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Leveraging lean and green supply chain practices for sustainable supply chain performance: the moderating role of environmental orientation

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ABSTRACT
This study investigates the impact of lean and green supply chain practices on business process performance and sustainable supply chain performance. The research utilises the resource-based view (RBV) theory to construct a conceptual model wherein lean and green supply chain practices are employed to augment business processes and sustainable performance. Concurrently, dynamic capabilities theory is applied to signify an organisation's capacity to adapt and evolve in response to internal and external pressures from customers and competitors. The conceptual model is validated using structural equation modelling with a sample of 170 supply chain practitioners from the apparel and textile supply chain in Jordan. Results indicate that lean practices exhibit no direct impact, whereas green practices significantly influence business process performance and indirectly affect sustainable supply chain performance. Business process performance does not mediate the relationship for lean practices, but it does so for green practices. Moreover, the environmental orientation of both competitors and customers negatively moderates the impact of green practices on business processes and sustainable supply chain performance. These findings contribute to existing literature and underscore the crucial role of green supply chain practices in enhancing sustainable supply chain performance in the apparel and textile industry.

KEY WORDS
lean, supply chain, green supply chain, business process performance, environmental orientation, sustainable, apparel industry, textile industry, Jordan

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Introduction

While the global apparel and textile (A&T) industry plays a critical role in the economy, it also faces substantial environmental and social challenges. The necessity for sustainable supply chain practices within this sector is evident, driven by the need to align with consumer and regulatory expectations while mitigating negative environmental and societal impacts. Achieving sustainable supply chain performance in this context requires the simultaneous adoption of lean and green supply chain practices.

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The combination of lean supply chain practices, centring on waste elimination and efficiency enhancement (Dora et al., 2016; Dhingra et al., 2014), and green supply chain practices, which incorporate environmental considerations into the supply chain (Razzak, 2022), is thought to yield the most effective outcomes for sustainable supply chain performance (Dües et al., 2013; Fercoq et al., 2016; Naseem & Abbas, 2022; Aladayleh et al., 2023).

Critical gaps persist, although the literature recognises the potential synergy between lean and green supply chain practices for achieving sustainable supply chain performance. Essaber et al. (2021) and Ezzahra et al. (2022) argue that there is a need for clarification regarding the relationship between lean and green paradigms, underscoring the importance of tangible integration approaches. Furthermore, comprehensive coverage of empirical research on the impact of these practices, particularly in the manufacturing sector, is yet to be attained (Kosasih et al., 2023; Lima et al., 2022).

Incorporating lean, green, and sustainability into the supply chain poses a formidable integration challenge, even for organisations in developed countries (Essaber et al., 2021; Ezzahra et al., 2022). Awan et al. (2022) emphasised the complexities that organisations encounter when attempting to merge lean, green, and sustainability approaches.

Numerous studies have explored the effects of either lean or green supply chains on sustainable performance. However, there is a need for additional research that investigates the integration of both models. Additionally, there is an apparent absence of studies examining the moderating role of environmental orientation in the relationship between lean and green supply chains, specifically in sustainable supply chain performance.

Kosasih et al. (2023) highlighted the need to investigate how lean and green practices influence the sustainable supply chain performance of manufacturing. Simultaneously, El-Garaihy et al. (2022) delved into institutional pressures and environmental orientation, emphasising their roles in implementing green supply chain practices and their considerable impact on economic and ecological performances. Khattab et al. (2022) stressed the importance of environmental orientation, particularly in adopting green supply chain practices. Furthermore, Choudhary et al. (2022) explored the effects of lean and quality management practices on green supply chain practices, revealing enhancements in operational and environmental performances despite the decrease in economic performance. Awan et al. (2022) contributed by demonstrating the substantial impact of lean manufacturing practices on sustainable performance and elucidating the mediating role of green supply chain management.

While current research suggests that a proactive environmental stance among competitors and heightened environmental awareness among consumers encourage adopting lean and green practices, there is still a notable gap. It is crucial to explicitly explore how the environmental orientation of both competitors and consumers influences the relationship between lean and green supply chain practices. A holistic approach is necessary to effectively implement lean and green practices, particularly within the apparel and textile (A&T) industry. The challenges associated with extending these practices to developing countries, especially in the textile sector, highlight significant gaps in existing research. Bridging these gaps is essential for a nuanced understanding of the interplay between lean and green supply chain practices and their impact on sustainable supply chain performance.

According to the World Trade Organisation (2021), International Labour Organisation (2021), and McKinsey & Company (2021), the apparel and textile (A&T) industry stands as a cornerstone in the global economy, wielding considerable economic value and employment influence. Engaged in the production of clothing, textiles, and related goods, this industry is a significant contributor to the economic growth of numerous nations. The World Trade Organisation (WTO) estimates the global textile and apparel industry's value to be an impressive USD 2.4 trillion, underscoring its substantial economic footprint. The A&T sector operates within intricate supply chains, with production typically concentrated in developing countries and consumption predominantly in developed nations. However, this industry grapples with multifaceted challenges, ranging from sustainability concerns and labour conditions to the rapid pace of technological advancements. As highlighted in reports by the International Labour Organisation (ILO) and McKinsey & Company, responsible business conduct and navigating the evolving landscape are pivotal for the A&T industry's sustainable development. Given its profound impact on the global economy, continuous scrutiny and analysis of this sector are imperative.

According to the Jordan Chamber of Industry and Jordan Investment Board, Jordan's Apparel and Textile (A&T) industry plays a significant role in the

country's economy, substantially contributing to industrial exports. As the Jordan Investment Board reported, the A&T sector stands as Jordan's second-largest export sector, constituting approximately 20 % of total exports. The sector employs around 75,000 workers, predominantly in the garment-manufacturing sub-sector. The industry strongly emphasises export-oriented production, with a considerable portion directed towards the US and EU markets (Jum'a, 2023).

Moreover, the industry has benefited from several free trade agreements with the US and EU, increasing exports and attracting foreign investment. Renowned for its highly skilled workforce and the ability to manufacture high-quality products at competitive prices, the A&T industry faces challenges common to many industrial sectors, including the pressure on natural resources and contributions to pollution and waste (Al-Ma'aitah, 2018; Diab et al., 2015).

Beyond lean and green supply chain practices, environmental orientation is a critical factor influencing sustainable supply chain performance. Environmental orientation is an organisation's recognition and response to environmental considerations in operations and decision-making (Keszey, 2019). This orientation has shown a positive impact on Business Process Performance (Chan, 2010; Dolores López-Gamero et al., 2011), as well as overall financial and market performance (Leonidou et al., 2017; Amores-Salvadó et al., 2015; Vidal et al., 2022).

The environmental orientation of competitors and consumers can influence the impact of lean and green management practices on business process performance. Awan et al. (2022) emphasised the role of the environmental orientation of competitors and consumers in influencing the adoption and implementation of Green Supply Chain Management, suggesting that it can moderate the impact of lean management practices on business process performance. Choudhary et al. (2022) revealed that adopting lean and quality management practices led to improvements in operational and environmental performance. This underscores the notion that the environmental orientation of competitors and consumers, which may drive the adoption of green supply chain practices, can moderate the impact of lean management practices on business process performance.

Furthermore, Kosasih et al. (2023) emphasised the necessity for a practical model to encourage companies to adopt lean and green practices. This underscores the potential moderating influence of environmental orientation on the connection between lean and green practices and business process performance. El-Garaihy et al. (2022) highlighted the substantial impact of environmental orientation on green supply chain practices and their positive effects on economic and ecological performances.

However, the relationships among environmental orientation, lean supply chain practices, green supply chain practices, and sustainable supply chain performance require further clarification and investigation (Raut et al., 2021; Fercoq et al., 2016; Huo et al., 2017). This need is particularly pronounced in Jordan's Apparel and Textile (A&T) industry, where organisations aspire to achieve sustainable supply chain performance but need more specific models and approaches for success. This research aims to fill this gap by examining the relative impact of business process performance when implementing lean and green management practices in Jordan's A&T industry. Additionally, the study aims to test the moderating effect of environmental orientation on the relationship between green supply chain practices and business process performance, contributing to a deeper understanding of how business process performance, influenced by the lean and green approach, contributes to sustainable supply chain performance.

This research addresses gaps in the existing literature and the practical implementation of sustainable practices in the A&T industry, specifically focusing on extending these practices from developed to developing countries. The study is significant for the textile sector, providing valuable insights that can inform strategies for achieving sustainable supply chain performance in this critical industry.

The rest of this paper is organised as follows: Section 2 discusses the literature review and hypotheses development. Section 3 details the methodology, sampling, measures, and the survey. The measurement and structural model results are presented in Section 4. Section 5 discusses the results and provides theoretical and managerial implications. Finally, Section 6 offers a conclusion, limitations, and directions for future work.

1. Literature review and hypotheses development

In alignment with the resource-based view (RBV), organisations attain a competitive edge by

efficiently leveraging and managing natural resources (Hart, 1995; Hart & Dowell, 2011). Extending this perspective, lean and green practices can be viewed as resources empowering organisations to enhance business process performance and sustainability (Awan et al., 2022; Waqas et al., 2022). The study's conceptual model is also congruent with dynamic capabilities defined by Teece et al. (1997) as an organisation's ability to adapt to external and internal pressures. Organisations can adeptly respond to the escalating market demand for sustainability by improving business process performance through lean and green practices.

Various lean manufacturing and green practices significantly influence sustainability performance, aligning with RBV theory's emphasis on internal resources and capabilities (Waqas et al., 2022). According to Waqas et al. (2022), sustainable firm performance is triggered by lean, green, and supply chain practices, underscoring the role of unique and valuable resources in driving sustainability. The integrated lean-green practices and supply chain sustainability for manufacturing underscores the necessity for a practical model to attract organisations to lean and green practices, in harmony with RBV theory's acknowledgement of the importance of developing and leveraging internal resources (Sukwadi & Caesar, 2022).

Supply chain sustainability involves integrating environmentally and socially responsible practices throughout the supply chain. This integration ensures that processes, products, and services contribute to the health and well-being of society and the environment (Espinoza et al., 2023; Keller et al., 2022). Sustainability in the supply chain has gained significant attention due to the increasing world population, resource scarcity, and the imperative to address environmental and social impacts (Espinoza et al., 2023).

Sustainable supply chain performance measures the environmental and social impacts of supply chain activities (Fercoq et al., 2016). Lean supply chain practices aim to minimise waste and improve efficiency in the supply chain (Kosasih et al., 2023), while green supply chain practices focus on reducing environmental impact (Choudhary et al., 2022). The sustainability performance in supply chain management underscores the need to adapt lean and green supply chains to contemporary manufacturing processes and environmental protection (Espinoza et al., 2023; Sharifpour et al., 2022).

Environmental orientation refers to business strategies and management approaches prioritising environmental sustainability. In this context, environmental orientation signifies a company's commitment to minimising environmental impact and integrating sustainability principles into its operations (Vidal et al., 2022; Kosasih et al., 2023; Azam et al., 2022). These concepts are interconnected and essential for creating a sustainable and efficient supply chain. They collectively address environmental and social impacts, efficiency, and governance mechanisms, all crucial for achieving long-term success while minimising environmental and social impacts.

Fig. 1 shows a proposed conceptual framework consisting of five factors: lean supply chain practices, green supply chain practices, business process performance, sustainable supply chain performance, and environmental orientation for competitors and customers. Business process performance mediates the relationship between lean and green supply chain practices in sustainable supply chain performance. The environmental orientation of competitors and customers moderates the relationship between green supply chain practices and business process performance.

1.1. Lean supply chain practices, business process performance, and sustainable supply chain performance

Lean supply chain practices are acknowledged in the literature for their positive influence on sustainable supply chain performance (Dora et al., 2014; Lyu et al., 2020; Jiang et al., 2018; Carter & Liane Easton, 2011; Lee & Zhang, 2019; Bhanot et al., 2017; Dües et al., 2013). The fundamental principle of the lean model revolves around fostering collaboration among interdependent partners, eliminating waste, and streamlining non-value processes through comprehensive value chain analysis (Dora et al., 2016). Critical implementations of lean supply chain practices, such as just-in-time, lead time reduction, and mass customisation, have effectively reduced waste and enhanced efficiency in companies (Jiang et al., 2018; Carter & Liane Easton, 2011; Lee & Zhang, 2019).

Furthermore, the lean model is crucial in identifying organisational gaps and standardising internal processes to achieve technical and organisational flexibility (Bhanot et al., 2017; Dües et al., 2013). The literature underscores that business process performance mediates the relationship between lean supply chain practices and sustainable supply chain performance (Raut et al., 2021; Fercoq et al., 2016; Amores-Salvadó et al., 2015). Implementing the lean model

enhances business process performance and overall sustainability (Feng & Jiang, 2022). This is attributed to the lean model's focus on waste reduction, efficiency improvement, and subsequent enhancement of business process performance, ultimately culminating in improved sustainability performance (Raut et al., 2021; Fercoq et al., 2016; Huo et al., 2019).

The literature review suggests a positive impact of lean supply chain practices on sustainable supply chain performance and identifies business process performance as a mediating factor in this relationship. Given this, investigating the effects of lean supply chain practices on business process performance and sustainable supply chain performance in this specific industry is particularly relevant.

Based on the literature, the following hypotheses are formulated:

H1: Lean supply chain practices positively impact business process performance in the Jordanian A&T supply chain.

H2: Business process performance mediates the relationship between lean supply chain practices and sustainable supply chain performance in the Jordanian A&T supply chain.

1.2. Green supply chain practices, business process performance, and sustainable supply chain performance

Green supply chain practices encompass initiatives such as energy use reduction, eco-design, and waste management, which have been shown to enhance business process performance (Leonidou et al., 2017; Doolun et al., 2018; Feng & Jiang, 2022). Implementing optimal environmental practices, including adopting more efficient processes, eco-friendly packaging, emission reduction, and recycling, has been associated with achieving economic value and improving business process performance (Doolun et al., 2018; Lyu et al., 2020).

Moreover, the relationship between green supply chain practices and sustainable supply chain performance is mediated by business process performance. By augmenting business process performance through the adoption of green supply chain practices, companies are positioned to achieve superior sustainable supply chain performance outcomes (Raut et al., 2021; Fercoq et al., 2016; Amores-Salvadó et al., 2015). This is attributed to the focus of green supply chain practices on waste reduction and efficiency improvement, contributing to an enhanced business process performance that ultimately translates into improved sustainable supply chain performance (Huo et al., 2019).

The hypotheses proposed that green supply chain practices play a pivotal role in enhancing both business process performance and sustainable supply chain performance. Companies operating in this sector stand to improve their overall performance by prioritising green supply chain practices initiatives and recognising the mediating influence of business process performance on sustainable supply chain performance. Drawing from the reviewed literature, the following hypotheses are posited:

H3: Green supply chain practices positively impact business process performance in the Jordanian A&T supply chain.

H4: Business process performance mediates the relationship between green supply chain practices and sustainable supply chain performance in the Jordanian A&T supply chain.

1.3. Business process performance and sustainable supply chain performance

A thorough literature examination indicates that business process performance is critical to sustainable supply chain performance. Business process performance is integral to achieving sustainable outcomes (Raut et al., 2021). sustainable supply chain performance, in this context, refers to a supply chain's ability to meet present needs without compromising the ability of future generations to meet their own needs (Fercoq et al., 2016).

Empirical evidence supports the notion that the implementation of green supply chain practices, encompassing measures like energy use reduction, eco-design, and waste management, can enhance business process performance, ultimately contributing to improved sustainable supply chain performance (Leonidou et al., 2017; Doolun et al., 2018). Companies focusing on optimal environmental practices, such as adopting efficient processes, eco-friendly packaging, emission reduction, and recycling, can simultaneously achieve economic value (Doolun et al., 2018; Lyu et al., 2020). Additionally, lean supply chain practices have been identified as effective means to reduce waste and increase operational efficiency (Jiang et al., 2018; Carter & Liane Easton, 2011; Lee & Zhang, 2019).

Furthermore, existing research highlights that business process performance acts as a mediator in the relationship between green supply chain practices and sustainable supply chain performance (Raut et

al., 2021; Fercoq et al., 2016; Amores-Salvadó et al., 2015). This implies that by enhancing business process performance by adopting lean and green supply chain practices, companies can achieve superior sustainable supply chain performance outcomes (Raut et al., 2021; Fercoq et al., 2016; Huo et al., 2019).

Given the robust support from the literature, the following hypothesis is well-founded and can be proposed:

H5: Business process performance positively impacts sustainable supply chain performance in the Jordanian A&T supply chain.

1.4. Moderating-mediating role of environmental orientation

The moderating role of environmental orientation has been extensively acknowledged in prior research (e.g., Jiang et al., 2018; You et al., 2019; Groening et al., 2018; Vidal et al., 2022). These studies highlight environmental orientation as a critical moderator influencing the relationship between green supply chain practices and performance, offering a comprehensive perspective on the impact of lean and green approaches on process performance and sustainability. Notably, two specific moderators, competitor environmental orientation and customer environmental orientation, are identified within the study model, contributing to a nuanced understanding of the moderation effects. Despite the valuable insights provided by external environment-related moderator variables, they are, regrettably, "seldom considered".

Competitor and customer environmental orientation, assessed as micro-environmental variables, are defined by the degree to which competitors and customers perceive environmental issues as significant (Dolores López-Gamero et al., 2011; Chan, 2010; Sharafuddin, 2022). This study posits that these factors can moderate the relationship between green supply chain practices and business process performance. In markets with high competitors and customer environmental orientation, customers strongly prefer environmentally friendly products, and competitors actively emphasise green values (Leonidou et al., 2013). In such environments, survival necessitates companies to be attuned to customer preferences and competitor actions (Dolores López-Gamero et al., 2011; Vidal et al., 2022). Consequently, under heightened environmental pressure from competitors and customers, environmental orientation is expected to amplify its impact on business process performance, indirectly influencing sustainable performance (Leonidou et al., 2013).

Facing elevated environmental pressure, firms are incentivised to develop effective environmental marketing strategies, navigating market turbulence and managerial uncertainty (Fraj-Andrés et al., 2009; Mastos et al., 2022). The ensuing uncertainty prompts firms to leverage intangible resources efficiently. Thus, given the higher pressure levels from the microenvironment, we anticipate that environmental orientation will exert a more pronounced impact on green supply chain practices when both competitors and customers exhibit a heightened environmental orientation. In competitive environments, adopting environmental strategies gives firms a substantial advantage over rivals that is challenging to negate.

Likewise, environmentally conscious customers are inclined to avoid products that are not produced sustainably. Consequently, under conditions of high customer environmental orientation, it is posited that firms more actively engaged in green supply chain practices will exhibit superior processes (Dolores López-Gamero et al., 2011; Vidal et al., 2022; Chavez et al., 2022). The environmental orientation, conceptualised as a second-order model, leads to the formulation of moderator relationships as follows:

H6: The impact of green supply chain practices on business process performance in the A&T supply chain is moderated by the environmental orientation of both competitors and customers.

1.5. Moderating role of environmental orientation on the relationship between green supply chain practices and business process performance and sustainable supply chain performance

Considering (Jiang et al. 2018; You et al., 2019; Groening et al., 2018; Vidal et al., 2022), this study proposes a nuanced perspective on the moderating role of environmental orientation in the relationship between green supply chain practices and business performance and sustainable supply chain performance.

Environmental orientation, as gauged from the standpoint of competitors and customers, emerges as a pivotal factor in shaping the impact of green supply chain practices on business process performance and sustainable supply chain performance. The environmental consciousness of competitors and customers, reflecting their perception of environmental issues' importance (Dolores López-Gamero et al., 2011;

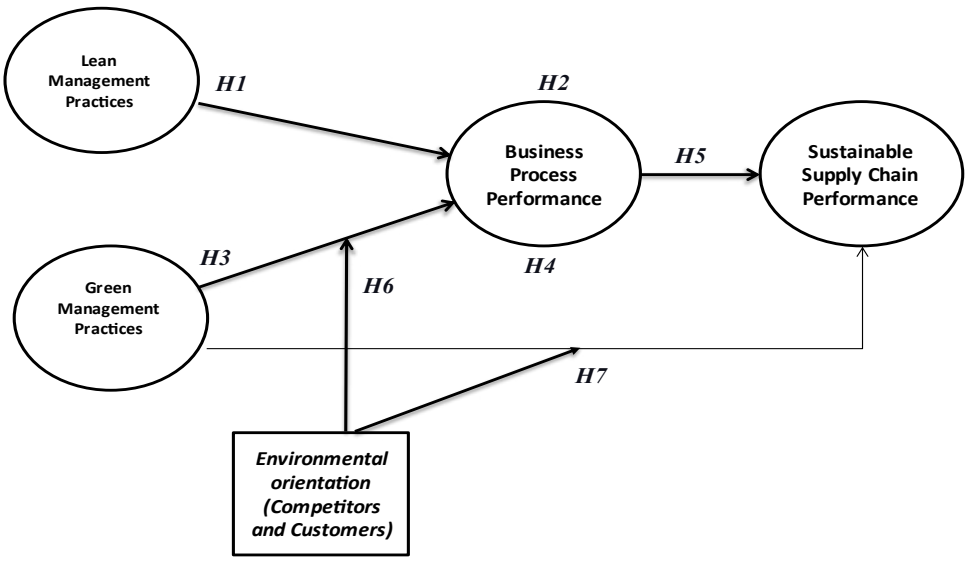

Fig. 1. Proposed Conceptual Framework

Chan, 2010; Sharafuddin, 2022), stands out as a key moderating variable.

In markets characterised by high-end customers and competitor environmental orientation, a distinctive consumer preference exists for environmentally friendly products and a concerted effort by competitors to underscore green values (Leonidou et al., 2013). Navigating such markets necessitates companies to be attuned to customer preferences and competitor actions to thrive (Dolores López-Gamero et al., 2011; Vidal et al., 2022). Consequently, the environmental orientation of competitors and customers is posited to amplify the influence of green supply chain practices on both business process performance and sustainable supply chain performance (Leonidou L.C. et al., 2013).

Furthermore, heightened market pressure from the micro-environment towards environmental values introduces managerial uncertainty and turbulence (Fraj-Andrés et al., 2009; Mastos et al., 2022). This uncertainty, in turn, may affect firms' efficient utilisation of intangible resources. In environments where both competitors and customers are more environmentally oriented, the environmental orientation is anticipated to exert a more pronounced impact on green supply chain practices. Embracing environmental strategies in competitive settings becomes instrumental for firms to gain a substantial edge over key rivals (Dolores López-Gamero et al., 2011; Vidal et al., 2022). Similarly, environmentally conscious customers will likely abstain from purchasing products that do not adhere to sustainable production practices. Consequently, under high competitors and customer environmental orientation conditions, a positive relationship is anticipated between the firm's engagement in green supply chain practices and both process efficiency and sustainable performance (Chavez et al., 2022).

Building on this rationale, the following hypothesis is posited:

H7: Environmental orientation of competitors and customers positively moderates the effect of green management practices on business process performance and sustainable supply chain performance.

Fig. 1 illustrates the conceptual model of this study.

2. Methodology

2.1. Measures, survey, and methods

This study aims to examine and substantiate the impact of lean supply chain practices and green supply chain practices on business performance and sustainable supply chain performance within the A&T supply chain in Jordan. Additionally, the study endeavours to validate the moderating role of environmental orientation from competitors and customers in influencing the relationship between green

supply chain practices, business process performance and sustainable supply chain performance. The research objectives were pursued by analysing data collected from Supply Chain managers in the Jordanian A&T supply chains.

The data collection instrument was a questionnaire featuring individual items gathered from prior studies (refer to Appendix A for a comprehensive list of constructs and their items). Twelve items, drawn from the works of Fercoq et al. (2016), Raut et al. (2021), Dey et al. (2019), and Digalwar et al. (2020), were employed to gauge lean supply chain practices. The measurement of green supply chain practices adopted items from studies conducted by Huo and Wang (2019), Kumar and Rodrigues (2018), Lee et al. (2012), and Lee et al. (2015). Business process performance was measured using items derived from research by Lyons et al. (2019), Wan et al. (2014), and Zhang et al. (2007). The scale items for sustainable supply chain performance were developed based on studies by Raut et al. (2021) and Centobelli et al. (2020). Finally, items from the studies of Keszey (2019), Jiang et al. (2018), and Dolores López-Gamero et al. (2011) were employed to measure the environmental orientation of both competitors and customers.

The environmental orientation was modelled as a second-order construct, encompassing two sub-constructs: competitors and customers. All items were assessed using a five-point Likert scale (ranging from five for "Strongly Agree" to one for "Strongly Disagree"). A non-probability sampling method was used due to the absence of specific data from the A&T supply chains and the complexity of determining the number of managers involved in supply chain activities in industrial companies. The questionnaires were distributed to managers overseeing various aspects of supply chain operations, including purchasing, inventory, production, customer and supplier relations, and managers and engineers affiliated with companies engaged in supply chain operations within the Jordanian A&T sector.

The survey was meticulously designed to focus on individuals with expertise in manufacturing-related practices within the Jordanian A&T sector. Factories with a workforce exceeding 100 employees were deliberately selected to ensure a comprehensive and representative sample — this criterion aimed to obtain a sufficiently large and diverse dataset.

In the distribution phase, the questionnaire was directly administered to managers identified through the research team. A targeted outreach effort targeted 230 managers across various companies within the sector. In total, 179 responses were received, reflecting the engagement and cooperation of the surveyed entities. Notably, 170 of these responses proved to be valid and substantial, contributing valuable information to the analysis. This subset constituted a significant 74 % of the total questionnaires received, attesting to the robustness and reliability of the collected data for the research objectives.

To counteract potential common method bias, the study followed the guidelines outlined by Podsakoff et al. (2003), urging respondents to finalise the questionnaire within a defined and brief timeframe (limited to a maximum of two weeks). The assessment of common method bias, conducted through Harman's single-factor test, revealed a variance of 37.06, well below the critical threshold of 50 %. This outcome affirms the absence of common method bias in the study.

The study employed partial least squares-structural equation modelling (PLS-SEM) using SmartPLS to test the proposed model. PLS-SEM was deemed suitable for its capability to accurately estimate the relationships between constructs and simultaneously analyse structural and measurement models, especially in cases involving exploratory and intricate relationship models with elements of mediation and moderation (Chin, 1998; Sarstedt et al., 2017; Hair et al., 2014).

2.2. Sample

Table 1 presents comprehensive information on the study participants, offering insights into their demographics based on experience level, education, and job title. The breakdown of respondents by experience reveals that the largest segment (28 %) has less than five years of experience, followed by those with 5–10 years (22 %), 10-15 years (31 %), and over 15 years (19 %) of experience. Regarding educational background, the majority (55 %) hold an undergraduate degree, while 45 % possess a graduate degree.

The distribution of respondents across various job titles is as follows: 22 % in purchasing, 6 % in inventory, 8 % in production and operations, 7 % in customer relations, 14 % in supplier relations, 12 % in quality management, 7 % in design and engineering, 11 % in transportation and logistics, 5 % in information and technology, 2 % in marketing and sales, and 4 % in other roles.

Tab. 1. Information about the respondents

Experience	Frequency	%
Demographics		
< 5 Years	47	28 %
5 - < 10 Years	38	22 %
10 - < 15 Years	52	31 %
> 15 Years	33	19 %
Education		
Undergraduate	94	55 %
Graduate	76	45 %
Job title		
Purchasing	38	22 %
Inventory	11	6 %
Production and operations	14	8 %
Customer relations	12	7 %
Supplier relations	23	14 %
Quality management	21	12 %
Design and engineering	12	7 %
Transportation and logistics	19	11 %
Information and technology	9	5 %
Marketing and sales	4	2 %
Others (SC planners, analysts, project managers, export/import, auditors, etc.)	7	4 %
Total	170	

3. Results

3.1. Measurement model, reliability, and validity

Reliability signifies the extent to which the measurement model is devoid of error and consistently produces reliable results. Hair et al. (2014) advocate using Cronbach's alpha and composite reliability to assess reliability. A measurement model is deemed to yield consistent results when all alpha measures surpass the threshold of 70 %, and all composite reliability values are greater than 70 %. These criteria indicate that the measurement model provides reliable and dependable outcomes.

Validity, on the other hand, reflects the accuracy with which the items measure the intended construct. It is established when the Average Variance Extracted (AVE) values surpass the designated threshold of 0.5 (Fornell & Larcker, 1981), as illustrated in Table 2. Convergent validity, as indicated by Hair et al. (2014), is confirmed when standardised loading values for each item exceed the 0.70 cutoff (t-value > 2) and are statistically significant. The validity outcomes of the scale were enhanced by eliminating items with insufficient factor loadings, specifically those falling below the threshold of 0.70. A detailed presentation of these adjustments can be found in Appendix A, illustrating the items dropped from the analysis.

According to Hair et al. (2014), reliability is affirmed by assessing collinearity. As depicted in Table 2, the Variance Inflation Factor (VIF) values do not exceed the threshold value of three, indicating the absence of collinearity issues. This supports the formative nature of all constructs. The evaluation of the second-order measurement scale is also presented in Table 3.

Moreover, Table 3 highlights that the outer weights of each Environmental Orientation (EO) indicator surpass the 10 % limit, and the significant values of these weights for all indicators provide empirical support for the validity of the retained items. The results in Table 3 indicate positive relationships between the competitor's environmental orientation and the customer's environmental orientation with environmental orientation. Specifically, the competitor's environmental orientation exhibits the most significant contribution (0.551), followed by the customer's environmental orientation (0.529).

Discriminant validity gauges the degree to which a construct distinguishes itself from others. This is determined by calculating the square root of the AVE value for each construct and comparing it with the cross-loading values of different constructs (Fornell & Larcker, 1981). Considering these criteria ensures a comprehensive assessment of the measurement model's reliability and validity.

In Table 4, the results reveal that each construct's square root of the Average Variance Extracted (AVE) values surpasses the correlations in both rows and columns within the matrix. This finding suggests the achievement of discriminant validity. The first-order measurement model is characterised by reliability, internal consistency, and satisfactory convergent and discriminant validity levels.

Additionally, the cross-loading results indicate that values correlating with a particular variable are higher than those correlating with other variables. Consequently, the inter-variable correlation is low, indicating favourable conditions, and the discriminant validity values are within acceptable ranges, as detailed in Table 5.

Finally, Fig. 2 presents the outcomes of the measurement model testing, providing a visual representation of the results.

Tab. 2. First-order model

Constructs	Loading	VIF	a	CR	AVE
Business Process Performance			0.893	0.916	0.61
BPP1	0.720	1.666			
BPP2	0.757	2.095			
BPP3	0.798	2.281			
BPP4	0.798	2.663			
BPP6	0.821	2.301			
BPP7	0.788	2.729			
BPP8	0.781	2.513			
Competitors' environmental orientation			0.864	0.907	0.71
CEO1	0.817	1.909			
CEO2	0.828	2.120			
CEO3	0.863	2.414			
CEO4	0.862	2.237			
Customers' environmental orientation			0.822	0.883	0.655
CuEO1	0.708	1.359			
CuEO2	0.836	2.035			
CuEO3	0.827	1.931			
CuEO4	0.859	2.132			
Green supply chain practices			0.848	0.892	0.622
GP1	0.748	1.569			
GP2	0.811	2.115			
GP3	0.790	2.022			
GP4	0.800	1.901			
GP5	0.793	1.913			
Lean supply chain practices			0.889	0.913	0.599
LP10	0.751	2.083			
LP11	0.814	2.667			
LP12	0.804	2.173			
LP4	0.719	1.724			
LP5	0.786	2.017			
LP8	0.771	2.078			
LP9	0.771	2.335			
SSCP			0.819	0.88	0.647
SSCP2	0.808	1.678			
SSCP3	0.805	1.824			
SSCP4	0.803	1.835			
SSCP6	0.802	1.746			

α= Cronbach's Alpha; CR=Composite Reliability; AVE = Average Variance Extracted.

Tab. 3. Second-order model evaluation (environmental orientation)

SECOND-ORDER/ FIRST-ORDER CONSTRUCTS	OUTER VARIANCE INFLATION FACTORS (VIF)	OUTER WEIGHTS	STANDARD DEVIATION	T-VALUE	P-VALUES
Competitors' environmental orientation		0.551	0.02	28.185	0.000
CEO1	2.256	0.168			
CEO2	2.154	0.148			
CEO3	2.597	0.161			
CEO4	2.651	0.178			
Customers' environmental orientation		0.529	0.022	24.026	0.000
CuEO1	1.814	0.156			
CuEO2	2.223	0.161			
CuEO3	2.146	0.166			
CuEO4	2.195	0.17			

Tab. 4. Fornell–Larcker criterion of Discriminant validity for the first-order factor model

CONSTRUCT	1	2	3	4	5	6
1. Business Process Performance	**0.781**					
2. Competitors' environmental orientation	0.670	**0.843**				
3. Customers' environmental orientation	0.746	0.716	**0.809**			
4. Green SC	0.714	0.486	0.613	**0.789**		
5. Lean SC	0.614	0.549	0.572	0.746	**0.774**	
6. Sust. SC performance	0.754	0.773	0.741	0.626	0.566	**0.805**

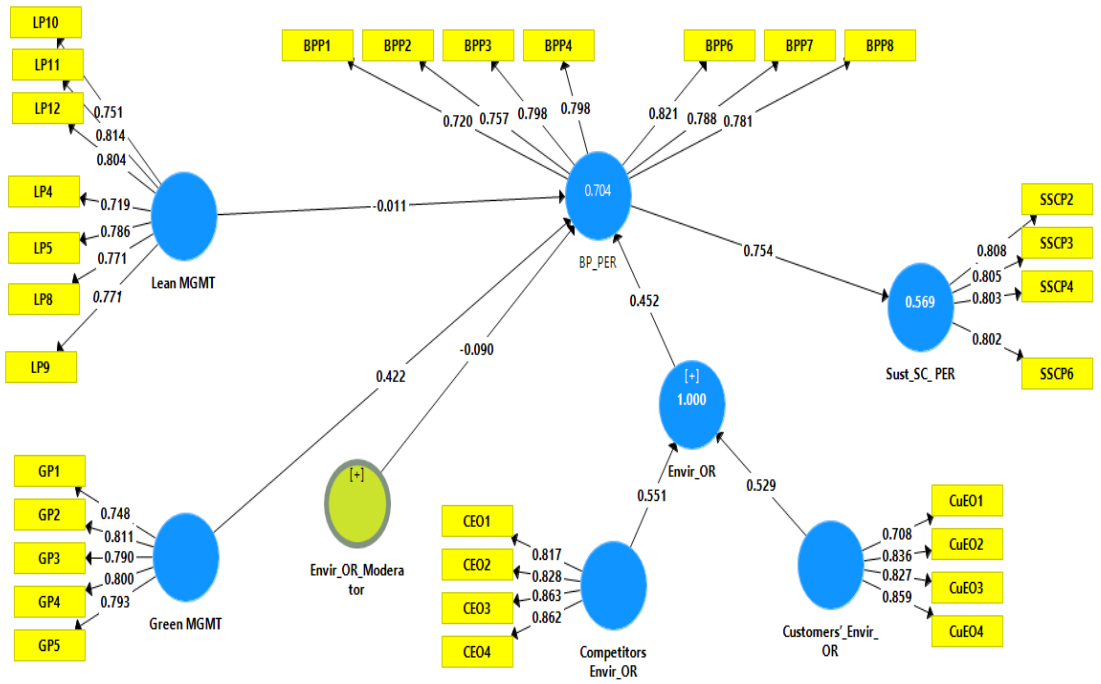

Fig. 2. Measurement scale output

Tab. 5. Fornell–Larcker criterion of discriminant validity for the first-order factor model

	Business Process Performance	Competitors' environmental orientation	Customers' environmental orientation	Green SC	Lean SC	Sust. SC performance
BPP1	**0.720**	0.378	0.523	0.670	0.550	0.491
BPP2	**0.757**	0.498	0.482	0.489	0.461	0.526
BPP3	**0.798**	0.551	0.613	0.530	0.505	0.543
BPP4	**0.798**	0.556	0.551	0.535	0.430	0.507
BPP6	**0.821**	0.604	0.674	0.573	0.444	0.645
BPP7	**0.788**	0.550	0.608	0.545	0.483	0.715
BPP8	**0.781**	0.508	0.604	0.565	0.493	0.658
CEO1	0.629	**0.817**	0.587	0.439	0.472	0.726
CEO2	0.478	**0.828**	0.520	0.338	0.397	0.604
CEO3	0.518	**0.863**	0.610	0.355	0.432	0.608
CEO4	0.628	**0.862**	0.685	0.497	0.540	0.667
CuEO1	0.580	0.614	**0.708**	0.387	0.405	0.513
CuEO2	0.596	0.529	**0.836**	0.458	0.391	0.580
CuEO3	0.605	0.593	**0.827**	0.609	0.584	0.674
CuEO4	0.631	0.579	**0.859**	0.522	0.464	0.624
GP1	0.568	0.472	0.531	**0.748**	0.718	0.558
GP2	0.562	0.401	0.504	**0.811**	0.528	0.529
GP3	0.503	0.286	0.363	**0.790**	0.545	0.409
GP4	0.603	0.360	0.512	**0.800**	0.561	0.478
GP5	0.568	0.386	0.492	**0.793**	0.584	0.485
LP10	0.393	0.355	0.386	0.531	**0.751**	0.332
LP11	0.492	0.408	0.470	0.582	**0.814**	0.422
LP12	0.507	0.518	0.474	0.549	**0.804**	0.492
LP4	0.406	0.381	0.427	0.566	**0.719**	0.362
LP5	0.558	0.466	0.505	0.590	**0.786**	0.522
LP8	0.478	0.426	0.408	0.658	**0.771**	0.469
LP9	0.460	0.396	0.410	0.565	**0.771**	0.431
SSCP2	0.685	0.576	0.682	0.631	0.563	**0.808**
SSCP3	0.542	0.673	0.585	0.396	0.386	**0.805**
SSCP4	0.557	0.609	0.544	0.445	0.376	**0.803**
SSCP6	0.624	0.640	0.559	0.510	0.471	**0.802**

3.2. Structural model and hypothesis testing

This study used structural equation modelling to examine relationships (Fig. 3). The findings presented in Table 6 indicate that all direct hypotheses are substantiated, except for the impact of lean supply chain practices (H1) on business process performance (β = -0.011, p= 0.89). The hypothesis regarding the influence of green SC practices (H3) on business process performance is confirmed (β = 0.422, p= 0.000), as is the effect of business process performance on sustainable supply chain performance (H5) (β = 0.754, p= 0.000). Following the procedures outlined by Preacher and Hayes (2008), bootstrapping was employed to assess mediation relationships, as detailed in Table 7.

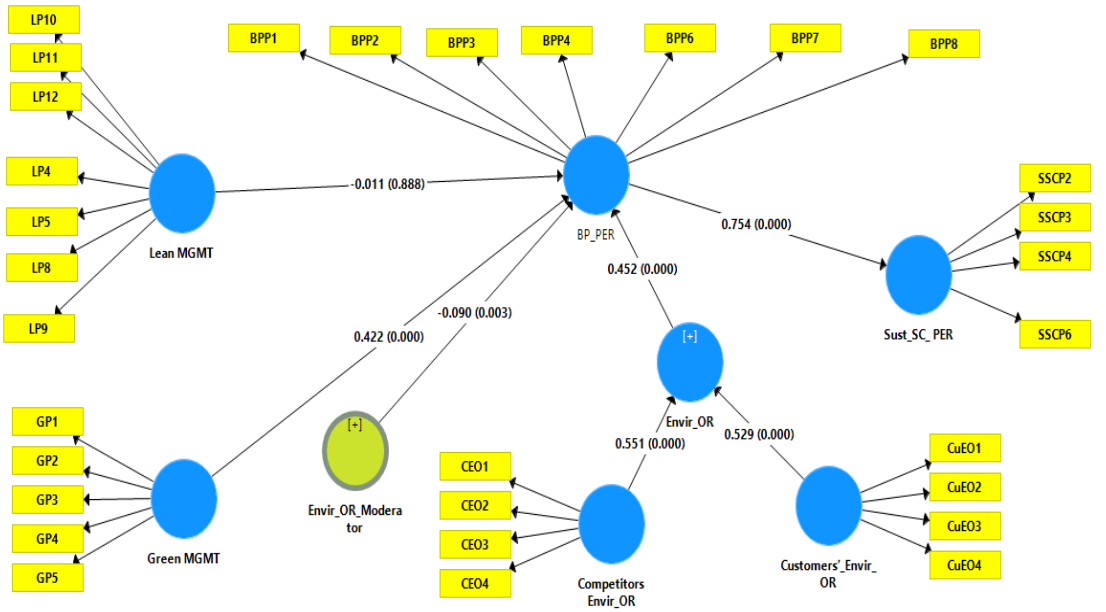

Fig. 3. Testing of the structural model

Tab. 6. Direct Hypotheses Testing

Hypothesis		Beta	Mean (M)	Standard Deviation (STDEV)	T (O/STDEV|)	P Values	Decision
Direct (H1)	Lean SC -> business process performance	-0.011	-0.005	0.082	0.138	0.890	Not supported
Direct (H3)	Green SC -> business process performance	0.422	0.424	0.067	6.313	0.000	Supported
Direct (H5)	Business process performance -> Sust. SC performance	0.754	0.756	0.052	14.564	0.000	Supported

Tab. 7. Indirect Hypotheses and moderated mediation analysis

Hypotheses (Path)		Estimate	Mean (M)	Standard Deviation (STDEV)	T (O/STDEV)	P Values	LL	UL	Decision
Indirect (H2)	Lean SC -> business process performance -> Sust. SC performance	-0.009	-0.003	0.062	0.138	0.890	-0.123	0.12	Not supported
Indirect (H4)	Green SC -> business process performance -> Sust. SC performance	0.318	0.32	0.049	6.513	0.000	0.227	0.417	Supported
*Confidence interval (CI): 95 % adopted									

The results reveal a significant and indirect effect of green supply chain practices on sustainable supply chain performance, mediated through business process performance (β = 0.318, t = 6.513, 95 % CI = 0.227, 0.417, and non-crossing zero). Meanwhile, the indirect effect of lean supply chain practices on sustainable supply chain performance, mediated by business process performance, is deemed insignificant (β = -0.009, t = 0.138, 95 % CI = -0.123 - 0.12, crossing zero). Consequently, the hypothesis regarding the indirect impact of green supply chain practices (H4) is supported, while the corresponding lean supply chain practices (H2) hypothesis is not supported.

3.3. Moderation-mediation analysis

The study also implemented Preacher and Hayes's (2008) procedures to examine moderation mediation further. Table 8 displays results indicating the attainment of formative factors in the second-order model of environmental orientation, specifically, competitors' environmental orientation (β = 0.551, P = 0.000) and customers' environmental orientation (β = 0.529, P = 0.000). Independently, the direct effect of environmental orientation on business process performance is statistically significant (β = 0.452, t = 6.013, P = 0.000). Furthermore, the moderation effect of environmental orientation on business processes, with green supply chain practices as an independent variable, is significant (β = -0.09, t = 2.891, P = 0.004).

Both the direct impact of green supply chain practices on business process performance (β = 0.422, p = 0.000) and the indirect effect of green supply chain practices on sustainable supply chain performance is significant (β = 0.318, t = 6.513, 95 % CI = 0.227, 0.417, not crossing zero). Consequently, the impact of environmental orientation on business process performance is negatively significant but small. Similarly, for the impact of environmental orientation as a moderation variable on the indirect path (green supply chain practices — business process performance — sustainable supply chain performance, the path test results indicate significance (β = -0.068, t = 2.88, 95 % CI = -0.14, (-) 0.417, not crossing zero). Thus, it can be concluded that the moderation mediation of the environmental orientation hypothesis (H6 and H7) is supported.

Table 8 presents the results of the moderated mediating analysis focusing on environmental orientation. The results indicate a significant negative direct moderation effect of environmental orientation on business process performance. The T-value of 2.891 and the associated p-value of 0.003 suggest that the relationship is statistically significant. The confidence interval (CI) further supports this, providing a range of values within which the actual effect is likely to lie. The moderation effect is negative, indicating that external factors influence the impact of environmental orientation on business process performance. Results in Table 8 also reveal a significant negative indirect moderation effect of environmental orientation on sustainable supply chain performance through business process performance. The T-value of 2.88 and the associated p-value of 0.000 indicate statistical significance. The confidence interval (CI) again supports the result, confirming that the media-

Tab. 8. Results of moderated mediating analysis of environmental orientation

Hypothesis		Beta	Mean (M)	Standard Deviation (STDEV)	T (O/STDEV|)	P Values	LL	UL	Decision
Direct moderation (interaction) H6	Environmental orientation (moderator)-> business process performance	-0.09	-0.09	0.031	2.891	0.003	0.161	0.329	supported
Indirect moderation (interaction) H7	Environmental orientation (moderator) -> business process performance -> sust. SC performance	-0.068	-0.07	0.024	2.88	0.000	-0.14	-0.01	Supported
*Confidence interval (CI): 95 % adopted									

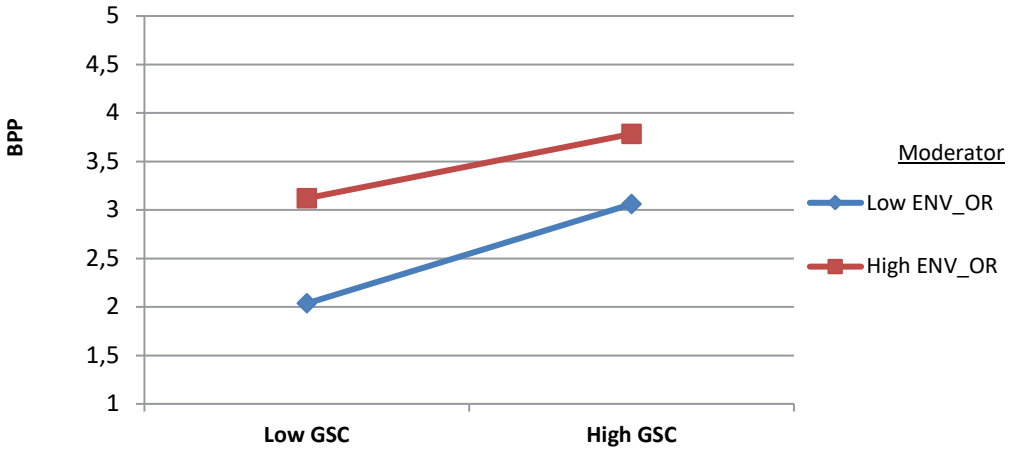

Fig. 4. Moderation effect of environmental orientation on green supply chain practices and business process performance

tion effect is likely present. This suggests that the influence of environmental orientation on sustainable supply chain performance is partially mediated by its impact on business process performance.

Results indicated that both direct and indirect moderation effects are supported by the analysis, indicating that environmental orientation plays a significant role in influencing both business process performance and sustainable supply chain performance. The results provide valuable insights into the complex interplay of these variables within the study context.

As illustrated in Fig. 4, the environmental orientation of competitors and customers underscores the relationship between green supply chain practices and business process performance. The results indicate that environmental orientation dampens the positive relationship between green supply chain practices and business process performance.

4. Discussion and theoretical and managerial implications

This paper examines the impact of green supply chain practices and lean supply chain practices on business performance and sustainable supply chain performance in industrial supply chains. Simultaneously, it explores the moderating role of competitors and customers' environmental orientation on the relationships between green supply chain practices, business process performance, and sustainable supply chain performance. The study employs a structural equation modelling approach to validate and ensure the reliability of the measurement model within the Jordanian A&T supply chain. It scrutinises the structural model and assesses the moderating effect.

The results do not provide direct support for the impact of lean supply chain practices on business process performance, and lean supply chain practices do not exert an indirect impact on sustainable supply chain performance. Conversely, the impact of green supply chain practices is highly significant on business process performance, and the indirect impact is also noteworthy.

Non-confirmation of the hypothesis regarding the impact of lean supply chain practices on business process performance and sustainable performance contradicts the findings of most studies (e.g., Razzak, 2022; Lee & Zhang, 2019; Naseem & Abbas, 2022). Several studies have illustrated the negative effects of lean supply chain practices on sustainable supply chain performance (e.g., D'Souza et al., 2020; Fikar et al., 2018). Despite A&T companies in Jordan adopting lean supply chain practices in their supply chains, they are still in the early stages of implementation. Further skills and experience are needed, such as managers in industrial companies with the ability to recognise the use of lean supply chain practices to enhance business process performance.

Companies require enhanced internal processes for material efficiency, including improved control and monitoring systems and inventory control systems that address removing materials or outdated products. A&T companies should also make more informed choices when selecting production locations to minimise packaging usage, especially for

items exported overseas. Additionally, there is a need for more policies promoting recycling and reducing transportation costs, and there is a lack of emphasis on utilising reusable packaging or implementing inventory or just-in-time production strategies to minimise waste.

On the contrary, the results supported the hypothesis regarding the impact of green supply chain practices on both business performance and sustainable supply chain performance. This outcome aligns with the prevailing theoretical literature on green supply chain practices (Vidal et al., 2022; Mastos et al., 2022). Managers underscored that companies within the Jordanian A&T industry actively strive to integrate environmental considerations into their business practices, primarily through collaboration with suppliers and partners in their supply chains.

Industrial textile companies, in particular, are adopting sustainable design and production techniques while simultaneously undertaking measures to curtail their environmental footprint. These measures encompass minimising material usage, reducing energy consumption, and incorporating more environmentally friendly materials. Notably, efforts extend to decreasing energy consumption in distribution, recycling used and defective products, and collaborating with partners to appropriately manage industrial waste, including sewage, gas, solid, and liquid waste.

This proactive response to global pressures for reducing air emissions, curbing pollution, and conserving natural resources underscores a company's commitment to environmental sustainability intricately linked to its overall business strategy and sustainable performance (Chavez et al., 2022; Kosasih et al., 2023).

It has been observed that the perceptions of competitors and customers regarding the environment significantly impact a business's performance. This finding aligns with several studies (e.g., Amores-Salvadó et al., 2015; Sharafuddin, 2022). Markets with a robust environmental focus have customers who strongly prefer environmentally friendly products, and competitors prioritise green values and sustainability.

Contrastingly, the moderation effect of environmental orientation on the relationship between green supply chain practices and business performance, as well as on Sustainable Supply Chain Performance, is adverse but noteworthy. As depicted in Fig. 4, the moderation effect is subtle, indicating that environmental orientation restrains the positive correlation between green supply chain practices, business process performance, and sustainable supply chain performance. This result contradicts most studies emphasising that environmental orientation can positively influence green supply chain practices to enhance business performance and sustainable supply chain performance (Fraj-Andrés et al., 2009; Mastos et al., 2022).

The significant effect suggests that companies in the A&T supply chain are attuned to customer preferences and competitors' reactions, exerting precise environmental pressure on the companies' green values. However, concurrently, this dynamic creates uncertainty and managerial turmoil. This aligns with the perspectives of Vidal et al. (2022) and Leonidou et al. (2013), who argue that such uncertainty contributes to current situations remaining ambiguous concerning how companies utilise their resources.

Mastos et al. (2022) corroborate that heightened pressure from competitors, customers, or the overall microenvironment, particularly in design, production, distribution, and environmental delivery, may have adverse short-term effects on process performance and, consequently, sustainable performance. Faced with environmental pressures from competitors and customers, companies must make substantial short-term investments in intricate, environmentally friendly design. This involves significant expenditures in research and development, engineering design modifications, and diverse component processing costs. Such circumstances necessitate increased allocations for quality control and technology investment. These factors collectively lead to elevated costs, a decline in operational performance, and potential damage to market share and competitive advantage. Operational delays may arise due to changes in environmental policies (Chavez et al., 2022; Leonidou et al., 2013).

Research by various authors (e.g., Fraj-Andrés et al., 2009; Mastos et al., 2022; Vidal et al., 2022; Chavez et al., 2022) demonstrates that the adoption of environmentally conscious practices can confer a competitive advantage to businesses. Moreover, the substantial consumer demand for eco-friendly products is a significant motivator for companies to integrate sustainable production methods, leading to improved business outcomes and sustainable supply chain practices.

The finding that the environmental orientation of competitors and customers exerts a negative moderation effect on the influence of green supply chain

practices on business performance and sustainable supply chain performance is a somewhat novel finding that merits further investigation. This insight suggests that the efficacy of green supply chain practices could be enhanced when operating in a market with low environmental awareness among competitors and customers.

However, this negative moderation effect might arise because companies facing heightened environmental orientation levels among their competitors and customers experience significant pressure to adopt green supply chain practices. Consequently, they witness a more substantial improvement in both business process performance and sustainability. In contrast, companies operating in a market with low environmental awareness among competitors and customers may encounter less pressure to adopt green supply chain practices, leading to a more modest enhancement in business process performance and sustainability. This nuanced dynamic highlights the intricate relationship between environmental orientation, green supply chain practices, and the environmental consciousness of the market, warranting in-depth exploration.

4.1. Theoretical implications

The theoretical implications derived from the hypothesis testing results in the A&T industry shed light on the effectiveness of green supply chain practices in enhancing business performance and contributing to heightened sustainability performance. This alignment with the principles of the natural resource-based view (RBV) theory is notable, as the RBV suggests that organisations gaining a competitive advantage effectively utilise and possess valuable resources (Hart, 1995; Hart & Dowell, 2011; Waqas et al., 2022). In the context of the A&T industry, green supply chain practices emerge as a crucial natural resource, empowering organisations to elevate their business process performance and sustainability performance.

Moreover, the results unveil a positive mediating role of business process in the relationship between green supply chain practices and Sustainable Supply chain performance (sustainable supply chain performance). This finding resonates with the concept of dynamic capabilities, denoting an organisation's capacity to adapt and evolve in response to internal and external pressures (Teece et al., 1997). By enhancing business process performance through the implementation of green supply chain practices, A&T industry organisations exhibit an enhanced ability to adapt and respond to the growing market demand for sustainability.

The results also illuminate a significant negative moderation effect of competitors' and customers' environmental orientation on the impact of green management practices on both business process performance and sustainable supply chain performance. This underscores the critical importance of considering the external context within which organisations operate. The actions and attitudes of other industry stakeholders, as evidenced by the environmental orientation of competitors and customers, wield influence over the efficacy of green supply chain practices (Gambardella et al., 2015). Consequently, organisations in the A&T industry must be cognisant of the environmental orientation prevailing among their counterparts and customer base to implement green supply chain practices and enhance both business process performance and sustainability performance.

The theoretical implications drawn from the hypothesis testing results in the A&T industry contribute valuable insights to the natural resource-based view, dynamic capabilities theory, and the significance of acknowledging the external context. These findings offer guidance for organisations in the industry aiming to refine strategies and practices, leveraging green supply chain practices to enhance business process performance and sustainability performance.

4.2. Managerial implications

The results of the hypothesis testing offer valuable insights for organisations aspiring to enhance their sustainable supply chain performance. The revelation that lean supply chain practices do not significantly impact business process performance implies that A&T industry organisations need to maintain efficiency to embrace sustainable practices. This resonates with the notion that sustainability and efficiency are not inherently contradictory; organisations can concurrently pursue both objectives (Gao et al., 2018). Furthermore, the correlation between enhanced business process performance and increased sustainability underscores the pivotal role of internal processes and operations in pursuing sustainability. To achieve efficiency and sustainability goals simultaneously, A&T industry organisations should prioritise optimising their business processes and operations (Lin & Chen, 2020).

The positive impact of Green Supply Chain Practices on business process performance in Jordan's

A&T industry suggests that companies should contemplate integrating green supply chain practices to enhance their business processes. Additionally, the finding that business process performance positively mediates the impact of green supply chain practices on sustainable supply chain performance underscores the importance of focusing on improving business process performance to elevate sustainability performance.

Conversely, the results did not substantiate the hypothesis that lean supply chain practices significantly impact business process performance in Jordan's A&T. This implies that companies can adopt lean supply chain practices without detrimentally affecting their business process performance. However, it is crucial to note that the results did not support the hypothesis that business process performance mediates the impact of lean supply practices on sustainable supply chain performance. Consequently, the influence of lean supply chain practices on sustainability performance remains unclear, necessitating further investigation.

Finally, the results indicate that the environmental orientation of competitors and customers can negatively moderate the impact of green management practices on business process performance and sustainable supply chain performance. This underscores the importance for companies to consider the environmental attitudes of their competitors and customers when implementing green supply chain practices. By doing so, organisations can maximise the positive effects of green supply chain practices on both business process performance and sustainability performance. This emphasises the need for a nuanced approach that acknowledges and aligns with the environmental perspectives of stakeholders in the industry.

Conclusions, limitations, and future directions

The imperative role of lean supply chain practices and green supply chain practices in shaping business process performance and sustainable supply chain performance, spanning economic, social, and environmental dimensions, underscores their indispensable relevance in the modern business landscape. In the fiercely competitive environment, the strategic imperative of minimising natural resource utilisation and mitigating societal and environmental impact stands as a linchpin for attaining a sustainable advantage over the long term. Companies navigating this terrain must perceive responding to environmental pressures as a strategic goal that is pivotal for enhancing business operations and realising sustainability in their supply chains.

This study augments the comprehension of the intricate mechanisms inherent in lean supply chain practices and green supply chain practices, elucidating the pivotal role played by the environmental orientation of competitors and customers in effecting transformative changes in business process performance within the unique context of a developing Middle Eastern nation like Jordan. Consequently, this research not only contributes valuable insights to the existing body of knowledge on supply chain practices but also furnishes compelling evidence underscoring the critical importance of the environmental orientation of competitors and customers in shaping the interplay between green supply chain practices, business process performance, and sustainable performance within A&T supply chains.

In consonance with the resource-based theory, which advocates for exploring contingent effects, this study highlighted the imperative of strategic planning and extensive design to facilitate the adoption of environmentally friendly products. This necessitates radical transformations in supply processes, procurement, storage, and material handling, though the short-term pressures may potentially impede process performance (Ferreira & Silva, 2022).

The resource-based view is that sustained high-performance levels necessitate the comprehensive integration of all supply chain members over the long term. This study, while focusing on the Jordanian industrial sector, opens avenues for future exploration across diverse sectors such as tourism and services. Prospective research endeavours may benefit from delving into causal relationships through longitudinal studies spanning extended time frames, offering insights with enhanced generalisability. Comparative studies leveraging data from various global markets can unveil nuanced similarities and differences, attuning findings to the unique dynamics of different contexts. Furthermore, future research may explore additional mediator variables influencing sustainable performance, including supply chain practices, total quality, dynamic capabilities, and information systems. Simultaneously, examining other moderation variables, such as the environmental orientation of suppliers and government, can enrich the research landscape by providing more

holistic insights into the complex dynamics of sustainable performance within supply chains.

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Appendix A. Measurement scale items

Lean supply chain practices	
LP1	Our company adheres to the production schedule to generate the correct amount of output. (Dropped)
LP2	Our company follows an inventory control system that eliminates obsolete materials or products. (Dropped)
LP3	The company adopts process optimisation at the beginning of the inventory process to reduce its levels to a minimum. (Dropped)
LP4	The company follows the selection of optimal locations to reduce the need for packaging.
LP5	The company uses reusable packaging.
LP6	We recycle internally to reduce transportation. (Dropped)
LP7	We are pooling waste transport to reduce environmental impact per ton of waste. (Dropped)
LP8	We control essential parameters (setting mode, control card, etc.) to reduce defects.
LP9	Scraps are re-integrated into the process as raw material.
LP10	We follow process control to optimise material efficiency.
LP11	We follow strict rules and limit the material used to the right amount.
LP12	We reduce work-in-progress inventory to prevent damage to the material/product
Green supply chain practices	
GP1	We work with our major suppliers to incorporate environmental issues into our product design process (e.g., reduce consumption of material/energy; increase the use of environmentally friendly materials).
GP2	We work with our partners to incorporate environmental issues into our manufacturing process (e.g., reducing consumption of material/energy; and increasing the use of environmentally friendly materials).
GP3	We work with our partners to incorporate environmental issues into our delivery process (e.g., reduce consumption of material/energy; use recyclable packages).
GP4	We work with our partners to establish a recycling process for used and defective products.
GP5	We work with our partners to better manage the disposal of industrial wastes (wastewater, gas, and residue).
Business process performance, please indicate the relative impact of lean, green, and SC management practices on each of the following business process performance indicators.	
BPP1	Engineering (e.g., design complexity, R&D cost, unit cost of the product, engineering design change cost).
BPP2	Manufacturing (e.g., quality control, manufacturing process cost, manufacturing complexity, material cost, manufacturing lead time, process technology investment cost.
BPP3	Procurement (e.g., purchasing costs, order processing, purchased component variety).
BPP4	Logistics (e.g., work-in-process and finished goods inventory, inventory cost, purchased component inventory, transportation cost).
BPP5	Sales (e.g., demand forecasting uncertainty). (Dropped)
BPP6	Customer satisfaction.
BPP7	Sales/market share.
BPP8	Competitive advantage.
Sustainable supply chain performance, please indicate the relative impact of lean, green, and SC management practices on each of the following:	
SSCP1	We are reducing environment, SC, and responsiveness costs. (Dropped)
SSCP2	Improve customer satisfaction.
SSCP3	Saving time.
SSCP4	Improve service level.

SSCP5	Improve the responsiveness. (Dropped)
SSCP6	Improve organisation's agility.
SSCP7	Supporting customer and supplier collaboration. (Dropped)
SSCP8	Improve overall firm performance. (Dropped)
Competitors' environmental orientation	
CEO1	Our competitors have appropriate environmental certificates.
CEO2	Our competitors emphasise green values in their marketing activities.
CEO3	Our competitors make significant efforts to use environmentally friendly technologies.
CEO4	Environmental issues are very relevant for our competitors.
Customers' environmental orientation	
CuEO1	Environmental issues are very relevant for our customers.
CuEO2	Our customers have a strong preference for environmentally friendly products.
CuEO3	Our customers would be willing to pay more for environmentally friendly products.
CuEO4	Environmentally friendly offers positively influence our customers' product choices.