which shows the F value, which must be greater than 4, and in this model, the F value is 38.777, the sig value, which is less than 0.05, actually is 0.000*, which predicts our model is significant. However, reject the null hypothesis, and hence the model is significant, and the independent variables (green purchasing, green manufacturing, and green distribution) show a positive relationship with the dependent variable (sustainable practices), so the model is said to be a good fit.

4.4 Hypothesis Testing

Table 9: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.077	.911		2.280	.025
	Green Purchasing	.211	.135	.137	1.566	.120
	Green Manufacturing	.261	.110	.213	2.379	.019
	Green Distribution	.700	.115	.505	6.106	.000

a. Dependent Variable: Sustainable Performance

Source: SPSS output

The above-given coefficient Table 9 shows that the beta is positive, which means that green purchasing, manufacturing, and distribution are directly related to sustainable performance. Hence, the t value is greater than 2, which is 2.280. The sig value is less than 0.05, which is 0.025*** Rejecting the null hypothesis means this model is significant. It is also shown that if green purchasing is increased by 1%, the sustainable performance will increase by 21.1%; if green manufacturing is increased by 1%, the sustainable performance will increase by 26.1%; and if the green distribution is increased by 1%, the sustainable performance will increase by 70.0%.

4.5 Hypothesis Assessment

Table 10 below represents the hypothesis assessment.

Table 10: Hypotheses Assessment Table

Hypotheses	Sig	Results
The P value is 0.120, more significant than 0.05, and the T value is 1.566, less than 2. Therefore, the null hypothesis is accepted, and the alternate hypothesis is rejected.	0.120	Rejected H1
The P value is 0.019, less than 0.05, and the T value is 2.379, greater than 2. Therefore, the null hypothesis is rejected, and the alternate hypothesis is accepted.	0.019	Accepted H2
The P value is 0.000, less than 0.05, and the T value is 6.106, greater than 2. Therefore, the null hypothesis is rejected and the alternate hypothesis is accepted.	0.000	Accepted H3

Source: SPSS output

5. Conclusion, Discussion, Implications, Limitations, and Recommendations

5.1 Conclusion

In this research, social, economic, and environmental factors are considered highly influential among the green practices in the pharmaceutical industry of Karachi. These results show the proficiency of sustainable performances in the pharmaceutical industry of Karachi. Green variables

are highly considerable and preferred by the employees. On the other side, we have concluded that respondents gave less importance to green purchasing. The respondents also highly rated green manufacturing and green distribution. This study explains that pharmaceutical employees are highly significant regarding the industry's social, economic, and environmental performance. To conclude the above research, green purchasing has an insignificant relationship with sustainable performance, while green manufacturing and green distribution have a significant relationship with sustainable performance. The above results show that green manufacturing and distribution strongly influence sustainable performance, while green purchasing does not.

5.2 Discussion

In this research, our findings show that green purchasing has an insignificant relationship with the sustainable performance of the pharmaceutical industry in Karachi. The insignificance of the relationship between green purchasing and sustainable performance results of this variable may be due to the respondents' considering it less important. However, as shown in the results, H2 and H3 hypothesize a significant relationship. Green manufacturing and distribution significantly impact sustainable performance (Çankaya & Sezen, 2019). Our findings suggest that respondents highly consider green practices and sustainable performance.

5.3 Implications

This study research will contribute to sustainable supply chain performance in the pharmaceutical sector of Karachi by implementing green practices. This research has already been done in various countries and organizations. However, it was not done in the pharmaceutical sector of Karachi. The results and findings show that green practices are crucial for sustainable performance. Furthermore, the environment positively impacts organizational operations regarding material, manufacturing, and pollution generated by the industry, as well as leftovers in the ocean, garbage, soil, and other environment-related components that harm health. Nevertheless, organizations are required to implement green variables to enhance environmental sustainability.

5.4 Limitations and Recommendations

This research is limited to Karachi and the pharmaceutical supply chain network. The limitation is that this study covers 30 pharmaceutical companies based in Karachi, including manufacturing and distributing. Where do we identify the problems faced by pharmaceutical organizations, and what measures have they taken to deal with them regarding supply chain sustainability? This was considered basic research based on the limited sample; due to the limitation of the sample, more than this research is needed.

One of the recommendations for this study, which is extracted, is to improve their green manufacturing considerations. However, employees feel more likely to use green manufacturing and distribution. In this research, green manufacturing and distribution are highly significant, including social, economic, and environmental performance. Further variables of green practices could be considered in other industrial sectors. A future study could increase the sample size for better and more appropriate results. Nevertheless, this study was conducted in Karachi, and the data was limited to Karachi. Further research can be conducted across Pakistan because there could be some cultural preferences and points of view, including different cities like Lahore, Peshawar, Faisalabad, Multan, and Gujranwala. Collecting data from different cities may show different findings and results.

References

Afum, E., Agyabeng-Mensah, Y., Sun, Z., Frimpong, B., Kusi, L. Y., & Acquah, I. S. K. (2020). Exploring the link between green manufacturing, operational competitiveness, firm reputation and sustainable performance dimensions: a mediated approach. *Journal of Manufacturing Technology Management*, *31*(7), 1417–1438. https://doi.org/10.1108/jmtm-02-2020-0036

Agha, A. A., Rashid, A., Rasheed, R., Khan, S., & Khan, U. (2021). Antecedents of Customer Loyalty at Telecomm Sector. *Turkish Online Journal of Qualitative Inquiry*, *12*(9), 1352–1374. https://www.tojqi.net/index.php/journal/article/view/5873/4175

Albhirat, M. M., Rashid, A., Rasheed, R., Rasool, S., Zulkiffli, S. N. A., Zia-Ul-Haq, H. M., & Mohammad, A. M. (2024). The PRISMA Statement in Enviropreneurship Study: A Systematic Literature and a Research Agenda. *Cleaner Engineering and Technology*, *18*(2024), 100721. https://doi.org/10.1016/j.clet.2024.100721

Alrazehi, H. A. A. W., Amirah, N. A., Emam, A. S., & Hashmi, A. R. (2021). Proposed model for entrepreneurship, organizational culture and job satisfaction towards organizational performance in International Bank of Yemen. *International Journal of Management and Human Science*, *5*(1), 1-9. https://ejournal.lucp.net/index.php/ijmhs/article/view/1330/1399

Amirah, N. A., Him, N. K, Rashid, A., Rasheed, R., Zaliha, T. N., & Afthahnoon, A. (2024). Fostering a Safety Culture in Manufacturing through Safety Behavior: A Structural Equation Modelling Approach. *Journal of Safety and Sustainability*, In press.

Azevedo, S. G., Carvalho, H., & Cruz Machado, V. (2011). The influence of green practices on supply chain performance: A case study approach. *Transportation Research Part E: Logistics and Transportation Review*, *47*(6), 850–871. https://doi.org/10.1016/j.tre.2011.05.017

Baloch, N. & Rashid, A. (2022). Supply chain networks, complexity, and optimization in developing economies: a systematic literature review and meta-analysis. *South Asian Journal of Operations and Logistics*, *1*(1), 1–13. https://doi.org/10.57044/SAJOL.2022.1.1.2202

Boote, D. N., & Beile, P. (2005). Scholars before researchers: On the centrality of the dissertation literature review in research preparation. *Educational Researcher (Washington, D.C.: 1972)*, *34*(6), 3–15. http://www.jstor.org/stable/3699805

Bortolini, M., Faccio, M., Gamberi, M., & Pilati, F. (2016). Multi-objective design of multi-modal fresh food distribution networks. *International Journal of Logistics Systems and Management*, *24*(2), 155. https://doi.org/10.1504/ijlsm.2016.076470

Çankaya, Y. S., & Sezen, B. (2019). Effects of green supply chain management practices on sustainability performance. *Journal of Manufacturing Technology Management*, *30*(1), 98–121. https://doi.org/10.1108/jmtm-03-2018-0099

Carter, C. R., & Rogers, D. S. (2008). A framework of sustainable supply chain management: moving toward new theory. *International Journal of Physical Distribution & Logistics Management*, *38*(5), 360–387. https://doi.org/10.1108/09600030810882816

Chin, T., & Sulaiman. (2015). Green Supply Chain Management, Environmental Collaboration and. In *Procedia CIRP* (pp. 695–699).

Das, S., Ghani, M., Rashid, A., Rasheed, R., Manthar, S., & Ahmed, S. (2021). How customer satisfaction and loyalty can be affected by employee's perceived emotional competence: The mediating role of rapport. *International Journal of Management*, *12*(3), 1268–1277. https://doi.org/10.34218/IJM.12.3.2021.119

Deif, A. M. (2011). A system model for green manufacturing. *Journal of Cleaner Production*, *19*(14), 1553–1559. https://doi.org/10.1016/j.jclepro.2011.05.022

Haq, Z. U., Rasheed, R., Rashid, A., & Akhter, S. (2023). Criteria for Assessing and Ensuring the Trustworthiness in Qualitative Research. *International Journal of Business Reflections*, *4*(2), 150–173. Available at: http://journals.pu.edu.pk/journals/index.php/ijbr/article/view/7358

Haque, I., Rashid, A., & Ahmed, S. Z. (2021). The Role of Automobile Sector in Global Business: Case of Pakistan. *Pakistan Journal of International Affairs*, *4*(2), 363-383. https://doi.org/10.52337/pjia.v4i2.195

Hashmi, A. (2022). Factors affecting the supply chain resilience and supply chain performance. *South Asian Journal of Operations and Logistics*, *1*(2), 65–85.

https://doi.org/10.57044/SAJOL.2022.1.2.2212

Hashmi, A. R., & Mohd, A. T. (2020). The effect of disruptive factors on inventory control as a mediator and organizational performance in health department of Punjab, Pakistan. *International Journal of Sustainable Development & World Policy*, *9*(2), 122-134. https://doi.org/10.18488/journal.26.2020.92.122.134

Hashmi, A. R., Amirah, N. A., & Yusof, Y. (2020a). Mediating effect of integrated systems on the relationship between supply chain management practices and public healthcare performance: Structural Equation Modeling. *International Journal of Management and Sustainability*, *9*(3), 148-160. https://doi.org/10.18488/journal.11.2020.93.148.160

Hashmi, A. R., Amirah, N. A., & Yusof, Y. (2021b). Organizational performance with disruptive factors and inventory control as a mediator in public healthcare of Punjab, Pakistan. *Management Science Letters*, *11*(1), 77-86. https://doi.org/10.5267/j.msl.2020.8.028

Hashmi, A. R., Amirah, N. A., Yusof, Y., & Zaliha, T. N. (2020b). Exploring the dimensions using exploratory factor analysis of disruptive factors and inventory control. *The Economics and Finance Letters*, *7*(2), 247-254. https://doi.org/10.18488/journal.29.2020.72.247.254

Hashmi, A. R., Amirah, N. A., Yusof, Y., & Zaliha, T. N. (2021a). Mediation of inventory control practices in proficiency and organizational performance: State-funded hospital perspective. *Uncertain Supply Chain Management*, *9*(1), 89-98. https://doi.org/10.5267/j.uscm.2020.11.006

Hashmi, R. (2023). Business Performance Through Government Policies, Green Purchasing, and Reverse Logistics: Business Performance and Green Supply Chain Practices. *South Asian Journal of Operations and Logistic*s, *2*(1), 1–10. https://doi.org/10.57044/SAJOL.2023.2.1.2301

Hutomo, A., Haizam, M., & Sinaga, O. (2018). The mediating role of organizational learning capability on green distribution and green packaging towards sustainability performance as A function environmental dynamism: Indonesia and Malaysia fishery industries. *IOP Conference Series. Earth and Environmental Science*, *164*, 012018. https://doi.org/10.1088/1755-1315/164/1/012018

Kafa, N., Hani, Y., & El Mhamedi, A. (2013). Sustainability performance measurement for green supply chain management. *IFAC Proceedings Volumes*, *46*(24), 71–78. https://doi.org/10.3182/20130911-3-br-3021.00050

Kessel, M. (2014). Restoring the pharmaceutical industry's reputation. *Nature Biotechnology*, *32*(10), 983–990. https://doi.org/10.1038/nbt.3036

Khan, S. K., Ahmed, S., & Rashid, A. (2021). Influence of social media on purchase intention and customer loyalty of generation Y with the mediating effect of conviction: a case of Pakistan. *Pakistan Journal of International Affairs*, *4*(2), 526–548. https://doi.org/10.52337/pjia.v4i2.207

Khan, S. K., Rashid. A., Benhamed, A., Rasheed, R., & Huma, Z. (2023b). Effect of leadership styles on employee performance by considering psychological capital as mediator: evidence from airlines industry in emerging economy. *World Journal of Entrepreneurship, Management and Sustainable Development*, *18*(6), 799-818. https://doi.org/10.47556/J.WJEMSD.18.6.2022.7

Khan, S., Rasheed., R., Rashid, A., Abbas, Q., & Mahboob, F. (2022). The Effect of Demographic Characteristics on Job Performance: An Empirical Study from Pakistan. *Journal of Asian Finance, Economics and Business*, *9*(2), 283-294. https://doi.org/10.13106/JAFEB.2022.VOL9.NO2.0283

Khan, S., Rashid, A., Rasheed, R., & Amirah, N. A. (2023a). Designing a knowledge-based system (KBS) to study consumer purchase intention: the impact of digital influencers in Pakistan. *Kybernetes*, *52*(5), 1720-1744. https://doi.org/10.1108/K-06-2021-0497

Klassen, R. D., & McLaughlin, C. P. (1996). The impact of environmental management on firm performance. *Management Science*, *42*(8), 1199–1214. https://doi.org/10.1287/mnsc.42.8.1199

Kumar, G., & Goswami, M. (2019). Sustainable supply chain performance, its practice and impact on barriers to collaboration. *International Journal of Productivity and Performance Management*, *68*(8), 1434–1456. https://doi.org/10.1108/ijppm-12-2018-0425

Lin, P. C., & Huang, Y. H. (2012). The influence factors on choice behavior regarding green products based on the theory of consumption values. *Journal of Cleaner Production*, *22*(1), 11-18. https://doi.org/10.1016/j.jclepro.2011.10.002

Markley, M. J., & Davis, L. (2007). Exploring future competitive advantage through sustainable supply chains. *International Journal of Physical Distribution & Logistics Management*, *37*(9), 763–774. https://doi.org/10.1108/09600030710840859

Masoumik, S. M., Abdul-Rashid, S. H., Olugu, E. U., & Ghazilla, R. A. R. (2015). A strategic approach to develop green supply chains. *Procedia CIRP*, *26*, 670–676. https://doi.org/10.1016/j.procir.2014.07.091

Matlin, S. A., Mehta, G., Hopf, H., & Krief, A. (2016). One-world chemistry and systems thinking. *Nature Chemistry*, *8*(5), 393–398. https://doi.org/10.1038/nchem.2498

Min, H., & Galle, W. P. (1997). Green purchasing strategies: Trends and implications. *International Journal of Purchasing and Materials Management*, *33*(2), 10–17. https://doi.org/10.1111/j.1745-493x.1997.tb00026.x

Nash, J. P., Kime, D. E., Van der Ven, L. T. M., Wester, P. W., Brion, F., Maack, G., Stahlschmidt-Allner, P., & Tyler, C. R. (2004). Long-term exposure to environmental concentrations of the pharmaceutical ethynylestradiol causes reproductive failure in fish. *Environmental Health Perspectives*, *112*(17), 1725–1733. https://doi.org/10.1289/ehp.7209

Pagell. (2009). Building a more complete theory of sustainable supply chain management using case studies of ten exemplars. *Journal of Supply Chain Management*, 37–56.

Pal, U. (2002). Identifying the path to successful green manufacturing. *JOM (Warrendale, Pa.: 1989)*, *54*(5), 25–25. https://doi.org/10.1007/bf02701691

Paulraj, A. (2011). Understanding the relationships between internal resources and capabilities, sustainable supply management and organizational sustainability. *Journal of Supply Chain Management*, *47*(1), 19–37. https://doi.org/10.1111/j.1745-493X.2010.03212.x

Porter, M. E., & Kramer, M. R. (2006). The link between competitive advantage and corporate social responsibility. *Harvard Business Review*, *84*(12), 78-92.

Porter, M. E., & Linde, C. V. D. (1995). Toward a new conception of the environment-competitiveness relationship. *The Journal of Economic Perspectives: A Journal of the American Economic Association*, *9*(4), 97–118. https://doi.org/10.1257/jep.9.4.97

Pujari, D. (2006). Eco-innovation and new product development: understanding the influences on market performance. *Technovation*, *26*(1), 76–85. https://doi.org/10.1016/j.technovation.2004.07.006

Randolph, J. (2009). A guide to writing the dissertation literature review. In *Practical assessment, research & evaluation* (Vol. 14, Issue 1, p. 13). University of Massachusetts Amherst. https://doi.org/10.7275/B0AZ-8T74

Rao, P., & Holt, D. (2005). Do green supply chains lead to competitiveness and economic performance? *International Journal of Operations & Production Management*, *25*(9), 898–916. https://doi.org/10.1108/01443570510613956

Rasheed, R., & Rashid, R. (2023). Role of service quality factors in word of mouth through student satisfaction. *Kybernetes*, In press. http://dx.doi.org/10.1108/k-01-2023-0119

Rasheed, R., Rashid, A., Amirah, N. A., & Afthanorhan, A. (2023). Quantifying the moderating effect of servant leadership between occupational stress and employee in-role and extra-role performance. *Calitatea*, *24*(195), 60-68. *https://doi.org/10.47750/QAS/24.195.08*

Rashid, A. & Rasheed, R. (2022). A Paradigm for Measuring Sustainable Performance Through Big Data Analytics–Artificial Intelligence in Manufacturing Firms. *Available at SSRN 4087758*. https://doi.org/10.2139/ssrn.4087758

Rashid, A. (2016). Impact of inventory management in downstream chains on customer satisfaction at manufacturing firms. *International Journal of Management, IT and Engineering*, *6*(6), 1–19.

Rashid, A., & Amirah, N. A. (2017). Relationship between poor documentation and efficient inventory control at Provincial Ministry of Health, Lahore. *American Journal of Innovative Research and Applied Sciences*, *5*(6), 420–423.

Rashid, A., & Rasheed, R. (2023). Mediation of Inventory Management in the Relationship between Knowledge and Firm Performance. *SAGE Open*, *13*(2), 1–11. https://doi.org/10.1177/21582440231164593

Rashid, A., & Rasheed, R. (2024). Logistics Service Quality and Product Satisfaction in E-Commerce. *SAGE Open*, *14*(1), 1–12. https://doi.org/10.1177/21582440231224250

Rashid, A., Ali, S. B., Rasheed, R., Amirah, N. A. & Ngah, A. H. (2022a). A paradigm of blockchain and supply chain performance: a mediated model using structural equation modeling. *Kybernetes, 52*(12), 6163-6178. https://doi.org/10.1108/K-04-2022-0543

Rashid, A., Amirah, N. A., & Yusof, Y. (2019). Statistical approach in exploring factors of documentation process and hospital performance: a preliminary study. *American Journal of Innovative Research and Applied Sciences*, *9*(4), 306-310.

Rashid, A., Amirah, N. A., Yusof, Y., & Mohd, A. T. (2020). Analysis of demographic factors on perceptions of inventory managers towards healthcare performance. *The Economics and Finance Letters*, *7*(2), 289-294. https://doi.org/10.18488/journal.29.2020.72.289.294

Rashid, A., Baloch, N., Rasheed, R., & Ngah, A. H. (2024b). Big Data Analytics-Artificial Intelligence and Sustainable Performance through Green Supply Chain Practices in Manufacturing Firms of a Developing Country. *Journal of Science and Technology Policy Management*, In press, *https://doi.org/*10.1108/JSTPM-04-2023-0050

Rashid, A., Rasheed, R., & Amirah, N. A. (2023). Information technology and people involvement in organizational performance through supply chain collaboration. *Journal of Science and Technology Policy Management*, In press. https://doi.org/10.1108/JSTPM-12-2022-0217

Rashid, A., Rasheed, R., & Amirah, N. A., & Afthanorhan, A. (2022b). Disruptive factors and customer satisfaction at chain stores in Karachi, Pakistan. *Journal of Distribution Science*, *20*(10), 93-103. https://doi.org/10.15722/jds.20.10.202210.93

Rashid, A., Rasheed, R., & Ngah, A. H. (2024a). Achieving Sustainability through Multifaceted Green Functions in Manufacturing. *Journal of Global Operations and Strategic Sourcing*, In press. https://doi.org/10.1108/JGOSS-06-2023-0054

Rashid, A., Rasheed, R., Amirah, N. A., Yusof, Y., Khan, S., & Agha, A., A. (2021). A Quantitative Perspective of Systematic Research: Easy and Step-by-Step Initial Guidelines. *Turkish Online Journal of Qualitative Inquiry*, *12*(9), 2874–2883. https://www.tojqi.net/index.php/journal/article/view/6159/4387

Rashid, A., Rasheed, R., Ngah, A. H., Pradeepa Jayaratne, M. D. R., Rahi, S. & Tunio, M. N. (2024c). Role of Information Processing and Digital Supply Chain in Supply Chain Resilience through Supply Chain Risk Management. *Journal of Global Operations and Strategic Sourcing*, In press. https://doi.org/10.1108/JGOSS-12-2023-0106

Rehman, M. A., Seth, D., & Shrivastava, R. L. (2016). Impact of green manufacturing practices on organizational performance in Indian context: An empirical study. *Journal of Cleaner*

Production, *137*, 427–448. https://doi.org/10.1016/j.jclepro.2016.07.106

Roschangar, F., Colberg, J., Dunn, P. J., Gallou, F., Hayler, J. D., Koenig, S. G., Kopach, M. E., Leahy, D. K., Mergelsberg, I., Tucker, J. L., Sheldon, R. A., & Senanayake, C. H. (2017). A deeper shade of green: inspiring sustainable drug manufacturing. *Green Chemistry: An International Journal and Green Chemistry Resource: GC*, *19*(1), 281–285. https://doi.org/10.1039/c6gc02901a

Russo, M. V., & Fouts, P. A. (1997). A resource-based perspective on corporate environmental performance and profitability. *Academy of Management Journal*, *40*(3), 534–559. https://doi.org/10.5465/257052

Salam, M. A. (2009). RETRACTED ARTICLE: Corporate social responsibility in purchasing and supply chain. *Journal of Business Ethics*, *85*(S2), 355–370. https://doi.org/10.1007/s10551-008-9733-0

Sarkis, J. (2003). A strategic decision framework for green supply chain management. *Journal of Cleaner Production*, *11*(4), 397–409. https://doi.org/10.1016/s0959-6526(02)00062-8

Sezen, B., Karakadilar, I. S., & Buyukozkan, G. (2012). Proposition of a model for measuring adherence to lean practices: applied to Turkish automotive part suppliers. *International Journal of Production Research*, *50*(14), 3878–3894. https://doi.org/10.1080/00207543.2011.603372

Sharma, S., & Vredenburg, H. (1998). Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities. *Strategic Management Journal*, *19*(8), 729–753. https://doi.org/10.1002/(sici)1097-0266(199808)19:8<729::aid-smj967>3.0.co;2-4

Swan, G., Naidoo, V., Cuthbert, R., Green, R. E., Pain, D. J., Swarup, D., Prakash, V., Taggart, M., Bekker, L., Das, D., Diekmann, J., Diekmann, M., Killian, E., Meharg, A., Patra, R. C., Saini, M., & Wolter, K. (2006). Removing the threat of diclofenac to critically endangered Asian vultures. *PLoS Biology*, *4*(3), e66. https://doi.org/10.1371/journal.pbio.0040066

Walker, H., Di Sisto, L., & McBain, D. (2008). Drivers and barriers to environmental supply chain management practices: Lessons from the public and private sectors. *Journal of Purchasing and Supply Management*, *14*(1), 69–85. https://doi.org/10.1016/j.pursup.2008.01.007

Ward. (2014). Green chemistry: Pharmaceutical companies try to clean up their act. *Financial Times*. http://www.ft.com/intl/cms/s/0/20265526-e58c-11e3-a7f5-00144feabdc0.

Zhu, Q., Sarkis, J., & Lai, K. H. (2008). Confirmation of a measurement model for green supply chain management practices implementation. *International Journal of Production Economics*, *111*(2), 261-273. https://doi.org/10.1016/j.ijpe.2006.11.029

Zhu, Q., Sarkis, J., & Lai, K.-H. (2007). Green supply chain management: pressures, practices and performance within the Chinese automobile industry. *Journal of Cleaner Production*, *15*(11–12), 1041–1052. https://doi.org/10.1016/j.jclepro.2006.05.021