

Article

The Effect of Suppliers' Green and Traditional Selection Criteria in Supply Chain Management on Purchasing Firms' Performance

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Abstract: In recent years, procurement managers have introduced environmental considerations into supplier selection and evaluation as a response to strict environmental regulations implemented by governments. Although previous research investigated the selection of eco-friendly suppliers, little research has been conducted on the significance of the wide range of selection criteria used by industrial customers. The aim of this study was to address this gap and examine the difference in the perceived importance of the selection criteria versus the performance achieved using the selection criteria, in addition to the difference in the business performance and the total supply performance. By investigating the selection criteria of manufacturers in the market environment, this study aimed to demonstrate how their business performance was affected by the performance of suppliers in relation to such criteria. To accomplish this task, this study conducted an empirical analysis based on the questionnaire responses of 72 purchasing managers working in the electrical/electronic and heavy chemical industries. Based on previous research, the following six supplier selection factors were identified: eco-friendliness, quality, relationship, flexibility, delivery, and price/finance. By using statistical analyses, including sample *t*-tests and multiple regression analysis, this study identified a correlation between supplier and manufacturer performance. The findings show that some factors, such as eco-friendliness, flexibility, price, and delivery, were statistically relevant to the performance of manufacturers, which added value to the decision-making strategy employed in supplier selection.

Keywords: suppliers' selection criteria; green suppliers; purchasing firms; performance



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1. Introduction

Since the introduction of just-in-time (JIT) production, total quality management (TQM), and supply chain management (SCM), which were implemented to gain a competitive advantage after 1980, purchasing strategies that were previously considered within the realm of production have garnered heightened attention from management [1]. The emergence of multinational corporations and globalization has emphasized the important role played by purchasing activities in corporate strategy [2]. Consequently, apart from core competencies, all aspects of production are increasingly being delegated to specialized collaborative or supply partners, highlighting the establishment of a comprehensive purchasing process that encompasses the entire supply chain [3,4].

In line with this, various studies have been conducted on the purchasing strategies that are utilized within the supply chain [1,5–7]. In particular, research on supplier selection holds a significant position within the purchasing strategy of companies [3,8–10]. This is because a company's purchasing strategy begins with their collaborative relationship with suppliers [11,12]. In other words, the selection of suppliers that meet the company's criteria

and the formation of long-term and strategic partnerships can be considered a competitive advantage that is not easily replicated by competitors [2,13,14]. Thus, the establishment of more efficient and effective relationships with these collaborative partners is considered a key element in the success strategy of the supply chain [13].

Meanwhile, both government intervention regarding the environmental issues that arise from corporate activities and the pressure exerted by stakeholders demanding corporate social responsibility significantly influence corporate strategies today [15]. To survive and thrive in the global market, companies can no longer exclude environmental issues, which have rapidly emerged as a major global concern, from their strategic decision-making processes [16,17]. Particularly in markets such as Europe, where environmental issues are being seriously addressed at a national level, the adoption of voluntary environmental management is essential for exporting products to these markets or sustaining business relationships with companies therein [18].

Today, a substantial literature stream confirms that the focus on adopting environmentally friendly practices has pivoted from the company level to the supply chain level [19–21]. Accordingly, many scholars have studied environmental practices in the supply chain and purchasing strategy domain based on real-world cases. For example, Ref. [22] highlighted the pivotal role of green supplier selection in pharmaceutical supply chains before and after the COVID-19 pandemic. Ref. [1] provided another case study from China that exhibits the importance of integrating green supply chain principles in equipment manufacturing companies' purchase strategy as a primary source to maintaining sustainability. Ref. [23] indicated that, as the literature reported, approximately 80% of greenhouse gas (GHG) emissions result from suppliers' practices in implementing supply chain activities. Therefore, suppliers' environmental practices that reduce such damage have become one of the supplier evaluation and selection indicators.

However, many research gaps remain despite the large body of literature devoted to studying the environmental side of the supply chain, purchasing strategy, and supplier selection criteria. Most studies assume that supplier selection criteria will obtain the same importance level in all organizations and will accordingly be applied. These studies ignored the buying managers' perception and purchasing firms' performance effects on adopting those criteria or their importance, and few studies addressed this gap, such as [24–26]. This led to scarce evidence concerning the effect of supplier selection criteria on a purchasing company's performance [27] and how each affects the other's performance in the buyer-supplier relationship [28]. Moreover, studies on the relationship between the performance of the supplier and manufacturing firm in relation to the supplier selection criteria have yielded ambiguous results, and they focused on financial performance [3,29,30]. In addition, research on comprehensive supplier selection, which integrates the environmental factors recognized as essential elements in today's corporate strategies and traditional supplier selection factors, such as quality, price, or flexibility, has been largely lacking [31].

Furthermore, many recent studies have concentrated on developing models for green suppliers' evaluation and selection using mathematical, statistical, laboratory, and multi-criteria decision-making models [22,23,32–38]. Despite their importance, none of these studies have yet to go beyond the selection stage. In other words, these studies are limited to developing supplier selection models without considering the supplier's ability to meet these criteria, making these models useless. Additionally, these studies have inconsistent results due to the differences in weights given to each criterion. Most also depend on simulation without real-world evidence and neglect the interaction relationships between criteria and sub-criteria. Additionally, their results must be validated and compared with those from other studies using different techniques.

Finally, the large body of prior studies has focused on developed economies. Hence, there is a considerable knowledge gap concerning the incorporation and effectiveness of green supplier selection with traditional selection criteria in developing economies [3] such as Jordan.

Based on the research gaps identified in prior literature, this study raises the following research questions:

1. Is the selected supplier actually capable of meeting the purchasing firm's requirements, which are reflected in the pre-identified selection criteria based on which it was selected?
2. Are there differences between purchasing firms' corporate performance levels resulting from actual suppliers' performance levels in fulfilling the pre-identified selection criteria?
3. Do the supplier selection criteria affect the purchasing firm's overall corporate performance?

This study conducted an in-depth empirical analysis of the supplier's traditional and green selection criteria, as perceived by purchasing managers of manufacturing firms in Jordan, and whether those criteria affect the buying firm's performance. Such analysis helps fill the existing literature's knowledge gaps by providing comprehensive supplier selection criteria that combine traditional and green ones, reconciling the contradictory results of prior studies, offering an in-depth understanding of interactions between selection criteria and buyer performance, and validating the results of previous studies based on real-world evidence. Therefore, this study contributes valuable insights into the existing literature and advances the extent of the existing body of knowledge on traditional and green criteria of supplier selection and the effects of those criteria on buyer performance in the context of business from a strategic purchasing management perspective.

In the remainder of this paper, Section 2 reviews the relevant literature, while Section 3 presents the conceptual research models and hypotheses. Subsequently, Section 4 gives the results of the empirical analysis, and finally, Section 5 presents the conclusions drawn from the research.

2. Theoretical Background

2.1. Traditional Supplier Selection Criteria

The concept of supplier selection can be traced back to [39] research, in which he described the identification of 23 selection criteria via empirical analysis. In his study, Dickson found that the quality, delivery, and performance history of the supplier were the most important factors among these criteria. Subsequently, based on previous studies, Refs. [2,9] suggested that quality, delivery, and price, in that order, are the most important factors in the supply chain selection criteria. In contrast, Ref. [40] concluded that quality is the most significant factor, followed by price, while delivery is the least important factor in suppliers' selection criteria.

Ref. [41] conducted an empirical analysis based on previous studies to examine whether there are differences in the supplier selection criteria depending on the agents in the supply chain. Specifically, they added criteria such as "cooperation" and "reputation", which were not mentioned in previous studies on supplier selection criteria; therefore, they redefined a total of seven supplier selection criteria. Furthermore, they categorized the seven individual factors into "product quality, cost, delivery performance, quality system certifications, and flexibility, cooperation, and reputation factors". The analysis results showed that "product quality, delivery performance and cost" are the most important criteria for the supplier selection.

Research on environmentally conscious supply chains has been ongoing in recent years, as seen in studies by [22,23,32,34,37,42,43]. Additionally, with advancements in machine learning (ML) methods, Multi-Criteria Decision-Making (MCDM) models, and hybrid methods, research on supplier selection has also incorporated these techniques. Refs. [44,45] presented various machine learning methods that could be applied to supplier selection. While previous research often assumed that data follow a probability distribution, these authors argued that applying data mining techniques yields better results, as real-world data often deviate from or cannot be defined by probability distributions. Their studies applied machine learning methods to generate data that were divided into four categories: price, quality, delivery time, and after-sales service level. After applying

machine learning to the generated data, they proposed optimal machine learning methods to address issues related to supplier selection. Refs. [40,41] incorporated several Multi-Criteria Decision-Making (MCDM) models, and hybrid methods that could be applied to supplier selection, such as “Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), Analytical Hierarchy Process (AHP), and Analytical Network Process (ANP)”. However, it is worth noting that these studies had limitations, as they did not consider environmental factors and relied on simulation data to present their results.

Thus far, much of the research on supplier selection criteria has generally been based on traditional criteria, such as the quality, technological capabilities, and delivery time of the supplier, but ignores the importance of shared prosperity arising from buyer–supplier relationships [46]. However, in today’s context, in which environmental issues have emerged as an essential strategic consideration that corporations cannot afford to overlook, relying solely on traditional supplier selection criteria may yield short-term results, and it is unlikely to guarantee long-term sustainable growth [31,32,34,42].

2.2. Green Supplier Selection Criteria

In recent years, environmental factors have emerged as significant issues in corporate decision-making [15–17]. In particular, since the mid-1990s, governments, such as the European Union countries, have strengthened the various environmental regulations that businesses must abide by, including regulations regarding the mandatory recycling of waste electrical and electronic equipment (WEEE), restrictions on hazardous substances (RoHSs), obligations regarding the eco-design of energy-using products (EuPs), and the management of chemicals (REACH) [47]. Given the nature of supply chain management, in which individual activities alone cannot generate excellent environmental performance, global corporations have subsequently strengthened the environmental standards to be met by their collaborative partners [48].

Ref. [42] assert that possible suppliers who adopt environmentally friendly practices achieve high sustainability performance levels and have a higher chance of being chosen as actual vendors. They prove that the supplier’s practices to protect the ecology or natural environment resources can positively affect the buying company’s purchasing decision.

Ref. [49] proposed four environmental evaluation criteria for measuring the environmental performance of suppliers. These criteria include the environmental capabilities, efficiency, green image, and total life cycle costs of suppliers, thus forming a green supplier grading evaluation tool. By applying this tool to the analytic hierarchy process (AHP) model, decision-makers can effectively select environmentally responsible suppliers from an environmental perspective.

Ref. [50] in their study evaluated the sustainable performance of humanitarian relief supply chains based on “economic, social, and environmental” performance. They identified the measurement criteria by utilizing the fuzzy Delphi methodology with the participation of humanitarian logistics professionals, media influencers, and academic studies. Consequently, the results highlighted the important role that green suppliers play in enhancing the sustainable performance of supply chain parties.

Ref. [51] empirically analyzed Pakistan’s manufacturing sector’s performance resulting from green supply chain practices, including green purchasing strategies and environmentally friendly suppliers. The study revealed that green purchasing strategies and supplier selection positively affect manufacturing firms’ environmental performance. This study did not consider other types of performance, such as economic ones. Hence, it cannot be definitively concluded that green practices related to purchasing and suppliers can affect purchasing firms’ financial and non-financial performance.

In their study, Ref. [52] aimed to test the role of green supply chain management (GSCM) practices in enhancing environmental performance. The analysis was based on survey results obtained from 710 general managers of Chinese companies operating in different industries, such as technology, automotive, and pharmaceutical sectors, and structural equation modeling was used to analyze the links between theoretical constructs.

Ref. [52] study produced crucial conclusions on the significant and favorable links between GSCM practices and environmental performance. Based on the results, they concluded that green supplier selection criteria should be incorporated into supplier assessment and selection to improve organizational performance. However, the study results are conditional to management commitment in implementing GSCM patterns and will vary due to cultural differences. Moreover, Ref. [52] study focused on a particular province in China. However, concentrating on a single province has its own benefits; excluding other provinces may skew the sample and limit the generalizability of the results.

Research on green supplier selection has been actively conducted in recent years. Various analysis methods have been employed to identify green supplier criteria, and several models have been proposed to select effective and appropriate green suppliers. In particular, these studies have depended heavily on “Multi-Criteria Decision Making” (MCDM), Optimization, and hybrid methods to evaluate and select suppliers. Among these methods are the “Analytical Hierarchy Process (AHP)”, the “fuzzy Preference Programming (FPP)” technique, and the “fuzzy Inference System (FIS)” [23], “Fuzzy Analytical Hierarchy Process (AHP)”, “Weighted Aggregated Sum-Product Assessment (WASPAS)”, and “Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)” [22,37], “Analytical Network Process (ANP)” and “Data Envelopment Analysis (DEA)” [34], “Importance-Performance Analysis (IPA)” [35], “Interpretive Structural Modeling (ISM)” and “Principal Component Factor Analysis (PCFA)” [33], “Interval-Valued Pythagorean Fuzzy Analytical Hierarchy Process (IVPF-AHP)” and “VIseKriterijumsa Optimizacija I Kompromisno Resenje (VIKOR)” [36], “Complex Proportional Assessment (COPRAS)” approach and “Fuzzy Additive Ratio Assessment Method (FARAM)” [38], and “Decision-Making Trial And Evaluating Laboratory (DEMATEL)”, “De-fine-Measure-Analyze-Improve-Control (DMAIC)”, “Measuring Attractiveness Through a Categorical-Based Evaluation Technique (MACBETH)”, “Fuzzy Cognitive Maps”, “Markovian-based decision-making (MADM)” approach, and “Fuzzy Best–Worst Method (FBWM)” [22]. However, despite these efforts, research in this area remains primitive. These studies have inconsistent results due to the differences in weights given to the criterion. Additionally, most of them depend on simulation without real-world evidence and neglect the interaction relationships between criteria and sub-criteria. Their results must also be validated and compared with other studies using different techniques. Hence, it is crucial that research addressing these gaps is conducted.

2.3. Research Hypotheses

The perceived importance of the supplier selection criteria used by purchasing firms varies across industries, countries, and periods [49,53]. Ref. [1] found that cost, quantity, time, and quality performance are of the same importance to the suppliers’ environmental practices when selecting the suppliers by equipment manufacturing companies in China. Ref. [54] asserted that product competency and delivery reliability, from one side, are the most critical factors in selecting suppliers, while innovation capabilities and technology level have insignificant effects, from another side, based on the perspective of 110 Korean companies operating in the retail industry. Ref. [40] used quality, price, and delivery as supplier selection criteria for Indonesia’s mild steel raw materials industry. The analytical hierarchy process (AHP) results show that quality is the most significant factor, followed by price, while delivery is the least important criterion. Ref. [2] show that quality is the most critical factor in selecting suppliers, followed by delivery, cost, geographic location, and environmental practices. The results of the above studies provide robust evidence regarding the differences in the priority and importance of each supplier selection criteria among purchasing firms. However, what really matters is to what extent suppliers can meet these criteria. Ref. [55] categorized suppliers into good and bad categories based on their performance on selection criteria such as “quality, flexibility, relationship and cooperation, price, and delivery”. They found that suppliers in the electronic industry exhibited poor performance on all criteria except the price. In contrast, Ref. [3] propose

that suppliers of specific production materials demonstrated their failure to satisfy the purchasing firm's needs related to traditional criteria such as "cost, quality, delivery, or service, environmental regulations, and social norms". Thus, many buying firms face problems arising from the weak performance of their suppliers and are usually concerned about whether their suppliers can satisfy the requirements embodied in the criteria based on which they are selected. Meanwhile, Ref. [56] found that the failure of construction projects in Nigeria was primarily attributed to the poor performance of suppliers in obeying delivery times, cost, and quality. The results of the above studies are in line with the empirical analysis results carried out by [57], who assumed there would be significant differences between the criteria that purchasing firms prioritize when selecting suppliers and the perceived performance of the supplier, where the results show significant differences in the quality, price, and relationship factors. The contradictory results of previous studies led to the formulation of the following research hypothesis:

H1: *There is a significant difference between the importance of the supplier selection criteria, as perceived by the purchasing firms, and the actual performance of the suppliers on each criterion, as perceived by the purchasing firms.*

Ref. [25] implemented a study that was applied to the German manufacturing sector using two case studies. The first involved 60 grid interviews, and the second involved 25 semi-structured interviews. The interviewees of both were purchasing managers. The results affirmed that the purchasing company's performance levels vary due to suppliers' ability to fulfill selection criteria. Hence, if the supplier's capability to fulfill criteria is high, the performance level will be high, and vice versa. Ref. [24] also concluded that when supplier performance on each selection criterion satisfies the needs of purchasing firms, the dyadic performance of buyer-suppliers will improve. The findings of the aforementioned studies are in line with the results of empirical research conducted by [26], which investigated whether there are significant differences in purchasing firms' performance resulting from supplier performance. Their analysis revealed that there is a significant difference between the two groups regarding the performance of suppliers in terms of their reliability, competitive pricing, service, and technological capabilities. This suggests that companies with a stable performance in the market prioritize supplier selection criteria more than those who are unable to do so. Consequently, the following hypothesis was formulated:

H2: *There is a significant difference between purchasing firms' levels of corporate performance, low and high, attributed to the perceived performance level of actual suppliers to fulfill the pre-identified selection criteria.*

Due to the importance of the supplier selection criteria, research on supplier evaluation and its correlation with purchasing firms has been conducted. Ref. [58] conducted a survey study to investigate whether supplier evaluation and selection criteria, which include supplier performance, quality, and risk management practices, affect supply chain parties' performance in Bangladesh. The study concluded that there is an insignificant relationship between supplier selection criteria and supply chain parties' performance. In contrast, Ref. [27] concluded that purchasing companies' green performance is affected by green supplier selection based on analyzing data collected from 295 Chinese companies operating in manufacturing sectors. Ref. [59] provided empirical evidence from the textile sector in Kuantan regarding the positive effect of suppliers' cost or price and deliveries on the purchasing firms' performance, while quality does not have any effect. Ref. [60] investigated how the relationship between UK importing firms and US exporting firms affects repurchasing decisions. Contrary to previous studies, they found that purchasing firms prioritize criteria related to supplier relationships, such as service, flexibility, and effective packaging, over product-related criteria when selecting suppliers. However, their focus on the relative importance of selection criteria led to ambiguous results regarding the relationship between the supplier selection criteria and the performance of both suppliers

and manufacturing firms. Therefore, the present study aimed to elucidate the relationship between supplier performance and corporate performance via the following hypothesis:

H3: *There is a significant positive correlation between the performance level of actual suppliers that is perceived by purchasing firms regarding supplier selection criteria and the overall corporate performance of the purchasing firms.*

3. Research Methodology

3.1. Method and Procedures

This study adopted a mixed approach, quantitative and qualitative. To examine the measurement validity and reliability, describe the respondents' characteristics, and test the hypothesis, the factor analysis, frequencies, independent sample *t*-test, and multiple regression analyses were used, utilizing SPSS version 23.0. The study was conducted in Jordan, and data collection utilized an online survey sent via email supplemented by site visits. Data were obtained in the 4th quarter of 2023. The research participants were informed of the study objectives and notified that their identities were confidential. The resulting consent is in line with the research's ethical considerations.

3.2. Development of Measurement Tools

Through a careful review of previous literature, it is clear that researchers agree that the criteria for selecting suppliers that significantly affect their performance and, thus, the companies' decision to purchase from them are price (cost), quality, delivery, technological capability, flexibility, relationship, financial issues, and environmental aspects related to green practices. Accordingly, these criteria were chosen as dimensions for selecting suppliers in this study, and the following explains each.

(1) Price (Cost)

Traditionally, manufacturing firms consider price to be a significant factor in supplier selection [2,40,41]. In particular, Ref. [61] asserted that in cases where multiple suppliers are contracted for short-term agreements, price is deemed the most important criterion in supplier selection. Ref. [62] also presented research findings from Tanzania indicating that purchasing firms who prefer multiple sources prioritize price more than those who favor single sources. Moreover, the findings assert that less price enables purchasing firms to reduce cost, and as a result, their performance enhanced.

(2) Quality

Ref. [63] mentioned that quality is the most important factor among the supplier selection criteria, with similar results being presented by [64] in review papers on supplier selection. Ref. [65] compared supplier selection criteria based on the size of the enterprise and mention that both large and small businesses prioritize quality the most. Additionally, Ref. [58] found that all entities in most industries consider quality, on-time delivery, and consistency to be the most important criteria for their supply chain.

(3) Delivery

Many researchers have emphasized the importance of delivery time. Ref. [66] concluded that in the pharmaceutical industry, quality and delivery time are the most critical criteria considered during supplier selection, despite the differences between the countries studied. Ref. [67] also mentioned that along with quality, the delivery time contributes greatly to customer satisfaction and represents a crucial competitive advantage; in addition, there is a particular emphasis on the lead time among the delivery-related factors.

(4) Technological Capability

Technological capability has also been widely recognized as a key criterion in supplier selection across many studies [68,69]. Ref. [70] found that larger enterprises prioritize the

suppliers' technological capabilities more than smaller ones, indicating that larger firms rely more on their suppliers' technological innovation and their participation in design.

(5) Flexibility

Ref. [71] emphasized the importance of flexibility in their research. However, Ref. [72] analyzed various supplier selection criteria, including price, quality, and delivery, and found that flexibility in response to order changes was rated as less important. This may be attributed to their study's focus on metal fabrication manufacturers dealing with small machinery, indicating that criteria such as flexibility in supplier selection are greatly influenced by the characteristics of the industry. Therefore, analyzing such criteria is deemed necessary, given their substantial impact compared with other criteria.

(6) Relationship

Ref. [73] argued that long-term relationships characterized by trust and cooperation should be established. Ref. [74] also emphasized the importance of communication with suppliers, particularly two-way communication. They suggested that by engaging in bidirectional communication, purchasing firms can not only provide feedback to suppliers but also improve the efficiency of the supply chain through these suppliers.

(7) Financial

While research using financial factors as criteria for supplier selection is relatively limited, the importance of such factors continues to grow. Ref. [75] emphasized that the financial stability of suppliers is essential to the establishment of long-term partnerships. Additionally, Ref. [76] mentioned that the financial status of the supplier provides reliability for the establishment of long-term contracts with purchasing firms.

(8) Environmental (Green)

Since the increased government intervention and stakeholders' pressures concerning environmental issues, there has been an explosion of research that has considered ecological factors; this has been due to the tightening of environmental regulations for businesses. Ref. [77] presented several criteria for measuring suppliers' environmental performance using the Delphi technique. Ref. [13] divided environmental criteria into quantitative and qualitative factors and provided recommendations. Ref. [42] assert that possible suppliers who adopt environmentally friendliness practices achieve high sustainability performance levels and have a higher chance of being chosen as actual vendors.

Table 1 presents the items used in this study to measure the above criteria or dimensions with references, while Table 2 displays the items used to measure business performance.

Table 1. Measurement items for supplier selection criteria.

Components	Measurement Items	Source
Cost (price)	Competitive pricing (Cost 1)	[78–80]
	Attractive credit terms offered by suppliers (Cost 2)	
	Attractive discounts provided by suppliers (Cost 3)	
Quality	Acquisition of quality-related certifications by suppliers (Quality 1)	[65,81–83]
	Capacity for continuous quality improvement (Quality 2)	
	Consistency in quality level (Quality 3)	
	Reliability of the products (Quality 4)	
Delivery	Supplier's ability to deliver on time (Delivery 1)	[67,84]
	Supplier's ability to comply with order quantities (Delivery 2)	
	Supplier's capacity for stable supply (Delivery 3)	
	Real-time updates on order processing status (Delivery 4)	

Table 1. *Cont.*

Components	Measurement Items	Source
Technological capability	Research and development capabilities of the supplier (Technological capability 1)	[70,85,86]
	Technical expertise in product manufacturing (Technological capability 2)	
	Product innovation capabilities of the supplier (Technological capability 3)	
Flexibility	Immediate response to requirements (Flexibility 1)	[72,87]
	Acceptance of order changes (quantity, product, etc.) (Flexibility 2)	
	Short supply lead time of the supplier (Flexibility 3)	
	Ability to resolve conflicts with partner companies (Flexibility 4)	
Relationship	Likelihood of maintaining a long-term relationship with the supplier (Relationship 1)	[73,74]
	Degree of intimacy with the supplier (Relationship 2)	
	Open communication with the supplier (Relationship 3)	
	Supplier’s reputation for honesty and integrity (Relationship 4)	
	Supplier involvement in the development of new products for the purchasing company (Relationship 5)	
Finance	Financial status regarding assets and liabilities (Finance 1)	[75,76]
	Profitability of the supplier (Finance 2)	
	Disclosure of financial records by the supplier (Finance 3)	
	Past business performance of the supplier (Finance 4)	
Green	Certification of environmental management obtained by the supplier (Green 1)	[13,77]
	Use of hazardous substances in production processes (Green 2)	
	Implementation of environmentally friendly packaging for products (Green 3)	
	Establishment of environmental assessment programs (Green 4)	

Table 2. Measurement items for business performance.

Components	Measurement Items	Source
Business performance	BP1—Profitability	[26]
	BP2—Sales growth rate	
	BP3—Market share	
	BP4—Overall customer satisfaction	

3.3. Data Collection

In this study, we conducted a survey (Appendix A) targeting purchasing managers working in domestic technology-intensive industries. We assessed supplier selection criteria using the dimensions mentioned above. Precisely, cost (price) was assessed using a 3-item scale developed based on the studies of [78–80]. Sample items include “We make our decision to purchase our supplies based on competitive pricing provided by suppliers” and “We make our decision to purchase our supplies based on attractive credit terms offered by suppliers”. Quality was measured using a 4-item scale adapted from the work of [65,81–83]. Sample items include “We make our decision to purchase our supplies based on supplier’s capacity for continuous quality improvement” and “We make our decision to purchase our supplies based on supplier’s consistency in quality level”. Flexibility was evaluated using a 4-item scale established in the research of [72,87]. Sample items include “We make our decision to purchase our supplies based on supplier’s immediate response to requirements” and “We make our decision to purchase our supplies based on the short supply lead time of the supplier”. The relationship was measured using a 5-item scale introduced

by [73,74]. Sample items include “We make our decision to purchase our supplies based on the degree of intimacy with the supplier” and “We make our decision to purchase our supplies based on supplier’s reputation for honesty and integrity”. Technological capability was assessed using a 3-item scale identified by [70,85,86]. Sample items include “We make our decision to purchase our supplies based on the supplier’s technical expertise in product manufacturing” and “We make our decision to purchase our supplies based on the product innovation capabilities of the supplier”. Delivery was measured using a 4-item scale adapted from the work of [67,84]. Sample items include “We make our decision to purchase our supplies based on the supplier’s ability to deliver on time” and “We make our decision to purchase our supplies based on the supplier’s ability to comply with order quantities”. Finance was evaluated using a 4-item scale developed by [75,76]. Sample items include “We make our decision to purchase our supplies based on the supplier’s financial status regarding assets and liabilities” and “We make our decision to purchase our supplies based on the disclosure of financial records by the supplier”. Green or environmentally friendless practices were evaluated using a 4-item scale adapted from the research of [13,77]. Sample items include “We make our decision to purchase our supplies based on the certification of environmental management obtained by the supplier” and “We make our decision to purchase our supplies based on the supplier’s implementation of environmentally friendly packaging for products”. Business performance was measured using a 4-item scale developed by [26]. Sample items include “Our profitability increased over the last two years” and “Our sales growth rate increased over the last two years”.

Respondents rated their agreement for all the above scales on “a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree)”.

The survey was conducted via email and direct visits. Out of the 82 questionnaires collected, those with responses that were insincere, extreme outliers, or unrelated to the scope of this study were excluded; this totaled 10 responses. The remaining 72 questionnaires were used for the empirical analysis.

The possibility of bias exists in both convenience sampling and random sampling methods (email) [88]. To enhance the reliability of the sample used in this study, an independent sample *t*-test was conducted to analyze the differences in the means of the 24 questionnaires obtained through random sampling and the 48 questionnaires obtained through convenience sampling. Upon examining the analysis results presented in Table 3, no significant differences in the mean were observed across all items used in this study. Therefore, it can be reasonably concluded that there was no inherent bias, and it was feasible to consider the two groups, which exhibited conceptually distinct characteristics, as a single group.

Table 3. Independent sample *t*-test for two groups using survey methods.

Factors		Levene’s Test for Equality of Variances		Survey Methods		t-Value	p-Value
Components	Measurement Items	F	p-Value	Email	Visit		
Cost	Cost 1	0.029	0.852	3.990	3.920	0.422	0.691
	Cost 2	0.127	0.695	3.501	3.199	0.799	0.433
	Cost 3	1.401	0.257	3.304	3.401	−0.496	0.598
Quality	Quality 1	0.016	0.021	0.889	3.690	0.684	0.514
	Quality 2	0.119	0.132	0.737	3.498	0.392	0.712
	Quality 3	1.594	1.594	0.199	3.799	0.571	0.583
	Quality 4	0.038	0.051	0.852	3.901	−0.684	0.511

Table 3. Cont.

Factors		Levene's Test for Equality of Variances		Survey Methods		t-Value	p-Value
Components	Measurement Items	F	p-Value	Email	Visit		
Delivery	Delivery 1	0.089	0.763	3.871	3.792	0.119	0.911
	Delivery 2	0.397	0.535	3.799	3.798	−0.851	0.395
	Delivery 3	0.052	0.837	3.871	3.795	0.138	0.901
	Delivery 4	0.027	0.893	3.702	3.690	−0.497	0.633
Technological capability	Technological capability 1	0.301	0.601	3.211	3.294	−0.533	0.611
	Technological capability 2	1.501	0.233	3.605	3.614	−0.071	0.957
	Technological capability 3	0.089	0.764	3.307	3.209	0.181	0.874
Flexibility	Flexibility 1	1.493	0.237	3.921	3.799	0.489	0.667
	Flexibility 2	0.271	0.621	3.698	3.802	−0.295	0.763
	Flexibility 3	0.504	0.496	3.394	3.562	−0.647	0.541
	Flexibility 4	4.991	0.031	3.411	3.704	−1.194	0.219
Relationship	Relationship 1	0.149	0.688	3.822	3.297	0.007	0.988
	Relationship 2	1.227	0.287	3.601	3.400	1.091	0.294
	Relationship 3	1.125	0.286	3.471	3.501	−0.118	0.912
	Relationship 4	0.492	0.495	3.596	3.512	0.842	0.415
	Relationship 5	0.401	0.542	3.511	3.490	0.561	0.595
Finance	Finance 1	0.199	0.694	2.974	3.337	−1.294	0.215
	Finance 2	0.171	0.692	3.407	3.402	−0.265	0.799
	Finance 3	1.262	0.274	3.398	3.390	−0.040	0.985
	Finance 4	0.794	0.382	3.511	3.524	1.042	0.301
Green	Green 1	0.021	0.901	3.474	3.308	0.472	0.651
	Green 2	0.132	0.744	2.998	3.307	−0.647	0.563
	Green 3	0.081	0.802	3.417	3.285	0.711	0.455
	Green 4	4.512	0.041	2.997	2.902	1.112	0.297
Business performance	Business performance 1	1.101	0.298	3.610	3.688	−0.179	0.866
	Business performance 2	0.701	0.399	3.517	3.624	−0.789	0.455
	Business performance 3	0.001	0.985	3.811	4.007	−0.803	0.441
	Business performance 4	0.483	0.488	4.010	4.015	0.199	0.794

4. Empirical Analysis

4.1. Sample Characteristics

When examining the characteristics of the sample, it was observed that the respondents were primarily from the electronics industry, accounting for 29.7%, followed by the precision machinery and equipment industry at 26.5%, the chemical industry at 24.7%, and the automotive sector at 11.6%. Regarding the number of employees, companies with less than 500 employees constituted approximately 47% of the sample, thus indicating a relatively even distribution between small and large enterprises. In terms of job positions, roles in middle management and above accounted for approximately 35% of the sample, while those with a tenure of more than three years, including managerial positions, represented approximately 79% of the sample. This suggests that the criteria for key informants were adequately met [89].

4.2. Measurement Validity and Reliability

The measurement tools used in this study underwent a refinement process involving expert panels and preliminary surveys, ensuring the content's validity. Precisely, 6 professors specialized in the supply chain field from 4 Jordanian universities evaluated the study questionnaire, and 6 purchasing managers from the study sample evaluated the measurement tool to ensure that the measurement instruments used to measure the constructs of interest are normative and relevant. Based on their notes and comments, some items have been refined. Additionally, a factor analysis using the varimax rotation method was conducted to verify the validity of the construct, which assessed whether the intended abstract concepts were adequately measured by the measurement tools. The varimax rotation is a statistical technique utilized to simplify the factor structure of a set of variables to make it easier to ascertain and view the underlying construct [90].

The analysis resulted in the removal of 10 items due to their failure to surpass the criterion of 0.4 for factor loading or due to their redundancy; this left 21 items for further analysis. As shown in Table 4, these items were categorized into six factors, with high factor loadings and Cronbach's alpha values exceeding 0.7. Regarding corporate performance, the initial four items were classified under one factor; these exhibited similarly high factor loadings and Cronbach's alpha values, as shown in Table 5. Therefore, it can be concluded that the measurement tools used in this study were reliable and valid.

Table 4. Factor analysis of supplier selection criteria.

Factors	Measurement Items	Factor Loading	Cumulative Variance	α
Green practices	Use of environmentally friendly packaging (Green 3)	0.887	19.010	0.929
	Use of hazardous substances in products (Green 2)	0.858		
	Implementation of environmental assessment programs (Green 4)	0.821		
	Attainment of environmental certifications (Green 1)	0.813		
Quality	Consistency in quality level (Quality 3)	0.832	34.002	0.887
	Reliability of the products (Quality 4)	0.824		
	Capacity for continuous improvement in quality (Quality 2)	0.728		
	Technical expertise in product manufacturing (Technological capability 2)	0.619		
Relationship	Degree of intimacy with the supplier (Relationship 2)	0.815	48.114	0.871
	Open communication with the supplier (Relationship 3)	0.812		
	Likelihood of maintaining a long-term relationship with the supplier (Relationship 1)	0.749		
	Profitability of the supplier (Finance 2)	0.631		
Flexibility	Short supply lead time of the supplier (Flexibility 3)	0.859	61.210	0.874
	Immediate response to requirements (Flexibility 1)	0.818		
	Real-time updates on order processing status (Delivery 4)	0.726		
Price/delivery	Attractive discounts provided by suppliers (Cost 3)	0.839	71.992	0.791
	Competitive pricing (Cost 1)	0.677		
	Supplier's ability to comply with order quantities (Delivery 2)	0.652		
	Attractive credit terms offered by suppliers (Cost 2)	0.583		
Finance	Disclosure of financial records by the supplier (Finance 3)	0.788	79.977	0.852
	Past business performance of the supplier (Finance 4)	0.742		

Table 5. Factor analysis of corporate performance.

Constituent Factors	Measurement Items	Factor Loading	Cumulative Variance	α
Corporate performance	Profitability (BP1)	0.854	58.911	0.781
	Sales growth rate (BP2)	0.761		
	Market share (BP3)	0.744		
	Overall customer satisfaction (BP4)	0.729		

4.3. Hypothesis Testing

4.3.1. Testing of Hypothesis 1

The results obtained when testing hypothesis 1, as displayed in Table 6, show statistically significant differences at the 5% significance level in the supplier capability to meet criteria based on which that supplier was selected and the importance level for each criterion as perceived by purchasing firms in the quality ($t = 5.98$; $p = 0.000$), flexibility ($t = 4.002$; $p = 0.002$), price, and delivery ($t = 4.825$; $p = 0.001$) criteria. These results indicate that the suppliers cannot satisfy the buying firms' requirements reflected in these criteria. In contrast, the results suggest that there are no statistically significant differences among purchasing firms regarding the supplier's capability to meet the criterion and the importance of that criterion concerning green practices ($t = 0.497$; $p = 0.610$), the relationship with the supplier ($t = 0.091$; $p = 0.918$), and financial aspects ($t = -0.692$; $p = 0.479$).

Table 6. Independent sample *t*-test for correspondence between the importance and actual performance of supplier selection criteria.

Criteria	Mean		Mean Difference	SD	t-Value	p-Value
	Importance	Performance				
Green Practices	3.310	3.225	0.085	0.802	0.497	0.610
Quality	4.224	3.731	0.493	0.620	5.988	0.000
Relationship	3.562	3.501	0.061	0.710	0.091	0.918
Flexibility	4.105	3.703	0.402	0.712	4.002	0.002
Price/delivery	4.118	3.597	0.521	0.669	4.825	0.001
Finance	3.298	3.414	-0.116	0.699	-0.692	0.479

4.3.2. Testing Hypothesis 2

As shown in Table 7, this study revealed statistically significant differences at the 5% significance level in the purchasing firms' performance due to suppliers' performance in green practices ($t = 2.901$; $p = 0.004$), quality ($t = 2.184$; $p = 0.041$), price, and delivery ($t = 2.449$; $p = 0.014$), whereas high supplier performance was observed in purchasing firms that exhibited high performance, while poor supplier performance was observed in purchasing firms with low levels of performance, and the most pronounced distinction was observed in the green practices factor, which shows a clear difference between high- and low-performing companies by comparing the arithmetic mean for the performance variable in the high-performing firms (3.390) and low-performing firms (2.788). On the other hand, the analysis results indicate no statistically significant differences concerning the relationship with the supplier ($t = 1.542$; $p = 0.161$), flexibility ($t = 1.896$; $p = 0.059$), and the financial criterion ($t = 1.452$; $p = 0.129$) among purchasing firms that exhibited high and low levels of performance.

Table 7. The independent sample *t*-test results for the performance of the two groups of purchasing firms.

Factors	Levene's Test for Equality of Variances		Arithmetic Mean of Performance		t-Value	p-Value
	F	p-Value	High (n = 35)	Low (n = 27)		
Green Practices	3.01	0.089	3.390	2.788	2.901	0.004
Quality	3.850	0.061	3.786	3.390	2.184	0.041
Relationship	0.167	0.705	3.448	3.488	1.542	0.161
Flexibility	1.085	0.299	3.909	3.488	1.896	0.059
Price/delivery	1.204	0.283	3.902	3.399	2.449	0.014
Finance	2.307	0.142	3.497	3.091	1.452	0.129

4.3.3. Testing of Hypothesis 3

The results obtained when testing hypothesis 3, as shown in Table 8, exhibit that at the 5% significance level, the “Green Practices” factor had the most robust positive relationship with the performance of manufacturing firms ($\beta = 0.321$; $p = 0.008$). The results also indicate that flexibility ($\beta = 0.291$; $p = 0.017$) and price/delivery ($\beta = 0.283$; $p = 0.019$) have a significant statistical and positive relationship with the purchasing firms’ corporate performance, while there is no significant statistically relationship for quality ($\beta = 0.199$; $p = 0.091$), relationship with the supplier ($\beta = 0.069$; $p = 0.537$), and the financial criterion ($\beta = -0.361$; $p = 0.764$) with the purchasing firms’ performance.

Table 8. Multiple regression analysis of corporate performance.

Dependent Variable	Independent Variables	Unstandardized Coefficients		Standardized Coefficients	t-Value	p-Value
		B	Standard Error	B		
Corporate performance (manufacturing firms)	Intercept	−0.069	0.118		−0.641	0.531
	Green Practices	0.299	0.118	0.321	2.724	0.008
	Quality	0.201	0.119	0.199	1.801	0.091
	Relationship	0.081	0.119	0.069	0.657	0.537
	Flexibility	0.279	0.116	0.283	2.503	0.019
	Price/delivery	0.278	0.113	0.291	2.501	0.017
	Finance	−0.361	0.114	−0.361	−0.311	0.764
R² (Adjusted R²) = 0.329 (0.275), F = 4.011, Sig. F = 0.002, D-W = 2.241						

5. Discussion

This study explored whether purchasing firms’ supplier selection criteria differ in importance and whether supplier performance on each criterion differs. Moreover, it investigated whether the differences in buying firms’ performance occur due to the suppliers’ ability to satisfy these criteria and whether these criteria can affect purchasing firm performance. To find answers to the study questions, comprehensive supplier selection criteria in the supply chain that combine environmental issues and traditional criteria such as quality, relationship with suppliers, flexibility, price, delivery, and financial capabilities have been investigated. This study also conducted an in-depth empirical analysis to detect whether the purchasing firms’ performance is affected by those criteria. The sample examined in this study primarily consisted of purchasing professionals working within technology-intensive industries in Jordan.

The statistical analysis revealed that the suppliers’ performance ratings in the quality, flexibility, price, and delivery criteria are less than the purchasing firms’ ratings for the importance of these criteria. Hence, the differences between the performance and importance of a particular selection criterion suggest that the supplier cannot meet buying firm requirements reflected in that criterion. One interpretation of this result is that the supplier is unable to appreciate the importance of criteria determining the purchasing decision [26]. Another interpretation is that high uncertainty and competitive pressures

may affect suppliers' abilities to meet buyers' requirements [91]. Furthermore, the risk of disasters and crises negatively affects suppliers' performance within the supply chain [22]. From the purchasing firm's side, supplier selection is affected by managers' perceptions and behaviors; some of them pay less attention to supplier selection, while others give full consideration. Additionally, the ability of purchasing firms to communicate precise specifications and details regarding quantity, quality, and delivery times to suppliers plays a vital role in suppliers' performance [92]. However, this result is consistent with prior studies conducted by [3,55,56].

The analysis results also demonstrate that purchasing firms' performance differs due to suppliers' poor performance in green practices, quality, price, and delivery. When suppliers' performance was high in the above criteria, the purchasing firms' performance was high; in contrast, when suppliers exhibited poor performance on those criteria, the purchasing firms' performance was low. This result aligns with previous studies, e.g., [24–26]. Many studies assert that green practices maintain purchasing firms' sustainable performance [27,42], while quality is linked directly with customer satisfaction [58,63]. Regarding price and delivery, they are related to purchasing firms' margin profit and responsiveness [66,71]. Therefore, any failures in those facets will have a visible effect on purchasing firms' performance.

Finally, the analysis results indicate that green practices, flexibility, price, and delivery have a significant statistical positive relationship with the purchasing firms' corporate performance. Green practices reduce costs by saving energy, improving waste management, and reducing accidents [93]. Moreover, green practices improve efficiency linked to production, inventory, and responsiveness [94]. These practices also enhance the purchasing company's image and reputation [95], ultimately improving overall performance. Additionally, suppliers' flexibility enables purchasing firms to continue their operations, especially during crises and disruptions. This leads to maintaining customer satisfaction, protecting marketing share, and improving profitability and competitive edge [71,72,96]. Additionally, suppliers' prices of materials or components directly influence a buying firm's profitability, competitiveness, and overall organizational success [59,62,69]. Furthermore, suppliers' failure to deliver the supplied goods or services on time increases buying firms' costs, leads to customer loss, and disrupts the supply chain [66]. Hence, suppliers' obey delivery times visibly improve purchasing firms' performance [67,71]. However, no conclusive deductions have been drawn concerning the effects of green practices, flexibility, price, and delivery on buying firms' performance. The contradiction in previous studies' findings [27,41,50,58,59,97] prevents managers or scholars from agreeing on which supplier selection criteria affect performance.

5.1. Theoretical Contributions and Implications

This study contributes to the literature in several significant ways. First, we study perception-based supplier selection criteria ingrained in the buyer–supplier relationship setting that arise from buying managers' perceptions and their implications for supplier selection practices related to performance, largely overlooked in previous studies that developed suppliers' selection models in isolation of purchasing firms' perception [36–38]. Second, this study responds to recent cries to further assess the relationship between the performance of the supplier and manufacturing firm regarding the supplier selection criteria to validate the results of previous studies that yielded ambiguous results [30,54,58,98,99]. Third, the present study integrates the ecological factors, largely overlooked in the supplier selection research stream [1,2,31,40], with the traditional supplier selection criteria, providing a comprehensive understanding of the supplier selection process. With various industries and companies worldwide heavily adopting green practices, the valuable relevance of this research is undeniable. However, the effects of these eco-friendly practices on buying companies' performance remain a topic of global interest and controversy, with findings ranging from affirmative [100] to adverse or insignificant [27,97], which makes this topic fertile for future research. Fourth, the present study findings help us understand the reason behind the contradictory findings presented by previous studies, as the importance

of the suppliers' selection criterion differs from one company to another and from one industry to another, and supplier capabilities to meet each criterion are different [1,49,53,66]. This stimulates future research to consider which indicators to include and how by which weights are given to enhance generalizing the results. Fifth, this study overcame the issue raised in previous studies [22,23,34] regarding the interaction relationship between criteria and sub-criteria in supplier selection by using factor analysis and multiple regression, contributing to validating the results of earlier studies. This suggests that future research studies that employ new statistical techniques to overcome such issues become imperative. Finally, this study used financial and non-financial measures to evaluate the purchasing firm's performance, which substantially contributes to the literature. For instance, it demonstrated how supplier selection criteria affect purchasing firms' customer satisfaction, as previous studies have limited their analysis to financial performance [3,29,30]. This stresses the need for further studies due to scarce evidence regarding the influence of supplier selection criteria on purchasing firms' comprehensive performance.

5.2. Practical Implications

The study results provide practical implications for purchasing firms, as the purchasing managers who were surveyed in this study showed that the suppliers could not fulfill the buying firm's quality, flexibility, price, and delivery requirements. Thus, purchasing firms should monitor their supplier performance for each criterion. Additionally, buying firms should evaluate suppliers based on their historical performance. Those who exhibited a low commitment to meet each criterion should be excluded. Additionally, purchasing firms must assess the risk affecting the supplier's capability to meet pre-defined criteria and exclude high-risk suppliers. Purchasing firms also need to enhance supplier capabilities to meet each criterion requirement by adopting supplier development strategies and programs, and this could include training. Otherwise, managers should develop a switching strategy to change suppliers with poor performance. Another significant practical implication is that engaging suppliers when developing supplier selection criteria could raise their awareness regarding the priority and importance of each criterion.

Additionally, this study provides practical implications for suppliers. The findings revealed that a high supplier performance level in green practices, quality, price, and delivery is linked with high-performing purchasing firms. In contrast, poor supplier performance was related to low-performing purchasing firms. Hence, suppliers in technology-intensive industries must effectively adopt and implement green practices and commit to the quality level, price, and delivery required by purchasing firms to have a high selection potential. Green practices could include environmentally friendly packaging, environmental assessment, and environmental management programs.

The results also suggest that purchasing firms can enhance their financial and non-financial performance, such as profitability, sales growth rate, market share, and overall customer satisfaction, by selecting suppliers with high commitment levels to green practices, flexibility, price, and delivery. For instance, they should choose suppliers that implement biodegradable, recycled, or renewable materials, use clean technologies, and push eco-innovation, as these practices improve environmental performance, cut costs, and enhance a purchasing company's reputation. This sheds light on the crucial role of suppliers in sustaining the purchasing firms' performance in different aspects, such as economic, environmental, and social performance. Regarding price, delivery, and flexibility, if different cost aspects, such as the material price, costs related to transportation and inventory, and other hidden costs, are well-balanced and aligned with the quality level and suppliers' resilience and delivery capabilities are high, purchasing firms' performance will substantially improve.

6. Conclusions

Firms' success in selecting suitable suppliers is crucial to improving performance and establishing a competitive edge. The firms' purchasing decisions to select suppliers

have generally been based on traditional criteria, such as price, quality, delivery time, and technological capabilities. Nevertheless, relying solely on conventional criteria may yield only short-term results. To guarantee long-term sustainable growth in today's business context, firms should realize that ecological issues have become a crucial strategic imperative in purchasing and supplier management. This shift in focus forces buying firms to adopt a more holistic approach to selecting suppliers by incorporating suppliers' green practices into traditional selection criteria to keep up with the evolving strategic landscape. This study examined comprehensive supplier selection criteria combining traditional ones such as quality, flexibility, price, delivery, and green practices and their effects on buying firms' performance. An empirical analysis was conducted to verify if there is a significant difference between the importance of the supplier selection criteria, as perceived by the purchasing firms, and the actual performance of the suppliers, as perceived by the purchasing firms, as well as if there is a significant difference in the perceived performance level of actual suppliers between purchasing firms that show high and low levels of corporate performance, and if there is a significant positive correlation between the performance level of actual suppliers that is perceived by purchasing firms regarding supplier selection criteria and the overall corporate performance of the purchasing firms in order to provide an in-depth analysis of the relationship between manufacturers and suppliers by targeting purchasing professionals who were currently working in the high-technology industry in Jordan. The analysis results indicate that each supplier selection criterion differs from one company to another, and suppliers' capability to meet each criterion requirement varies. In high-performing purchasing firms, suppliers exhibited high performance in meeting selection criteria. In contrast, poor supplier performance was observed in low-performing purchasing firms.

The empirical analysis also revealed that green practices, flexibility, price, and delivery notably affect the purchasing firms' desired financial and non-financial performance, ultimately affecting their purchasing decisions. This study bridged notable gaps in most studies that relied solely on the financial performance measures and simulation for developing supplier selection models from developed economies in isolation of purchasing firms' perceptions. Drawing on study results, valuable insights were provided for theory and practice.

Despite the significance of this study, which highlights the influence of a supplier performance that features environmentally friendly factors and meets quality, flexibility, price, and delivery requirements on the purchasing decisions of manufacturing firms, it possessed certain limitations. First, the method used to collect the survey data of the purchasing managers employed a mix of convenience sampling and random sampling methods; here, the convenience sampling method may have introduced bias. Therefore, to address this bias, future research should consider employing a completely random sampling method. Second, the sample for the survey was restricted to professionals from technology-intensive industries, such as electrical/electronic and precision machinery/equipment, suggesting that future studies should use diverse samples that represent the entire manufacturing sector. Additionally, given that the scope of green supply chain management (GSCM) has expanded beyond manufacturing to include service industries, further research targeting various industrial sectors is warranted. Lastly, considering the rapid evolution of environmental awareness and technology, future research should not only rely on cross-sectional data but also incorporate time series data for additional insights.

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Appendix A

Study Questionnaire

Supplier selection criteria

A. Cost (price)

1. "We make our decision to purchase our supplies based on competitive pricing provided by suppliers".
2. "We make our decision to purchase our supplies based on attractive credit terms offered by suppliers".
3. "We make our decision to purchase our supplies based on attractive discounts provided by suppliers".

B. Quality

1. "We make our decision to purchase our supplies based on supplier's acquisition of the quality-related certifications".
2. "We make our decision to purchase our supplies based on the supplier's capacity for continuous quality improvement".
3. "We make our decision to purchase our supplies based on the supplier's consistency in quality level".
4. "We make our decision to purchase our supplies based on the supplier's products reliability".

C. Delivery

1. "We make our decision to purchase our supplies based on the supplier's ability to deliver on time".
2. "We make our decision to purchase our supplies based on the supplier's ability to comply with order quantities".
3. "We make our decision to purchase our supplies based on the supplier's capacity for stable supply".
4. "We make our decision to purchase our supplies based on the supplier's ability to provide real-time updates on order processing status".

D. Technological capability

1. "We make our decision to purchase our supplies based on the supplier's research and development capabilities".
2. "We make our decision to purchase our supplies based on the supplier's technical expertise in product manufacturing".
3. "We make our decision to purchase our supplies based on the product innovation capabilities of the supplier".

E. Flexibility

1. "We make our decision to purchase our supplies based on the supplier's immediate response to requirements".
2. "We make our decision to purchase our supplies based on the supplier's acceptance of order changes (quantity, product, etc.)".
3. "We make our decision to purchase our supplies based on the short supply lead time of the supplier".

4. “We make our decision to purchase our supplies based on the supplier’s ability to resolve conflicts with partner companies”.

F. Relationship

1. “We make our decision to purchase our supplies based on the likelihood of maintaining a long-term relationship with the supplier”.
2. “We make our decision to purchase our supplies based on the degree of intimacy with the supplier”.
3. “We make our decision to purchase our supplies based on the open communication with the supplier”.
4. “We make our decision to purchase our supplies based on the supplier’s reputation for honesty and integrity”.
5. “We make our decision to purchase our supplies based on the supplier’s involvement in the development of new products for our company”.

G. Finance

1. “We make our decision to purchase our supplies based on the supplier’s financial status regarding assets and liabilities”.
2. “We make our decision to purchase our supplies based on the supplier’s profitability”.
3. “We make our decision to purchase our supplies based on the disclosure of financial records by the supplier”.
4. “We make our decision to purchase our supplies based on the supplier’s past business performance”.

H. Green or environmentally friendless practices

1. “We make our decision to purchase our supplies based on the supplier’s certifications of environmental management”.
2. “We make our decision to purchase our supplies based on the hazardous substances used by the supplier in the production processes”.
3. “We make our decision to purchase our supplies based on the supplier’s implementation of environmentally friendly packaging for products”.
4. “We make our decision to purchase our supplies based on the supplier’s established environmental assessment programs”.

Business performance

1. “Our profitability increased over the last two years”.
2. “Our sales growth rate increased over the last two years”.
3. “Our market share increased over the last two years”.
4. “Our customers’ overall satisfaction increased over the last two years”.

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