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The Impact of Development Strategies on Operational Performance and Competitive Advantage among Transportation Refrigeration Service Providers in Saudi Arabia

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[I]

شكر وتقدير

أساتذتي الأفاضل، وزملائي الأعزاء، ولجنة الحكم والمناقشة الموقرة؛ الذين لم يخلوا بوقتهم الثمين وتوجيهاتهم السديدة، إن ملاحظاتكم القيّمة كانت بمثابة البوصلة التي قادتني إلى الارتقاء بمستوى هذا البحث، فلكم مني كل الاحترام والتقدير.

إلى والديّ الأكرمين، اللذين لم يدخرا جهداً في سبيلي، وكانا لي الدعم المستمر طوال مسيرتي العلمية والحياتية.

إلى زوجتي الغالية، رفيقة درب والخطوة، أهدي هذا النجاح اعترافاً بفضلها، وتقديراً لوقوفها بجاني ومساندتها الصادقة في كافة المراحل.

إلى أصدقائي وزملائي الكرام، الذين شاركوني عناء درب وكانوا لي عوناً ودافعاً للاستمرار.

وإلى كل من مدّ لي يد العون، أهدي هذا الجهد المتواضع، سائلاً الله العليّ القدير أن يكلل مسيرتنا جميعاً بالنجاح والتوفيق.

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1.Introduction

The transportation refrigeration industry plays a critical role in ensuring the integrity, quality, and safety of temperature-sensitive products throughout the supply chain. These products include food, pharmaceuticals, chemicals, and other perishable goods that require strict temperature control during transportation and distribution. As global trade expands and customer expectations continue to rise, transportation refrigeration service providers face increasing pressure to deliver reliable, efficient, and cost-effective solutions while maintaining compliance with quality, safety, and environmental standards (Christopher, 2016; Harrison et al., 2019).

In recent years, the transportation refrigeration sector has undergone significant transformation driven by technological advancements, digitalization, sustainability requirements, and evolving market demands. Organizations operating within this sector are increasingly investing in advanced refrigeration technologies, remote monitoring systems, predictive maintenance tools, data analytics, and workforce development initiatives to improve operational efficiency and strengthen their market position. At the same time, the growing emphasis on environmental sustainability and energy efficiency has accelerated the adoption of innovative solutions that reduce operating costs and environmental impact while supporting long-term business growth (Ivanov & Dolgui, 2021; Rogers, 2003).

Within the Kingdom of Saudi Arabia, the transportation refrigeration industry has gained strategic importance due to the objectives of Saudi Vision 2030, particularly those related to logistics development, industrial growth, food security, healthcare expansion, and economic diversification (Saudi Vision 2030, 2023). The continued development of the National Industrial Development and Logistics Program (NIDLP) and the expansion of industrial and logistics activities across the Kingdom have created significant opportunities for transportation refrigeration service providers. These developments have also increased the need for effective development strategies capable of addressing operational challenges, improving service quality, and enhancing competitiveness (General Authority for Statistics [GASTAT], 2024).

Development strategies encompass a range of initiatives aimed at improving organizational capabilities, including technological modernization, process optimization, service expansion, workforce development, strategic partnerships, and digital transformation. According to the Resource-Based View (RBV), organizations can achieve sustainable competitive advantage through the effective utilization of valuable and unique resources, capabilities, and competencies (Barney, 1991). Consequently, investments in technology, skilled human resources, and operational excellence can significantly improve operational performance and strengthen an organization's competitive position.

Operational performance is a critical indicator of an organization's ability to utilize its resources effectively and achieve strategic objectives. Measures such as productivity, service reliability,

responsiveness, cost efficiency, and quality performance are increasingly recognized as essential determinants of business success (Slack et al., 2022). Moreover, organizations that continuously improve operational performance are better positioned to create sustainable competitive advantages through superior customer service, innovation, and market responsiveness (Porter, 1985).

Despite the growing importance of transportation refrigeration services, limited research has examined the integrated relationship between development strategies, operational performance, and competitive advantage within this specialized industry. Existing studies have generally focused on strategic management, logistics performance, supply chain efficiency, or competitive advantage as separate domains rather than examining their interconnected effects in transportation refrigeration services (Christopher, 2016; Grant, 2021). Furthermore, relatively few studies have explored these relationships within the context of Saudi Arabia's rapidly evolving logistics and industrial sectors.

Therefore, this study seeks to investigate the impact of development strategies adopted by transportation refrigeration service providers on operational performance and competitive advantage. The study aims to provide a comprehensive understanding of the organizational, technological, and operational factors that contribute to business success within this sector. In addition, practical insights may be drawn from selected industry participants, including organizations such as Zamil Services, as reference cases to support the analysis and enhance the applicability of the findings. The results are expected to provide valuable recommendations for managers, policymakers, and industry stakeholders seeking to improve operational excellence, competitiveness, and long-term sustainability within the transportation refrigeration industry.

1.1 Problem Statement

Many transportation refrigeration service providers face challenges related to operational efficiency, workforce capability, spare parts availability, technological modernization, geographic coverage, and increasing customer expectations. Despite investments in development initiatives, there is limited understanding of which strategic development practices most effectively improve operational performance and sustainable competitive advantage. Therefore, this study examines how development strategies contribute to improving operational performance and strengthening competitive advantage in the transportation refrigeration industry (Christopher, 2016; Slack et al., 2022; Saudi Vision 2030, 2023).

1.2 Study Variables, Population, and Context

This study examines the relationship between development strategies and organizational outcomes within the transportation refrigeration service industry in Saudi Arabia. The study is structured around the following components:

1.2.1 Independent Variable: Development Strategies, which include organizational initiatives such as technological modernization, digital transformation, process optimization, workforce development, service expansion, and strategic partnerships implemented to enhance organizational capabilities and long-term performance.

1.2.2 Dependent Variables: Operational Performance, measured through indicators such as productivity, service reliability, responsiveness, quality of service, and cost efficiency. Competitive Advantage, reflected in the organization's ability to achieve superior market performance through service differentiation, innovation, customer satisfaction, and sustainable business growth.

1.2.2.1 Operational Performance, measured through indicators such as productivity, service reliability, responsiveness, quality of service, and cost efficiency.

1.2.2.2 Competitive Advantage, reflected in the organization's ability to achieve superior market performance through service differentiation, innovation, customer satisfaction, and sustainable business growth.

1.2.3 Study Population: The population of this study consists of transportation refrigeration service providers operating in the Kingdom of Saudi Arabia. These include organizations engaged in the installation, maintenance, repair, monitoring, and technical support of refrigeration systems used in temperature-controlled transportation.

1.2.4 Context: The research is conducted within the Kingdom of Saudi Arabia, where the transportation refrigeration industry is experiencing significant growth as a result of Saudi Vision 2030, the expansion of the logistics and industrial sectors, and increasing demand for reliable

cold chain services. This context provides an appropriate setting for examining how development strategies influence operational performance and competitive advantage within the industry.

This framework positions Development Strategies as the independent variable influencing the two dependent variables—Operational Performance and Competitive Advantage—among transportation refrigeration service providers operating in Saudi Arabia.

1.3 Importance of the Study

1.3.1 Theoretical Importance

1.3.1.1 Enriching Theoretical Knowledge

This study contributes to enriching theoretical knowledge in the fields of strategic management, operations management, and supply chain management by examining the impact of transportation refrigeration division development strategies on operational performance and competitive advantage. This topic has gained increasing attention due to rapid technological advancements and growing competition in the refrigerated transportation industry (Porter, 1985; Christopher, 2016).

1.3.1.2 Bridging a Gap in the Literature

The study seeks to fill a gap in the existing literature on transportation refrigeration, as previous studies have mainly focused on technical or logistical aspects separately. In contrast, this study examines the relationship between development strategies, operational performance, and competitive advantage in an integrated manner (Slack et al., 2022).

1.3.1.3 Providing an Integrated Theoretical Framework

The study provides an integrated theoretical framework linking development strategy, operational performance, and competitive advantage in the transportation refrigeration sector. This framework contributes to a better understanding of the relationships among these variables and offers a basis for future research in similar industries (Kaplan & Norton, 1996).

1.3.2 Practical Importance

1.3.2.1 Providing Recommendations for Organizations

The findings of this study can help organizations operating in the transportation refrigeration sector develop effective strategies to improve operational performance and strengthen their competitive advantage through investments in advanced technologies and process improvements (Christopher, 2016).

1.3.2.2 Assisting Policymakers and Decision-Makers

The study provides valuable information and insights that can assist policymakers and

senior managers in formulating policies and strategies that support innovation and operational efficiency in the transportation refrigeration industry, thereby contributing to sustainable development and enhanced competitiveness (Porter, 1985).

1.3.2.3 Developing Measurement and Evaluation Tools

The study contributes to the development of indicators and tools for measuring and evaluating operational performance and competitive advantage in transportation refrigeration divisions. These tools can help organizations monitor their performance and make informed decisions for continuous improvement (Kaplan & Norton, 1996; Slack et al., 2022).

1.4 Objectives of the Study

1.4.1 General Objective:

The general objective of this study is to examine the impact of transportation refrigeration service provider development strategies on operational performance and competitive advantage. Strategic development is essential for organizations seeking to improve efficiency and maintain a strong market position in an increasingly competitive environment (Porter, 1985).

1.4.2 Specific Objectives:

The specific objectives of this study are:

1. To identify the development strategies adopted by transportation refrigeration divisions to enhance their operational capabilities (Christopher, 2016).
2. To examine the effect of development strategies on operational performance, including efficiency, service quality, productivity, and cost reduction (Kaplan & Norton, 1996; Slack et al., 2022).
3. To investigate the role of technological innovation, digital monitoring systems, and process optimization in improving operational performance and competitiveness (Christopher, 2016).
4. To examine the relationship between operational performance and competitive advantage in transportation refrigeration divisions (Porter, 1985).
5. To provide recommendations for managers and decision-makers on how to develop effective strategies that enhance operational performance and strengthen competitive advantage (Slack et al., 2022).

1.5 Research Questions

1.5.1 Main Research Question:

How much do Saudi Arabian transportation refrigeration service providers' development strategies affect their operational performance and competitive advantage?

1.5.2 Sub-Research Questions

1.5.2.1 RQ1

How well are development strategies being implemented by transportation refrigeration service providers?

1.5.2.2 RQ2

What impact do development plans have on the performance of operations?

1.5.2.3 RQ3:

How do development initiatives impact competitive advantage?

1.5.2.4 RQ4

What is the relationship between competitive advantage and operational performance?

1.5.2.5 RQ5

Does the connection between competitive advantage and development plans get mediated by operational performance?

1.6 Hypotheses of the study

1.6.1 Main Hypothesis

H0

The competitive advantage and operational performance of transportation refrigeration service providers are not significantly impacted by development plans.

H1

The operational performance of transportation refrigeration service providers is significantly improved by development techniques.

H2

Direct Effect Hypotheses The competitive advantage of transportation refrigeration service providers is significantly enhanced by development initiatives.

H3

The competitive advantage of transportation refrigeration service providers is significantly enhanced by operational performance.

1.6.2 Hypothesis of Mediation

H4

The relationship between development plans and competitive advantage among transportation refrigeration service providers is substantially mediated by operational performance.

2. Literature Review

Although previous studies provide valuable insights into strategic management, logistics, operational performance, and competitive advantage, several limitations remain.

Most research investigates these constructs independently rather than examining their combined influence. Existing studies are largely conducted in manufacturing or general logistics contexts, with limited focus on transportation refrigeration service organizations. Furthermore, few studies examine the Saudi Arabian context, where logistics expansion, sustainability initiatives, and Vision 2030 are reshaping industry requirements.

Accordingly, this study develops an integrated framework to examine how development strategies influence operational performance and competitive advantage within transportation refrigeration services in Saudi Arabia.

2.1 Previous Studies

Transportation refrigeration is a critical component of the cold chain, ensuring temperature-sensitive products such as food, pharmaceuticals, chemicals, and biotechnology products are transported under controlled environmental conditions. In recent years, research regarding transportation refrigeration services has transitioned from examining simple equipment maintenance toward assessing integrated business solutions, fleet optimization, and digital capabilities.

To map the academic foundation of this evolution, relevant previous studies are evaluated individually below, ordered from the most recent to the oldest:

- **Khan and Al-Anazi (2021)**

This study investigated logistics operations within emerging Middle Eastern markets, focusing heavily on operational capabilities in extreme climate conditions. The authors highlighted that cold-chain efficiency relies on real-time tracking, responsive technician capabilities, and localized maintenance infrastructure. Their findings directly support the premise that service availability and rapid technician response are vital strategic differentiators for regional refrigeration providers.

- **Ivanov and Dolgui (2021)**

The researchers examined the digital transformation of modern logistics networks, focusing on the deployment of predictive analytics, digital monitoring, and preventive maintenance. Their work emphasizes that refrigeration services can no longer operate purely on reactive maintenance models; instead, integrating digital monitoring and fleet optimization tools is essential to enhance service reliability and minimize the risk of thermal breaches during transport.

- **Harrison et al. (2019)**

This study analyzed global logistics infrastructure and the strict regulatory frameworks governing pharmaceutical supply chains. The authors demonstrated that the globalization of trade requires transportation refrigeration systems to maintain absolute thermal compliance across vast geographic zones. They underscored the necessity for nationwide service coverage and robust spare parts availability to prevent costly supply chain interruptions.

- **Christopher (2016)**

A foundational study in strategic logistics management that explored how market globalization dictates stricter food safety regulations and cold-chain compliance. Christopher argued that transportation refrigeration service organizations must align their operational performance directly with customer satisfaction metrics to build sustainable, long-term business relationships in highly competitive commercial markets.

Contextual Imperative in Saudi Arabia

In Saudi Arabia, transportation refrigeration has become increasingly important due to Vision 2030 initiatives, the rapid expansion of localized logistics hubs, the growth of domestic pharmaceutical manufacturing, and stringent national food security requirements. Consequently, service providers are operating under unique environmental and economic conditions, forcing them to continuously improve operational capabilities while maintaining cost efficiency and service reliability.

2.2 Transportation Refrigeration Services

In Saudi Arabia, transportation refrigeration has become increasingly important due to Vision 2030 initiatives, expansion of logistics hubs, growth of pharmaceutical manufacturing, and increasing food security requirements. Consequently, service providers must continuously improve operational capabilities while maintaining cost efficiency and service reliability.

2.3 Development Strategies

Development strategies refer to the systematic initiatives organizations implement to enhance capabilities, improve operational efficiency, expand services, and achieve sustainable competitive advantage (Grant, 2021).

Several researchers classify development strategies into:

- Digital transformation
- Workforce development
- Process improvement
- Technology adoption
- Strategic partnerships
- Service diversification
- Geographic expansion

Recent literature suggests that organizations investing simultaneously in technological innovation and organizational capability development consistently outperform competitors (Teece, Pisano, & Shuen, 1997; Ivanov & Dolgui, 2021).

However, studies rarely investigate how these strategies specifically affect transportation refrigeration businesses.

2.4 Operational Performance

Operational performance represents an organization's ability to utilize resources efficiently while achieving strategic objectives.

According to Slack et al. (2022), operational performance includes:

- Productivity
- Service quality
- Response time
- Cost efficiency
- Reliability
- Customer satisfaction

Kaplan and Norton (1996) argue that operational performance should be evaluated through multiple dimensions rather than relying solely on financial indicators.

Recent logistics research further emphasizes that digital technologies, predictive maintenance, and real-time monitoring significantly improve operational performance (Ivanov & Dolgui, 2021).

Despite these advances, there remains limited evidence concerning operational performance drivers within transportation refrigeration services.

2.5 Competitive Advantage

Competitive advantage refers to an organization's ability to create superior customer value compared with competitors (Porter, 1985).

Porter identifies three generic competitive strategies:

- Cost Leadership
- Differentiation
- Focus Strategy

More recent research argues that competitive advantage increasingly depends on organizational capabilities such as:

- innovation,
- responsiveness,
- digitalization,
- customer relationships,
- service quality,
- sustainability.

Within transportation refrigeration, competitive advantage extends beyond pricing to include:

- service availability,
- technician competence,
- rapid response,
- nationwide coverage,
- spare parts availability,
- remote monitoring capabilities,
- long-term customer relationships.

These dimensions remain underexplored in the literature.

2.6 Relationship Between Development Strategies, Operational Performance and Competitive Advantage

Several empirical studies have demonstrated positive relationships among strategic development, operational performance, and competitive advantage.

For example:

- Digital transformation improves operational efficiency.
- Workforce development enhances service quality.
- Predictive maintenance reduces downtime.
- Process optimization lowers operational costs.
- Operational excellence strengthens customer satisfaction.
- Customer satisfaction contributes to competitive advantage.

However, previous studies generally examine only individual relationships rather than testing an integrated model.

Moreover, little empirical evidence exists within transportation refrigeration organizations operating in emerging markets such as Saudi Arabia.

2.7 Transportation Refrigeration in Saudi Arabia

Saudi Arabia's logistics sector is undergoing rapid transformation under Vision 2030.

Government initiatives have expanded:

- logistics hubs,
- food security programs,
- pharmaceutical manufacturing,
- industrial cities,
- cold-chain infrastructure.

These developments create significant opportunities for transportation refrigeration service providers.

However, organizations continue to face major operational challenges, including:

- shortage of skilled technicians,
- increasing customer expectations,
- dependence on imported spare parts,
- technological modernization,
- sustainability requirements,
- environmental regulations,

- nationwide service coverage.

Despite these challenges, empirical research addressing strategic business development within Saudi transportation refrigeration services remains limited.

2.8 Critical Discussion

Most previous studies focus primarily on the technical or thermodynamic aspects of cold-chain logistics (e.g., thermal insulation, coolant efficiency). Limited empirical attention has been given to strategic business development, capability building, and organizational performance drivers within transportation refrigeration service organizations—a major research gap that this study aims to fill.

2.9 Research Gap

A review of previous studies shows that strategic management, operational performance, and logistics management have generally been examined as separate research domains. Porter (1985) focused on competitive advantage and strategic positioning, Christopher (2016) emphasized logistics and supply chain performance, while Kaplan and Norton (1996) concentrated on performance measurement systems and organizational effectiveness. Although these studies provide strong theoretical foundations, several gaps remain in the literature.

First, most previous studies have not examined the **combined relationship between development strategies, operational performance, and competitive advantage within a single integrated model**. Instead, each study tends to focus on isolated relationships, which limits understanding of how these variables interact simultaneously in real organizational settings.

Second, there is a clear **contextual gap**, as limited research has been conducted specifically within the transportation refrigeration industry. Most existing studies focus on general manufacturing, logistics, or service sectors, with little attention given to temperature-controlled transportation systems, which have unique operational and technological requirements.

Third, there is a **methodological limitation** in many previous studies, as a large proportion are conceptual or based on secondary data and case studies rather than primary data collection from industry practitioners. This reduces the ability to generalize findings to specific operational environments such as transportation refrigeration divisions.

Fourth, prior research has not sufficiently considered the impact of **modern technological developments**, such as digital monitoring systems and advanced refrigeration technologies, on operational performance and competitive advantage in an integrated manner.

Therefore, the current study seeks to fill these gaps by examining the impact of transportation refrigeration division development strategies on both operational performance and competitive advantage simultaneously, using a more focused industry context and an integrated analytical

approach. This contributes to a deeper and more practical understanding of how strategic development influences organizational outcomes in specialized logistics environments.

2.10 Theoretical Foundations of the Study

2.10.1 Resource-Based View (RBV)

The current study is grounded in several theoretical perspectives that explain the relationship between development strategies, operational performance, and competitive advantage in transportation refrigeration divisions. The primary theoretical framework is the **Resource-Based View (RBV)**, which argues that organizations achieve sustainable competitive advantage through the effective utilization of valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). In the context of transportation refrigeration, these resources include advanced refrigeration technologies, skilled employees, digital monitoring systems, and efficient operational processes. The study applies this theory by examining how the development of these strategic resources contributes to improving operational performance and enhancing competitive advantage.

2.10.2 Innovation Theory

The study also draws on **Innovation Theory**, which emphasizes that technological innovation and continuous improvement are key drivers of organizational growth and competitiveness (Rogers, 2003). This theory is particularly relevant to transportation refrigeration divisions, where innovations such as smart monitoring systems, energy-efficient refrigeration units, and process optimization can significantly improve service quality and operational efficiency. The current study applies Innovation Theory by investigating the role of technological advancements and innovation in enhancing operational performance and competitiveness.

2.10.3 Dynamic Capabilities Theory

In addition, the study is supported by **Dynamic Capabilities Theory**, which emphasizes an organization's ability to sense changes in the business environment, seize emerging opportunities, and reconfigure its resources and capabilities to maintain competitiveness in dynamic markets (Teece, Pisano, & Shuen, 1997). This theory is particularly relevant to the transportation refrigeration industry, which is influenced by evolving customer requirements, technological advancements, environmental regulations, supply chain challenges, and increasing demand for sustainable cold-chain solutions. Dynamic capabilities enable organizations to adapt effectively by developing new services, strengthening technical expertise, improving operational processes, and establishing strategic partnerships. Therefore, this theory provides a valuable framework for understanding how transportation refrigeration divisions can enhance operational performance and achieve sustainable growth in a competitive business environment.

2.10.4 Stakeholder Theory

Furthermore, the study is supported by **Stakeholder Theory**, which suggests that organizations must create value for all stakeholders, including customers, employees, suppliers, and

shareholders, in order to achieve long-term success (Freeman, 1984). In transportation refrigeration, meeting stakeholders' expectations regarding product quality, reliability, and sustainability is essential for maintaining competitiveness. Therefore, the study examines how development strategies can help organizations satisfy stakeholder needs while improving operational outcomes and achieving sustainable competitive advantage.

3. Research Methodology and Methods

3.1 Research Methodology

This study adopts a Sequential Exploratory Mixed-Methods Research Design that combines qualitative and quantitative research approaches. The mixed-method approach is appropriate because it enables a comprehensive examination of the relationship between development strategies, operational performance, and competitive advantage within transportation refrigeration services. The qualitative phase provides in-depth industry insights and helps identify critical development factors, while the quantitative phase statistically validates the relationships among the study variables.

The integration of both approaches enhances the validity, reliability, and practical relevance of the study findings and supports the development of a strategic framework for improving operational performance and competitiveness within transportation refrigeration services.

This study adopts a **Sequential Exploratory Mixed-Methods Research Design**, combining qualitative and quantitative research approaches. The mixed-method approach is appropriate because it enables a comprehensive examination of the relationship between development strategies, operational performance, and competitive advantage within transportation refrigeration service providers in Saudi Arabia. The qualitative phase provides in-depth industry insights and helps identify key development factors, while the quantitative phase statistically examines the relationships among the study variables.

In the **qualitative phase**, data will be collected through **semi-structured interviews** with **8–10 participants**, including senior managers, operations managers, service managers, and technical managers from transportation refrigeration service providers in Saudi Arabia. These participants will be selected using purposive sampling because of their knowledge and experience in strategic planning, operational management, and business development. The interviews will provide insights into current development strategies, operational challenges, and sources of competitive advantage within the industry.

In the **quantitative phase**, data will be collected using a **structured questionnaire** distributed to **150 employees and managers** working in transportation refrigeration service providers in Saudi Arabia. Respondents will include operations managers, service supervisors, maintenance engineers, technicians, and administrative staff involved in implementing organizational strategies and daily operations. The questionnaire will use a **five-point Likert scale** to measure the study variables: development strategies, operational performance, and competitive advantage. The quantitative data will be analyzed using appropriate statistical techniques, such as

descriptive statistics, reliability analysis, correlation analysis, and multiple regression analysis, to test the proposed relationships among the variables.

The integration of both qualitative and quantitative findings enhances the validity, reliability, and practical relevance of the study. By combining the perspectives of industry experts with quantitative evidence from a broader sample of employees and managers, the study aims to develop recommendations for improving operational performance and strengthening competitive advantage among transportation refrigeration service providers in Saudi Arabia.

3.2 Research Methods (Procedures)

3.2.1 Phase One: Qualitative Research

3.2.1.1 Purpose

The qualitative phase aims to explore the current challenges, growth opportunities, critical success factors, and development strategies adopted within the transportation refrigeration industry. It also seeks to identify the organizational, technological, and operational factors that influence performance and competitiveness.

3.2.1.2 Participants

Semi-structured interviews will be conducted with experienced professionals from transportation refrigeration services, cold-chain logistics organizations, food distribution companies, pharmaceutical logistics companies, and industry experts operating within Saudi Arabia.

To provide practical industry insights, professionals from Zamil Services will be included among the interview participants due to the organization's experience in transportation refrigeration services and cold-chain operations. However, Zamil Services will serve only as one of several industry reference organizations and will not represent the sole focus of the study.

3.2.1.3 Sampling Technique

A purposive sampling approach will be used to select participants possessing substantial experience in transportation refrigeration, logistics management, operations management, business development, and cold-chain services.

3.2.1.4 Sample Size

Approximately 10–15 industry experts will be interviewed or until thematic saturation is achieved.

3.2.1.5 Data Collection

Semi-structured interviews will be conducted using an interview guide covering:

- Industry challenges
- Business development strategies
- Digital transformation initiatives
- Workforce development practices
- Service expansion opportunities
- Technology adoption
- Sustainability initiatives
- Competitive challenges
- Critical success factors

3.2.1.6 Data Analysis

Interview data will be analyzed using thematic analysis to identify recurring themes, patterns, and strategic priorities. The findings will be used to refine the conceptual framework and support the development of the quantitative questionnaire.

3.2.2 Phase Two: Quantitative Research

3.2.2.1 Purpose

The quantitative phase aims to statistically examine the impact of development strategies on operational performance and competitive advantage and validate the findings generated during the qualitative phase.

3.2.2.2 Population

The target population consists of managers, supervisors, engineers, operations personnel, and business professionals working within:

- Transportation refrigeration service providers
- Cold-chain logistics organizations
- Food distribution companies
- Pharmaceutical logistics companies
- Temperature-controlled transportation organizations

operating within the Kingdom of Saudi Arabia.

3.2.2.3 Sampling Technique

A stratified sampling approach will be employed to ensure representation from different industries, organizational levels, and geographical regions.

3.2.2.4 Sample Size

The study aims to obtain between 200 and 300 valid responses from industry professionals.

The sample may include participants from Zamil Services as well as other transportation refrigeration and logistics organizations operating within Saudi Arabia to ensure broader industry representation.

3.2.2.5 Data Collection Instrument

A structured questionnaire will be developed based on:

1. Findings from the literature review.
2. Results of the qualitative interviews.
3. Established measurement scales from strategic management and logistics research.

3.2.2.6 Data Analysis

The collected data will be analyzed using SPSS and/or SmartPLS through:

- Descriptive Statistics
- Reliability Analysis (Cronbach's Alpha)
- Correlation Analysis
- Multiple Regression Analysis
- Mediation Analysis

to evaluate the mediating role of operational performance between development strategies and competitive advantage.

3.3 Integration of Findings

The final stage of the study will integrate the qualitative and quantitative findings to develop a strategic framework for improving transportation refrigeration services. Industry insights obtained from interview participants, including selected professionals from Zamil Services and other transportation refrigeration organizations, will be combined with the statistical findings to generate practical recommendations for improving operational performance and strengthening competitive advantage within the Saudi transportation refrigeration sector.

3.4 limitations of the study

This study is contextualized within the following human, geographical, and temporal boundaries:

3.4.1 Human Scope:

- **Study Population:** The target population encompasses all industrial companies operating within the Kingdom of Saudi Arabia, specifically focusing on those utilizing transportation refrigeration and logistics divisions.
- **Study Sample:** The sample consists of large-scale industrial companies located across major industrial hubs: Riyadh, Jeddah, and Dammam.
- **Sample Size and Selection Method:** A sample size of 50 large industrial companies was selected utilizing a **purposive sampling technique**, ensuring the

inclusion of major corporations with established logistical infrastructures. The study directly targets managers and employees within these specified divisions.

3.4.2 Geographical Scope:

- **Geographical Region:** The spatial limits of this research are restricted to the **Kingdom of Saudi Arabia (KSA)**, with empirical focus executed within the key economic cities of Riyadh, Jeddah, and Dammam.

3.4.3 Temporal Scope:

- **Data Collection Period:** The primary data collection phase and questionnaire administration were conducted during the **(Q3) of 2026**.
- **Study Duration:** The overall timeframe for conducting, analyzing, and finalizing this research spans the years **2026–2027**

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