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Translation of Green Supply Chain Management to Environmental Performance via Green Process Innovation and the Moderation of Managers' Job Satisfaction and Top Management Commitment

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Abstract

This paper investigates the effects of green strategy and design (i.e., two important facets of green supply chain management) on firms' environmental performance through the mediating role of green process innovation. In addition, the moderation of two management attitudes (managers' job satisfaction and top management commitment) are tested as the boundary conditions of the proposed relationships. A time-lag design was used to collect data from 279 managers of 31 manufacturing firms in Jordan. SPSS and PROCESS macro were utilized to test hypothesized relationships. All hypothesized mediation and moderation relations were supported, except the moderation of top management commitment to the green design-green process innovation relationship. These findings provide managers with evidence to proactively implement and invest in green strategy and green design facets because such facets will not only positively affect their environmental performance but enhance other performances and help achieve a competitive advantage for the firm. Our findings expand the literature on green strategy and design facets. It is among

the few studies that have explored the link between green strategy and environmental performance, the underlying process, and introducing two managerial attitudes (middle manager job satisfaction and top management commitment) as boundary conditions in a single study. The testimony from the Jordanian manufacturing sector is another unique contribution to this study.

Keywords: Green strategy, green design, green process innovation, supervisors' job satisfaction, top management commitment, environmental performance.

1. Introduction

Growing environmental concerns and resource depletion challenges have significantly impacted manufacturing firms in recent years. As a response, green supply chain management (GSCM) practices have emerged as essential tools to address environmental issues. GSCM represents a holistic approach to supply chain management aimed at protecting the environment by minimizing harmful effects (Haiyun et al., 2021; Maaz et al., 2022; Silva et al., 2019) while also meeting customer demands (Khan & Qianli, 2017). Many large firms have shifted their management strategies toward sustainable practices by adopting proactive measures such as GSCM to enhance environmental performance (Khan et al., 2017; Luong et al., 2023; Maaz et al., 2022; Stranieri et al., 2022). The focus on sustainability has evolved into both a necessity and a trend, making GSCM and related environmental concerns a prominent research topic (Khan et al., 2019; Olivares Tenorio et al., 2021; Younis et al., 2016; Zhu et al., 2008). Adopting strategies that emphasize environmental protection, ecological responsibility, and social accountability (green strategy), along with designing products that maintain high ecological quality while reducing environmental impact across their lifecycle (green design), is essential for fostering green innovation.

Green innovation is a proactive environmental management approach that has recently gained emphasis on removing harmful consequences of the environment (Chang, 2011; Khan et al., 2022). It requires the creation of new markets to enhance the firm's growth, given its remarkable growth expected over the next decade, which offers many potentials and opportunities (Nakandala et al., 2023). Therefore, green technology innovation is a continuous and dynamic long-term process driven by the evolving environment for firms to develop sustainable technologies and the active market demand for eco-friendly products (Saether et al., 2021; Wei & Wang, 2023; Xie & Jamaani, 2022). In this aspect, the Jordanian government has approved several environmental laws that support the notion of greening and obliges manufacturing and service firms to consider these laws (Al-Ghwayeen & Abdallah, 2018).

Firms adopting green practices face several technological challenges. Top management handles such challenges (El-Kassar & Singh, 2019). Thus, Rupa and Saif (2022) and Wiredu et al. (2024) indicated that top management commitment aims to reduce the change resistance when implementing GSCM facets. Further, they added that one of the barriers to implementing greening practices in Bangladesh is the lack of top management support.

In addition, managers with high job satisfaction have better jobs, control tasks, and are highly satisfied. Job satisfaction among managers is related to curtailment (Aloisio et al., 2019) and performance improvements (Garg et al., 2018; Zhao et al., 2020). The implementation of green strategy and green design will translate more into green innovation when middle managers have high job satisfaction. This notion is yet to be tested empirically. Likewise, converting green innovation to environmental performance is more plausible when the top management commitment is high. Overall, the role of management (both middle and top managers) has rarely been investigated simultaneously. This is one of the main motivations behind the current investigation.

Although researchers explored the organizational consequences of GSCM (Zhu & Sarkis, 2004; Chen et al., 2006; Seman et al., 2019), the effect of specific GSCM facets (strategy and design) on the environmental performance of the firm has remained unconvincing (Seman et al., 2019; Sharma et al., 2017). Furthermore, the present literature provides contradictory impacts of GSCM on firm performance; for instance, Geng et al. (2017) pointed out that some GSCM facets negatively affect firms' performance. In the same context, Dzikriansyah et al. (2023) reported that in prior studies, some GSCM facets, such as green purchasing and green design, negatively affect environmental performance. Meanwhile, Khan and Qianli (2017) indicated that some GSCM facets, such as green purchasing and design, are not vital leading indicators of organizational performance. On the other hand, other scholars posit that there is a positive effect of GSCM facets on the performance of the firms (Chiou et al.,2011; Dzikriansyah et al., 2023; Geng et al., 2017). Thus, the prior studies are fragmented and have stated varied empirical findings (Yi & Demirel, 2023). The contradictory results demonstrated a gap in the effect of GSCM facets on firm performance.

More research is needed to fill these gaps and gain insights into the effects of two GSCM facets on environmental performance. Specifically, the study addresses how and when green strategy and design impact a firm's environmental performance. Thus, this study attempts to discover how Jordanian manufacturing firms move towards green process innovation by following a green strategy and design, thereby enhancing their environmental performance in the presence of satisfied and committed management. This paper contributes in the following ways: First, one of the first studies in a developing country, Jordan, uses green strategy and green design facets as independent variables leading to environmental performance through green process innovation. Second, the study contributed to the literature using two management attitudes (middle managers' job satisfaction and top management commitment) as moderators in the consequences of GSCM facets. Third, the study considered the actionability of the research by providing some implications for the policymakers in Jordan regarding the implementation of GSCM in the industry, through which firms can enhance the implementation of GSCM.

2. Literature Review and Hypotheses Development

2.1. Green Supply Chain Management Facets

The concept of GSCM is based on integrating environmental thought into SCM. Moreover, GSCM is a capability primarily aimed at reducing the environmental effects of supply, production, and distribution along the supply chain and has gained attention among practitioners and researchers (Banik et al., 2022). Moreover, Çankaya and Sezen (2019) pointed out that GSCM is a multidisciplinary subject that arises from building eco-friendly management practices in the framework of supply chains. Further, GSCM has garnered more care in the past few years due to global warming and resource scarcity, which has created pressures on firms driven by legislation and competitive opportunities (Lerman et al., 2022). GSCM integrates environmental thought into SCM, plus product design, sourcing, and selection of materials, processes, and the finished product delivery to the customers (Srivastava, 2007). By examining the empirical studies on GSCM, we see that several authors have previously explored numerous facets (strategy, design, purchasing, manufacturing) of GSCM. This study focuses only on two facets, which are discussed below.

2.1.1 Green Strategy

Strategy is the most vital facet of the GSCM process. Without a clear strategy, the whole process is going in a dark direction. Olson (2008) defined the green strategy as one that complements the business, operations, and asset strategies already well-understood and often well-articulated by the firm. Furthermore, Makhloufi et al. (2022) reported that green strategy is the practice that enhances current measures highlighting environmental concerns to deliver green-added value to customers without any adverse effect on ecological systems. However, the green strategy clarifies how performance is measured and the approaches and procedures to assess the degree of adherence of the GSCM to environmental objectives (Hermann et al., 2021). Therefore, the strategy is the degree to which environmental issues are integrated into firms' strategies (Saether et al., 2021). The green strategy should stem from the firm-level strategy that represents the firm’s concern, regardless of its classifications. Very few firms have established a firm-level green strategy (Olson, 2008). Therefore, a lack of appropriate strategy may be a source of challenge for the firm (Papalexi et al., 2022).

2.1.2 Green Design

Green design involves creating products that require less energy, are easy to recycle, allow for straightforward recovery of parts, and avoid harmful manufacturing processes (Park et al., 2022). Additionally, Khan et al. (2022) and Cheng et al. (2022) highlighted that green design encompasses decisions made during product development to minimize the environmental impact throughout the product's lifecycle—from material sourcing and manufacturing to usage and disposal—without compromising performance or increasing costs. Similarly, green design activities focus on reducing a product's environmental

footprint across its entire lifecycle, from raw material acquisition to production, use, and final disposal (Park et al., 2022; Younis et al., 2016). These activities include using materials not hazardous to human health and toxic products (Abdallah & Al-Ghwayeen, 2019; Hermann et al., 2021) or making them with less energy consumption (Choi et al., 2018). Green design involves incorporating environmentally friendly initiatives into the product and service design. Its goal is to minimize material usage, reduce energy consumption, eliminate hazardous components, and ensure product materials can be recovered, reused, or recycled at the end of their lifecycle (Famiyeh et al., 2018; Zhu & Sarkis, 2004). Moreover, Mubarik et al. (2021) pointed out that green design is a contemporary area that aims to preserve the environment and systematically integrate environmental facets into product design while keeping all functional and safety requirements for customers.

2.2 Resource-Based View and Green Supply Chain Management

This study relies on the resource-based view (RBV) as a logic that supports and grounds the relationships in the study model to enhance our understanding of greening. RBV theory claims that firms should enable a group of resources to improve their competitive advantages (Hart, 1995; Li et al., 2020) and help firms form dynamic capabilities (Li et al., 2020). Indeed, logically combining resources can give firms a competitive advantage (Khan et al., 2023). From an RBV perspective, the intangibility, ambiguous causality, and social complexity embedded in firms' innovation strategies and other activities in the supply chain can serve as sources of sustained competitive advantage (SCA) (Alkaraan et al., 2025). Furthermore, Yahya et al. (2021) added that RBV inspires firms to bring innovative solutions to handle environmental problems. RBV focuses on the firm's internal resources to organize operations and gain SCA. The RBV approach assumes that managerial efforts are a source of SCA (Fahy & Smithee, 1999). RBV is a firm's SCA based on valuable, inimitable, rare, and non-substitutable resources (Barney, 1991). Also, Barney and Clark (2007) argued that the resources would be costly to duplicate when they are path-dependent, causally ambiguous, and socially complex.

2.3 Green Supply Chain Management Facets and Green Process Innovation

The existing literature highlights that GSCM facets affect green innovation (Zulfikarijah et al., 2023). Similarly, Yahya et al. (2021) indicated that a well-designed green strategy leads to innovative processes and product development. Indeed, firms adopt a strategy differently depending on their goals and objectives that meet their interest in innovation and ultimately reduce operational cost and resource consumption compared with different strategies due to resource constraints (Yahya et al., 2021). Furthermore, the relationship between GSCM, such as green design and green process innovation, is supported by RBV, building strategic capabilities by the firms that are valued, rare, unique, non-transferable, and non-substitutable through green innovation practices (Barney, 1991). Further, El-Kassar and Singh (2019) pointed out that capabilities are non-transferable subgroups of a

firm's resources directed at enhancing productivity. Therefore, based on the RBV logic, green strategy can help firms integrate environmental concerns into strategic planning. Green strategy and green design help firms gain greater access to knowledge sources for green innovation and provide an area for exchanging knowledge between firms and their partners (Nakandala et al.,2023). Accurate green knowledge broadens firms' knowledge base and is beneficial in implementing green innovation (Cheng et al., 2022; Li et al., 2022). Therefore, the study proposes the following hypotheses:

- *H1. Green strategy positively affects the green process innovation.*
- *H2. Green design positively affects the green process innovation.*

2.4 Green Process Innovation and Environmental Performance

In line with the RBV, the level to which firms can implement green design facets is dependent on the green capabilities the firms develop and deploy. In this aspect, Nakandala et al. (2023) and Shahzad et al. (2022) argued that by using diverse technology categories for green process innovations, firms are trying to achieve their goals related to pollution reduction, raw material retention, water, and production efficiency. Using RBV, green process innovation is expected to be a vital firm resource that a firm uses to enhance its environmental performance and gain goodwill among main stakeholders (Awan et al., 2023; Singh et al., 2019). Moreover, RBV suggests that competitive advantages and performance depend on how firms use their strategic resources, which are valuable, scarce, and difficult to imitate (Alkaraan et al., 2025; Barney, 1991; Kamra et al., 2024). Based on RBV logic, it can be assumed that green process innovation is a significant resource that a firm uses to boost its performance.

- *H3. Green process innovation positively affects environmental performance.*

2.4.1 The Mediation of Green Process Innovation

Green innovation involves reducing energy consumption and pollution emissions, recycling waste, and designing green products (Chen et al., 2006). According to Porter's hypothesis, the green innovation strategy mediates environmental regulation and firm environmental performance. Thus, this study also suggests similar mediation mechanisms in line with the previous research (Seman et al., 2019; Zulfikarijah et al., 2023). The literature about the role of green process innovation as a mediator parameter is limited. Nevertheless, the RBV proposes that unique resources such as green process innovation can help as a vital enabler through which GSCM facets can significantly lead to superior performance. Furthermore, Chiou et al. (2011) also found similar mediation. Therefore, the study posits the following hypotheses:

- *H4. Green process innovation mediates the relationship between green strategy and environmental performance.*
- *H5. Green process innovation mediates the relationships between green design and environmental performance.*

2.5 The Moderation Effect of Top Management Commitment

Top management commitment is instrumental in leading the firm toward sustainable development (Hariadi et al., 2023). It is an ability to organize employees within the firm structure and control it to accomplish the set objectives (Tarigan et al., 2020). Similarly, Khan et al. (2022) reported that it is a fundamental human activity that transforms external influences into managerial actions, combining them with internal knowledge to establish new organizational rules or modify existing ones.

Top management's commitment to resource allocation, building capabilities, and helping the firm achieve competitive advantage is crucial (El-Kassar & Singh, 2019; Wiredu et al., 2024), which meets the RBV theory aim. The RBV postulates that the individual facet (intellectual capital) of a firm is considered the core of the RBV of the firm toward its going trip to gain an SCA in a particular market. Therefore, top management can be a valuable, inimitable, rare, and non-substitutable resource for conceiving and implementing a strategy to gain an SCA (Barney, 2021). According to Barney (1991), resources in the RBV encompass all assets, capabilities, organizational processes, attributes, information, knowledge, technical expertise, and management skills. The RBV emphasizes the significance of a firm's intangible resources and capabilities as key drivers for achieving a competitive advantage.

Drawing on RBV, top management is an intangible resource (Barney, 1991; Khan et al., 2023). Therefore, the top management's commitment role as a moderator is to enhance the adoption of GSCM facets and green process innovation, create synchronization between them, and give support wherever and whenever needed. Khan et al. (2023) argued that the RBV declares that resources are combined to create capabilities. However, resources cannot give firms any value until the top management remains committed to their utilization sustainably. Therefore, the study posits the following hypotheses:

- *H6. Top management commitment moderates the relationship between (a) green strategy and environmental performance and (b) green design and environmental performance such that these relationships are strengthened when top management commitment is high and vice versa.*

2.6. The Moderation Effect of Managers' Job Satisfaction

The concept of job satisfaction reflects the extent to which the work outcome meets personal expectations (Zhao et al., 2020). Garg et al. (2018) found that satisfied employees have better jobs and control tasks. Furthermore, they added that when the employees are satisfied with their jobs and work culture, they are better representatives for their firm. The study uses RBV to address the relationships between the GSCM, green process innovation, and environmental performance with the effect of managers' job satisfaction as a moderator. Using RBV (Barney, 1991), it appears that employee collective learning and conduct may depend on leadership skills for resources that meet the criteria of being

valuable, inimitable, rare, and non-substitutable. These support the firm's capability to achieve superior performance (AlNuaimi et al., 2021). Therefore, drawing upon RBV theory, leadership is considered a crucial resource, like any other resource available to a firm, and can be used to achieve environmental performance objectives. Numerous studies have explored the impact of intangible resources, including managers' knowledge, skills, and capabilities (Ahmed & Brennan, 2019). The study thus expects that the managers' job satisfaction may affect the relationship between GSCM facets and its positive outcomes. Hence, we propose the following hypotheses:

- *H7. Managers' job satisfaction moderates the relationship between (a) green strategy and green process innovation and (b) green design and green process innovation such that these relationships are strengthened when managers' job satisfaction is high and vice versa.*

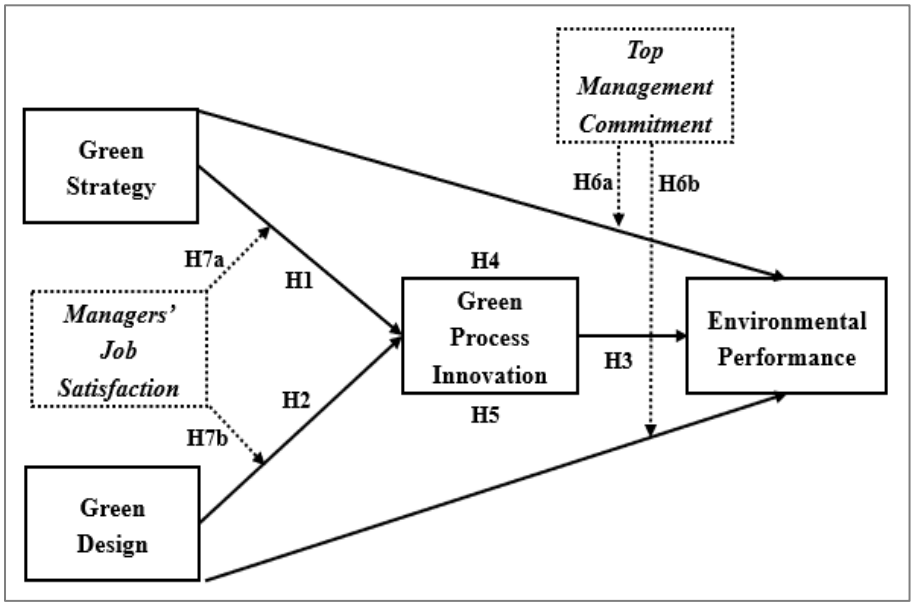

Figure 1: The Hypothesized Model

3. Methodology

The 31 manufacturing firms registered in the Jordan Chamber of Industry (JCI,2022) with more than 150 employees comprise the target population of this study. The sample consisted of managers from different departments concerned with the GSCM processes. i.e., supply chain, quality, operations, production, research, and development. Two time-lag surveys were used to avoid common method bias (Kock et al., 2021; Podsakoff et al., 2012; Podsakoff et al., 2003). Data was checked for this issue and found to be 33.9%, which is less than the cut of 50%. The first questionnaire for GSCM facets, top

management commitment, managers' job satisfaction, and demographics of the respondents. Several visits were made to contact all managers during the data collection period, and 411 questionnaires were distributed conveniently. At time 2, the second questionnaire was distributed for green process innovation and environmental performance. After the two lags, 293 sets of questionnaires were received back, and 14 incomplete questionnaires were dropped. Therefore, 279 usable sets of questionnaires represented a response rate of 67.9 %. According to Khine's (2013:38) sample size > 200, it is considered a large sample.

3.1 Measures

The study adopted pre-tested measures from previous relevant studies based on a literature review to measure the study variables. The green strategy was captured through ten items (Sellitto & Hermann, 2019); an example is "agility to take advantage of opportunities.". The green design was quantified through the 3-item scale (Zhu et al., 2008). An example item is "the design of products for reduced consumption of materials/energy." Green process innovation was measured using the 5 items (Chiou et al., 2011). An example item is "recycled, reused, and remanufactured materials or parts." Environmental performance was measured through 6 six items (Zhu et al., 2008). An example item is "reduction of air emissions." Top management commitment was measured using the 5-item scale (El-Kassar & Singh, 2019). An example item is, "top management articulates a vision for green supply chain collaboration." For measuring managers' job satisfaction, we followed Ybema et al. (2010); the respondents were asked the global question, "Do you mostly enjoy your work in this firm? The respondent chooses 1-7, Not at all (1) to Very much (7). Such single-item measures of overall job satisfaction are reliable and valid (Wanous et al., 1997). All the other items were rated on a 7-point Likert scale.

4. Data Analysis and Results

4.1 Sample Characteristics

The study performed data cleaning and screening, and there were no issues. About 77% were male. Incidentally, the percentage of married respondents was also 77%. The respondents were well educated because 79.2% had a bachelor's degree, and 16.5% had a master's degree. Regarding the age of the respondents, 35.1% were between 26-35, 36.6% between 36-45, and 20.4% between 46-55. The others were below 25 (1.8%) or above 55 (6.1%) years old. About 23% of the managers had work experience of 1-5 years in the firm, 35.8% had 6-10, 31.2% had 11-19, and the remaining 9.7% had 20-30 years. Our sample represented 53.8% senior-level managers, 38.7% middle managers, and 7.5% lower managers. Table 1 highlights the demographics of the 279 managers for the usable surveys.

4.2 Descriptives, Reliability, Validity, Factor Loadings and Multicollinearity

Table 2 presents the descriptive statistics and other estimates for the study variables. Data was reliable because Cronbach's α-coefficient of all scales is above 0.70 (Hair et al., 2019;

Kline, 2011). The skewness is less than 0.5, and the kurtosis is less than 2; therefore, there is no issue with data normality (Khine, 2013). The bi-variate correlations are per the expected direction; for example, the correlations of green strategy and green design with green process innovation are .542 and .604, respectively. Likewise, green process innovation is significantly correlated (.719, p<.01) with environmental performance.

Table 1: Demographics of the Respondents (n = 279)

Variable	Category	Freq	%
Gender	Female	64	22.9
	Male	215	77.1
Marital Status	Married	215	77.1
	Single	64	22.9
Education	Intermediate	12	4.3
	Bachelor	221	79.2
	Master	46	16.5
Age (years)	Below 25	5	1.8
	26-35	98	35.1
	36-45	102	36.6
	46-55	57	20.4
	56-65	17	6.1
Experience in the Firm (years)	1-5	65	23.3
	6-10	100	35.8
	11-19	87	31.2
	20-30	27	9.7
Hierarchical level	Lower	21	7.5
	Middle	108	38.7
	Senior	150	53.8

Table 2: Descriptive Statistics, Reliability, and Correlations

Variable	Mean	SD	Skewness	Kurtosis	1	2	3	4	5
1. Green Strategy	5.28	.637	.154	-.086	***.852***				
2. Green Design	5.47	.857	.139	-.608	.524**	***.750***			
3. Green PI	5.28	.804	.000	.000	.542**	.604**	***.855***		
4. EP	5.33	.767	-.497	1.649	.506**	.526**	.719**	***.815***	
5. TMC	5.47	.753	-.297	1.046	.196**	.105	.142*	.195**	***.859***
6. Manager's JS	5.78	1.020	.012	-.205	.251**	.295**	.307**	.346**	.074

Note: n = 279, *p <.05; ** p < .01; PI = Process Innovation, EP = Environmental Performance; TMC = Top Management Commitment; JS = Job Satisfaction

Table 3 highlights the results of the factor loading (>.5); all average variance extracted (AVE) are above .5; all composite reliabilities (CR) are above .7. Fornell and Larcker (1981) proposed a technique to establish discriminant validity. Specifically, the values of the square root of AVE compared with the interactors' correlations. Therefore, the results indicated that the value of the square root of AVE was higher than the inter-factors correlations. Multicollinearity can be tested using a regression test, tolerance value < 0.1, or if VIF >10, then there is a problem of Multicollinearity. Thus, all estimates are acceptable (Hair et al., 2019; Kline, 2011).

Table 3: Factor Loadings, AVE, C.R, DV, VIF, and CS

Variable	Items	Factor Loading	AVE	CR	DV	VIF	CS
Green Strategy	GSTR1	.750	.601	.884	.776	1.828	.547
	GSTR2	.720					
	GSTR3	.790					
	GSTR4	.780					
	GSTR5	.670					
	GSTR6	.860					
	GSTR7	.779					
	GSTR8	.820					
	GSTR9	.690					
	GSTR10	.870					
Green Design	GDES1	.802	.667	.857	.817	1.913	.523
	GDES2	.834					
	GDES3	.814					
Top Management Commitment	TMC1	.786	.634	.897	.796	1.145	.873
	TMC2	.806					
	TMC3	.795					
	TMC4	.829					
	TMC5	.765					
Green Process Innovation	GPRI1	.720	.578	.872	.760	1.732	.577
	GPRI2	.751					
	GPRI3	.799					
	GPRI4	.784					
	GPRI5	.744					
Environmental Performance	EPR1	.737	.590	.896	.768	2.564	.390
	EPR2	.829					
	EPR3	.825					
	EPR4	.750					
	EPR5	.719					
	EPR6	.740					

Note: AVE = Average Variance Extracted, C Composite Reliability, DV= Discriminant Validity, VIF=Variance Inflation Factor, CS= Collinearity Statistics

4.3 Regression Analysis

The model fitness statistics were acceptable: Chi-square=114.307, *df* =54, x2/df = 2.117, GFI=.942, TLI=.932, CFI=.953, RMSEA=.063 (Hair et al., 2019). The regression results for the direct and indirect effects were calculated using AMOS 23 for H1 to H5. The direct impact of GSCM facets on green process innovation showed a statistically significant effect (*H1:* β= 0.65, t= 10.73, R^2 =0.29). Green strategy accounts for about 29% of the total variance in green process innovation. Similarly, for green design effect on green process innovation (*H2:* β= 0.54, t= 12.61), R^2 =0.36, green design accounts for about 36% of the total variance in green process innovation. Furthermore, the direct impact of green process innovation on environmental performance also showed a statistically significant effect (*H3:* β= 0.62, t= 12.90), R^2 =0.54, meaning green process innovation accounts for about 36% of the total variance in environmental performance. Therefore, hypotheses *H1, H2, and H3 are supported* and in line with the findings of (Chiou et al., 2011; Li et al., 2022; Saether et al., 2021; Seman et al., 2019 and Suki et al., 2023). Furthermore, hypothesis H3 is supported and in line with the findings of (Aftab et al., 2023; Seman et al., 2019; Xie et al., 2022). Table 4 reports the regression results.

Table 4: Regression Results: Direct and Indirect Paths (H1 to H5)

Outcome Variable	**B**	**SE**	**t**	**R^2**
Green Process Innovation				
Constant	1.89	.32	5.86**	.29
Green Strategy *(H1)*	.65	.06	10.73**	
Constant	2.38	.24	10.04**	.36
Green Design *(H2)*	.54	.04	12.61**	
Environmental Performance				
Constant	1.15	.27	4.20**	.54
Green Strategy *(H1)*	.19	.06	3.37**	
Green Process Innovation *(H3)*	.62	.05	12.90**	
	Effect	*SE*	*LL 95% CI*	*UL 95% CI*
The indirect effect of green strategy on environmental performance *(H4)*	.40	.06	.30	.52
Constant	1.47	.23	6.28**	.53
Green Design *(H2)*	.13	.05	2.78**	
Green Process Innovation *(H3)*	.62	.05	12.20**	
	Effect	*SE*	*LL 95% CI*	*UL 95% CI*
The indirect effect of green design on environmental performance *(H5)*	.34	.05	.25	.43

Note: n=279, Bootstrap sample size = 5000, ** p <.01, LL=lower limit; CI=confidence interval; UL=upper limit

To test the direct and indirect effects of GSCM facets on environmental performance, Hayes (2022) proposed 5000 bootstrap samples to test the mediation effects in SEM. Model no (4) is used for mediation and at a level of confidence of 95%. GSCM facets indirectly affect environmental performance via green process innovation. However, the results indicated the direct positive effect of GSCM Facets on environmental performance. Therefore, hypotheses *H4 and H5 are supported* and in line with the findings of (Chiou et al., 2011 and Seman et al., 2019) as per the GSCM facets used in their study (green purchase). Table 4 highlights the results.

The PROCESS macro was used to test for moderation effects, and a 5000 bootstrap sample was selected for analysis with model no. (1) at a level of confidence of 95% (Hayes, 2022). The results (see Table 5) revealed that top management commitment significantly moderates the relationship between green strategy and environmental performance. In other words, the moderation of top management on the relationships between green strategy and environmental performance, the interaction (green strategy x TMC) is (B= -0.17, T= -2.7^{**}), $R^2 = 0.34$, the relation is significant at 0.02; thus, *H6a is supported*. On the other hand, *H6b has an insignificant impact*, i.e., top management commitment does not moderate the relationship between green design and environmental performance, the interaction (green design X TMC) is (B= -0.03, t= -0.71). R^2 =0.37, the relation is insignificant.

Table 5: Moderation of Top Management Commitment (H6a and H6b)

Outcome Variable	**B**	**SE**	**t**	**R^2**
Environmental Performance				
Constant	-2.80	1.74	-1.61	.34
Green Strategy	1.29	.33	3.87**	
Top Management Commitment (TMC)	1.18	.34	3.51**	
Green Strategy x TMC *(H6a)*	-.17	.06	-2.70**	
Change for unconditional interaction				.02**
Constant	.96	1.40	.69	.37
Green Design	.53	.26	2.06*	
Top Management Commitment	.49	.27	1.86*	
Green Design x TMC *(H6b)*	-.03	.05	-.71	
Change for unconditional interaction				.00

Note: n=279, Bootstrap sample size = 5000, * p <.05, ** < .01

Furthermore, the results in Table 6 are self-explanatory and reveal that managers' job satisfaction significantly moderates the relationship between green strategy and green

process innovation and between green design and green process innovation. Thus, both *H7a and H7b are supported*.

Table 6: Moderation of Managers' Job Satisfaction (H7a and H7b)

Outcome Variable	**B**	**SE**	**T**	**R^2**
Green Process Innovation				
Constant	5.63	1.59	3.55**	.34
Green Strategy	-.23	.31	-0.73	
Managers' Job Satisfaction (MJS)	-.60	.27	-2.21*	
Green Strategy x MJS *(H7a)*	.14	.05	2.74**	
Change for unconditional interaction				.02**
Constant	4.90	1.52	3.23**	.39
Green Design	-.06	.29	-0.20	
Managers' Job Satisfaction	-.38	.25	-1.52	
Green Design x MJS *(H7b)*	.09	.05	1.96 ^	
Change for unconditional interaction				.01 ^

Note: n=279, Bootstrap sample size = 5000, * p <.05, **p < .01, ^ p < .10

5. Discussion

The study explores the effect of two GSCM facets, green strategy and design, on environmental performance. The study also investigates the role of green process innovation as a mediator, moderating two management attitudes (top management commitment and managers' job satisfaction) to enhance GSCM facets' effect on green process innovation and indirectly on environmental performance. The study finds that both GSCM facets statistically significantly affect green process innovation. These findings align with the previous findings (Chiou et al., 2011; Li et al., 2022; Seman et al., 2019; Suki et al., 2023). Green process innovation has a statistically significant positive effect on environmental performance. This finding is consistent with previous research (Aftab et al., 2023; Seman et al., 2019). Furthermore, green process innovation mediates the relationships between green strategy and environmental performance and between green design and environmental performance.

Top management commitment moderates the relationships between green strategy and environmental performance; however, top management commitment does not affect the relationships between green design and environmental performance. Managers' job satisfaction significantly moderates the relationship between green strategy and green process innovation and between green design and green process innovation.

This study confirms the mediation effects of green process innovation and the moderation effects of top management commitment and managers' job satisfaction, thereby providing new relevant insights to the evolving literature and shedding light on previously overlooked gaps in theoretical understanding. As the study relies on the RBV as an overarching theoretical framework, the study clarified the effect of GSCM on firm performance. The new idea underlying RBV is that resources will influence a firm's ability to implement strategy (Barney, 1991). RBV focuses on the firm's internal resources to organize operations and gain an SCA. Green strategy, green process innovation, top management commitment, and managers' job satisfaction are internal firm resources that can be organized to achieve SCA. Therefore, the use of RBV matches the objective of the study. The study supports the theoretical extension of research into areas that will ground future studies linking other GSCM resources with RBV elements, which will enhance the applicability of RBV in research focusing on greening. The study findings support the existing knowledge and indicate that green innovation practices can explain all environmental performance mechanisms.

The study contributes to the importance of implementing GSCM facets understanding, which enables Jordanian manufacturing firms to enhance their environmental performances in a developing country such as Jordan with the help of green process innovation. Top management in Jordanian firms must realize that the GSCM facets include collaboration that creates value for firms and their supply chain partners for performance gains. The findings of this study will help specialists and policymakers in Jordan and other emerging countries understand the opportunities and challenges GSCM provides. However, Jordanian manufacturing firms believe that GSCM helps create new opportunities to improve their performances; they need to increase investment in implementing GSCM facets to sustain their competitive position in the changing environment and regard them as a strategic resource.

Moreover, the investment will improve their operational competitiveness regarding quality, flexibility, and cost. For instance, considering the roles of emerging technologies, those assist firms in managing information, practices, and processes, like Industry 4.0 technologies. The study suggests that the top managers in Jordanian firms should focus more on the issue of GSCM and support greening in their firms, as greening is a long-run process. Given the above arguments, there is still a need for more efforts by the Jordanian government to promote GSCM accreditation. High costs are associated with greening manufacturing facilities or upgrading existing ones, vast investments are also made in redesigning products and processes to make them eco-friendly. In other words, these initiatives impose a financial burden that reduces the firm's profitability. At the time of collecting data, Jordanian firms suffered from recession after the COVID-19 pandemic and were still trying to recover.

Although this study was designed and tested in the best possible manner, certain limitations would offer opportunities for future research. First, this study measured two GSCM facets, which are considered the main facets of the manufacturing processes. However, other facets exist, particularly in the context of other countries. Second, the study population included only manufacturing firms; there is a problem in generalizing the results for firms in the service sector. Thus, there is a need to investigate this further in future research. Third, the sample included firms of different industrial types due to the small number of firms in Jordan that belong to one kind. Future studies may be conducted on firms of one industry type to obtain more generalized results for industry types. Fourth, the study used top management commitment as a moderator. Future studies may investigate green training as a moderator between GSCM facets (green strategy and green design) and environmental performance. Fifth, having cross-sectional data on Jordanian manufacturing firms helped us to recognize the effect of GSCM facets and green process innovation on environmental performance. However, longitudinal data can help understand causal relationships and variable patterns over a certain period, ensuring further accuracy. A qualitative study to reveal why top management is unenthusiastic in implementing GSCM facets needs to be performed.

The main conclusion of this study is that management attitudes (managers' job satisfaction and top management commitment) need to be synchronized with green supply chain management practices. Green strategy is, after all, implemented by the managers. If they are unsatisfied with their work and do not have a conducive work environment, the chances of translating green strategy into green process innovation will be low. Likewise, top management's commitment to sustainable development and greening initiatives can attenuate the conversion of green strategy and design into environmental performance. Thus, organizations must focus on the middle managers' job satisfaction and work to maintain environmentally committed managers at the top positions.

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