KMAN PUBLISHING INSTITUTE

Article history:
Received 01 December 2024
Revised 15 February 2024
Accepted 20 February 2024
Published online 01 March 2024

Journal of Resource Management and Decision Engineering

Volume 3, Issue 1, pp 1-12

Assessing the Effectiveness of Green Supply Chain Management Strategies in Strengthening and Sustainably Enhancing the Competitive Position of Project-Based Organizations: A Case Study of Ariana Tunnel Dam Company

Ziba. Eghbal[1]

[1] Human Resources Manager, Tunnel Sadd Ariana Company, Tehran, Iran

*** Corresponding author email address**: ziba.eghbal2@gmail.com

A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Eghbal, Z., (2024). Assessing the Effectiveness of Green Supply Chain Management Strategies in Strengthening and Sustainably Enhancing the Competitive Position of Project-Based Organizations: A Case Study of Ariana Tunnel Dam Company. *Journal of Resource Management and Decision Engineering*, *3*(1), 1-12.
https://doi.org/10.61838/kman.jrmde.377

A B S T R A C T

The present study aimed to assess the effectiveness of green supply chain management strategies in strengthening and sustainably enhancing the competitive position of project-based organizations. The research method was descriptive-correlational. The statistical population included all experts of Ariana Tunnel Dam Company in Tehran. Based on the Krejcie and Morgan table, the sample size was 130 participants, who were selected through convenience sampling. The instruments used in this study included the Standard Competitive Strategies Questionnaire by Jolveh Hosseini (2013), the Green Supply Chain Management Strategies Questionnaire by Valaei (2014), and the Supply Chain Questionnaire by Ebrahimi (2007). The content validity of the questionnaires was established, and their reliability was confirmed using Cronbach's alpha coefficient. Data were analyzed using factor analysis and structural equation modeling through PLS software. The results showed that the supply chain had a significant effect on competitive strategies and green supply chain management strategies. Organizational infrastructure, information technology, interorganizational relationships, and the support system had significant effects on competitive strategies. The results also indicated that organizational infrastructure and interorganizational relationships had significant effects on green supply chain management strategies. Other findings of the study showed that information technology and the support and decision-making system did not have significant effects on green supply chain management strategies. Therefore, based on the findings, the implementation of green supply chain management strategies, particularly through strengthening organizational infrastructure and interorganizational relationships, plays an effective role in enhancing the competitive position of project-based organizations. Accordingly, it is recommended that managers of these organizations prioritize the development of infrastructure and the expansion of interorganizational relationship networks in their investment decisions.

Keywords: *supply chain, competitive strategies, green supply chain management strategies*

1. Introduction

In contemporary management research, supply chain management has moved beyond its traditional operational role and has become a strategic mechanism for achieving competitiveness, sustainability, resilience, and long-term organizational viability. The increasing complexity of markets, technological turbulence, environmental pressures, and stakeholder expectations has required organizations to reconsider how supply chain decisions influence not only efficiency and cost reduction but also strategic positioning and environmental legitimacy. This issue is particularly important for project-based organizations, where operations are often characterized by temporary structures, multiple contractors, high interdependence among actors, resource intensity, and exposure to uncertainty. In such organizations, the supply chain is not merely a channel for procuring materials and services; rather, it is a strategic system through which organizational capabilities, environmental responsibilities, interorganizational coordination, and competitive priorities are integrated. Therefore, understanding how green supply chain management strategies contribute to the sustainable enhancement of competitive position has become a central concern in management and operations research.

Competitive position is shaped by the ability of organizations to formulate and implement strategies that create value, distinguish them from competitors, and support superior performance. Competitive strategy has traditionally been discussed through approaches such as cost leadership, differentiation, and innovation-based advantage, but recent scholarship emphasizes that competitive strategy must be understood dynamically and contextually, especially in turbulent and sustainability-oriented environments. In small and medium-sized businesses, competitive strategy is not a fixed managerial choice but a multidimensional pattern of decisions that connects resources, market conditions, organizational capabilities, and performance expectations (Rahimizadeh, 2023). Similarly, differentiation strategy can strengthen export performance through positional advantage, indicating that competitive outcomes depend on the organization's ability to develop distinctive capabilities and translate them into market value (Hasanvand et al., 2024). In this regard, the competitive position of project-based organizations depends not only on their ability to reduce costs or provide differentiated services but also on their capacity to manage complex supply networks in ways that improve reliability, sustainability, responsiveness, and stakeholder trust.

Quality management and competitive strategy are closely interrelated because organizational performance is influenced by the extent to which quality-oriented practices are aligned with strategic priorities. Evidence from pharmaceutical companies shows that competitive strategy can mediate the relationship between quality management activities and firm performance, suggesting that operational practices produce stronger outcomes when they are embedded in a coherent strategic framework (Farhadi et al., 2021). This finding is especially relevant for project-based organizations, in which quality, timing, coordination, and resource management are essential for project success. When quality management, supply chain practices, and competitive strategy are disconnected, organizations may fail to convert operational improvements into sustainable advantages. Conversely, when supply chain practices are aligned with competitive priorities, organizations are better positioned to achieve efficiency, differentiation, and long-term performance.

In recent years, sustainability has become a defining dimension of competitive strategy. Organizations are increasingly expected to manage environmental impacts across their supply chains, not only within their internal operations. Green supply chain management refers to the integration of environmental considerations into procurement, production, distribution, logistics, collaboration with suppliers, product design, and post-consumption processes. From a resource-based perspective, green supply chain management can function as a strategic capability that enables firms to improve environmental performance while simultaneously strengthening competitiveness (Khan et al., 2023). In manufacturing firms, green supply chain management has been shown to contribute to business performance and environmental sustainability, particularly when green practices are implemented as part of broader organizational strategy rather than as isolated compliance activities (Rupa & Saif, 2022). Therefore, green supply chain management can be regarded as both an environmental management approach and a strategic instrument for improving organizational competitiveness.

The relationship between green supply chain management and competitive position is particularly significant in developing and emerging economies, where organizations often face simultaneous pressure to improve operational performance, control costs, comply with

environmental expectations, and enhance market legitimacy. Research on supply chain sustainability in the cement industry has shown that competitive strategies can affect supply chain sustainability, highlighting the importance of strategic orientation in achieving sustainable outcomes in resource-intensive sectors (Safari et al., 2021). In addition, sustainable global value chain management requires the structuring of strategic enablers that support coordination, governance, capability development, and long-term value creation (Malek Akhlaq et al., 2021). These insights suggest that organizations seeking sustainable competitiveness must move beyond short-term operational optimization and develop supply chain systems that integrate environmental responsibility, strategic coordination, and organizational learning.

Supply chains today are exposed to multiple sources of disruption, including demand volatility, supplier instability, geopolitical uncertainty, financial constraints, technology shifts, regulatory changes, and environmental risks. These disruptions can weaken organizational competitiveness by increasing costs, delaying projects, reducing service quality, and damaging stakeholder confidence. Studies of manufacturing industries indicate that various operational, technological, financial, and relational factors can disrupt supply chain management and reduce organizational effectiveness (Kanike, 2023). Accordingly, risk management has become a core element of supply chain strategy. Research on supply chain sustainability and resilience emphasizes that risk management strategies strengthen resilience capabilities and help organizations sustain performance under conditions of uncertainty (Han & Um, 2024). Although risk management has been examined in other management contexts, including financial and banking environments, its broader relevance lies in demonstrating that strategic responses to risk are essential for preserving organizational stability and performance (Syadali et al., 2023). For project-based organizations, where delays, contractor failures, resource shortages, and environmental constraints can directly affect project outcomes, green and resilient supply chain strategies are particularly important.

Digital transformation has further changed the logic of supply chain management. Digital technologies provide organizations with new tools for visibility, forecasting, coordination, automation, traceability, and decision support. Recent developments in digital technologies related to supply chain management demonstrate that organizations increasingly rely on digital systems to improve integration, responsiveness, and operational control (Mohsen, 2023). Digital technology is also central to achieving green supply chain management because it enables monitoring of environmental indicators, optimization of resource flows, reduction of waste, and more transparent collaboration among supply chain partners (Wang et al., 2023). Consequently, the integration of digital technologies and green supply chain strategies can enhance both environmental performance and strategic competitiveness, provided that organizations possess the infrastructure and managerial readiness required for implementation.

Artificial intelligence, machine learning, big data analytics, and advanced decision-support technologies are now increasingly recognized as transformative forces in operations and supply chain management. Artificial intelligence can improve decision-making by supporting forecasting, inventory management, logistics optimization, supplier selection, and risk assessment (Helo & Hao, 2022). A broader mapping of artificial intelligence in supply chain management shows that AI is reshaping planning, execution, coordination, and control processes across supply networks (Sharma et al., 2022). Similarly, artificial intelligence in logistics and supply chain management provides new opportunities for automation, prediction, and strategic intelligence, while also requiring further research on implementation challenges and organizational implications (Richey et al., 2023). These developments indicate that supply chain competitiveness increasingly depends on the ability to transform data into managerial insight and coordinated action.

Machine learning and deep learning techniques have added further analytical capacity to supply chain systems. Reviews of deep learning and machine learning applications in supply chain management show that these techniques can enhance demand forecasting, supplier evaluation, risk prediction, transportation planning, and overall supply chain performance (Khedr, 2024). Innovative machine learning models have also been proposed to improve supply chain management by identifying patterns, improving prediction accuracy, and supporting more adaptive decision-making (Lin et al., 2022). Moreover, reinforcement learning algorithms have gained attention for their potential to optimize sequential decisions in supply chain environments, including inventory control, routing, scheduling, and dynamic resource allocation (Rolf et al., 2023). These technologies provide important opportunities for organizations; however, their effectiveness depends on

organizational infrastructure, information system strategy, and decision-making capability.

Big data analytics represents another important capability for enhancing supply chain performance. The use of big data analytics can improve supply chain performance when it is aligned with supply chain strategy and information system strategy, indicating that technology alone is insufficient without strategic integration (Wei et al., 2022). This perspective is highly relevant for the present study because it suggests that information technology and decision support systems may influence competitive strategies and green supply chain management strategies only when they are supported by appropriate organizational structures, capabilities, and interorganizational relationships. In project-based organizations, data must be converted into actionable knowledge across temporary teams, suppliers, contractors, and project stakeholders. Therefore, the strategic value of information technology depends on how effectively it supports coordination, environmental decision-making, and competitive positioning.

Emerging digital environments, such as the metaverse, also point to new possibilities for operations and supply chain management. The metaverse has been described as a potential breakthrough for operations and supply chain management because it may enable simulation, immersive collaboration, virtual training, digital twins, and more interactive supply chain coordination (Queiroz et al., 2023). Although such technologies are still developing, they reflect a broader shift toward digitally mediated supply chain ecosystems. For project-based organizations, digital simulation and virtual coordination may help improve planning, reduce errors, support environmental assessment, and enhance collaboration among multiple actors. Nevertheless, these technologies must be embedded in coherent organizational and supply chain strategies to produce meaningful competitive benefits.

Despite the growing importance of technology, the organizational and relational dimensions of green supply chain management remain fundamental. Organizational infrastructure provides the structural, procedural, and resource foundations required for implementing supply chain strategies. Without adequate infrastructure, organizations may be unable to institutionalize green practices, coordinate with suppliers, monitor environmental performance, or align operational processes with strategic objectives. Interorganizational relationships are equally critical because green supply chain management often extends beyond organizational boundaries and requires cooperation with suppliers, contractors, customers, regulators, and other stakeholders. Strong interorganizational relationships facilitate knowledge sharing, trust, joint problem-solving, environmental collaboration, and coordinated implementation of green practices. Accordingly, green supply chain management should be viewed as a network-based strategic capability rather than a purely internal operational practice.

The integration of supply chain management, green strategy, competitive strategy, and digital capability is especially important in project-based organizations. These organizations typically operate through complex and temporary networks in which each project may involve different suppliers, contractors, resources, timelines, and environmental requirements. As a result, competitive position depends on the organization's ability to repeatedly configure and manage supply chain relationships in ways that deliver project outcomes efficiently and responsibly. Green supply chain management can help project-based organizations reduce waste, improve resource utilization, enhance environmental legitimacy, strengthen stakeholder relationships, and support differentiation in competitive markets. At the same time, supply chain capabilities such as organizational infrastructure, information technology, decision support systems, and interorganizational relationships may influence both competitive strategies and green supply chain management strategies.

Although previous studies have examined competitive strategy, green supply chain management, digital technologies, risk management, and supply chain performance from different perspectives, there remains a need for empirical research that connects these domains within project-based organizational contexts. Much of the existing literature focuses on manufacturing firms, logistics systems, global value chains, or general supply chain environments, while project-based organizations present distinct structural and managerial characteristics. In such organizations, supply chain decisions are often project-specific, time-sensitive, and dependent on collaboration across multiple organizational boundaries. Therefore, examining the effect of green supply chain management strategies on sustainable competitive position in a project-based organization can contribute to both theory and practice by clarifying how supply chain-related capabilities support strategic outcomes.

The present study aims to assess the effectiveness of green supply chain management strategies in strengthening and sustainably enhancing the competitive position of

project-based organizations, with Ariana Tunnel Dam Company as the case study.

2. Methods and Materials

In terms of nature and method, the present study falls within the category of descriptive-correlational research. In addition, research studies can be classified as longitudinal or cross-sectional depending on whether they are conducted at one point in time or across several time points. Since the present study was conducted within a specific time interval, it is considered cross-sectional in terms of its time horizon.

The statistical population of the present study consisted of all experts of Ariana Tunnel Dam Company in Tehran. Based on convenience sampling, 130 participants were selected.

In this study, three questionnaires were used to collect data and achieve the research objectives:

The Standard Competitive Strategies Questionnaire by Jelveh Hosseini (2013), consisting of 13 items and three components: cost leadership (items 13, 12, 9, 4, 3, and 2), marketing differentiation (items 10, 8, 6, and 1), and innovation differentiation (items 11, 7, and 5).

The Standard Green Supply Chain Management Strategies Questionnaire by Valaei (2014), consisting of 18 items and three components: internal practices (items 1 to 6), external practices (items 7 to 12), and environmentally compatible design (items 13 to 18).

The Standard Supply Chain Questionnaire by Ebrahimi (2007), consisting of 20 items and four components: organizational infrastructure (items 1 to 4), information technology (items 5 to 11), decision support system (items 12 to 15), and interorganizational relationships (items 16 to 20).

In the present study, the measurement scale was an ordinal scale. In this type of scale, the relative intensity or degree of an attribute, as well as respondents' preferences, can be determined. This intensity or degree is expressed in terms of priority and order. The scale used in this study was a Likert scale, ranging from strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), to strongly agree (5). To examine the validity of the research questionnaires and establish content validity, the opinions of university professors were used. Moreover, the research questionnaire was evaluated and analyzed based on the views of specialists and experienced experts in the field of management. Cronbach's alpha coefficients for all variables were above 0.70, indicating the reliability of the collected data.

In this study, SPSS was used for the preliminary analysis of the data, and structural equation modeling based on confirmatory factor analysis was used to test the model hypotheses. Structural equation modeling is a set of statistical methods that allows researchers to test a set of relationships between one or more independent variables and one or more dependent variables. In this study, SmartPLS software was used to assess model fit and examine the hypotheses.

3. Findings and Results

In the present study, 45.4% of the respondents were in the age group of 20 to 30 years, which had the highest frequency among the age groups. In addition, 41.5% were in the age group of 31 to 40 years, 9.2% were in the age group of 41 to 50 years, and 3.8% were older than 51 years. In terms of gender, 51.5% of the respondents were women and 48.5% were men. Regarding educational level, 11.5% had a high school diploma, 15.4% had an associate degree, 50.8% had a bachelor's degree, 20.8% had a master's degree, and 1.5% had a doctoral degree. In terms of work experience, 26.2% had less than 5 years of experience, 29.2% had 5 to 10 years, 26.9% had 10 to 15 years, and 17.7% had more than 16 years of work experience.

Table 1

Descriptive Data of the Main Research Variables

Variable	N	Missing Data	Mean	Standard Deviation	Variance	Skewness	Standard Error of Skewness	Kurtosis	Standard Error of Kurtosis	Minimum	Maximum
Interorganizational relationships	130	0	3.8815	0.64541	0.417	-0.910	0.212	1.505	0.422	1.40	5.00
Decision support system	130	0	4.0904	0.68271	0.466	-1.761	0.212	0.684	0.422	1.50	5.00
Information technology	130	0	3.7626	0.67583	0.457	-1.552	0.212	4.284	0.422	1.00	5.00

Organizational infrastructure	130	0	4.0000	0.67843	0.460	-1.354	0.212	3.696	0.422	1.00	5.00
Green supply chain management strategies	130	0	3.8205	0.51833	0.269	-1.102	0.212	2.104	0.422	1.94	4.78
Competitive strategies	130	0	3.8219	0.53825	0.290	-0.692	0.212	1.040	0.422	2.08	5.00
Supply chain	130	0	3.9054	0.57702	0.333	-1.679	0.212	3.6			

Based on the results of Table 1, the mean scores of all variables were at a desirable level and ranged from 3.82 to 4.09 out of 5. Among the variables, the decision support system had the highest mean score, with a mean of 4.09, while competitive strategies had the lowest mean score, with a mean of 3.82. Regarding standard deviation, the values of all variables ranged from 0.51 to 0.68, indicating a relatively similar and moderate dispersion of responses among the participants. The decision support system, with a standard deviation of 0.68, showed the greatest dispersion, whereas green supply chain management strategies, with a standard deviation of 0.51, showed the lowest dispersion. The skewness values of all variables were negative, indicating that the distributions were skewed to the left and that respondents tended to provide scores above the mean. In addition, the kurtosis values were positive for most variables, indicating a greater concentration of data around the mean compared with a normal distribution. Overall, the distribution of the research data was acceptable, and respondents held relatively positive views toward all research variables.

Table 2

Correlations Among the Research Variables Using Spearman's Test

Variable	Supply Chain	Competitive Strategies	Green Supply Chain Management Strategies	Organizational Infrastructure	Information Technology	Decision Support System	Interorganizational Relationships
Supply chain	1.000						
Competitive strategies	0.727	1.000					
Green supply chain management strategies	0.772	0.518	1.000				
Organizational infrastructure	0.773	0.616	0.710	1.000			
Information technology	0.810	0.517	0.324	0.651	1.000		
Decision support system	0.766	0.702	0.870	0.475	0.487	1.000	
Interorganizational relationships	0.776	0.764	0.718	0.473	0.509	0.515	1.000

Based on the correlation matrix, all research variables had positive and significant correlations with one another. The highest correlation was observed between supply chain and information technology, with a coefficient of 0.810, indicating a very strong relationship between these two variables. The correlations between supply chain and green supply chain management strategies (0.772), organizational infrastructure (0.773), and interorganizational relationships (0.776) were also high. Among the other relationships, the correlation between the decision support system and green supply chain management strategies, with a coefficient of 0.870, was notable. The lowest correlation was observed between information technology and green supply chain management strategies, with a coefficient of 0.324. Overall, these results indicate that the research variables had coherent and significant internal relationships.

Table 3

Results of Hypothesis Testing

Row	Research Hypothesis / Path	Path Coefficient β	T Statistic	Coefficient of Determination R^2	Result
1	Organizational infrastructure → Competitive strategies	0.729	14.327	0.531	Confirmed
2	Information technology → Competitive strategies	0.718	14.150	0.516	Confirmed
3	Interorganizational relationships → Competitive strategies	0.792	17.704	0.628	Confirmed
4	Decision support system → Competitive strategies	0.704	11.165	0.496	Confirmed
5	Organizational infrastructure → Green supply chain management strategies	0.627	5.359	0.393	Confirmed
6	Information technology → Green supply chain management strategies	-0.528	< 1.96	< 0.330	Rejected
7	Interorganizational relationships → Green supply chain management strategies	0.623	5.359	0.393	Confirmed
8	Decision support system → Green supply chain management strategies	0.530	1.101	0.281	Rejected

Figure 1

Measurement Model in the Significance Mode

According to the path coefficient related to the first hypothesis, organizational infrastructure had an effect of 0.729 on competitive strategies. This means that if organizational infrastructure increases by one unit, competitive strategies are expected to increase by 0.729 units at a 95% confidence level. The factor loadings also showed very good quality in explaining their respective construct, as all values were greater than 0.60.

According to the path coefficient related to the second hypothesis, information technology had an effect of 0.718 on competitive strategies. This means that if information technology increases by one unit, competitive strategies are

expected to increase by 0.718 units at a 95% confidence level. The factor loadings also showed very good quality in explaining their respective construct, as all values were greater than 0.718.

According to the path coefficient related to the third hypothesis, interorganizational relationships had an effect of 0.792 on competitive strategies. This means that if interorganizational relationships increase by one unit, competitive strategies are expected to increase by 0.792 units at a 95% confidence level.

According to the path coefficient related to the fourth hypothesis, the decision support system had an effect of 0.704 on competitive strategies. This means that if the decision support system increases by one unit, competitive strategies are expected to increase by 0.704 units at a 95% confidence level.

According to the path coefficient related to the fifth hypothesis, organizational infrastructure had an effect of 0.627 on green supply chain management strategies. This means that if organizational infrastructure increases by one unit, green supply chain management strategies are expected to increase by 0.627 units at a 95% confidence level.

According to the path coefficient related to the sixth hypothesis, information technology had an effect of -0.528 on the components of green supply chain management strategies. This means that if information technology increases by one unit, the components of green supply chain management strategies are expected to decrease by 0.528 units at a 95% confidence level. In other words, there was an inverse correlation between information technology and green supply chain management strategies. Therefore, this hypothesis was rejected because the R^2 value was lower than 0.33 and the T statistic was lower than 1.96.

According to the path coefficient related to the seventh hypothesis, interorganizational relationships had an effect of 0.623 on green supply chain management strategies. This means that if interorganizational relationships increase by one unit, green supply chain management strategies are expected to increase by 0.623 units at a 95% confidence level.

According to the path coefficient related to the eighth hypothesis, the decision support system had an effect of 0.530 on the components of green supply chain management strategies. This means that if the decision support system increases by one unit, the components of green supply chain management strategies are expected to increase by 0.530 units at a 95% confidence level. On the other hand, it can be concluded that there was no significant effect between the decision support system and green supply chain management strategies.

4. Discussion and Conclusion

The present study aimed to assess the effectiveness of green supply chain management strategies in strengthening and sustainably enhancing the competitive position of project-based organizations, with Ariana Tunnel Dam Company as the case study. The results showed that the supply chain had a significant effect on both competitive strategies and green supply chain management strategies. This finding indicates that the supply chain is not merely an operational mechanism for procurement, logistics, and coordination, but a strategic platform through which project-based organizations can develop competitive capabilities and institutionalize environmentally oriented practices. In project-based organizations, where activities are usually complex, temporary, resource-intensive, and dependent on multiple actors, the supply chain functions as an integrative system that connects organizational infrastructure, information flows, supplier relationships, decision-making mechanisms, and strategic priorities. Therefore, the significant effect of supply chain on competitive strategies and green supply chain management strategies confirms that supply chain capabilities can become a source of sustainable competitive advantage when they are aligned with environmental and strategic objectives. This result is consistent with the resource-based view of green supply chain management, according to which green supply chain practices can act as strategic resources that improve both environmental and business outcomes (Khan et al., 2023). It also aligns with evidence showing that green supply chain management improves business performance and environmental sustainability, particularly when it is implemented as a strategic rather than merely regulatory or operational activity (Rupa & Saif, 2022).

The findings further revealed that organizational infrastructure had a significant positive effect on competitive strategies. This result suggests that the structural, procedural, human, and managerial foundations of the organization create the necessary conditions for the formulation and implementation of competitive strategies. Organizational infrastructure includes the internal capacities that enable organizations to coordinate resources, standardize processes, control quality, manage projects, and respond to market and environmental requirements. In the context of project-based organizations, such infrastructure is

especially important because each project requires the rapid mobilization of resources, coordination among internal units and external partners, and the ability to maintain performance standards under uncertain conditions. This finding is consistent with studies emphasizing that competitive strategy is not formed independently of organizational capabilities; rather, it is developed through the alignment of resources, processes, and managerial systems with strategic priorities (Rahimizadeh, 2023). It also supports the argument that differentiation and positional advantage depend on internal capabilities that allow firms to offer distinctive value to customers and markets (Hasanvand et al., 2024). In addition, the result corresponds with evidence that quality management activities influence firm performance through the mediating role of competitive strategy, indicating that internal managerial systems and strategic orientation must be integrated for performance improvement (Farhadi et al., 2021).

Information technology also had a significant positive effect on competitive strategies. This result indicates that information technology strengthens competitive position by improving data accessibility, communication speed, process integration, monitoring capability, and managerial responsiveness. In supply chain contexts, information technology allows organizations to reduce uncertainty, improve coordination, enhance forecasting, monitor operational performance, and support timely decision-making. For project-based organizations, information technology is particularly valuable because project activities involve large volumes of data, multiple contractors, complex schedules, and continuous coordination requirements. The significant effect of information technology on competitive strategies is consistent with studies showing that digital technologies have become central to modern supply chain management and can improve operational integration and strategic responsiveness (Mohsen, 2023). This result also aligns with research indicating that artificial intelligence, machine learning, and digital technologies are reshaping supply chain planning, logistics, forecasting, and strategic decision-making (Khedr, 2024; Richey et al., 2023; Sharma et al., 2022). Moreover, the finding supports the view that big data analytics improves supply chain performance when it is aligned with information system strategy and supply chain strategy (Wei et al., 2022).

The results showed that interorganizational relationships had the strongest effect on competitive strategies among the examined antecedents. This finding is highly meaningful in project-based organizations because competitive advantage in such organizations is rarely created by a single firm acting independently. Instead, it is produced through coordinated networks of suppliers, contractors, consultants, clients, regulators, and technical partners. Strong interorganizational relationships facilitate trust, information exchange, resource sharing, risk reduction, joint problem-solving, and faster response to project requirements. In competitive environments, these relational capabilities can help organizations improve service quality, reduce delays, strengthen reliability, and differentiate themselves from competitors. This finding is consistent with research on sustainable global value chain management, which emphasizes the importance of strategic enablers, coordination mechanisms, and interorganizational governance in sustaining competitiveness across complex value networks (Malek Akhlaq et al., 2021). It is also compatible with studies showing that supply chain disruptions are often rooted in relational, operational, and coordination weaknesses; therefore, strong interorganizational relationships can reduce vulnerability and improve supply chain effectiveness (Kanike, 2023). In this respect, the present finding highlights that relationship-based capabilities are among the most important foundations of sustainable competitive position.

The decision support system also had a significant positive effect on competitive strategies. This result indicates that structured decision-making mechanisms, analytical tools, and managerial support systems can help organizations transform information into competitive action. In project-based organizations, decision support systems can improve prioritization, resource allocation, scheduling, risk assessment, supplier evaluation, and strategic planning. Such systems reduce dependence on intuition alone and enable managers to make more evidence-based decisions under uncertainty. This finding is consistent with the growing literature on advanced analytical systems in operations and supply chain management. Artificial intelligence and machine learning applications, for example, have been shown to support forecasting, optimization, supplier selection, inventory control, and operational decision-making (Helo & Hao, 2022; Lin et al., 2022). Reinforcement learning algorithms have also been identified as useful tools for sequential decision-making in supply chain environments, particularly where decisions must be adjusted dynamically over time (Rolf et al., 2023). Therefore, the significant effect of the decision support system on competitive strategies confirms that analytical and

decision-oriented capabilities can strengthen the strategic position of organizations.

Another important finding was that organizational infrastructure had a significant positive effect on green supply chain management strategies. This result indicates that the successful implementation of green supply chain management depends on the presence of adequate internal infrastructure. Green supply chain management requires more than environmental awareness; it requires formal procedures, managerial commitment, resource allocation, performance measurement systems, employee readiness, supplier evaluation mechanisms, and coordination structures. In the absence of organizational infrastructure, green practices may remain symbolic, fragmented, or limited to isolated activities. This finding aligns with studies showing that green supply chain management can enhance environmental sustainability and organizational performance when it is supported by firm-level resources and capabilities (Khan et al., 2023; Rupa & Saif, 2022). It also confirms that sustainable supply chain strategies require structured enablers and institutional support to become embedded in organizational routines (Malek Akhlaq et al., 2021). In project-based organizations, organizational infrastructure is particularly important because environmental practices must be applied across temporary project structures and diverse supplier networks.

The study also found that interorganizational relationships had a significant positive effect on green supply chain management strategies. This finding confirms that green supply chain management is fundamentally network-based. Environmental performance cannot be achieved solely through internal organizational decisions because suppliers, contractors, distributors, and project partners all influence resource consumption, waste generation, environmental compliance, and sustainability outcomes. Strong interorganizational relationships enable organizations to communicate environmental expectations, collaborate on green procurement, coordinate environmentally compatible design, improve supplier compliance, and share knowledge about sustainable practices. This result is consistent with research indicating that green supply chain management requires collaboration and integration across supply chain actors (Wang et al., 2023). It also aligns with studies on risk management and resilience, which show that supply chain sustainability depends on the ability of organizations to coordinate responses across networks and manage uncertainty collectively (Han & Um, 2024). Therefore, the present finding indicates that relationship quality is a key mechanism through which project-based organizations can institutionalize green supply chain strategies.

In contrast, the results showed that information technology did not have a significant effect on green supply chain management strategies. This finding is noteworthy because information technology had a significant effect on competitive strategies but not on green supply chain management strategies. One possible explanation is that information technology in the studied organization may be used primarily for operational coordination, communication, reporting, or efficiency improvement, rather than for environmental monitoring, green procurement, carbon tracking, waste reduction, or sustainability analytics. In other words, the mere existence of information technology does not automatically produce green supply chain capabilities unless technological systems are specifically designed and strategically aligned with environmental objectives. This interpretation is consistent with the argument that digital technologies contribute to green supply chain management only when they are integrated into sustainability-oriented processes and decision frameworks (Wang et al., 2023). It also aligns with research showing that big data analytics improves supply chain performance through the alignment of supply chain strategy and information system strategy, meaning that technology must be embedded in strategic and organizational contexts to generate desired outcomes (Wei et al., 2022). Therefore, the non-significant effect of information technology on green supply chain management strategies may reflect a gap between technological availability and sustainability-oriented use.

Similarly, the decision support system did not have a significant effect on green supply chain management strategies. This result suggests that decision support systems in the organization may not be sufficiently connected to environmental criteria, green supplier evaluation, sustainability indicators, or ecological risk assessment. Although decision support systems can strengthen competitive strategies by improving managerial analysis and planning, their impact on green supply chain management depends on whether environmental variables are included in decision models. If decision systems emphasize cost, time, technical performance, and operational control while neglecting environmental indicators, their contribution to green supply chain management will remain limited. This finding can be interpreted in light of studies showing that artificial intelligence and digital decision systems have strong potential for supply chain optimization but require

careful strategic design, data quality, and organizational integration (Helo & Hao, 2022; Richey et al., 2023; Sharma et al., 2022). It is also consistent with emerging discussions on advanced digital environments, such as the metaverse, which suggest that new technologies can transform operations and supply chain management only when organizations develop appropriate implementation frameworks and strategic use cases (Queiroz et al., 2023). Therefore, the rejection of this hypothesis does not imply that decision support systems are irrelevant to green supply chain management; rather, it indicates that their current configuration may not sufficiently support environmental strategy.

Overall, the findings show that organizational infrastructure and interorganizational relationships are the most consistent predictors of both competitive strategies and green supply chain management strategies, whereas information technology and decision support systems appear to contribute more clearly to competitive strategies than to green supply chain management strategies. This pattern suggests that sustainable competitive positioning in project-based organizations is primarily grounded in structural readiness and relational capability. Technology and decision systems can improve competitiveness, but their environmental effects depend on whether they are explicitly aligned with green supply chain objectives. These findings are compatible with the broader literature on supply chain risk, sustainability, digital transformation, and competitive strategy, which collectively indicates that performance improvement requires the integration of organizational resources, technological tools, collaborative networks, and strategic orientation (Han & Um, 2024; Kanike, 2023; Mohsen, 2023; Safari et al., 2021). The results also reinforce the idea that competitive strategies and green supply chain management strategies should not be treated as separate managerial domains; rather, they should be integrated into a unified strategic framework for achieving sustainable competitive advantage.

The present study had several limitations that should be considered when interpreting the findings. First, the study was conducted as a cross-sectional investigation; therefore, although significant relationships were identified among the variables, causal inference should be made with caution. Second, the statistical population was limited to experts of Ariana Tunnel Dam Company in Tehran, which may restrict the generalizability of the findings to other project-based organizations, industries, regions, or organizational cultures. Third, the data were collected through self-report questionnaires, which may be affected by response bias, social desirability, or respondents' subjective perceptions. Fourth, although the study examined important supply chain-related factors, other potentially influential variables such as environmental regulation, leadership commitment, supplier environmental capability, organizational culture, project complexity, and market pressure were not included in the model.

Future studies should examine the proposed relationships using longitudinal designs to better identify causal patterns and changes over time. Researchers are encouraged to test the model in different project-based industries, such as construction, infrastructure, energy, engineering services, and information technology projects, in order to compare sector-specific differences. Future research could also include mediating and moderating variables, such as environmental commitment, green innovation, organizational learning, digital maturity, supplier integration, and sustainability-oriented leadership. In addition, mixed-methods research may provide deeper insight into why information technology and decision support systems did not significantly affect green supply chain management strategies in the present study. Comparative studies between project-based and non-project-based organizations could also clarify whether the determinants of green supply chain management differ across organizational forms.

Managers of project-based organizations should treat green supply chain management as a strategic priority rather than a peripheral environmental activity. The findings suggest that strengthening organizational infrastructure and interorganizational relationships should be placed at the center of managerial investment. Organizations should develop formal procedures for green procurement, supplier evaluation, environmental monitoring, waste reduction, and sustainable project execution. They should also build collaborative relationships with suppliers, contractors, and project partners to ensure that environmental objectives are shared across the supply chain. Although information technology and decision support systems did not significantly predict green supply chain management strategies in this study, managers should not disregard them; instead, they should redesign these systems so that environmental indicators, sustainability metrics, and green decision criteria are incorporated into routine managerial decisions.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We would like to express our gratitude to all individuals helped us to do the project.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethics Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were considered.

References

Farhadi, F., Fathollahi Chaleshtari, S., & Babaei Farsani, M. (2021). Analysis of the mediating role of competitive strategy in quality management activities on firm performance: Case study of pharmaceutical companies in Shahrekord Industrial Town. *Standard and Quality Management*, *11*(1), 1-27.

Han, N., & Um, J. (2024). Risk management strategy for supply chain sustainability and resilience capability. *Risk management*, *26*(2), 6. https://doi.org/10.1057/s41283-023-00138-w

Hasanvand, A., Arefnejad, M., & Jafari, M. (2024). The effect of differentiation competitive strategy on export performance with positional advantage. *Business Management Explorations*, *35*(11), 1-18.

Helo, P., & Hao, Y. (2022). Artificial intelligence in operations management and supply chain management: An exploratory case study. *Production Planning & Control*, *33*(16), 1573-1590. https://doi.org/10.1080/09537287.2021.1882690

Kanike, U. K. (2023). Factors disrupting supply chain management in manufacturing industries. *Journal of Supply Chain Management Science*, *4*(1-2), 1-24. https://doi.org/10.18757/jscms.2023.6986

Khan, M., Ajmal, M. M., Jabeen, F., Talwar, S., & Dhir, A. (2023). Green supply chain management in manufacturing firms: A resource-based viewpoint. *Business Strategy and the Environment*, *32*(4), 1603-1618. https://doi.org/10.1002/bse.3207

Khedr, A. M. (2024). Enhancing supply chain management with deep learning and machine learning techniques: A review. *Journal of Open Innovation: Technology, Market, and Complexity*, *10*(4), 100379. https://doi.org/10.1016/j.joitmc.2024.100379

Lin, H., Lin, J., & Wang, F. (2022). An innovative machine learning model for supply chain management. *Journal of Innovation & Knowledge*, *7*(4), 100276. https://doi.org/10.1016/j.jik.2022.100276

Malek Akhlaq, E., Sangbar, M., Javidi, F., & Rajabi, J. (2021). Structuring the strategic enablers of sustainable global value chain management. *Management Research in Iran*, *25*(4), 1-25.

Mohsen, B. M. (2023). Developments of digital technologies related to supply chain management. *Procedia Computer Science*, *220*, 788-795. https://doi.org/10.1016/j.procs.2023.03.105

Queiroz, M. M., Fosso Wamba, S., Pereira, S. C. F., & Chiappetta Jabbour, C. J. (2023). The metaverse as a breakthrough for operations and supply chain management: Implications and call for action. *International Journal of Operations & Production Management*, *43*(10), 1539-1553. https://doi.org/10.1108/IJOPM-01-2023-0006

Rahimizadeh, R. (2023). Analyzing the concept of competitive strategy in small and medium-sized businesses. *Strategic Management and Futures Studies*, *6*(1), 115-134.

Richey, R. G., Jr., Chowdhury, S., Davis-Sramek, B., Giannakis, M., & Dwivedi, Y. K. (2023). Artificial intelligence in logistics and supply chain management: A primer and roadmap for research. *Journal of Business Logistics*, *44*(4), 532-549. https://doi.org/10.1111/jbl.12364

Rolf, B., Jackson, I., Muller, M., Lang, S., Reggelin, T., & Ivanov, D. (2023). A review on reinforcement learning algorithms and applications in supply chain management. *International Journal of Production Research*, *61*(20), 7151-7179. https://doi.org/10.1080/00207543.2022.2140221

Rupa, R. A., & Saif, A. N. M. (2022). Impact of green supply chain management (GSCM) on business performance and environmental sustainability: Case of a developing country. *Business Perspectives and Research*, *10*(1), 140-163. https://doi.org/10.1177/2278533720983089

Safari, M., Jamali, G., & Baversad, B. (2021). The effect of large competitive strategies on supply chain sustainability in cement industries of Bushehr Province. *Productivity management*, *57*(12), 229-258.

Sharma, R., Shishodia, A., Gunasekaran, A., Min, H., & Munim, Z. H. (2022). The role of artificial intelligence in supply chain management: Mapping the territory. *International Journal of Production Research*, *60*(24), 7527-7550. https://doi.org/10.1080/00207543.2022.2029611

Syadali, M., Segaf, S., & Parmujianto, P. (2023). Risk management strategy for the problem of borrowing money for Islamic commercial banks. *Enrichment: Journal of Management*, *13*(2), 1227-1236.

Wang, Y., Yang, Y., Qin, Z., Yang, Y., & Li, J. (2023). A literature review on the application of digital technology in achieving green supply chain management. *Sustainability*, *15*(11), 8564. https://doi.org/10.3390/su15118564

Wei, S., Yin, J., & Chen, W. (2022). How big data analytics use improves supply chain performance: Considering the role of supply chain and information system strategies. *The International Journal of Logistics Management*, *33*(2), 620-643. https://doi.org/10.1108/IJLM-06-2020-0255