School of Management and Marketing

Effects of Lean, Agile and Resilient Supply Chain on Retail Performance –The Case of Food Sector in Saudi Arabia

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Declaration

To the best of my knowledge and belief, this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material that has been accepted for the award of any other degree or diploma in any university.

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007, updated March 2014). The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number HRE2018-0437.

Signature: _____

Date: 30/03/2022

Dedication

To my loving family

My Parents, Mohammed Alharbi and Muna Almoqair
My wife, Samah
My sister, Sumiah
My sons, Mohammed and Saad

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In the name of Allah, the Most Gracious and the Most Merciful.

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Abstract

Food retailing in industrialised countries has benefited significantly from supply chain management, which provides a diverse range of consumers with high-quality items in a timely and efficient manner. While the Kingdom of Saudi Arabia is following in the footsteps of developed countries, it is also experiencing rapid growth in the food retail industry. Although the role of food retail in meeting consumers' requirements with high proficiency has been definitively confirmed, it has not been adequately established or thoroughly examined due to the lack of efficient and effective management of the food retail supply chain, as well as a lack of freely accessible food retail supply chain data. An effective framework for the food retail sector in the Kingdom of Saudi Arabia is desperately needed for exploring the roles and effects of the supply chain system through the most essential supply chain elements: leanness, resilience and agility.

In studying the above problem, this research first developed an initial model using dynamic capabilities theory, based on a comprehensive review of the literature. A qualitative field study contextualises and validates the constructs and elements of the initial research model because the leanness, resilience and agility of the supply chain are context-specific.

Consequently, a mixed-methods technique was used for this study, taking into account both qualitative and quantitative approaches. In the qualitative phase, 15 decision-makers from Saudi Arabian food retailers, who were involved in supply chain and logistics operations, were interviewed using a semi-structured interview style. This constituted the data for the field research. These field study data were evaluated using NVivo and content analysis methodology. Based on the findings of the content analysis, a field research model was developed. The final research model was then developed in combination with the initial model. This was then empirically validated, and various hypotheses were tested, using a quantitative research approach.

During the quantitative phase, a total of 296 completed responses were collected from supply chain and logistics departments of firms involved in food retailing activities in Saudi Arabia. Data were examined by applying a structural equation modelling method based on partial least squares.

Consequently, this research confirmed the direct effects of leanness, agility and resilience on food retail performance. Seven of the nine direct hypotheses were supported by the results of quantitative data analysis. Moreover, significant serial mediation effects between variables were also revealed. These results support the hypothesis that agility and resilience mediate the relationship between leanness and food retail performance. The data also show that agility mediates the relation between

leanness and resilience and that resilience fully mediates the relationship between agility and food retail performance.

This study has both theoretical and practical significance. This research significantly contributes to the current supply chain literature by providing a model that accounts for the leanness, agility and resilience of a supply chain, as well as their impact on food retail performance. The research also shows the power of resilience in improving food retail performance. The study extends dynamic capabilities theory by showing its application for the examination of the effects of a lean, agile and resilient supply chain on food retail performance. The findings of this study provide useful insights for food retail managers regarding the relative role of leanness, agility and resilience in achieving retail performance. The research model helps to improve Saudi Arabian food retailers' performance in terms of profits and efficiency. Furthermore, the study's implications are important for other countries with comparable institutional and industrial environments.

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List of Abbreviations

AVE	average variance extracted
IT	information technology
JIT	just in time
PLS	partial least squares
PLS-SEM	partial least squares–based structural equation modelling
RBV	resource-based view
SCM	supply chain management
SEM	structural equation modelling
TPM	total preventive maintenance
TQM	total quality management

Chapter 1: Introduction

1.1 Overview

The need for comprehensive development activities that include the whole supply chain has been widely recognised at a strategic level—first by business and then by academics (Georgiadis et al., 2005). In today's world of global marketplaces, intense competition for every product and rising customer demand, it is critical for businesses to investigate methods to improve their efficiency in terms of adopting excellent supply chain practices to remain competitive and profitable (Schonberger, 2007; Womack et al., 2007).

Due to the international dissemination and atomization, such as various products and services going through numerous stages of transformation, for example leanness with cost reduction via production outsourcing, market globalisation, cost savings, outsourcing and supplier consolidation, there is an increased likelihood of system and supply chain disruptions (Christopher, 2011). Zsidisin et al. (2005) and Wagner et al. (2010) have indicated that supply chain resilience is receiving increasing attention in recent business management and research. Carvalho et al. (2012) argued that businesses need to implement new strategies within supply chains to improve their ability to respond quickly and successfully to unforeseen market circumstances and increasing unpredictability, both of which are linked to company performance and competitiveness. Indeed, Carvalho et al. (2012) provided a theoretical framework that connected supply chain resilience and agility to a company's performance and competitiveness. Agility is intimately connected to speed, acceleration and visibility: the speed of recovery, according to Sheffi (2005). Christopher and Peck (2004) proposed a strategy taxonomy for supply chain resilience development that considered the corresponding link with agility.

In a global ecosystem created by their supply chains, companies compete with one another on a worldwide scale (Islam, 2013). According to Wagner and Bode (2008), Hurricane Katrina in the United States (in 2005), the 2001 terrorist incident in New York and the 2003 SARS epidemic in Asia were all pre-crisis events that interrupted supply chains and drew academic attention. Supply chains are becoming more fragile because companies have recently become more conscious of the influence of global competition. Due to the rise in unexpected events and the sensitivity of supply chain risk networks, firms' resilience must therefore be addressed (Wagner & Bode, 2008). Liu et al. (2018) argued that future research on the relationship between SCM and firm performance, resilience and agility should include financial measurements. Gunasekaran and Kobu (2007) provided various solutions both old and innovative, for example Overhead cost, value added, inventory cost, stock-out cost, transportation cost and warranty cost. Still, Stock and Boyer (2009) argued that researchers

should investigate and analyse the causes, implications and negative impacts of supply chain disruptions and unpredictability.

Long-term firm success may be achieved via the structural elements of efficient supply and timely delivery of products and services at the lowest possible cost (Cox & Chicksand, 2006). SCM links suppliers, manufacturers, distributors and consumers to meet the end consumer's requests and expectations efficiently and effectively (Jie et al., 2007). Effective global supply chain strategies may be developed based on market characteristics while striving for increased customer response at a lower overall supply chain cost (Christopher & Towill, 2000). In food supply chains, several studies using different approaches have been conducted, all to enhance efficiency.

In the context of SCM, a strategic inter-firm arrangement involving coordination and collaboration with trade partners to achieve competitive advantage by ensuring that maximum value is given to end customers has been defined (Cao & Zhang, 2011; Das, 2006; Kotzab et al., 2006). By emphasising the continuous integration of assessment operations through organisational boundaries, SCM improves the individual enterprise's performance and supply chain (Hsu et al., 2009; Li et al., 2006). However, despite a growing collection of SCM research, there is insufficient information in the literature to assist firms in SCM practice to the point where it may help them achieve their ultimate goal of obtaining the maximum degree of competitive performance (Cigolini et al., 2004; Li et al., 2006). Mistakes in effective SCM implementation are still common (Deshpande, 2012; Moberg et al., 2003). According to this argument, more research into the phenomenon of SCM is needed to uncover the characteristics that lead to successful SCM practice and to propose methods for SCM implementation to help organisations achieve competitive performance through supply chain system leanness, agility and resilience.

Building a firm's enduring competitiveness is crucial to success in today's highly competitive business climate (Cao & Zhang, 2011; Kotzab et al., 2009; Laseter & Gillis, 2012). The fundamental question in the field of strategic management is how companies achieve and sustain competitive advantage (Teece, Pisano and Shuen 1997). The dynamic capability theory provides important insights for understanding how competitive advantage within firms is created and how such advantage is sustained over time. Many academics, using the lens of dynamic capabilities theory, recognise leanness, agility and resilience as capabilities that may give firms different competitive advantages (Fawcett et al., 2011; Tan & Cross, 2012).

Food retail is a substantial sector in Saudi Arabia (Ismaiel et al., 2014), and food sellers must ensure that their business has a solid supply chain framework. This thesis examines aspects of the supply

chain (such as leanness, agility and resilience) to improve retail performance in Saudi Arabia's food sector.

1.2 Research Problem

The current state of the Saudi food retail industry is characterised by a lack of research into this area, including a significant gap in the literature regarding the Saudi food retail supply chain. Statistical data, whether from government or private organisations, are scarce. When data are available, they are complex and only cover a small section of the retail industry. The form and nature of the relationship between food retailers and their suppliers in Saudi Arabia, and the degree of supply chain integration and sector conflicts, have yet to be explored in the supply chain industry literature (Attia & Salama, 2018).

The growth of Saudi Arabian food stores from 1950 to 1980 was slow and concentrated in large cities, where higher-income clientele tended to congregate (Findlay et al., 1990; Galbraith & Holton, 1965). According to Goldman & Nagel (1993), one possible cause for delayed development in some countries is high food costs, partly caused by travelling to and from food retailers and by commodity prices that are higher than in typical food corner shops.

The first food shop in Saudi Arabia opened its doors in Al-Dahran, in the Eastern region, in 1974. Originally under British management, it was bought by Al-Souk Company Limited. The Saudi Arabian food retail business has since grown dramatically, due to streamlining and modernisation, as well as undergoing tremendous expansion (Aljaber, 2018). Customers in Saudi Arabia are especially fond of these outlets, resulting in a considerable increase in the number of food stores in the last 10 years. In 2012 the number of food retail outlets in Saudi Arabia was estimated at 40,435 stores and around 49,509 in 2022, as reflected in the whole food industry (Mohammed, 2020). However, according to Durugbo et al. (2021), Saudi businesses lack expertise in SCM, and there is a need to link the supply chain with suppliers. Although there has been a great deal of interest in SCM research, not enough attention has been directed to integrating a robust supply chain system. Conceptual ambiguity, difficulty inside SCM and the absence of a theoretical framework outlining the tools and processes that can support organisations adopt SCM effectively have all been presented as reasons for SCM implementation failure (Al Falah et al., 2003; Al-Hazmi, 2020; Syed, 2012).

Understanding the trade-offs of Lean, Agile and resilient management paradigms is important if supply chains and organisations are to become more efficient and sustainable. To be successful in today's market, businesses must find a way to integrate the three supply chain paradigms to their supply chain system.

Although a review of the literature reveals the importance of a good supply chain system and of attempts to integrate supply chain elements (i.e., leanness, agility and resilience) in terms of performance, there has been no prior study empirically assessing the relationship between leanness, resilience and agility specifically, and their mediating effects on performance. However, Aitkan et al. (2002), Towill and Christopher (2002) and Goldsby et al. (2006) have all conducted studies that combine two of these three elements. According to Christopher and Rutherford (2004), agile Six Sigma may aid in supply chain resiliency. Other studies, such as those by Carvalho et al. (2011), Machado and Duarte (2010), Carbal et al. (2011) and Azevedo et al. (2011), have looked at the issue of combining three elements of supply chain, but none of them does so in sufficient depth to fully address the problem.

Building a firm's enduring competitiveness is crucial to success in today's highly competitive business climate (Cao & Zhang, 2011; Kotzab et al., 2009; Laseter & Gillis, 2012). Many academics, using the lens of dynamic capabilities theory, recognise leanness, agility and resilience as capabilities that may give firms different competitive advantages (Fawcett et al., 2011; Tan & Cross, 2012). Leanness is a characteristic of Toyota, according to Grant (2005, p. 138). In contrast, agility has been defined by Swafford et al. (2006a) and Braunscheidel and Suresh (2009) as a supply chain's capacity to respond quickly to a changing marketplace environment. Coutu (2002) and Stoltz (2004) considered resilience to be a differentiating characteristic required to beat less-resilient competitors. However, no scientific evidence has yet shown how leanness enhances performance outcomes when combined with resilience and agility. Past research, such as that by Hallgren and Olhager (2009) and Narasimhan et al. (2006), has only looked at how leanness and agility influence performance outcomes and how agility and resilience affect performance outcomes (Carvalho et al., 2012).

Overall, the existing body of research lacks complete frameworks for incorporating supply chain elements (lean, agility and resilience), considering the whole supply chain and analysing its success in food retail performance.

1.3 Research Questions

Combining the three components of the supply chain has its limitations in practice, theory development and subsequent research; no single process acknowledged in the literature has combined the capabilities of leanness, agility and resilience to ensure a better supply chain. Most research on the food retail supply chain has concentrated on only one or two elements. Thus, this present study was carried out to broaden understanding and knowledge. To the researcher's knowledge, no research exists that examines the mediating effect of agility and resilience on the direct relationship between leanness and the retail performance of enterprises. In particular, no research exists that investigates

supply chain retail performance in the food sector or tests the moderation effect of supply chain elements. Therefore, this present study investigated the following research questions:

1. How can leanness, agility and resilience in the supply chain be integrated to achieve efficiency of the food sector firm's retail performance?
2. Do agility and resilience mediate the relationship between leanness and food retail performance?
3. Does resilience mediate the relationship between leanness and agility and food retail performance?
4. Does resilience moderate the relationship between leanness and agility and food retail performance?

1.4 Research Objectives

Based on the above research questions, the following specific objectives of this research were developed:

1. to investigate the impact of leanness, resilience and agility in the retail supply chain and food retail performance
2. to assess the impact of communication on supply chain elements (i.e., leanness, agility and resilience)
3. to assess the mediating effects of resilience and agility in the relationship between leanness and food retail performance
4. to assess the mediating effects of resilience in the relationship between agility and food retail performance
5. to assess the mediating effects of agility in the relationship between leanness and resilience
6. to assess the moderating effects of resilience in the relationship between leanness and agility and food retail performance.

1.5 Significance of Research

The present study's significance is in its theoretical and practical contributions.

1.5.1 Theoretical Contribution

Supply chain factors (leanness, agility and resilience) have been studied as isolated elements. However, no study has put these three supply chain factors together in a single framework for empirical validation. There is also a lack of research identifying and assessing the link between

leanness, resilience and agility as capabilities in a single supply chain system (Habibi Rad et al., 2021; Kamalahmadi & Parast, 2016). Therefore, this present study identifies and measures all three of these supply chain components.

Further, there has been no research into resilience and agility as mediators in the link between leanness and food retail performance, nor has there been research on the mediating role of agility between leanness and resilience. For this reason, mediation relationships are explored in this present study.

A further gap in the literature is a lack of research into the moderation impacts of resilience on the link between leanness and food retail performance and between agility and food retail performance. As a result, the formulation of supply chain elements (i.e., leanness, resilience and agility) in terms of their impact on food retail performance is a unique contribution of this study to the literature on supply chains in general and on the Saudi Arabian food supply chain in particular. Further, this research employs a dynamic capabilities view to explain the concept of combining supply chain elements into a single model, which adds a new dimension to the use of dynamic capabilities theory.

1.5.2 Practical Contribution

This study also provides various practical contributions. First, the study contributes to the current supply chain literature by proposing a paradigm encompassing the leanness, agility and resilience elements of a supply chain and their effects on food retail performance in Saudi Arabia. The proposed model is expected to help food supply chain managers secure a better supply chain system in their firm by overcoming any unexpected turbulence in the market to become more competitive and minimising wastage to maximise profit. Second, the proposed model and the findings of this study provide better knowledge of the interrelationships among supply chain elements in the context of food retail performance for Saudi Arabian managers. Third, the model and the findings of this study provide useful insights for retail food managers regarding the relative role of leanness, agility and resilience in achieving retail performance. Fourth, the research model helps to improve Saudi Arabian food retailers' performance in terms of profits and efficiency. Overall, this research aids in ensuring a better supply chain system for retail performance in the context of the food sector in Saudi Arabia.

1.6 Definition of Key Terms

Supply chain: A supply chain, according to Christopher (2010), is a network of downstream and upstream enterprises that engage in a variety of processes and activities to produce value for the end consumer in the form of products and services.

Lean supply chain: Vitasek et al. (2005) describe a lean supply chain as a network of businesses linked by upstream and downstream flows of products, services, information and funds, collaborating to reduce costs and waste by extracting just what is needed to meet customers' demands.

Supply chain resilience: Supply chain resilience is described by Falasca et al. (2008) as a supply chain's ability to reduce the probability of interruptions, the consequences of such disruptions and the time required to return to normal performance.

Supply chain agility: Supply chain agility refers to the capacity of a firm to adapt or respond rapidly and efficiently to changes in consumer and competitive needs in dynamic and constantly changing marketplaces, both internally and in collaboration with its major customers and suppliers (Baramichai et al., 2007; Braunscheidel & Suresh, 2009).

Food supply chain: The food supply chain refers to the activities that determine how food from a farm or factory reaches the ultimate consumer. These operations include production, processing, distribution, consumption and disposal (Dabbene et al., 2014; Igumbor et al., 2012; Pullman & Wu, 2021).

1.7 Organisation of the Thesis

The thesis is organised into eight chapters, as summarised in Table 1.1. The following describes each chapter in further detail.

Chapter 1—Introduction: The background and general organisation of the research are provided in this chapter. An introduction to the research subject, questions, objectives and contributions are presented in this chapter.

Chapter 2—Literature Review: Chapter 2 covers a complete review of the literature, focused on supply chain elements (i.e., leanness, resilience and agility) and the food retail industry in Saudi Arabia in terms of supply chain characteristics. In-depth studies of the core theory—dynamic capabilities theory—are presented. An initial research model is developed based on an assessment of the literature.

Chapter 3—Research Methodology: The main focus of Chapter 3 is to determine the best research method to be employed in this study. It also describes the methodology used in this research and discusses the reason for the study's chosen research technique. The data sampling and collection processes are also covered in this chapter. In addition, this chapter provides an overview of data analysis.

Chapter 4—Qualitative Field Study: The procedure of the field study and its findings are explained in Chapter 4. A content analysis of field research data is used to uncover the underlying factors and sub-factors as well as their interactions. Based on these findings, the first study model is improved. This chapter describes the overall development of the research model.

Chapter 5—Hypotheses: This chapter creates hypotheses based on the links and interconnections between the research model's constructs. Chapter 5 confirms the measurements and sources for each construct and covers the development of the survey's final questionnaire.

Chapter 6—Data Analysis and Results: Chapter 6 looks at the analysis of quantitative data, including the findings of the pilot study. First, data quality is ensured by checking for biases. Survey data are then examined using structural equation modelling (SEM) based on partial least squares (PLS) to determine the validity and reliability of the measures and constructs and the relationships between the constructs. The findings of the SEM analysis are presented (i.e., the measurement and structural models). The impacts of mediating and moderating are also examined.

Chapter 7—Discussion of the Findings: Chapter 7 explains the quantitative study's findings. Both the quantitative and qualitative findings of the project are addressed with reference to previous literature. Further, the results are explored in relation to the study's hypotheses and the linked research objectives.

Chapter 8—Conclusion: The last chapter summarises the thesis. The research results are summarised before moving on to the areas to which the research findings contribute. Finally, the study's limitations, followed by future research directions, are discussed.

Table 1.1: Structure of This Thesis

Chapter	Description	Output
1	• An overview of the research • Identifying the research problem	Research question and objectives
2	• Theoretical background • Research gap • Initial research model development	Review of relevant literature and an initial research model
3	• Discuss the study's research design and methodological approach	Determination of the methodology for this study
4	• Qualitative field study approach • Develop constructs and items	A comprehensive research model

5	• Details hypotheses aligned with the comprehensive research model • Questionnaire development	Finalised hypotheses and design of the survey instrument
6	• Analysis of survey data by deploying a partial least squares approach	Report of the survey analysis data
7	• Discussion of findings	Interpretation of the analysis
8	• Overview of the research limitations and future research directions	Summary of the thesis

1.8 Summary

Chapter 1 has sought to provide an overview of the research topic and the difficulties linked to the study context. The research background elaborated at the start of the chapter provided context. The next section examined the study area's research problems, followed by a short explanation of the study location and sample. This chapter then outlined the specific study questions and research objectives and explored the study's theoretical and practical significance. This chapter also included definitions of essential terminology used in this study, and the thesis structure was provided to complete this chapter.

Chapter 2: Literature Review

2.1 Introduction

This chapter reviews the literature on supply chain elements and food retail performance. The literature review begins with a brief history of the Saudi food retail industry. The following section proceeds with a description of the elements of the food supply chain. The next section examines the reviewed literature, with an emphasis on the major variables and constructs to be used in this study, followed by the conceptual model. The parts that follow cover existing research gaps as well as the theoretical underpinnings used to fill these gaps.

2.2 An Overview of the Food Retail Sector in Saudi Arabia

The Kingdom of Saudi Arabia is a large and rising Middle Eastern economy. This has largely been due to the Saudi Government's efforts to assist the Kingdom's economy while also increasing the purchasing power of Saudi residents. As a result, the dynamic food retailing industry has grown tremendously. According to Abunar et al. (2016), the Saudi retail industry is placed 16th in terms of retail growth among developing countries. Swartz (1997) has referred to the Middle East, including Saudi Arabia, as a 'possible franchising hotspot' due to fierce competition among its businesses to attract international investors. Marinov (2007) argued that the Middle East market has long-term promise since the area has been adjusting to changing conditions and is therefore potentially viable and more tolerant of changes.

When compared to a typical Western family, the Saudi home unit, for example, is large. As a result, Saudis have a tendency to purchase large amounts of consumer goods and food (Culpan, 1985). Of course, the Kingdom's food industry has flourished as a result of this spending, which has, in turn, helped the country's general economic activity. It is also worth noting that the Saudi Government's plan to invest SAR100 billion in Saudi Arabia's economy over the next 5 years has positively stimulated the country's markets (Habibi, 2019). As a consequence, big food retailers have seen a 40% increase in customer purchases, compared to Al Kathery's (2011) prediction of 60% growth in 2011. There have been a number of studies of the food retail sector and the advantages of collaborative supply chain activities between suppliers and retailers (Cachon & Fisher, 1997; Clark & Hammond, 1997). These studies have shown the necessity of a well-functioning supply chain system for food retail businesses. Cachon and Fisher (1997) have suggested that improving the supply chain would improve the food retail performance.

The dearth of research into the Saudi food retailing business (Al-Saidi et al., 2021) suggests that there is a significant vacuum in the literature with respect to the supply chain in the Saudi food retailing sector. Food supply chain statistical data, whether from government or commercial organisations, is scarce and, when it does exist, is confusing and only vaguely covers the full retailing industry. The form and nature of the connection between Saudi Arabia's food merchants and their suppliers, the degree of supply chain integration and the sector's disputes have yet to be addressed in the supply chain literature. Al-Sudairy and Tang (2000) determined the level of information technology (IT) employed in Saudi Arabian supermarket chains, and most of Saudi Arabia's largest food businesses had been upgrading their IT infrastructure. Due to the companies' rapid development and expansion since 1990, the front- and back-office systems had to be upgraded.

In terms of economic stability, cultural concerns, industrial resources and technical reliability, the natures of emerging and industrialised nations appear to differ in many ways, which is not surprising (Booth et al., 2001; Parfitt et al., 2010). Emerging economies, particularly those in Latin America, Asia, Central Europe, Eastern Europe and parts of Africa, have fallen behind in introducing retail services into their markets, which has had a substantial influence on the expected expansion of these services. Food retailing in underdeveloped nations has traditionally been limited to providing consumers with basic commodities, such as sugar, eggs, oil and rice. Meat and poultry have also been frequently available at specialist markets. According to the literature, the growth of supermarkets from 1950 to 1980 was not only moderate but also concentrated in metropolitan cities, where higher-income consumers tended to gather (AlGhamdi et al., 2011; Findlay et al., 1990).

According to McClure et al. (2009), the slow progress of developing countries has been due to a variety of factors. One reason was that the wealthier classes were less interested in purchasing retail items, a second was the high expense of travelling to and from supermarkets, and a third was that the prices of goods were greater than in conventional grocery and food corner shops. It is worth mentioning, however, that purchasing groceries from a supermarket was still a novel notion at the time. Getting clients to violate their conventional and social habits or to reject their social norms and cultural precepts, particularly in their daily behaviours, necessitated the development of efficient marketing strategies. As a result, supermarkets had to lower their selling prices to attract their target customers. According to Reardon et al. (2007), the rise that followed was the consequence of a shift in female shopper purchasing patterns as well as a shift in high-income workers' societal attitudes. As a result, the number of supermarkets in developing nations increased at the fastest rate in the 1990s. According to Reardon et al. (2007), the transition occurred for a variety of reasons. One is that customers were increasingly able to purchase the technology needed to store and maintain meals for extended periods of time, such as refrigerators. Furthermore, improvements in transportation

infrastructure made it simpler and more efficient for suppliers and manufacturers to deliver items to and from supermarkets (Reardon et al., 2003; Wrigley, 2000). In the United States, for example, supermarkets accounted for 75%–80% of the retailing industry in 2005 (Reardon et al., 2007). Meanwhile, the estimated supermarket shares of retailing sales climbed from 10%–20% in 1990 to 50%–60% in the 2000s to 92.1% in 2019 in several emerging nations, such as in much of South America, East Asia, Northern Europe, Eastern Europe and the Baltic.

In 1974, the Kingdom of Saudi Arabia opened its first supermarket in Al-Dahran, in the Eastern region. It began operations in 1974 under British administration and was subsequently purchased by Al-Souk Company Limited. Since then, Saudi Arabia's retail market has seen fast transformations as a result of simplification and modernisation, as well as massive growth (Rossides, 1994). In Saudi Arabia, the retail food business has expanded dramatically in the last 10 years. These establishments are particularly popular with Saudi customers, resulting in a 10-fold growth in the number of supermarkets in the recent decade (Leonidou, 1991). Previously, the corner store was the most common kind of retail outlet in Saudi Arabia (Rossides, 1994). There were few contemporary self-service businesses or supermarkets that offered a diverse selection of items to clients. According to Alawi (1986), the rise of supermarkets in Saudi Arabia had a number of causes. One is the government's incentives for tradespeople to practise and apply the newly implemented and desired business methods, which follow the developed country in supermarket trading. Another is the overall increase in client earnings, as well as merchants' preparedness for and the government's availability of startup financing.

Supermarkets first appeared in Saudi Arabia's larger cities, such as Riyadh and Jeddah. The size of shops at the time was restricted, and they were only able to sell a modest variety of foodstuffs. By the 1980s, supermarkets had seen a significant transformation in their operations. Simply stated, the markets used a premium price strategy to maximise profit margins by targeting rich clients. Because the shops were often clean, organised and air-conditioned, this method was initially quite effective in luring medium- and high-income earners. Later supermarkets, conversely, re-evaluated their price approach to attract more consumers and compete with other shops. Customers in the area began to demand much more than quality and cheap costs, and consumer loyalty became even more difficult to maintain (Alshaya, 2001). Supermarkets reacted by expanding their services by adding additional sections to their shops to give a wider range of items to their clients (Alawi, 1986; Al-Sudairy & Tang, 2000). For example, supermarkets that had previously sold 12,000 goods expanded their sales to 50,000 different items in a short period of time. In Saudi Arabia, there are now 21 significant grocery businesses (Al-Sudairy & Tang, 2000). Thus, the need for research into Saudi Arabia's retail industry has been a matter of importance in the industry.

The review of the literature and the current state of leanness, agility and resilience in the Saudi food retailing sector, evidents in a lack of research in this area, suggests a huge gap in the literature covering the supply chain in Saudi food retailing sector. The statistical data, be it from governmental or private associations, is very limited, and where it is available, it is ambiguous and loosely covers the entire retailing sector.

2.3 Method of Literature Search

The aim of the literature search in the present study was to find any existing research gaps in the field. The literature search process included collecting publications, selecting articles based on the context of the present study and analysing them for their relevance to the study. The researcher began by gathering a large amount of literature in the fields of SCM and food retailing.

For review, the researcher additionally gathered methodological and theoretical publications. The majority of the sources were located via Google Scholar and through the Curtin University Library databases. Business Source Complete, Emerald, ProQuest, ScienceDirect and Wiley Online Library were the most important databases. Literature on food retailing, supply chain components and research methodologies were acquired. To find relevant information for the study, the researcher employed keywords such as ‘leanness supply chain’, ‘agility supply chain’, ‘resilience supply chain’, ‘supply chain best practice’, ‘food retailing business supply chain’ and ‘prior of supply chain system’. During the search stage, literature on the application of theories in supply chain research was also examined. Dynamic capabilities theory was the key theory to emerge during this search process (Teece et al., 1997).

The next stage was to identify which papers were relevant to the present study. Exclusion criteria were used to exclude the less-relevant materials. The papers that were selected for examination were those that had some relation to the present study’s variables and sub-factors. As a consequence, many of the materials that were originally obtained were discarded. The exchange connection, as well as its antecedent and consequence factors, was detailed in the majority of the studies that were kept. In the framework of the current study, special attention was paid to identifying theory-driven literature. In addition, numerous approaches, such as qualitative, quantitative, case study and mixed-methods approaches, were identified for use in supply chain research throughout this literature review.

2.4 Components of the Supply Chain

2.4.1 Leanness

Lean is sometimes mistaken as just a technique or another strategy when it is really a mindset (Ransom, 2008). It is a philosophy in the sense that it is a way of thinking, while tactics or procedures refer to how these principles are put into action (Bhasin & Burcher, 2006). In the food retail context, lean implementation can typically be categorized as efforts which focus on waste reduction to lower costs, increase sales margins, improve resource efficiency and hence improve profitability.

2.4.1.1 Definition

A system called just in time (JIT), also called the Toyota Production System, is what led to the creation of Lean manufacturing (Hallgren & Olhager, 2009). In 1980, Taiichi Ohno, Shigeo Shingo and Yasuhiro Monden developed JIT / Toyota Production System / Lean. Later, the term 'lean manufacturing' was used to describe Toyota's strategies (Gošnik et al., 2014).

Waste reduction, according to Taiichi Ohno, was a critical component of every business's success (Goldsby et al., 2006). According to Goldsby et al. (2006), Ohno listed seven key categories of waste: manufacturing errors, overproduction, inventory, needless processing, inefficient personnel movement, excessive commodities transportation and employee waiting. Waste has been divided into two types: obvious wastes and wastes that are not so obvious (Narasimhan et al., 2006). Long setup times for executives, broken machines and rework are all obvious wastes of time, but people do not see these wastes very often. It is possible to split the costs of buffering caused by changes in process times and delivery times, as well as the changes in the number of workers and the demand for their services. Lean manufacturing is so-called because it is a set of processes that work together to make a system that is efficient and high quality (Shah & Ward, 2003); it produces completed items with low or no waste in response to consumer demand.

Many professionals and academics have embraced the promise of Lean concepts, according to Goldsby et al. (2006), and they have been extended into logistics, product development and buying. In the follow-up to Womack et al. (2007) the concept of lean operations was extended to bigger organisations. The Lean program strives for perfection by identifying the inherent value in individual things, establishing the value stream for each product, facilitating value flow, allowing customers to get value from the producer and reaching perfection. According to Goldsby et al. (2006), the theory extends beyond functional strategy to a larger supply chain strategy. A lean supply chain requires a thorough examination of all processes and the identification of any unused resources, which may then

be measured in terms of cost and time as well as stock levels (Machado & Duarte, 2010). Konecka (2010) attributes the rise of lean supply chains to the quality–price connection: in addition to time, cost, speed, customer satisfaction, product variety and technology (among other factors). These are the most significant factors that determine competitiveness. Present activities in SCM are geared towards cost reduction via the use of lean management practices. In situations where market demand is easily predictable, and plans and schedules can be formed based on demand predictions and implemented exactly, lean supply chains are an advantageous choice. Table 2.1 outlines the most important literature on leanness in terms of specific definitions that have been used in earlier works.

Table 2.1: Leanness-Related Definitions

Sub-dimension	Definition	Reference
JIT, TPM, TQM	'Collection of practices that work together synergistically to create a streamlined, high quality system that produces finished products at the pace of customer demand with little or no waste.'	Shah & Ward (2003, p. 129)
JIT, TQM, TPM	'Integrated manufacturing system intended to maximize capacity utilization and minimize buffer inventories through minimizing system variability.'	De Treville & Antonakis (2006, p. 99)
JIT	'Production that is accomplished with minimal buffering costs.'	Hopp & Spearman (2004, p. 133)
TQM	'Response to the demand of high quality products with varying production requirements, and often require deliveries in small lot sizes with short lead times.'	Fullerton & Wempe (2009, p. 214)

Note. JIT = just in time; TPM = total preventive maintenance; TQM = total quality management.

As previously stated, scholars have defined leanness in different ways, with manufacturing being the most common use for the term. According to Arif-Uz-Zaman and Nazmul Ahsan (2014), a lean supply chain is 'the identification of all sorts of waste in the supply chain's value stream and taking actions to eradicate them and decrease lead time' (p. 588). To explain leanness, the present study employs Eroglu and Hofer's (2011) definition, according to which it is a concept that relies on JIT delivery, comprehensive quality management and other related strategies to reduce waste and enhance business performance. This viewpoint also gives credibility to the lean approaches employed in this study.

2.4.1.2 Leanness Requirements and Related Practices

According to Bhasin and Burcher (2006), there are two forms of leanness: technical and cultural. Technical leanness is defined as continuous improvement; some of the technological needs are cellular production, Kanban, single-minute device exchange, supplier development, supplier base reduction and total preventive maintenance (TPM). Although Lean is concerned with decreasing waste at all levels, it is also concerned with transforming an organisation's performance, according to the authors. JIT, TPM and total quality management (TQM) are also techniques linked with Lean practice, according to Shah and Ward (2003), who also identified three underlying components of Lean reduction: supplier-related, customer-related and internally-related.

Hopp and Spearman (2004) assert, in their research on avoiding waste, that Lean is a basis for enhancing production. Their advice for Lean adoption includes removing apparent waste, altering buffers, reducing variability and constantly improving. Lean manufacturing job designs have been discussed further by De Treville and Antonakis (2006), who believe that lean manufacturing may be achieved over time by integrating a variety of synergistic and mutually reinforcing methodologies, such as JIT, TPM and TQM. The sub-dimensions of leanness are summarised in Table 2.2.

Table 2.2: Sub-dimensions of Leanness

Sub-dimension	Reference
JIT	Basu (2009; p. 26); De Treville & Antonakis (2006); Jayaram et al. (2008); Konecka (2010); Narasimhan et al. (2006); Sanchez et al. (2001); Shah & Ward (2003, 2007)
TPM	Basu (2009; p. 27); Bhasin & Burcher (2006); De Treville & Antonakis (2006); Shah & Ward (2003, 2007)
TQM	Basu (2009; p. 33); De Treville & Antonakis (2006); Fullerton & Wempe (2009); Konecka (2010); Narasimhan et al. (2006); Sanchez et al. (2001); Shah & Ward (2003)

Note. JIT = just in time; TPM = total preventive maintenance; TQM = total quality management.

2.4.1.3 Strategic Implications of Lean Enterprise

In the past, the concept of Lean was considered an odd alternative to the standard production methods offered by Womack et al. (2007). However, leanness is a management philosophy that emphasises quality, supplier management and waste reduction through a number of approaches (Shah & Ward, 2003). According to Bhasin and Burcher (2006) and Breen et al. (2020), the most significant aims of Lean are to reduce costs and shorten lead times. Lean and performance have been investigated in a number of studies; however, the majority of these studies have focused on only a few components of

Lean (Cagliano et al., 2004). According to research by Al-Araidah et al. (2010), Lean practices can reduce human effort, tool investment and delivery time and enhance quality.

The inability of Lean to manage changes or declines in demand for completed things is one of its weaknesses. Focus should be placed on streamlining the supply chain, creating new products and improving management and employee conduct. Katayama & Bennett (1996) found that leanness is ineffective in responding to large fluctuations in aggregate demand quantities. Additionally, according to Byrne (2021), leanness should be employed to improve responsiveness rather than to boost profitability.

2.4.2 Agility

The Iacocca Institute at Lehigh University published a paper titled 'Agility' in 1991, which was the first time the topic was presented. The findings of the study suggested ways by which United States corporations may regain their position as the world's manufacturing powerhouse (Nagel & Dove, 1991). Agility in the context of food retail supply chain, can naturally be categorized as a capability of an organization to adapt or react to any changes in the demand or supply in the marketplace.

2.4.2.1 Definition

Agility may be defined in terms from manufacturing to SCM, but the emphasis here is on supply chain agility. According to Christopher and Peck (2004), an agile supply chain is one that can respond quickly to unanticipated changes in demand or supply. The presence of agile partners both upstream and downstream of the core organisation is critical to an agile response.

There are two critical characteristics of an agile supply chain: visibility (the ability to see from one end of a pipeline to the other) and velocity (distance travelled during a period of time; Christopher & Peck, 2004). Additionally, the rate of change is critical: this is defined as the speed with which a supply chain can respond to changes in demand. The relevant literature on agility in relation to the particular definitions is summarised in Table 2.3.

Table 2.3: Agility-Related Definitions

Sub-dimension	Definition	Reference
Flexibility, quickness, competences	'Capability to survive and prosper in a competitive environment of continuous and unpredictable change by reacting quickly and effectively to changing markets, driven	Gunasekaran & Yusuf (2002, p. 1357)

Sub-dimension	Definition	Reference
	by customer-designed products and services.'	
Flexibility, quickness	'Capability of an organization to adapt or react to marketplace changes or to seize/exploit market opportunities with speed and quickness.'	Swafford et al. (2006a, p. 170)
Responsiveness, visibility	'Supply chain's capability to respond in a speedy manner to a changing marketplace environment.'	Braunscheidel & Suresh (2009, p. 126)
Flexibility, responsiveness	'Ability to sense, respond to, and exploit anticipated or unexpected changes in the business environment.'	Sharifi & Zhang (2001, p. 772)
Quickness, competences, flexibility	'Capabilities of an enterprise to reconfigure itself in response to sudden changes in ways that are cost effective, timely, robust and of broad scope.'	Prince & Kay (2003, p. 305)
Responsiveness, flexibility, competences, quickness	'Ability to respond quickly and effectively to changes in market demand.'	Brown & Bessant (2003, p. 707)
Flexibility, competences	'Capability to change market requirement, maximize customer service level, minimize the cost of goods.'	Vázquez-Bustelo et al. (2007, p. 1303)

Various academics define agility differently. Swafford et al.'s (2006a) definition—'the supply chain's capacity to adapt or react quickly to a changing marketplace environment'—is used in this study. This term also lends credence to the agility practices explored in this study.

2.4.2.2 Agile Supply Chain–Related Practices

Supply chain agility is impacted by supply chain flexibility (Swafford et al., 2006a). Flexibility is linked to internal competence, while agility is linked to external capability (Braunscheidel & Suresh, 2009). Competence is appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competences to match the requirements of a changing environment, while capability is appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competences to match the requirements of a changing environment (Chiang et al., 1987). Additionally, according to Chiang et al. (2012), a system may be flexible without being agile, while an agile system is unquestionably flexible.

When it comes to systems, responsiveness has been described as the ability to respond to changes in stimuli using a certain set of skills, responsiveness system is defined as the ability of systems to respond quickly to changing conditions. When it comes to adaptability, flexibility refers to having a wide variety of possibilities, while responsiveness is an outcome of using it—it is a system feature. It is also defined as 'the speed with which the system can alter its output in reaction to an external stimulus, such as a client order' (Reichhart & Holweg, 2007, p. 1144). A system's responsiveness may be measured by its speed, adaptability and scalability, according to the extant literature. Table 2.4 lists the most critical components of agility.

Table 2.4: Sub-dimensions of Agility

Sub-dimension	Reference
Flexibility	Aitken et al. (2005); Christopher & Towill (2000); Goldsby et al. (2006); Ramesh & Devadasan (2007); Sharifi & Zhang (2001); Swafford et al. (2006a); Braunscheidel & Suresh (2009); Hallgren & Olhager (2009); Holweg (2005); Swafford et al. (2006a); Van Hoek et al. (2001)
Quickness	Hallgren & Olhager (2009); Sharifi & Zhang (2001)
Responsiveness	Gould (1997); Hormozi (2001); Sharifi & Zhang (1999)
Competences	Braunscheidel & Suresh (2009); Hallgren & Olhager (2009); Holweg (2005); Swafford et al. (2006a); Van Hoek et al. (2001)

2.4.3 Resilience

Resilio is the Latin origin of the term resilience and means 'to leap backwards'. According to Merriam-Webster (2007), resilience is 'the propensity of a substance to return to its original form following the removal of a tension that has created elastic strain'. Research into resilience has its origins in social psychology's development theory and is now an autonomous theory (Ponomarov & Holcomb, 2009). Ecological, sociological, psychological, economic, organisational and supply chain resilience may all be considered aspects of resilience. However, this present study is primarily concerned with SCM; therefore, it is vital to examine how resilience has been defined in this context, as well as how it has grown in this industry. Resilience in the context of food retail supply chain, can naturally be characterized as the capacity of the supply chain system to deal with a disruption without significantly affecting its ability to service customers.

2.4.3.1 Definition of Supply Chain Resilience

Supply chain resilience was first described by Christopher and Peck (2004) as the ability of a system to return to its original shape or to migrate to a new, more desirable state after being disrupted. They

offered four essential principles for constructing a supply chain that is both reliable and resilient: re-engineering the supply chain, collaboration, agility and the creation of an SCM culture. By enhancing redundancy and adaptability, resilience is the capability to bounce back from a disruption (Sheffi & Rice, 2005). As a result, it is a strategic move. Rice and Caniato (2003) defined redundancy as the ability to respond to disruptions in the supply network by increasing capital and capacity ahead of time.

Panomarov and Holcomb (2009) describe supply chain resilience as the adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function (p. 131). With origins in psychology, ecology, risk management and SCM, 'resilience' may be defined as a multidimensional and multidisciplinary concept. According to Panomarov and Holcomb (2009), the current definitions of resilience are imprecise and inconsistent and that scientists are currently trying to develop a unified theory of resilience. They state that two things are required to explain robust supply chains: an operational definition of resilience and knowledge of the main parts and capabilities that define it.

Another impressive supply chain resilience analysis was completed by Wieland and Wallenburg (2012). According to their paper, a proactive ability to take action before it becomes a final need and a reactive capacity to recover after experiencing a tragedy are two examples of resilience. Recovering to an acceptable level of performance after being influenced by an event, as well as the ability to prevent or resist being impacted by an event, is included in this definition. Table 2.5 summarises the many definitions of supply chain resilience that can be found in the literature.

Table 2.5: Resilience-Related Definitions

Resilience supply chain definition	Reference
'The capability of a supply chain to prevent disruptions and to reduce the impact of disruptions through developing required level of readiness, quick response and recovery ability.'	Chowdhury & Quaddus (2016, p. 712)
The supply chain's capacity to deal with a disruption without significantly affecting its ability to service customers.	Craighead et al. (2007)
Being able to deal with unforeseen circumstances.	Azevedo et al. (2008)
An organisation's ability to recover from a disruptive event or shift to an improved condition after an unavoidable risk event occurs is known as 'resilience'.	Christopher & Peck (2004)
The supply chain's ability to anticipate and react to unforeseen occurrences, as well as recover from them, by keeping operations at	Ponomarov & Holcomb (2009)

Resilience supply chain definition	Reference
the required degree of connectivity and control over structure and function.	

Research on supply chain resilience is still in its infancy, according to Mensah and Merkuryev (2014). As a result, they believe that the term 'supply chain resilience' is presently lacking in clarity. Sheffi and Rice's (2005) definition of resilience as the ability to bounce back from perturbation, was used in the present study. The resilience tactics investigated in this research are also supported by this principle.

2.4.3.2 A Review of the Literature on Supply Chain Resilience

In many cases, price and/or customer service are the cornerstones of supply chain operations. For too long, resilience has been undervalued. Collaboration may be achieved in two ways: via collaborative planning and via the use of supply chain information. The purpose of high-level supply chain resilience is to gain more insight into the risk profiles of the supply chain's upstream and downstream components.

Christopher and Peck (2004) believe in the importance of agility for future resilience in their supply chain model because of the greater visibility and speed it provides. However, despite being one of the first to develop a framework for supply chain resilience, their study lacks empirical analysis. According to Pettit et al. (2010), researchers from the Massachusetts Institute of Technology have analysed several case studies of supply chain disruptions in, concentrating on management solutions such as flexibility and collaboration. The disruption MIT discussed in their research came from the demand and customer side.

According to Sheffi and Rice (2005) and Alemsan et al. (2022), resilience may be achieved by improving flexibility, and they view it as a strategic endeavour. Redundancy, according to Rice and Caniato (2003), is the ability to react to supply chain system disruptions by investing in capital and capacity before the point of need. Controlling inventory, maintaining overcapacity production lines or facilities, committing to material supply contracts by acquiring capacity whether or not it is used, and maintaining a specialised transportation fleet are all ways to do this.

Long-term competitive advantage, according to Panomarov and Holcomb (2009) and Irfan et al. (2022), can be achieved through the dynamic integration of logistical capabilities. In their model of supply chain resilience, they analysed the connection between logistical capabilities and supply chain resilience. At the time of their paper, supply chain resilience was a relatively young field of research,

and their conceptual model was only one of many possible approaches. They also have not yet performed any empirical research.

A supply chain resilience framework was proposed by Pettit et al. (2010) in an exploratory study that recognised the need to balance managerial capabilities with the environmental disasters of the supply chain and the environment. They found that there were 14 distinct actions that may be taken to increase supply chain resilience. A company's capacity and efficiency in sourcing and fulfilling orders in a flexible manner is a good illustration of these traits. However, one of their major flaws, as stated in their article, was the absence of an empirical comparison of their approach to previous research. Various frameworks are presented; however, no actual research on the issue can be found, casting doubt on the frameworks' validity.

Supply chain risk management has been defined by Jüttner et al. (2003) as 'the identification of possible sources of risk and the execution of suitable methods to decrease supply chain vulnerability via a coordinated approach among supply chain risk participants' (p. 201). A more conventional definition of risk, according to Norman and Jansson (2004), is the possibility, in quantitative terms, of a specific hazard happening. This definition combines a probabilistic estimate of the main event's occurrence with a measure of the event's effects (The Royal Society, 1992, p. 4).

According to Jüttner et al. (2003), threats should be separated from the sources of threats as well as the repercussions or effects of those threats. They broke down supply chain risk into three categories—internal, external and network-related risks—each with their own sub-categories. Internal risk factors include those relating to labour (e.g., strikes) or production (e.g., machine failure), as well as uncertainty in IT systems. External risks include those related to politics, the environment, society and the industry or market in which a company or product operates. Interactions between supply chain enterprises (e.g., a lack of cooperation) may lead to network hazards.

Concentrated supply chain outcomes, such as cost and quality, are known as risk effects. Risk, according to Sodhi and Tang (2012), should be seen as a set of issues spanning causes, actual risk events and results. There are occurrences before and after the risk event, and the cause comes first. In the supply chain industry, there are three types of corrosion: supplier risk, demand risk and business risk.

Managing risk is the next step after classifying them. Decisions on risks and their subsequent implementation are made via risk estimates and risk evaluations (Tummala & Schoenherr, 2011). In practice, risk management requires analysing all possible outcomes of a project or process then comparing the potential profits against the investment's possible risks (Pettit et al., 2010). In the risk

management process, risk assessment is crucial. It is accomplished depending on the projected chance of an occurrence and the severity of the event if it were to occur (see Figure 2.1). However, risk management is unable to effectively describe low-probability, high-consequence occurrences, and this is its most serious flaw. Furthermore, standard risk assessment methods are incapable of dealing with unanticipated situations. However, according to Pettit et al. (2010), supply chain resilience may cover these gaps, resulting in supply networks that can survive unanticipated interruptions.

As Hanifan (2007) points out, the ability to forecast and control supply chain risk does not grow in tandem with supply network expansion and reach. Supply chain disruptions are becoming more sophisticated, and traditional risk assessments are no longer sufficient to protect against them. To deal with today's complex supply chains, traditional risk assessments lack the granularity and precision needed to accurately predict the financial repercussions of various vulnerabilities, such as recovery fees and costs, as well as future expenses to be avoided. According to Pettit et al. (2010), traditional techniques often focus on two risk parameters: probability and size.

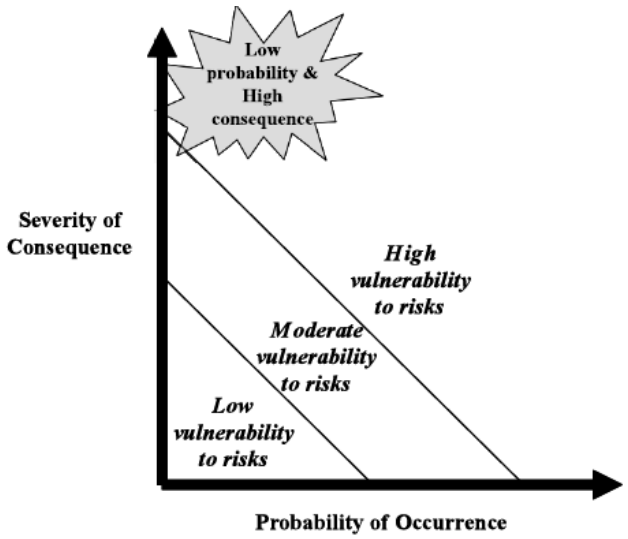

Figure 2.1: Traditional Methods of Assessing Risk

Source: Pettit et al. (2010).

2.4.3.3 Measurement of Supply Chain Resilience

Carpenter et al. (2001) stated that resilience is context-dependent, implying that resilience capacity needs (to what degree and what sort of capability) are dependent on the nature of the risk. As a result, after risks have been discovered, it is critical to examine the system's resilience in order to design a resilient system. Supply chain resilience can be measured by a variety of characteristics, such as visibility, flexibility, collaboration, responsiveness, recovery and other supply chain design attributes (Christopher & Peck, 2004; Pettit et al., 2013). A summary of prior research on supply chain resilience assessments can be found in Table 2.6.

Table 2.6: Resilience Supply Chain Sub-dimensions

Sub-dimension	Reference
Responsiveness	Chowdhury & Quaddus, (2016), Ponomarov & Holcomb, (2009); Sheffi & Rice (2005)
Collaboration	Christopher & Peck, (2004); Peck (2006); Pettit et al. (2010); Ponomarov & Holcomb (2009); Sheffi & Rice (2005)
Flexibility	Bartos & Balmford (2011); Erol et al. (2010); Peck (2006); Pettit et al. (2010); Ponomarov & Holcomb (2009); Rice & Caniato (2003); Sheffi & Rice (2005); Xu (2008)
Recovery	Chowdhury & Quaddus, (2016), Ponomarov & Holcomb, (2009); Sheffi & Rice (2005)
Visibility	Christopher & Peck (2004); Jüttner & Maklan (2011); Pettit et al. (2010)
Redundancy	Erol et al. (2010); Jüttner & Maklan (2011); Pettit et al. (2010)
Disaster readiness	Chowdhury & Quaddus (2016); Erol et al. (2010); Jüttner & Maklan (2011); Pettit et al. (2010)
Financial strength	Erol et al. (2010); Jüttner & Maklan (2011); Pettit et al. (2010)
Market capability	Erol et al. (2010); Jüttner & Maklan (2011); Pettit et al. (2010)

2.5 How the Supply Chain Literature Connects Leanness, Agility and Resilience

This section discusses the substance and results of the literature review: how the literature has connected these three supply chain components (leanness, agility and resilience) and what the key criticisms are. Although leanness, agility and resilience have been discussed before, the present study focuses on how these three components interact within the supply chain.

2.5.1 Leanness and Agility

The combination of Lean and Agile strategies is known as ‘leagile’. ‘Agility entails using market intelligence and a virtual firm to seize profitable opportunities in a volatile marketplace’, writes Naylor et al. (1999), and leanness entails building a value stream to reduce any waste, including time, and to maintain a regular timetable. As previously stated, Lean promotes smooth demand, reduced variety and lower costs, whereas Agile allows for highly variable demand, product variety and the ability to deliver to an unpredictable marketplace (Mason-Jones et al., 2000). Their combination enables businesses to make and handle products in a generic format for as long as possible before collecting them once an order or request from the end consumer has been received, as mentioned by Chan & Chan (2009).

There are three forms of Lean and Agile cohabitation, according to Inman et al. (2011), Hallgren and Olhager (2009) and Krishnamurthy and Yuach (2007). The first is that being lean is an important prelude to being agile. Many experts, as shown in Table 2.7, believe that Agile is a logical continuation of Lean. Agile, according to Sarkis (2001), is a flexible system that has been added to Lean. The outcomes of a study by Narasimhan et al. (2006) suggest that leanness is a precursor to agility.

The second is that the concepts of Lean and Agile go hand in hand. Lean, as shown in Table 2.1, is considered by many academics to be consistent with, complementary to and mutually supportive of agile manufacturing. Agile aspects include the ability to produce large or small batches with minimum setups, cross-trained adaptable workers, lower process lead times and costs, fully empowered employees, and JIT purchasing and flexible setups. JIT, a process control characteristic, suggests that these two strategies may complement one another.

The third is that Lean and Agile are not synonymous. Thus, the word 'leagility' was created (Aitken et al., 2002; Bruce et al., 2004; Krishnamurthy & Yauch, 2007; Mason-Jones et al., 2000; Naylor et al., 1999; Van Hoek, 2000). According to Van Hoek (2000), the purpose of 'leagility' is to integrate waste elimination or efficiency with customer responsiveness within the same supply chain. The perspectives on the link between leanness and agility are summarised in Table 2.7.

Table 2.7: Views on the Relation between Leanness and Agility

Leanness and agility relations summary	Reference
The transition from mass manufacturing to JIT to Lean to Agile is the most recent stage.	Hormozi (2001); Jin-Hai et al. (2003)
A more unpredictable market and a wide range of products make Agile production more suitable than Lean production.	Naylor et al. (1999); Vázquez-Bustelo et al. (2007)
Agility adapts the complete spectrum of flexible production technologies, together with TQM, JIT and Lean production.	Goldman & Nagel (1993)
Agile manufacturing may be done by exploiting and combining aspects of current systems and procedures that have already been established and are in use.	Gunasekaran et al. (2008); Sharifi & Zhang (2001); Vázquez-Bustelo et al. (2007)
From the concept of Lean, agility is the next logical step or natural progression.	Booth (1996); Gunasekaran et al. (2008); Hormozi (2001); Maskell (2001)

Note. JIT = just in time; TQM = total quality management.

2.5.2 Agility and Resilience

According to Lee (2004), the best supply chains are not only cost effective; they are also agile and adaptable … the most efficient supply chains can become uncompetitive if they do not adapt to structural changes. Numerous studies demonstrate how the collaborative management of strategies that enable a better and faster response to altering customer needs in changing settings improves supply chain performance and competitiveness. Many of the characteristics that make companies successful in the current economic context are the same characteristics that make these companies resilient (Sheffi, 2015). Sheffi (2015) has stated that resilience enables businesses to compete by building a culture of surveillance practices, as well as responsiveness and flexibility, to detect and respond to disruptive crises promptly and effectively. Supply chains must become more resilient and agile to deal with unexpected disruptive events: that is, resilient in order to cushion the negative effects of crises (Carvalho et al., 2012), and agile in order to recover quickly (Lee, 2004). These should be viewed as a priority at the present time.

According to Christopher and Peck (2004), resilience includes agility, and agility contributes to supply chain resilience. According to Lenort and Wicher (2012), resilience can be thought of as a characteristic of agility. Ponomarov and Holcomb (2009) have also highlighted agility as a critical component of resilience. Additionally, Wieland and Wallenburg (2012) believe that resilience is composed of two components: agility and robustness. Carvalho et al. (2012) argued that supply chains must embrace new strategies to enhance their ability to respond rapidly and cost-effectively to unforeseen market shifts and rising levels of turbulence and that they must tie these capabilities to corporate performance and competitiveness. They presented a conceptual framework that connected supply chain resilience and agility to a company's performance and competitiveness, dividing up operational and economic performance. However, Carvalho et al. (2012) showed agility and resilience to be two constructs that both promote supply chain performance and thus supply chain competitiveness in their conceptual framework model.

2.5.3 Resilience, Leanness and Agility

For SCM, various management strategies have been used. The cost-cutting foundation of the Lean supply chain is based on waste elimination and process improvement. Supply chains that are flexible are designed to allow companies to swiftly adjust when the market changes in terms of product diversity and volume (Agarwal et al., 2006). However, the Lean supply chain is more susceptible when it is disturbed by sudden and unanticipated incidents. Without buffers in the form of spare capacity, lead time and inventory, Melnyk et al. (2010) trusts that lean supply chains will be more susceptible. Dealing with unanticipated incidents is difficult due to a lack of additional resources.

According to Jüttner (2005), companies should attempt to be lean—but not too slim—since the dangers grow considerably. A study by Faisal et al. (2006) found that the more integrated and leaner the supply chain, the greater the risk of errors, accidents and uncertainty. Inventory being reduced as waste in a lean supply chain increases the impact of supply chain interruptions (Chopra & Sodhi, 2004). According to Konecka (2010), more efficient operations are associated with greater risk due to a focus on cost; consequently, dealing with unexpected circumstances is more challenging.

Towill (2005) argued that, if a corporation lacks both agility and resilience, it runs the danger of being too vulnerable to shocks and disruptions, which might jeopardise the organisation's very survival. According to Konecka (2010), the finest approach to satisfying extremely demanding consumers is to be nimble. This is because there is a lessened likelihood of clients being unsatisfied, orders being lost and answers being overly slow. This does, however, come with its own set of difficulties, as the need for available open spaces to enable flexible operations lowers efficiency. Konecka (2010) further stated that each supply chain method has its own specific set of benefits and drawbacks. Thus, more work on compatibility is required in light of this.

According to Carvalho et al. (2011), the trade-offs between Lean, Agile and resilient management paradigms can help supply chains become more efficient, streamlined and long-lasting. In a supply chain, leanness maximises revenues by reducing costs, whereas agility maximises sales by delivering exactly what the consumer wants to buy. Although resilient supply chains are more expensive, they are better equipped to deal with the current business environment's unpredictability.

2.6 Overall Research Gap

Based on the preceding brief assessment, the present study addresses research gaps in the existing literature that relate to the impacts of a lean, agile and resilient supply chain on retail performance. The identified research gaps and accompanying research issues are provided as follows.

Actual market competition is fierce, and supply chains must be built to provide the best performance possible. In today's economic environment, where businesses must respond to market uncertainty, the issue is merging new paradigms and integrating them into supply chains. The recognition of substantial trade-offs between Lean, Agile and resilience paradigms may aid in the efficient and long-term competitiveness of supply chains and organisations.

According to Vachon and Klassen (2006), SCM has been investigated based on its products and the processes on both the upstream and downstream sides of the supply chain. In addition, Naylor et al. (1999) illustrated the application of Lean and Agile paradigms together. Leagile is a supply chain

approach that takes market information and the location of the decoupling point into account when implementing Lean and Agile practices. Furthermore, the American Management Association (2006) revealed that there was a lack of understanding regarding the functional knowledge and abilities required to help make people, teams and organisations more agile or more resilient. For them, the distinction between agility and resilience is far less significant than the reality that developing and maintaining jointly is vital to survive in tumultuous settings. Agility without resilience may generate an overexposed organization that stresses leanness, boundary demolition, openness, and speed so much that major shocks and disruptions can seriously impair its performance, even jeopardize its survival (American Management Association, p. 6).

Lean principles ask for distances in a supply chain to be as short as feasible; however in this era of global commerce, few supply chains can consist completely of short transportation connections. Understanding the trade-offs of Lean, Agile and resilient management paradigms is important if supply chains and organisations are to become more efficient and sustainable. To be successful in today's market, businesses must find a way to integrate the three supply chain paradigms—this is a difficult task.

The main outcome of each paradigm's practices is the formation of capabilities or attributes that have a direct impact on supply chain performance. According to Naylor et al. (1999), leanness and agility should be considered together rather than separately. Lean techniques result in significant increases in resource productivity by reducing the amount of energy, water, raw materials and non-product output involved in manufacturing processes, thereby decreasing the environmental impact of industrial activities (Larson & Greenwood, 2004). Resilience involves flexibility and agility. As a result, it is critical to have agility abilities in order to build a strong supply chain (Christopher & Peck, 2004).

Numerous studies have emphasised the importance of various evolving practices and theories, including those by Chavez et al. (2020), Govindan et al. (2015), Sayyadi Tooranloo et al. (2018) and Sen et al. (2017). This research has examined the synergies and contrasts between these paradigms and their attributes, focusing only on a few at a time. Agarwal et al. (2006), Bruce et al. (2004), Christopher (2000), Mason-Jones et al. (2000) and Vonderembse et al. (2006) discussed the relationship between Lean and Agile paradigms, and Christopher and Peck (2006) discussed the relationship between Agile and resilience paradigms. Previous studies have focused on the direct effects of supply chain elements on performance, which seem unable to capture the full picture of supply chain complexity, however, indirect effect on firm performance are often crucial and needs attention. However, there has been no study of the mediation and moderation impacts of agility and

resilience in the relationship between leanness and the retail performance of enterprises, particularly in examining supply chain retail performance of the food sector.

In summary, the research gaps are as follows:

- There is no single recognised process capturing the abilities of leanness, agility and resilience in securing a better supply chain.
- None of the existing literature has studied the mediation effects of agility and resilience in the relationship between leanness and the retail performance of firms, particularly with respect to the supply chain retail performance of the food sector.
- No formal test of this connection has been conducted as yet, particularly in the food retail sector.

2.7 Initial Research Model

The above analysis of the literature demonstrates that several supply chain elements and their internal interactions have been investigated in isolation. Despite the fact that supply chain studies are well represented in the current literature, the subject of how supply chain factors combine to affect retail performance—in the context of the food industry in Saudi Arabia—remains unexplored. Consequently, an initial research model was developed for this study. Based on the connections and relationships discussed in Section 2.5, the initial research model in Figure 2.2 was developed.

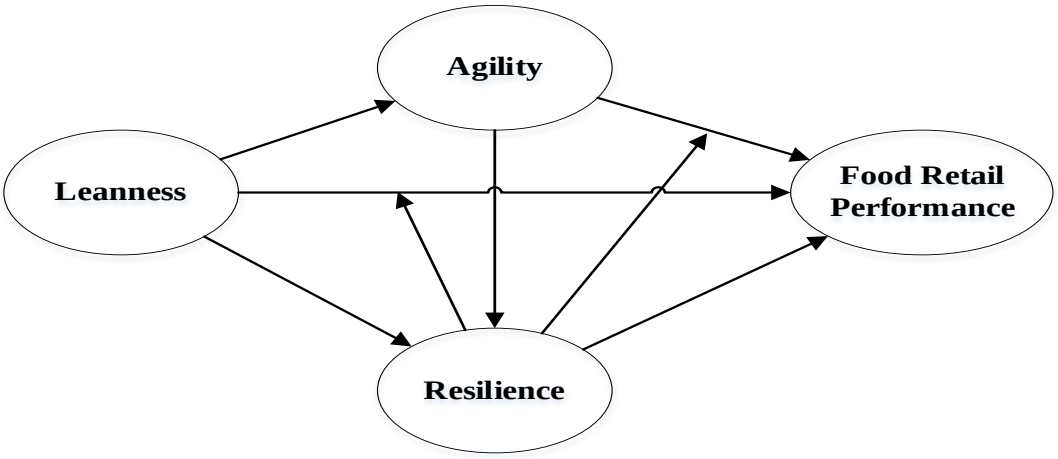

Figure 2.2: Initial Research Model

2.8 Background Theories and Relationships among the Constructs

This study is based on dynamic capabilities theory, which was first put forth by Teece et al. (1997). The concept of dynamic capabilities has evolved as a result of the unpredictability and rapid change in the business environment and market. Companies' dynamic capabilities are described as their ability to produce, integrate and restructure internal and external resources in response to rapidly changing business conditions. It was this dynamic capabilities viewpoint that replaced the resource-

based view (RBV; Bowman & Ambrosini, 2003). RBV focuses on resource identification and resource selection, whereas the dynamic capabilities approach stresses resource deployment and capacity-building to respond to changes in the market and customer needs. The standard RBV is unable to clearly define its capabilities when faced with dynamic shifts in unpredictable contexts. According to Eisenhardt and Martin (2000), the dynamic capabilities approach solves this gap by preparing resources and capabilities that can respond to situation-specific changes, thereby addressing the idiosyncrasies of contingencies. A framework for dynamic capability–building, created by Teece (2007), includes the following components: seeing opportunities and threats, taking advantage of them and reorganising a company's tangible and intangible assets. As a result of scanning, learning and interpreting actions both inside and outside of the company, opportunities or risks might be identified (Teece, 2007). A supply chain system can help improve operational performance—for example, in terms of shipment accuracy, customer service and inventory turnover—leading to competitive advantage (Barratt & Oke, 2007; Småros et al., 2003).

Dynamic capabilities enable firms to renew and reorganise their resource base to meet changing consumer demands and market competitor strategies (Zahra & George, 2002), and the use of dynamic capabilities in the supply chain is becoming increasingly crucial (Allred et al., 2011; Witcher et al., 2008). Changes in long-term and short-term supply and demand, market structure and customer preferences have led to the development of dynamic supply chain capabilities (Ju et al., 2016) because organisations must have such capabilities in order to respond to these changes.

The development of dynamic capabilities within the supply chain, according to Mathivathanan et al. (2017), is crucial for addressing future requirements. Through dynamic supply chain capabilities, organisations can form collaborative links with other firms, customers and suppliers and also accurately foresee market trends, boosting supply chain responsiveness to meet customer and supplier demands (Sanders, 2014). Kareem et al. (2020) described dynamic supply chain capabilities as a firm's ability to detect and use internal and external resources to enhance supply chain operations efficiently and effectively. Lean supply chain skills like JIT, TQM and TPM are examples of dynamic supply chain capabilities (Liker & Morgan, 2006).

According to Chowdhury and Quaddus (2016), the dynamic capabilities view can be used to analyse the need for resilience capabilities in the context of disruptive events. The dynamic capabilities view (Teece et al., 1997) presumes that, with changes in the market and consumer demands, competing firms should quickly reconfigure and adapt their capabilities to overtake competitors. Arguably, supply chains should also have the responsive capability to compete with large market changes and customer demands and to improve quickly from disturbances.

Various scholars have identified lean, agile and resilient capabilities as capabilities that can provide organisations with a variety of competitive advantages. According to Jorgensen et al. (2007), being lean—successfully and sustainably—entails more than simply implementing tools, processes and activities; it should be viewed as lean capability development. Swafford et al. (2006a) defined agility as a supply chain's capability to respond quickly to changing market conditions. Braunscheidel and Suresh (2009) described agility as a business's adaptability or swift response to market changes—both internally and in collaboration with important suppliers and customers. Coutu (2002) identified resilience as a vital success capability. Furthermore, Stoltz (2004) has regarded resilience as a separate organisational characteristic that is essential for outperforming less-resilient rivals.

To summarize the above discussion, the present study is focused on the integration of various competences, which results in competitive advantages. A firm's RBV gives crucial insights into how competitive advantages are produced inside organisations (Ponomarov & Holcomb, 2009), which will help in answering the research questions, by showing the effects of the supply chain dynamic capabilities on firm performance. The dynamic capabilities view confirms the interaction between supply chain components. in this study, the supply chain is viewed as a dynamic capability that is formed by a lean, agile and resilient supply chain.

2.9 Summary

In this chapter, the research gaps in the available literature were emphasised. Identifying the variables used in various studies and finding the relationships between the variables for the current study were the major objectives of the literature review. Additional studies were examined to gain a better understanding of the present study's setting from a theoretical standpoint. Following the completion of the literature review, this chapter highlighted research gaps from the theoretical, methodological and contextual viewpoints. Additionally, this review assisted the researcher in identifying existing research gaps and their relevant research issues. The dynamic capabilities view was researched further in terms of its relevance for solving the research gaps and the study's objectives. A conceptual model based on the variables and linkages was provided at the conclusion of this chapter.

Chapter 3: Research Methodology

3.1 Introduction

This chapter begins with a description of research paradigms to identify the study's distinct paradigmatic approach. The next section explains the study's methodology. Due to the mixed-methods nature of the study, a substantial section of this chapter highlights the qualitative processes used in conjunction with the quantitative techniques. The description of the quantitative technique comprises the bulk of this chapter, and it is used to estimate both the measurement model and the structural model, as well as other parameters. Additionally, the validity and reliability of the measurement model are discussed in this chapter. The remainder of the discussion is devoted to establishing the structural linkages in the research model, exploring the predictive abilities of the model's latent constructs. The last section summarises this chapter.

3.2 Research Paradigm

A paradigm offers fundamental guidance and concepts for research. The paradigm for research will direct study and practise with a specific focus. According to Willis (2007), paradigms exist for the purpose of creating and growing consciousness, citing Guba and Lincoln's (1994) introduction of four paradigms: positivism, postpositivism, critical theory and constructivism. Creswell (2003) has similarly distinguished postpositivism, constructivism, pragmatism and participation in paradigmatic experiences. While scientific research has a number of paradigmatic stances, Onwuegbuzie and Leech (2005) classified work into two main perspectives: positivist and interpretivist.

The paradigms of this present study were aligned with Onwuegbuzie and Leech (2005). It can be stated that the majority of studies on SCM are positivistic in nature since they use empirical analysis to support the ideas and hypotheses put forward (Denzin & Lincoln, 2005). A positivistic researcher also believes in objective data and analysis because reality exists outside of the researcher's control (Krauss, 2005; Johnson & Onwuegbuzie, 2004). This demonstrates that work cannot be completed objectively; rather, it should be objective in order to explore, comprehend and evaluate the phenomenon (Johnson & Onwuegbuzie, 2004). Additionally, the positivist paradigm is applicable to quantitative research in terms of developing and testing hypotheses (Creswell, 2003, 2008).

The present study's research framework was determined by its purpose, existence and research context. The goal of this study was to create a model of the implications of a lean, agile and resilient supply chain on retail performance in the context of Saudi Arabia's food sector. Its purpose was to

identify measurable and observable predictors of the effects of such a supply chain on retail performance. Thus, this study establishes hypotheses, includes specific variables, tests hypotheses and draws conclusions based on the statistical analysis of data. As a result, the positive research paradigm appeared to be appropriate for this research.

Along with the positive paradigm, the project collects and analyses qualitative data to improve understanding of the impact of a lean, agile and resilient supply chain on retail performance in the Saudi Arabian food industry. The use of a qualitative method suggests a preference for the constructivist model, based on the contextual factors and experiences of the research participants (Willis, 2007). Thus, this study used a mix of qualitative and quantitative approaches, as well as a combination of positivist and interpretative methodologies.

The combination of quantitative and qualitative techniques in a single study is referred to as a mixed-methods design (Tashakkori & Teddlie, 2003; Teddlie & Tashakkori, 2012). There are several grounds to justify the use of mixed-methods analysis in this study. The combination of leanness, agility and resilience in supply chain research is still in its infancy, with no related theories having been formed (Agarwal et al., 2007; Carvalho et al., 2011; Jüttner et al., 2007; Naim & Gosling, 2011; Naylor et al., 1999). The factors and elements affecting leanness, agility and resilience in supply chain retail performance have not yet been investigated. Consequently, there is a need for exploratory research to establish appropriate concepts and hypotheses.

Additionally, leanness, agility and resilience in supply chains depend on the context (Afonso & do Rosário Cabrita, 2015; Agarwal et al., 2006; Walker et al., 2002). Thus, the variables and elements described in the lean, agile and resilient supply chain and food retail performance literature must be validated by a group of food industry professionals to contextualise the study model. Moreover, new factors related to leanness, agility and resilience in the supply chain are unlikely to have been investigated in the context of the food sector in Saudi Arabia. All of these considerations support the use of a qualitative research approach in this study.

The reason for using quantitative techniques, such as a survey, is also similarly compelling. The factors and variables linked with supply chain elements, as well as their correlations, must be statistically validated and verified by data collection through a quantitative survey, which justifies the employment of the quantitative technique in this study.

3.3 Mixed-Methods Research

This study used a mixed-methods technique (Biddle & Schafft, 2015; Creswell, 2010; Maxwell, 2016; Tashakkori & Teddlie, 2010). Whether sequentially or in parallel, a mixed-methods approach combines qualitative and quantitative data collection and analysis techniques (Tashakkori & Teddlie, 1998). Mixed-methods approaches have grown widespread in a variety of sectors, as well as in the social sciences. Additionally, it is considered as a third research methodology that aids in the integration of qualitative and quantitative methodologies throughout the study process (Onwuegbuzie & Leech, 2005). Mixed-methods research provides an excellent chance for scholars to put different approaches into practice (R. B. Johnson & Onwuegbuzie, 2004). Due to the fact that mixed approaches are the most often used in practice, research has grown in popularity (Creswell, 2015; Tashakkori & Teddlie, 2010).

According to R. B. Johnson et al. (2007), research using mixed approaches combines qualitative and quantitative methods. The goal of a mixed-methods approach is to mitigate the limits and maximise the strengths of both qualitative and quantitative approaches rather than depending only on one (R. B. Johnson et al., 2007). Additionally, when both qualitative and quantitative research methodologies are applied concurrently, they enhance the validity of the study (Creswell, 2003). For instance, quantitative techniques give statistical evidence and validation of a qualitative study's elements and variables. As a result, a mixed-technique approach seems to be applicable in this study.

Creswell (2003) classified mixed-methods research into four categories: embedded design, triangulation design, explanatory design and exploratory design. Campbell and Fiske (1959) used the term 'multiple operationalism' to describe the concept of triangulation and the use of different validation methods. Embedded design is a strategy in which both qualitative and quantitative data are collected, but one of the data performs an auxiliary purpose in the overall design. The second variants of embedded designs include experimental models, wherein qualitative data are embedded in experimental, and correlational models, in which qualitative data are used to explain how mechanisms work in a correlation model (Creswell, 2003). In triangulation design, researchers collect and analyse data derived from both qualitative and quantitative methodologies to validate or enhance qualitative findings (Creswell, 2003). An explanatory design suggests that quantitative data should be collected and analysed and that qualitative data collection and analysis should be used to support those findings. Finally, an exploratory design starts with a qualitative approach and progresses to a quantitative method (Creswell, 2003).

It is important to choose the best form of mixed technique for a particular research situation. To choose the most appropriate mixed-methods technique, the researcher must first examine and analyse

the study objective. The primary objective of this present study was to develop a supply chain model for food retail performance and to investigate the link between food retail performance and supply chain variables. To operationalise the study aims, an initial research model (see Figure 2.2) was developed based on a comprehensive analysis of the literature. Because the research linked to combining leanness, agility and resilience in the supply chain was still in its early stages, a qualitative analysis was considered essential to ensure the consistency and validity of the model in a specific context. Consequently, a field study was performed using semi-structured interviews, and a comprehensive model was built based on the conceptual model and field research data. For validation, a quantitative survey was undertaken following the field investigation. As a result, the combination of qualitative and quantitative methodologies in a triangular approach was deemed appropriate for this study.

3.4 Research Process

To gain an in-depth understanding, both qualitative and quantitative research approaches were employed. Two methods were used to gather data: one for exploration and one for verification. The process for the research is shown in Figure 3.1, followed by a summary of each step.

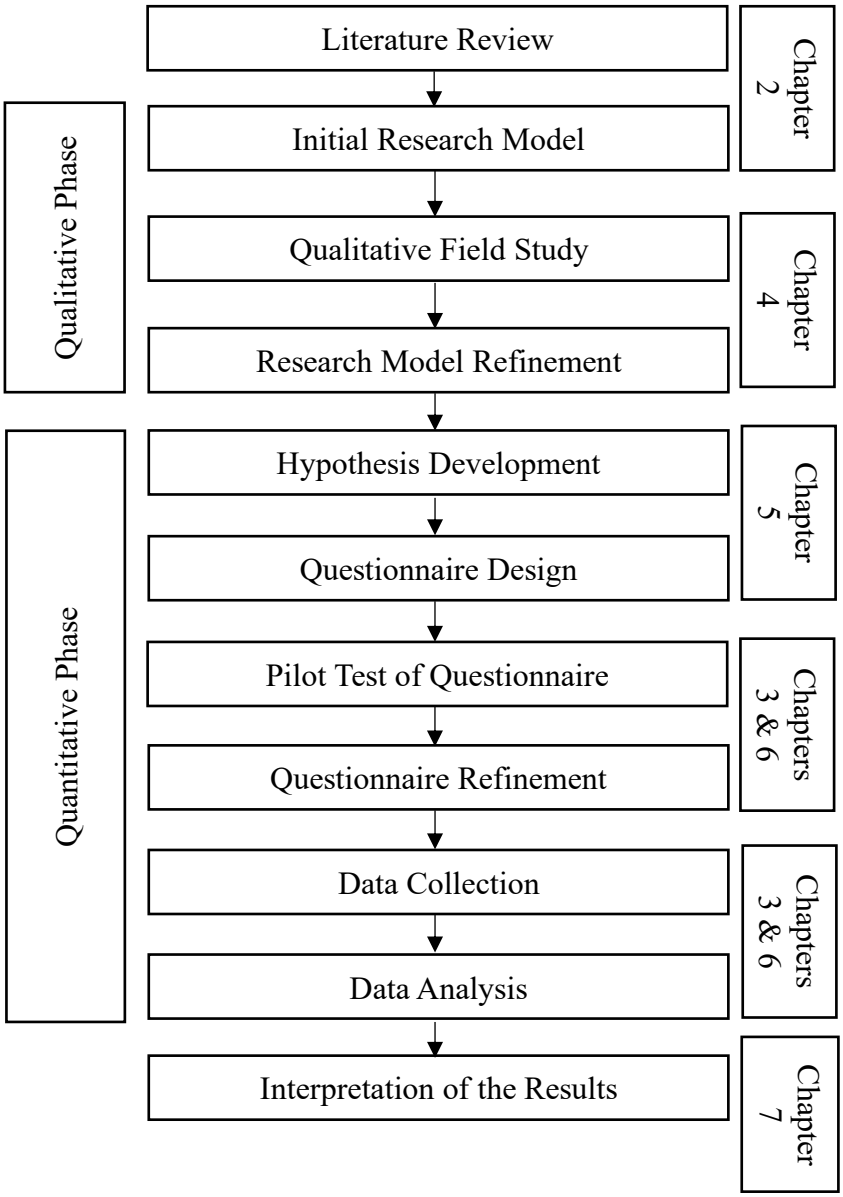

Figure 3.1: Research Process

3.4.1 Step 1: Literature Review

In the first phase, research was performed on leanness, agility and resilience in supply chains and food retail performance. Additionally, one significant theory of strategic management was explored as a foundation for a model—namely, dynamic capabilities theory (Altay et al., 2018). Thus, the proposed model's structures and their relationships were conceptualised and founded on a solid theoretical foundation (see Chapter 2).

3.4.2 Step 2: Initial Research Model Development

A preliminary supply chain food retail performance research model was constructed on the basis of the literature study (as shown in Figure 2.2). Following a review of the literature, the sub-constructs,

constructs and linkages that were included in the original research model, as well as the linkages between them, could be explained, justified and rationalised.

3.4.3 Step 3: Qualitative Field Study

Following the development of the initial research model, the researcher used semi-structured interviews as part of a field study to verify and contextualise this model. The data were then analysed using content analysis techniques. Following a study of the content, data from each interview were used to identify the factors and sub-factors present. Cross-interview transcripts were then compared and analysed to incorporate both factors and related relationships to create a combined model.

3.4.4 Step 4: Research Model Refinement

The researcher compared the findings from the literature review and the qualitative data to revise the initial research model. On the basis of this comparison, the necessary addition and deletion of items and constructions were made. For each construct and dimension, justifications based on prior research and ideas were analysed. Following this refinement procedure, a final research model was proposed.

3.4.5 Step 5: Hypothesis Construction

To develop testable hypotheses, the researcher justified every link between constructs in the proposed model after reviewing their application and associated theories. For the quantitative confirmation of relations between constructs, 13 hypotheses were established. Chapter 5 provides a comprehensive review of this hypothesis development process in detail.

3.4.6 Step 6: Questionnaire Design

In line with the 13 hypotheses, a preliminary survey was designed. To ensure content validity, the measurement items for each concept were primarily generated from previous research. Certain items were formed as a result of the area study because they were clearly relevant to the circumstance. As a result, a preliminary questionnaire using a 6-point Likert scale was developed. Chapter 5 presents the details of the questionnaire structure. This preliminary questionnaire was then analysed and improved through a pre-testing procedure to determine the validity and reliability of the measurement items.

3.4.7 Step 7: Pre-testing the Questionnaire

The researcher performed pre-testing for the initial questionnaire for refinement and checking of any errors or unclarities in the questionnaire. The researcher included 10 respondents for questionnaire

pre-testing. An improved questionnaire was created based on the replies received in this pre-testing phase.

3.4.8 Step 8: Pilot Study

A pilot study was conducted in the form of a survey with the goal of ensuring the accuracy of the information. Employees in the supply chain and logistics business were identified as potential data collectors. The pilot study yielded a total of 30 replies, which was considered a success. Following comments from this pilot study, the questionnaire was restated and prepared for use in the final survey (see Chapter 6).

3.4.9 Step 9: Quantitative Data Collection

Face-to face interviews were conducted with supply chain and logistics staff of targeted businesses during which the quantitative survey data was collected. Snowball sampling was used to choose respondents from the Saudi Ministry of Commerce's list.

3.4.10 Step 10: Data Analysis

SEM, based on PLS and using IBM SPSS, was used to analyse the collected data (Chin, 1998; Ringle et al. 2012). Partial least squares–based structural equation modelling (PLS-SEM) was used to investigate convergent validity, discriminant validity and test hypotheses, while SPSS was employed to investigate descriptive statistics and categorical variables. The specifics of this analysis are covered in Chapter 6.

3.4.11 Step 11: Discussion

The study's last step included the evaluation and discussion of the findings from both the quantitative and qualitative data analyses. A debate was conducted in accordance with the hypotheses as well as the study's objectives.

3.5 Qualitative Study

A qualitative field study was conducted for the experimental stage of this study to analyse and confirm the items and constructs (Creswell, 2003) that were defined in the initial research model shown in Figure 2.2. The purpose of this field study was to validate and contextualise the initial model that was developed as a result of the literature review. Additionally, it was targeted at determining elements and their relationships. Semi-structured interviews were employed to better understand the research area's benefits and limitations. Interview methodology has been a very popular and successful way

of gathering qualitative data (Malhotra et al., 2004). The research model was then fine-tuned based on the outcomes of this qualitative field study.

3.5.1 Sample Selection for the Qualitative Field Study

For a field study, samples must be selected through either a random or non-random method (Xu & Quaddus, 2005). The researcher selected the first interview participant randomly. This was followed by the use of a snowball technique because this sort of sampling approach is reliable for obtaining the necessary information and also aided in identifying the most representative participants for this study (Creswell, 2007) based on their place of employment.

The names of potential participants were gathered based on personal contacts. The researcher selected the participants for the interview based on two criteria:

- company activity—the participant's company must be in food retail in Saudi Arabia in any part of department of the supply chain or logistics
- employment level—the researcher aimed to interview people from the management level to allow the researcher to contextualise the research model.

A total of 15 interviews were conducted. The researcher did not need to conduct additional interviews because the data saturation level was reached (Mason, 2010).

3.5.2 Data Collection Methods

After identifying the prospective participants, the researcher approached them by phone to schedule a time for their interview. All participants who were contacted by phone to participate in the interview agreed to participate. The researcher booked interviews for 1 hours and 40 minutes to allow the participants enough time during the interview. Before the interview, the researcher approached the participants and explained that the interview would be recorded and sought their consent to participate. After receiving consent, the interview was conducted by the researcher using a semi-structured method. The researcher conducted the interview at the respondent's place of business. Interviews were conducted in English, and the average duration of the interviews was 1 hour.

3.5.3 Data Analysis Techniques for the Qualitative Field Study

As stated earlier, this study used content analysis to analyse the qualitative data and focus more on context (Merriam & Tisdell, 2015; Siltaoja, 2006). Content analysis has been confirmed to be a good method and has been extensively applied in many studies (Siltaoja 2006). The technique has also been considered a very valuable tool for measuring the frequency and variety of messages from

comparatively unstructured patterns (Merriam & Tisdell, 2015). This study identified the constructs, items and any associations via content analysis using NVivo 12. NVivo software was considered to be suitable analytical software because it helps to find constructs and explore the patterns and any links (Vickery et al., 1999). According to Quaddus and Xu (2005) and Siltaoja (2006), content analysis can be performed in a variety of ways, including inductively and deductively. A two-step content analysis technique (Berg, 2004; Quaddus & Xu, 2005) was used in this study to identify and confirm the themes and sub-themes from the raw data before building the research model. In the first, inductive step, the themes, sub-themes, constructs and items were explored and confirmed. In the second, deductive step, the initial model and the field study model were compared to refine a final research model.

3.6 Quantitative Study

Once the initial model was refined, the following step was to confirm the constructs, items and the relationship among them by using quantitative analysis. It has been mentioned previously that the present study had more emphasis on the quantitative phase than the qualitative phase. The quantitative phase of this study included developing hypotheses based on the research model and testing them by analysing survey data using the PLS method.

3.6.1 Hypotheses and Questionnaire Development

The researcher designed the quantitative questionnaire based on the comprehensive research model. In the questionnaire, the researcher consulted all the constructs and their relationships in the research model. The first part of the questionnaire, Part A, included closed-ended questions in relation to all the constructs and their items that were in the research model. This study used a 6-point Likert scale for the measurement of constructs and items in Part A in the questionnaire, where 1 indicated *strongly disagree* and 6 indicated *strongly agree* for each item. The Likert scale, in quantitative data collection, is considered an effective approach for gathering quantitative data since respondents have more choices when selecting their replies (Mourad & Valette-Florence, 2016). Moreover, most of the previous SEM-based empirical studies have been conducted using Likert scales to measure the links and relationships between constructs and variables (e.g., Hossain et al., 2015; Mourad & Valette-Florence, 2016). To avoid the central tendency error when *none* is a neutral option, the researcher used a 6-point scale (Hills & Argyle, 2002). Choosing the neutral option is common among people from Asian backgrounds (Wibowo et al., 2009). Since the research site was Saudi Arabia, on the Asian continent, the researcher did not include the neutral option in the questionnaire.

3.6.2 Pre-testing the Questionnaire

The initial questionnaire was tested prior to quantitative data collection. The researcher sent the questionnaire to 12 respondents: five supply chain and logistics academics, three supply chain and logistics employees in high-level positions in their firms and four PhD students. Scholars have different views regarding the sample size for questionnaire pre-testing (Hunt et al., 1982). Ferber and Verdoorn (1962) have stated that 12 is an acceptable sample for questionnaire pre-testing (as cited in Hunt et al., 1982). The purpose of pre-testing is to determine whether there are any difficulties in understanding any of the questionnaire items. Therefore, the researcher asked all participants for their opinions regarding the deletion, addition and clarification of the questions. The participants were approached randomly by the face-to-face technique. Overall, pre-testing was carried out to establish a consensus on the understandability and viability of the selected scopes. Based on the feedback and opinions of these experts, necessary adjustments were made to the final version of the questionnaire.

3.6.3 Pilot Study

After refining the questionnaire, the researcher conducted a pilot study. The reason for this pilot study was to test the applicability of the questionnaire, find any problems from respondents and check whether there was any unclarity in the concepts or phrases used in the questionnaire that could hinder respondents from answering the questionnaire. Supply chain and logistics employees were the potential respondents; however, people who worked in any stage of supply chain and logistics activities in any food retail business in Saudi Arabia were also included in the pilot phase. The researcher contacted respondents by phone to inform them of the objective of the study. After this, respondents who agreed to participate in the survey were selected for the data collection. Face-to-face interviews were conducted in the participants office and used for data collection in the pilot study. The selection of pilot study participants was done on a random basis. In the end, 30 participants completed the survey with usable data for the pilot study. Following this, data were reviewed and analysed to determine the validity of the questionnaire. The data's descriptive statistics were examined and verified. The pilot study results are presented in Section 6.2.

3.6.4 Study of Population and Sampling Technique

The population for this study was any employee who was involved in a supply chain and logistics activity in food retailers in Saudi Arabia. The aim of the research was to look into the integrated influence of leanness, agility and resilience on the supply chain systems of food retail firms in the Kingdom of Saudi Arabia to improve their retail performance. Therefore, supply chain firms, logistics firms and food retailers were considered the target population for this study. Organisations of different

sizes were considered for data collection: very small, small, medium, large and very large. This study originally intended to obtain 350 responses from different job levels in supply chain and logistics departments and firms dealing with food retailing activities in Saudi Arabia. For this reason, the data collection team conducted surveys in the study sites face to face. To find the right sample for this study, snowball sampling was adopted. Table 3.1 shows the details of the sampling procedure.

Table 3.1: Sampling Procedure for This Study

Procedure	Strategy	Comments
Target population	Supply chain and logistics departments and firms dealing with food retailing	To investigate the integrated impact of leanness, agility and resilience in the supply chain system of food retail firms in the Kingdom of Saudi Arabia
Sampling frame	The most business trading city (Riyadh, the capital city of Saudi Arabia)	The capital city represents the sampling area of the target population
Sampling unit	All supply chain and logistics departments and firms involved in food retailing activity	The sampling units cover all the elements of the target population
Sampling elements	People who hold any work position in supply chain or logistics departments or firms that deal with food retailing	A supply chain department may not technically exist in certain small food retailing firms, but the role of supply chain is handled by the department of operations
Sampling strategy	Snowball sampling	First, the target group was identified randomly, and then snowball sampling was used for data collection
Sample size	The initial sample size was 350	For the pilot study, 30 responses were received. For the full study, 307 responses: 296 valid for analysis and 11 invalid

3.6.5 Sample Size Determination

To measure dimensions and evaluate alternative hypotheses in the research model, an SEM technique based on PLS was used. For this, the researcher must carefully determine the sample size in the study context. The sample size required for a PLS investigation should be at least 10 times the number of items in the most complicated component in the research model (Gefen et al., 2000; Hair et al., 2016).

The researcher must choose the appropriate sample size for the data to be run effectively using PLS software. Consequently, the minimum sample size for this study was 120 replies, according to the rule of thumb (10 × 12). The total usable response data for the final data analysis was 296 responses, which achieved the minimum sample size of 120 in accordance with regulation given by Gefen et al. (2000) and Hair et al. (2016).

3.6.6 Quantitative Data Analysis by Structural Equation Modelling

As noted previously, the researcher used PLS-based SEM in this study to analyse the quantitative data. This is considered the second generation of data analysis techniques (Chin, 2010), which are able to handle a large number of constructs and also provide the researcher immediate options for numerous regression calculations. The following sub-sections provide the reasons for using SEM.

3.6.6.1 Why Use Structural Equation Modelling?

There are many benefits of using SEM. SEM has the ability to deal with the construct measurement properties in different theoretical sets. It can also deal with measurement errors and with the measurements of reliability and validity. Moreover, SEM has other benefits—for example, multiple regressions, group analysis, depth and creativity in analysis and principal component analysis—not available with analysis tools in the more limited first generation (Barclay et al. 1995; Lowry & Gaskin, 2014; Ullman & Bentler, 2012).

In the second generation of SEM tools, researchers are able to deal with a variety of research questions in a single, systematic and thorough study while modelling the interactions between different constructs (Gefen et al., 2000). Many constructs and items in this study required the use of these second-generation analysis techniques for measurement and structural elements. It was also clear that SEM is increasingly being used in supply chain studies.

3.6.6.2 Justification for Using Partial Least Squares–Based Structural Equation Modelling for This Study

Covariance-based SEM and PLS-SEM are two of the most commonly used methods of SEM analysis, according to previous studies (Rai et al., 2006). PLS-SEM is recommended for building predictive research models. It is good for exploratory research because PLS-SEM can be run with a reasonably small sample; by contrast, covariance-based SEM requires a large amount of data (Chin, 1995, 2010; Hair et al. 2011; Hulland, 1999; Rai et al., 2006). Moreover, covariance-based SEM requires multivariate normal distribution, whereas normality is not an important requirement for PLS-SEM.

According to Wilson (2010), PLS has become more popular among researchers because of its capacity to deal with a smaller number of samples, latent items and uncommon settings. According to Kondo and Ghyas (2016), PLS can be used in new measurement contexts even if the measurement items have not yet been established. Moreover, PLS has become more popular because the analysis software is available online for free. Based on the above benefits, the researcher decided to use SmartPLS to analyse the data for this study.

3.6.7 Partial Least Square Procedure

In PLS-SEM, evaluations of the measurement model and the structural model are required (Hair et al., 2012; Ringle et al., 2012). It is critical to understand the link between the latent variable and its items while analysing the measurement model (Jarvis et al., 2003). As a result, the measurement model was evaluated by investigating indicator reliability, internal consistency, average variance extracted (AVE), indicator weight, multicollinearity and discriminant validity as suggested by Hair et al. (2011). Using the structural model to study the *t* statistics for each path coefficient corresponding to the linked hypotheses, the relationships between the constructs were analysed. The systematic procedure of PLS-SEM is shown in Table 3.2. Chapter 6 explains the analytical procedures in detail.

Table 3.2: Systematic Procedure for Structural Equation Modelling Analysis

Adapted from (Ali, 2017)

Analysis	Acceptable value	Accepted cut-off in this study
Stage 1: Assessment of the measurement model—Reflective indicators		
Reliability		
Indicator	≥ 0.70; in exploratory studies, loadings of 0.40 are also acceptable (Hair et al., 2013)	≥ 0.60
Internal consistency	Composite reliability ≥ 0.7 (Hair et al., 2011)	≥ 0.75
Validity		
Convergent (AVE)	≥ 0.5 (Hair et al., 2013)	≥ 0.5
Discriminant: Construct level	Square root of AVE of each latent variable greater than the correlations among the latent variable (Fornell & Larcker, 1981)	Supported with the rule of thumb
Discriminant: Item level	An indicator's loadings should be higher than all of its cross-loadings (Hair et al., 2011)	Supported with the rule of thumb

Analysis	Acceptable value	Accepted cut-off in this study
Stage 2: Assessment of the structural model—Reflective indicators		
Coefficient of determination		
Amount of variance explained (R^2)	Substantial = 0.67; moderate = 0.33; weak = 0.19 (Suhartanto, 2016). Acceptable level depending on the research context (Hair et al., 2013)	≥ 0.18 (0.30 with ultimate dependent variable)
f^2 effect size	Strong = 0.35; moderate = 0.15; weak = 0.02 (Hair et al., 2013)	$f^2 \geq 0.001$
Predictive relevance		
Cross-validated redundancy (Q^2)	$Q^2 > 0$ is indicative of predictive relevance (Hair et al., 2013)	$Q^2 \geq 0.08$
q^2 effect size	Strong = 0.35; moderate = 0.15; weak = 0.02 (Hair et al., 2013)	$q^2 \geq 0.001$
Path coefficient (β) and statistical significance of *t* values	t = 1.65 at a significance level of 10%; 1.96 at 5%; and 2.58 at 1% (Hair et al., 2011)	$t \geq 2.47$

Note. AVE = average variance extracted.

3.6.7.1 Specification of Reflective Measurement

Whether the measurements in a model are reflective or formative should be specified; misspecification of a measurement model will cause the results to be biased (Blut, 2016; Henseler et al., 2009; Petter et al., 2007). The constructs used in the present study's research model were reflective constructs. Mainly, the theoretical direction and connections between each latent variable and its construct support a reflective measurement model. Theoretically, in the model of the reflective items, the direction of the connections is from the construct to the items (see Figure 3.2). This means that all measures reflect the same relationship between the construct and latent variable. That is why it is important to have a reflective model: to illustrate how all the measurements under a construct share a similar theme (Polites et al., 2012). Because of the cross-correlation between indicators, any alteration in one indicator will have an effect on the results on the other indicators, but any changes to the indicators will not lead to changes in the values of hidden variables. According to Jarvis et al. (2003), deleting one or more indicators will not change the theoretical area of the latent variable. It is additionally necessary that each indicator in a reflective model has similar antecedents and consequences.

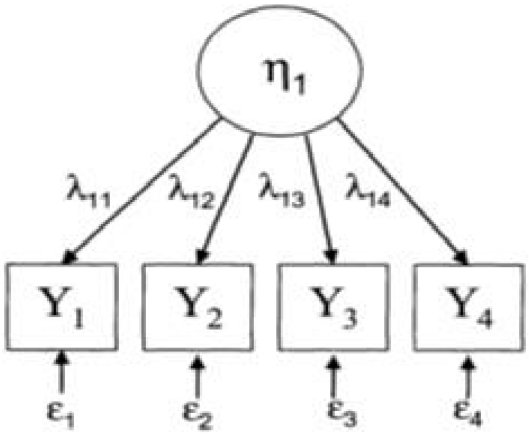

Figure 3.2: Reflective Measurement Model

Note. η_1 = latent variable; λ = loading; Y = reflective indicator; ε = measurement error on the level of the indicator. Source: Bollen and Lennox (1991).

It is necessary to specify the type of indicator used in the measurement model to ensure that it is consistent with the theoretical setup. Table 3.3 shows how to identify the reflective flow of constructions.

Table 3.3: Decision Rules for Reflective Measurements

Decision Rules	Reflective Model
Direction of causality	Construct to indicators; indicators are manifestations of the construct
Interchangeability of the indicators/items	Indicators should be interchangeable and should have the same or similar content
Covariation among indicators	Indicators are expected to co-vary with each other
Nomological net of the construct indicators	The nomological net for the indicators should not differ. As such, all indicators should have the same antecedents and consequences

Source: Jarvis et al. (2003).

The theoretical link between latent items and their constructs in regards to reflective models is depicted in Figure 3.2 and Table 3.3. Coltman et al. (2008), Diamantopoulos and Siguaw (2006), Jarvis et al. (2003), Petter et al. (2007) and other studies' norms and suggestions, as well as the outcomes of the field study, were used to model the constructs used in this research (related to food retail performance, resilience, leanness, agility and communication) as reflective. Indeed, this research has a reflective focus.

3.6.7.2 Assessment of the Reflective Measurement Model

It is necessary to examine the measurement model to analyse and validate its constructs (Henseler et al., 2009). The reflecting measurement model's convergent validity and discriminant validity were evaluated (Barclay et al., 1995; Jarvis et al., 2003; Henseler et al., 2009). The reliability of the reflection model was examined in terms of item reliability and internal consistency reliability, while its validity was evaluated in terms of convergent validity and discriminant validity in regards to the manifest items of each reflective construct (Jarvis et al., 2003). Table 3.2 shows the stages of analysis in regards to the model, which are also further explained in the following sub-sections.

3.6.7.2.1 Item Reliability

The evaluation of the measurement model began with evaluating the reliability of the items. Item reliability examines how effectively each item connects to the corresponding construct by assessing the loading of each item with the corresponding constructs. In other words, it quantifies the degree of variation that happens in each particular item as a result of the concept (Barclay & Higgins, 1995). Additionally, item loading reflects the items' ability to measure a given construct. Items with a low loading imply a weak correlation with the construct, while items with a high loading suggest a strong correlation (Nunnally, 1978). Item reliability in PLS can be determined by examining either the item loading scores and their impact on the reflecting assessment or the item level weights and their significance level for the formative measurement (Hair et al., 2011; Ringle et al., 2012).

However, researchers have differing opinions on the optimal degree of item loading. The item loading value should be more than 0.7, according to Hair et al. (2011). Similarly, Barclay et al. (1995) recommend a threshold of 0.707 for item loading. Furthermore, according to Hair et al. (2011, 2013) and Wong (2013), current research says that appropriate loadings should be greater than or equal to 0.70, and that loadings of 0.40 are appropriate in exploratory studies. The extant literature establishes a strong foundation for minimum acceptable loading scores for the indicators employed in this research. As a result, for this study, a loading score of at least 0.60 was acceptable. To attain at least this minimum score, certain indicators were deleted from the dataset to increase their reliability. This would very certainly result in an enhanced evaluation of the real link between the study model's constructs.

3.6.7.2.2 Internal Consistency

The next stage of reliability assessment was concerned with internal consistency, which is associated with construct reliability. While construct reliability is a term that pertains to the assessment of constructs within a latent variable, internal consistency refers to the measure of a latent variable's

reliability. Cronbach's alpha is the most widely used method for determining internal consistency in social science research (Wong, 2013). Studies have shown that Cronbach's alpha gives conservative measurements of internal consistency, whereas composite reliability values remain at the upper limit of internal consistency (Ballestar et al., 2016). Given the growing trend of using composite reliability ratings to assess a construct's internal consistency, the present study employed this technique. Internal consistency was defined as follows in PLS:

$$Internal\ consistency = \frac{(\sum \lambda i)^2}{(\sum \lambda i)^2 + \sum Var(\varepsilon i)},$$

where λi is the factor loading, which represents the simple correlation between the item and its constructs, and $Var(\varepsilon i)$ is equal to $1 - \lambda i^2$ (the unique/error variance).

3.6.7.2.3 Average Variance Extracted

According to Ringle et al. (2012), the AVE from a construct's related items is beneficial for determining its validity. AVE measures the amount of variation explained by a given construct in its link and relation to its items (Ballestar et al., 2016; Fornell & Larcker, 1981; Wong, 2013). A score greater than 0.5 indicates good convergent validity and that the latent variable can account for, on average, more than 50% of the variation in its indicators. Thus, at this level or above, convergent validity is confirmed (Wong, 2013). The formula for calculating AVE is as follows:

$$AVE = \frac{(\sum \lambda i^2) varF}{(\sum \lambda i^2) varF + \sum \Theta ii},$$

where λi, F and Θii represent factor loading, factor variance and unique/error variance, respectively (Chin, 2010).

3.6.7.2.4 Discriminant Validity

The next step in assessing the measurement model was discriminant validity analysis. Discriminant validity is a measure of how distinct the constructs are from one another in reflective measurement (Ballestar et al., 2016). That is, discriminant validity refers to the degree of variance shared by the model's elements and constructs. To assess discriminant validity, Ballestar et al. (2016) and Ringle et al. (2011) use two methods: cross-loading and Fornell criteria. The Fornell criterion of diagonal inter-construct correlation compares the square root of a latent variable's AVE to the square root of the corresponding diagonal latent variables. The present study assessed discriminant validity using

both criteria. This began with an examination of the cross-loading matrix: if a certain item's correlation did not score higher than the correlations of other items in both the row and column, then that item was eliminated from the analysis. Fornell–Larcker's criterion was used for the constructs that met the cross-loading evaluation requirements.

3.6.7.3 Assessment of Hierarchical and Multidimensional Constructs

After defining the research model's focus constructs, the next stage was to determine if each construct fit inside the hierarchical structure and to determine if there were any multidimensional features. Constructs are hierarchical in structure, and they had multiple dimensions in the present study's model as per the hierarchical component model (Wetzels et al., 2009). To include multidimensional constructs in the study model, a solid theoretical foundation in favour of their use is required because such a theory would explain how the constructs are interrelated and also demonstrate their connections with higher-order constructs (MacKenzie et al., 2011). An inability to justify the inclusion of a multidimensional variable in a research model may result in unsatisfactory model fit (Jarvis et al., 2003). However, the dimensions of a multidimensional construct can be examined using either formative or reflective measuring items (Jarvis et al., 2003). Whatever the constructs' forms, each of the sub-dimensions must be properly described to guarantee that the measurement relationship accurately matches the study setting (Wetzels et al., 2009).

The use of hierarchical constructs in PLS-SEM models is gaining popularity (Becker et al., 2012; Ringle et al., 2012). Due to the multidimensionality of latent variables and their dimensions, it is expected that situational criteria have better predictive ability (Johnson et al., 2012). A hierarchical and multidimensional model is characterised by the number of levels (e.g., second-order) and the kind of interactions between the latent variables (e.g., reflective-reflective, reflective-formative, formative-reflective or formative-formative; Becker et al., 2012; Ringle et al., 2012). The number of levels in the present study's model could be characterised as either second-order or third-order. According to Ringle et al. (2012), in the current PLS-SEM literature, second-order latent variables are the most prevalent. In terms of connection types, a Type I reflective-reflective model is best suited when the study's purpose is to identify a common factor across multiple related but separate reflective constructs. Lower-order constructs are a broad concept in the reflective-formative Type II model in which constructs are reflectively measured. The Type III formative-reflective model is advantageous when a higher-order construct represents the common component of multiple indexes claiming to measure the same item. In the Type IV formative-formative model, formative indicators are used to evaluate lower-order constructs, and formative indexes ultimately combine to form a higher-order idea (Becker et al., 2012).

3.6.7.4 Assessment of the Structural Model

After adequately assessing the measurement model, the structural model was evaluated to confirm that the measurement constructs were reliable and accurate (Ballestar et al., 2016). The evaluation of a structural model in PLS-SEM involves determining the importance of the hypothesised links between the research model's constructs and evaluating the path statistics, such as the loadings and path coefficients (Ballestar et al., 2016; Hair et al., 2013). Structural model assessment is one of the most efficient analytical processes because it allows for the prediction and estimate of relationships between the parts of the research model (Ballestar et al., 2016; Hair et al., 2011). The coefficients of determination (R^2 and f^2 effect sizes), predictive relevance and predictive accuracy (cross-validation redundancy Q^2, and q^2 effect size) have been defined by Ballestar et al. (2016) and Ringle et al. (2012), and path coefficients (β) and significance levels of *t* statistics are the measuring criteria for the structural model. According to Hair et al. (2011) and other studies, R^2 and the significance levels of the path coefficients are the major benchmarks for evaluating a structural model.

3.6.7.4.1 Coefficient Determination

The coefficient of determination expresses a model's ability to explain and predict endogenous variables (Ringle et al., 2012). R^2 values and f^2 effect sizes are used as empirical test criteria for the coefficient of determination (Ringle et al., 2012). According to Ballestar et al. (2016), R^2 describes the variation in the proportion of latent endogenous constructs, which is the source of latent exogenous constructs. The R^2 of an endogenous latent construct reveals the explanatory strength of the exogenous latent construct. This value is calculated in PLS using the algorithm method. For endogenous latent constructs in a structural model, an R^2 value of 0.67 is substantial, 0.33 is moderate, and 0.19 is weak (Suhartanto, 2016). However, according to Ballestar et al. (2016), an R^2 of 0.20 is high for an endogenous latent construct, and, according to Hair et al. (2013), the acceptable R^2 value is context-dependent.

As noted before, another criterion for estimating the coefficient of determination is the effect size. Indeed, effect size (f^2) quantifies the contribution of each exogenous latent construct to the explanation of its corresponding endogenous latent variables and is therefore regarded as complementary to the R^2 value (Ballestar et al., 2016). According to Ringle et al. (2012), this enables the researcher to assess the independent external latent construct's incremental explanatory power over an endogenous latent construct. According to Hair et al. (2013), f^2 values of 0.02, 0.15 and 0.35 indicate a mild, moderate or high level of influence, respectively. Conversely, Ringle et al. (2012) predicted an f^2 of 0.30 or less. The following formula was used to compute the effect size:

$$f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}}.$$

3.6.7.4.2 Predictive Validity

Estimating cross-validated redundancy (Q^2) and the q^2 effect magnitude determines predictive validity. Each of the measurement criteria complements R^2 and contributes to the statistical significance of the propositions (Ballestar et al., 2016). According to Hair et al. (2013), studies have employed PLS-SEM for predictive purposes and have considered a low R^2 value but have not analysed the predictive importance of Q^2, thereby limiting the structural relationship's predictive capacity. According to Ballestar et al. (2016), predictive validity assesses how well each exogenous latent variable predicts its corresponding endogenous latent constructs. Geisser (1975) and Stone (1974) invented the predictive sample re-use methodology, which Chin (2010) has suggested be used for calculating predictive validity. Blindfolding is used in PLS to produce Q^2 values related to each structure (Hair et al., 2011, 2013). Ballestar et al. (2016) have proposed a Q^2 value of at least 0.5, which indicates that exogenous latent components have greater predictive importance than endogenous latent constructs, as an acceptable value. According to Hair et al. (2013), additional literature supports a Q^2 of at least 0 as the acceptable value while performing PLS analysis blindfolded—a value less than 0 would show that a model lacks predictive validity. According to Chin (2010), the predictive significance of a given construct may be quantified using the following equation:

$$Predictive\ relevance\ (Q^2) = 1 - \frac{\sum D\ ED}{\sum D\ OD},$$

where *E* represents the sum of squares of the prediction error, *O* represents the sum of squares of the prediction error when the mean is used, and *D* represents the omission distance.

Furthermore, the q^2 effect size boosts the statistical significance of interactions between exogenous and endogenous latent components and is used to aid decision-making (Fan, 2001). According to Ringle et al. (2012), the q^2 effect size is significant when changes in Q^2 entail an examination of the structural relationship's relative influence on forecasting the indicators of an endogenous latent construct. In PLS, the blindfolding procedure is used to calculate the size of q^2 based on Q^2. According to Hair et al. (2013), q^2 values of 0.02, 0.15 and 0.35 imply a low, moderate or high degree of predictive relevance for each effect, respectively. According to Chin (2010), the q^2 effect magnitude may be evaluated as follows:

$$q^2 = \frac{Q^2_{included} - Q^2_{excluded}}{C - Q^2_{included}}.$$

3.6.7.4.3 Path Coefficient (β)

The path coefficient in a structural model represents the links between latent variables: 0.1 represents a minimal effect on the link; 0.3, a moderate effect; and over 0.5, a large effect (Ballestar et al., 2016). The connection's *p* value—ranging from 0 to 1—represents the significance of the degree of the association (Lowry & Gaskin, 2014). Bootstrapping strategies in PLS provide path coefficients, β, and their significance levels, *t* (Ballestar et al.,2016; Hair et al.,2013).

3.6.8 Power Analysis

Power analysis is used to calculate the probability of obtaining a statistically significant result or of successfully rejecting the null hypothesis (Cohen, 1988; Murphy et al., 2014). It is critical to evaluate the implications of the sample size when creating and testing a complex model using PLS path modelling (Akter et al., 2011; Chin & Newsted, 1999). According to Cohen (1988), power analysis is influenced by three variables: the significance level, α; the sample size, *N*; and the magnitude of the impact. Cohen (1988) advocated that the power of a statistical test be greater than 0.80. In a model with a power greater than 0.80, there can be a sufficient degree of confidence in the anticipated correlations (Akter et al., 2011).

3.7 Chapter Summary

This chapter detailed the study's research design. The first section looked at the research paradigm as well as the obstacles associated with quantitative and qualitative approaches. Following this, the case for employing a mixed methodology (a combination of qualitative and quantitative techniques) was reviewed. The data collection and analysis procedures used in the qualitative (field study) and quantitative stages (pilot study and survey) were then discussed; Chapters 4–6 explicate the qualitative and quantitative levels in greater detail. The final section of this chapter summarised the research design.

Chapter 4: Qualitative Field Study Results

4.1 Introduction

This chapter focuses on the analysis of the field study data. Fifteen people from Saudi Arabian food retailers involved in supply chain and logistics decision-making took part in the semi-structured interview process. To make the interviews more efficient, a semi-structured interview schedule that covered the suggested model constructs was used. The initial research model's constructs and variables were drawn from extant literature and needed to be conceptualised and legitimised for use in the current study's contexts. Thus, the major objective of the field study was to discover factors and sub-factors that might be used to validate the suggested research model.

This chapter documents the field study process and the data collected from the field study. The latter part of this chapter describes the construction and comparison of a model based on the data analysis. Additional literature analysis was undertaken, which resulted in the final research model incorporating all of the variables and sub-factors discovered in the field study data. This chapter concludes with the construction of a complete research model supported by data from the field study and current literature.

4.2 Overview of the Field Study

The field study was conducted as the first step of the mixed-methods technique used in this study to acquire qualitative information from the respondents. To make the field study more efficient, a semi-structured interview schedule was used. NVivo was then used to examine the data (Welsh, 2002). The following sub-sections explain the field study procedure in detail.

4.2.1 Designing an Interview Schedule

A semi-structured interview approach was used to draw attention to the most important aspects of the initial research model. The interviewees' socio-demographic details were covered in the interview: age, gender, level of education, occupation and duration of current employment. This interview session contained a total of 15 questions. Table 4.1 summarises the topics and relevant questions. The first section of the interview included questions on respondents' supply chain and logistics experience (see Table 4.1). The initial model included important criteria for the interview schedule, while others were added to accommodate for the study's context (see Appendix A). The first question probed respondents' broad understandings of the retail supply chain. The second concerned the effect of the supply chain on the business's retail performance, which is part of the first study model. There were

then a few questions on supply chain characteristics, such as leanness, agility and resilience: what participants knew about them and how they ensured they were incorporated in their supply chain system. The next phase of the interview schedule examined the relationship and influence of the constructs on one another and on the participant's organisation's supply chain system. The final question on the interview agenda sought any additional pertinent information regarding what the participants may have believed necessary for their organisation's supply chain system to operate effectively.

Table 4.1: Questions of the Semi-structured Interview in the Field Study

Topic	Question	Description
Retail supply chain	1	Understanding of the retail supply chain
Influence of the supply chain	2	The influence of the supply chain on their organisation's retail performance
Leanness	3, 4	Understanding of lean supply chains and how to ensure leanness in a supply chain system
Agility	5, 6	Understanding of agile supply chains and how to ensure agility in a supply chain system
Resilience	7, 8	Understanding of resilient supply chains and how to ensure resilience in a supply chain system
Leanness relationship	9, 10, 11	How leanness affects retail performance, agility and resilience in the supply chain system
Agility relationship	12, 13	How agility affects retail performance and resilience in the supply chain system
Resilience relationship	14	How resilience affects the retail supply chain system
Relevant information	15	Relevant information that participants believed was important to their organisation's effective supply chain system

The responses and input from participants in the field study provided an in-depth understanding of the items and constructs associated with the effects of a lean, agile and resilient supply chain on retail performance. Additionally, connections between the variables were elucidated; this is discussed in later sections. Appendix B contains the entire list of questions for the field study. All questions were approved in accordance with Curtin University's ethical standards (ethics approval no. HRE2018-0437).

Before the first interview, a pilot study was undertaken to ensure that the interview questions were understandable and applicable. Additionally, the pilot study was beneficial in identifying any other

issues pertinent to the questions. The pilot study enrolled four participants: one supply chain manager, one logistics manager and two researchers (all of whom were PhD holders with expertise in supply chain–related research). All pilot study participants were interviewed over the phone. All of the questions appeared to be pertinent; however, a few were modified in response to respondents' comments. Accordingly, the interview questions for the field study interviews were finalised.

4.2.2 Sample Selection

Interviews were conducted with 15 logistics and supply chain decision-makers from various food retail businesses in Saudi Arabia. The first interview participant was chosen at random, and all subsequent interview participants were chosen based on referrals received by the participants before them (i.e., snowball sampling technique). Before each in-depth interview, participants were supplied with a set of interview kits, which included the research goals, to guide their comprehension of the topic before the interview.

4.2.3 Data Collection

Fifteen in-depth interviews were conducted by the researcher with supply chain and logistics managers from the Saudi Arabian food retail industry. The researcher was satisfied with the 15 in-depth interviews because data redundancy had been achieved by that point (Guest et al., 2006; Mason, 2010). Indeed, the ninth interview was the data saturation threshold; six more interviews were conducted to ensure that the data were saturated, although no new information was discovered during the extended interviews. Given that there was not an agreed-upon minimum number of interviews necessary to generate a representative sample size for qualitative research, the number of interviews conducted here was considered sufficient (Collins et al., 2007). In general, small sample sizes are required for qualitative research, whereas large sample sizes are required for quantitative research (Onwuegbuzie & Collins, 2007). Aside from this, some research indicates that a minimum sample of 12 is suitable for studies that include interviews (Guest et al., 2006; Onwuegbuzie & Collins, 2007).

Each interview lasted around 1 hour on average. After obtaining consent from each participant at the start of their respective interviews, the interview was recorded, and notes were taken. Following the interview, the recordings were transcribed directly to ensure that the spirit and tone of the interview were faithfully recorded.

4.2.4 Data Analysis

Because the focus of this study was to contextualise the basic model, content analysis was regarded more relevant than other analytic methodologies (Siman et al., 2016). The data analysis process was

aided by the use of NVivo, which is a powerful tool for discovering, linking and analysing patterns of data and ideas (Richards, 1999). To fulfil the exploratory investigation's aim, this study employed a two-step procedure of inductive and deductive analysis to scan and support the themes and sub-themes that emerged from the raw data (Berg, 2004; Quaddus & Xu, 2005).

The inductive phase resulted in the identification of themes, sub-themes, factors, sub-factors and variables. Once free nodes had been identified, tree nodes were built from a group of relevant free nodes that shared comparable concepts (Zamawe, 2015). A result of this was that each tree node could be seen as a possible construct. To compare the constructs obtained from each interview, a field study model was built based on all of the relevant constructs and dimensionalities.

Next, the deductive phase involved comparing and reviewing the field study model and initial model to determine the importance of the constructs and variables and to justify the field study findings based on the literature review. A complete and final research model was then established for this study. Figure 4.1 illustrates the procedures used during this qualitative phase of the present study.

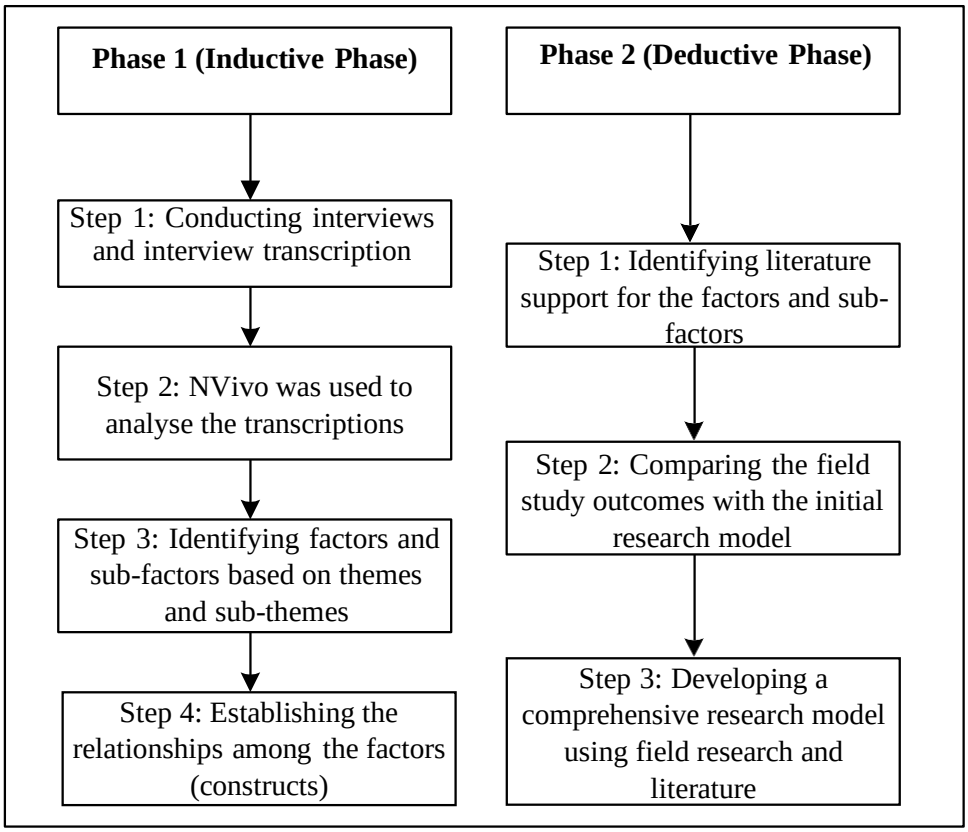

Figure 4.1: Data Analysis Process of the Field Study

4.3 Findings of the Field Study

4.3.1 Socio-demographics

Prior to the audio-recording of the interview, each participant's socio-demographic profile was obtained. Age, gender, level of education and length of time in current work were the socio-demographic characteristics included in this study. Of the 15 interview participants, 11 were male, with the largest group being those over 40 years of age. All of the participants had a tertiary education. Additionally, 60% had a yearly income between US$45,000 and US$55,000. In terms of occupation, 53.3% worked in supply chain–related businesses, while 46.7% worked in logistics-related businesses. With regards to the participant's type of company, 66.7% worked in the retail sector, and 33.3% worked in the logistics sector. The last demographic question concerned the duration of the participant's present occupation: 73.3% had worked for the same business for between 6 and 10 years, and 26.7% had worked for the same business for more than 10 years. Table 4.2 summarises the demographic information of the participants.

Table 4.2: Socio-demographic Profile of the Participants

Participants	Age	Gender	Level of education	Annual income	Occupation	Type of firm	Period of current occupation
1	23-30	Male	Tertiary	45,000–55,000	Supply Chain	Retailing	6-10
2	31-39	Female	Tertiary	>55,000	Logistics	Retailing	>10
3	>40	Male	Tertiary	>55,000	Supply Chain	Retailing	>10
4	23-30	Male	Tertiary	45,000–55,000	Supply Chain	Retailing	6-10
5	31-39	Male	Tertiary	45,000–55,000	Supply Chain	Retailing	6-10
6	>40	Female	Tertiary	45,000–55,000	Supply Chain	Logistics	6-10
7	23-30	Male	Tertiary	45,000–55,000	Supply Chain	Retailing	6-10
8	23-30	Male	Tertiary	45,000–55,000	Logistics	Retailing	6-10
9	31-39	Female	Tertiary	>55,000	Logistics	Logistics	6-10
10	31-39	Male	Tertiary	45,000–55,000	Logistics	Retailing	6-10
11	>40	Male	Tertiary	45,000–55,000	Logistics	Logistics	6-10
12	>40	Male	Tertiary	45,000–55,000	Logistics	Retailing	>10
13	>40	Male	Tertiary	>55,000	Supply Chain	Logistics	6-10
14	>40	Female	Tertiary	>55,000	Supply Chain	Logistics	>10
15	>40	Male	Tertiary	>55,000	Logistics	Retailing	>10

4.3.2 Findings regarding Factors and Sub-factors

The 'Text Search' feature in NVivo was used to locate all factors and sub-factors in the interview dataset. The factors and sub-factors that were found are discussed below.

4.3.2.1 Leanness

According to the interview data, there were three sub-factor child nodes within the primary factor parent node of leanness: TPM, JIT and TQM. However, TQM was mentioned in about 73.3% of interviews. One of the interview participants mentioned how important TQM was in the lean supply chain:

> *it is a continuous improvement process with the leanness or within the lean supply chain that you are looking for, and part of it is the total quality management, part of it is the total preventive maintenance schedules. So, all these are parts of the TQM system or the lean supply chain system.* (Interview 1)

Another interview participant mentioned TQM:

> *The supply chain department must be aware of the whole process of a product from the time it leaves the nation of origin until it reaches the client's hands, and they must search for any method that the business may save money while engaging in this process … Changing the shipment method by using a different carrier, for example, may result in lower shipping costs. Additionally, if the warehouse is not properly managed, the business will not be able to increase sales since the warehouse does not have enough capacity… However, the supply chain department is responsible for ensuring the quality of the labour and goods … It does not imply that a different carrier will offer a better or the same level of service … If it is poor, the quality of the product could suffer as a result of the bad changing decision.* (Interview 7)

The second important sub-factor in leanness is JIT, which was mentioned in about 53.3% of interviews. One of the participants in the interview mentioned JIT as follows:

> *As a business, the first step is to consider how we can best satisfy our customers while also maximising profits … This basically comes down to providing a high-quality product at a reasonable price while still delivering the goods on time. This will result in more satisfied consumers and less difficulties with the supply chain system.* (Interview 4)

The last sub-factor in leanness is TPM, which was mentioned in about 26.6% of interviews. One of the interview participants expressed TPM as follows:

> *I think it is when you put the processes around the supply chain elements, you will always need to do continuous improvements, and continuous improvement come by learning and by experience, along with the results with the problems that come through your operations. So, whenever you find the process is not giving you the right result, then the process should be reviewed; it should be optimised, and the results that you are looking for should be built*

in the process back again. So, it is a continuous improvement process with the leanness or within the lean supply chain that you are looking for, and part of it is the total quality management, part of it is the total preventive maintenance schedules, so all these are parts of the lean system in the supply chain. (Interview 1)

Table 4.3 summarises the mentions of leanness sub-factors in the interviews.

Table 4.3: Leanness Sub-factors

Child node	Interview															%
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Total preventive maintenance	x							x			x				x	26.6
Just in time		x	x	x				x	x			x	x	x		53.3
Total quality management	x	x	x	x	x	x	x		x	x		x	x			73.3

4.3.2.2 Agility

There were four sub-factor child nodes under agility in the supply chain. According to the data, it is necessary to have a high level of agility to have a good supply chain system in the Saudi Arabian food retail sector, because this ability allows a business to act very efficiently inside the supply chain system with quickness, response, flexibility and competence. All of these aspects of agility support supply chain system activity. One of the participants expressed his view, being a supply chain manager in his firm:

Preparing the supply chain system from the beginning to be able to respond to any changes in the market is very important; our company built a system between the department of operations and supply chain to share information quickly. So, the team will be able to avoid any problem as quickly as possible. (Interview 3)

As Table 4.4 shows, the sub-factor of competency was mentioned in about 53.3% of interviews. One of the participants mentioned competency as follows:

At the end of the day, the company needs to make sales to profit; if the company does not have a good system in place to meet client needs, the company will undoubtedly lose clients; and, furthermore, the company must compete with other competitors and do everything possible to stay ahead of the competition in order to satisfy the customers. Using a basic example, anytime there is a sale, we get cancellations of orders and highly personalised orders, which we must accept to run the sale and keep our clients pleased. I believe that every company should understand their customers' behaviour to predict and be always prepared, as there is no mercy in the market. One of the best methods, in my opinion, while working in the Saudi market, is for the company to have a strong relationship with its customers and suppliers to minimise waste and stay ahead of the competition. (Interview 5)

The second most mentioned sub-factor was response, which was mentioned in 46.6% of interviews. One of the participants mentioned response as follows:

> *Agility in the supply chain system requires a rapid response to a crisis, and, if this is lacking, it would damage the business's sustainability.* (Interview 15)

Table 4.4 summarises the mentions of different sub-factors relating to agility in the supply chain.

Table 4.4: Agility Sub-factors

Child node	Interview															%
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Quickness	x		x				x			x	x		x			40.0
Response		x	x			x				x		x		x	x	46.6
Flexibility	x				x	x			x					x	x	40.0
Competency	x			x	x	x	x	x			x		x			53.3

4.3.2.3 Resilience

There were five sub-factor child nodes under resilience: visibility, collaboration, recovery, response and flexibility. Respondents mentioned collaboration or recovery in about 53.3% of interviews; response was mentioned in about 46.6% of interviews. One of the participants mentioned collaboration, recovery and response as follows:

> *the resilience system require a good plan ahead of time to be able to response to any crisis and avoid the big losses. Also, the resilience system require a good collaboration between departments because the sharing of information during logistics or supply chain process is very important; without the correct information and right collaboration, the supply chain most likely will not survive faster.* (Interview 7)

Another participant mentioned recovery as follows:

> *To have a resilient supply chain system, several elements must be implemented. One of the most important components is good planning in advance. Second, the supply chain department must have a risk team. When a crisis occurs, the risk team comes together and develops a plan to ensure that supply chain work continues unbroken and recovers quickly to avoid any disruptions in business … Moreover, relationships inside the business and with suppliers must be maintained to ensure that the recovery strategy is transparent and fast.* (Interview 15)

Table 4.5 summarises the mentions of resilience sub-factors in the interviews.

Table 4.5: Resilience Sub-factors

Child node	Interview															% Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Visibility								x								6.6
Collaboration	x	x					x			x	x	x		x	x	53.3
Recovery		x	x			x	x		x			x		x	x	53.3
Response			x			x	x		x	x				x	x	46.6
Flexibility						x			x		x	x	x			33.3

4.3.2.4 Retail Performance

Participants addressed how the supply chain system in their firm affected retail performance. They highlighted nine important factors: sales, profit margin, revenue growth, market share, customer satisfaction, service quality, customer retention rate, on-time delivery and degree of overall success. Participants believed that their department's supply chain would have an effect on those variables in terms of their retail performance. The literature has advocated for these items in measuring retail performance (see Table 4.6). Most of the participants (86.6%) spoke about how the supply chain system could affect their firms' sales and market share. One of the participants explained his view regarding how the supply chain department at his firm could help grow sales:

> *Supply chain is the main process in all retail companies and, since our company is a food retail company, supply chain department play a big factor in the business and have a direct influence to the success of our company and the growing in sales. If the supply chain system is good in the company, the company will be more profitable and successful. Proper supply chain means more profit to the organisation and would help achieving the company goals.* (Interview 4)

Another participant mentioned that:

> *I believe if the supply chain system is not agile, it would be hard to compete and to satisfy our customers … every day, we must deliver a big number of orders. If our supply chain and logistics department are not flexible with the orders and are not responding as quickly as the customer needs, we will lose some of the market share, and this will be very bad on our company performance and profit.* (Interview 15)

Another participant provided their views as follows:

> *supply chain involves many elements within the upstream and downstream operations of food retail. If you don't plan properly your orders, you will not be able to display them in the stores, and you will not be able to sell them. If you do not forecast properly your sales volume, you will occupy a space that is not required. If you do not have proper warehousing and distribution elements of your supply chain, you will not be able to increase your sales.*

All these are parts of supply chain that will help any company to achieve its goals. (Interview 1)

Table 4.6 summarises the mentions of retail performance sub-factors in the interviews.

Table 4.6: Retail Performance Sub-factors

Child node	Interview															% Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Sales	x	x	x	x	x		x	x	x	x	x	x		x	x	86.6
Profit margin	x		x	x											x	26.6
Revenue growth		x	x	x	x	x	x		x	x				x	x	66.6
Market share	x	x	x	x	x		x	x	x	x	x	x		x	x	86.6
Customer satisfaction		x		x		x				x	x		x			40.0
Customer retention rate	x			x			x		x		x		x		x	46.6
Service quality		x			x						x			x	x	33.3
On-time delivery		x				x			x				x			26.6
Degree of overall success	x			x		x				x		x	x		x	46.6

4.3.2.5 Communication

Communication is another important factor in the supply chain. Participants added this factor while talking about the effective supply chain system in their firms. It is noted that communication was not in the initial model (see figure 2.2). Good internal communication between the departments in the firm and good external communication with suppliers and customers is one of the important elements in the supply chain system. Communication is a crucial function in business because it promotes the exchange of information and product flows, as well as relationship-based resources, between corporate partners (Argenti, 2015; Cornelissen, 2008). Communication has a tremendous influence on the relationship's shared component, creating and maintaining trust between members (van Riel & Fombrun, 2007). The interactive dimension of communication, which has been described as the key relational variable between a firm and its environment, may be used to trigger mutual adaptation processes among participants in business interactions (Gambetti & Giovanardi, 2013; Rao Tummala et al., 2006; Susanne Johansen & Ellerup Nielsen, 2011). Relationship-building and coordination within and outside the limits of an organisation can thus be traced back to communication (Ledingham & Bruning, 2000; Paulraj et al., 2008). Every company's decision-making processes have a strategic component of communication integrated into them as a way to facilitate relational exchanges between the various actors involved (Susanne Johansen & Ellerup Nielsen, 2011).

4.3.2.5.1 Internal Communication

Internal communication has been researched to improve operational efficacy while simplifying information, product and process flow from suppliers to end customers (Sammuel & Kashif, 2013; Xu al., 2014). Internal communication refers to how well a corporation communicates with its own internal functional divisions (Lee & Whang, 2004; Lotfi et al., 2013; Richey et al., 2010). According to the research, there is a favourable association between internal communication and performance in terms of cost, quality, delivery, flexibility and process efficiency (Huo et al., 2016; Saeed et al., 2005; Xu et al., 2014). Companies may more readily communicate information across various departments—such as SCM, warehousing and logistics—by using an integrated communication system and structure (Wu et al., 2006). By fostering internal channels of communication among employees, businesses are better equipped to adapt to changing market conditions, increasing their market share while also enhancing their product and service quality (DeGroote & Marx, 2013).

According to previous research, internal communication is a facilitator of external communication (Chen et al., 2015; Lin et al., 2013). Through internal communication, businesses are able to coordinate with their external partners on information, processes, technologies and measurements (Stank et al., 2005) and plan and execute their processes with channel partners in an integrated manner (Lee & Whang, 2004). Internal communication promotes operational coordination as well as strategic ties with channel partners (Jonsson & Holmström, 2016). According to Saleh and Roslin (2015), it also helps enterprises to expedite the food supply process, fulfil the need of downstream customers and optimise value.

4.3.2.5.2 External Communication

If a corporation successfully collaborates with external partners upstream and downstream to maximise collective performance in the manufacturing, distribution and support of ultimate product value, this is called external communication (Flynn et al., 2010). Several studies have indicated that external communication improves performance (Cao & Zhang, 2011; Ülgen & Forslund, 2015; Prajogo & Olhager, 2012; Zampese et al., 2016). Information exchange, process collaboration and resource-sharing with channel participants are all examples of external communication (Seo et al., 2014; Wu et al., 2006). Effective external communication minimises lead times for services, production planning and inventory control to maximise operational and supply chain efficiency (Huo et al., 2016; Richey et al., 2010). Organisations can achieve strategic goals by establishing long-term connections with their partners through external communication (Lee & Whang, 2004). Enterprises can gain a competitive advantage over competitors by better forecasting fluctuations in demand through external communication (Demeter et al., 2016).

One participant mentioned the importance of having a good communication system to secure good result in the company:

> *I think what needs to happen in any supply chain is two factors: communication and information. Without these two, you will not be able to do or to reach the results that you are looking for. What I'm saying about communication—communication is at all levels—upstream and downstream within the company—at all levels must have a proper alignment between the departments, between the suppliers, between the customers' requirements. And information-sharing is, if you don't know what is happening, you cannot control; if you don't measure, you cannot control. So, these two are very important factors in any successful supply chain. Information to do analysis, track history, forecast, take actions and communication is to ensure that everybody is aligned at the same time, having the same piece of information that is required.* (Interview 1)

Another participant talked about the importance of having good communication with suppliers:

> *The best methods is to have an easy and good supply chain system, to have a good relationship with the suppliers and the key customers to help the system move faster during any problem or market changes—in my opinion, that would also save some money to the company.* (Interview 5)

One of the participants suggested that the supply chain department deploy an IT system for better and faster communication:

> *Supply chain department should push their system to be totally using the information technology and computerisation knowledge-sharing; by doing this, I believe the organisation performance will jump very high.* (Interview 15)

Table 4.7 summarises the mentions of communication in the interviews; the response rate was very high.

Table 4.7: Communication Sub-factors

Child node	Interview															%
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Internal communication	x		x	x	x	x	x				x			x	x	60.0
External communication	x			x	x	x			x	x		x		x		53.3

4.3.3 Relationships among the Factors

Analysis of the interview data revealed that the importance of a robust supply chain department in the business was critical, the consequence of which was a kind of exchange connection developing among supply chain elements. As a result, supply chain leanness increases to agility, as 60% of the participants mentioned. One of the participants expressed his thoughts on this as follows*:*

> *I think leanness, if available, will be helping you to process orders faster and to process volumes faster, because, as we said, the more you cut fat out of processes, the faster you can prepare you orders. You can react to the market requirements, so I think there is interrelated; they are working hand in hand to deliver a better customer experience and a better customer service. Once you have leanness, you should be able to be agile and respond to the market as quickly as possible.* (Interview 1)

Another participant expressed their thought about the relationship between leanness and agility in the supply chain system as follows:

> *Lean supply chain has a good effect on the total process in the company: if the company has a good, lean system and ensure the delivery on time and the quality of the goods in the right standard of the company, I believe, in my opinion, will make the supply chain system more agile and faster in responding to any changes to the market.* (Interview 5)

It was mentioned by 80% of the participants that there is a relationship from leanness to resilience in securing a better supply chain system in the firm:

> *I believe leanness is the first stage to have a good supply chain system. If the supply chain not lean, of course would not be resilience, or resilience would be hard to implemented. If the supply chain want to be efficient and stable, it must be lean … lean basically affecting all of the supply chain process. The supply chain system cannot be resilient if it's not lean. An example for this … if the company have a good communication line between the departments, that would help the supply chain system to recover quickly from shocks and also would help the company to minimise wastes.* (Interview 4)

Another participant mentioned this connection:

> *As previously said, leanness has an impact on the supply chain at every stage of the business. We will be more resilient and recover faster if we maintain a lean supply chain. Because a lean supply chain and resilience rely on communication, a solid communication system will definitely assist in the quick recovery.* (Interview 5)

From the analysis of interview data, it was also found that resilience was affected by agility. Table 4.8 shows that 60% of participants mentioned the relationship between agility to resilience:

> *I think, yes, agility has an effect on resilience. Now, with this, it is very directly related because, in crisis, you need to be very agile and need to react very quickly to the situation. So, if you haven't plan this properly, if the processes you had before were not about delivering quickly whenever you have a problem, then I don't think it will work. So, having the agility concept in your supply chain from the beginning will help reacting to a resilient situation or in building business continuity plans.* (Interview 1)

Another participant who mentioned the relationship between agility to resilience said*:*

> *yes, of course there is a link between agility and resilience: both agility and resilience would assist the firm in recovering faster from crises and returning to regular operations. So, if*

the supply chain team did not design the agility effectively or did not execute a suitable agile system, it would have a negative impact on resilience. Agility requires a rapid response to a crisis, and, if this is lacking, it would impair the business's sustainability. (Interview 4)

As quoted from Interview 7:

Agility and resilience are working together to improve the company's performance … Agility, of course, can assist resilience in responding faster to assist the firm in a stronger and successful recovery from any major crisis the company may encounter … If the supply chain is agile or the company implemented a good agile system to their supply chain, for example, the supply chain is very quick to respond to market changes and flexible, then the supply chain's resilience system can move faster to recover from any shocks, and both of these systems have something in common in that they both require good communication with each level within the supply chain.

Therefore, implementing agility in the supply chain system was reportedly very important to ensure that the resilience system was working well during any crisis that might occur.

Analysis of the interviews also showed a relationship between leanness, agility and resilience and retail performance. Regarding the relationship from leanness to retail performance, one of the participants stated:

The margins in retail are very thin, so the more you work on lean supply chain, the better margins you get in your retail business. Cost-saving in terms of wastages is part of Lean. Improving processes within your operations wherever they are, whether in demand, whether in warehousing, whether in distribution—all of these where you cut the fat out will help you to save cost because the margins, as we said, at a bottom line, are very thin. For you to compete in the market, you will have to maintain a lean supply chain. (Interview 1)

In Interview 3, the interviewee mentioned the relationship from leanness to retail performance as follows:

Leanness would assist the firm in minimising waste, and, as a result, the company's profit would be maximised. As an example, as a hypermarket manager, I sign everyday people who are responsible for the miss shelf items. Some customers pick any item and decide not to buy it in the middle of their shopping, so they end up replacing it in the wrong spot, and some of this goes to waste, and for us not to lose the sale of this item, we need to replace it back to the right shelf, especially the cold shelf.

Similarly, some participants mentioned the importance of the relationship from agility to retail performance for the firm to have a good supply chain system. One of the participants mentioned in this connection as follows:

Agility will help the company's overall performance, especially during sales seasons, because the company may face turbulence during sales seasons if the supply chain is not agile, which will have a negative impact on the company's performance because the supply

chain team needs to be very fast to respond to market changes in order to be competitive. An example of agility … It happened many times, actually, when there is a back-to-school promotion or during Ramadhan promotion and we need to make a delivery, the customers cannot wait for the next day because it is a high season, so we had to contact third party. We have a good relationship with a logistics company: when we have such a problem to our trucks, we just contact them. (Interview 4)

Similarly, some participants mentioned the importance of the relationship from resilience to retail performance for the firm to have a good supply chain system. One of the participants mentioned this connection as follows:

As we have mentioned earlier, the company needs a system that ensure the continuity of the business … resilience have the capability to save the company during crises because having resilience system means that you have a team ready to establish a recovery plan, and that [is] going to help the company system to get back to normal routine. Actually, we had couple of serious issue, and there is a team ready to make a plan to save the company. The team mostly has some people for the operation and one or two from the finance department and some from the supply chain and logistics team; so, basically, they find a quick solution to secure the company. (Interview 5)

Table 4.8 summarises the analysis of mediation relationships. It was found that agility mediated the relationship from leanness to retail performance. One of the participants stated*:*

lean or leanness have a good impact to the total supply chain … regarding the effect to agility, for example, when the supply chain department have a good—a good team to do the maintenance all over the process of supply chain and keep the standard of the quality that will help the agility to fast in responding to any changes in the market … also leanness and agility have something in common, like both require a good amount of information from the market and from other departments in the company for better performance. If this [is] missing, that will make the movement very slow in responding to the changes in the market. (Interview 9)

In Interview 8, the interviewee mentioned that resilience mediated the relationship from leanness to retail performance*:*

from leanness point of view, by the quality management and also time management; from resilience point of view, by having sustainability plan including our company and business continuity. Basically, the importance of leanness is very high for us, and, if we don't have apply leanness correctly in our system with not doubt, we will face difficulties on recovery during bad time.

Some of the participants mentioned how resilience mediated the relationship from agility to retail performance. One of the interview participants mentioned this connection as follows*:*

I think, yes, agility has an effect on resilience. Now, with this, it is very directly related because, in crisis, you need to be very agile and need to react very quickly to the situation. So, if you haven't plan this properly, if the processes you had before were not about

delivering quickly whenever you have a problem, then I don't think it will work. So, having the agility concept in your supply chain from the beginning will help reacting to a resilient situation or in building business continuity plans. (Interview 1)

Furthermore, the interview data revealed that communication—both internal and external—was directly linked in the supply chain system and has a strong relationship with leanness, agility and resilience. One of the interview participants said*:*

While the other parts of the supply chain are important, if you do not have an effective communication system in place across departments, your supply chain will fail, since communication is critical for the business to function smoothly and profitably. (Interview 3)

Another interview participant stated the following:

I think that, in order to have a successful supply chain system, the firm must implement an effective communication system that allows for easy information-sharing and the ability to quickly identify any cargo or delivery. (Interview 4)

Table 4.8 summarises the relationships identified from and mentioned in the interview data.

Table 4.8: Relationships between the Factors

Relationship dimensions	**Interview**															**%**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Total**
Leanness → Agility	x	x			x	x	x		x	x		x			x	60.0
Leanness → Resilience	x			x	x	x	x		x	x	x	x	x	x	x	80.0
Leanness → Retail performance	x	x	x	x	x	x	x	x		x	x	x	x		x	86.6
Agility → Resilience	x	x		x			x		x		x	x		x	x	60.0
Agility → Retail performance	x	x	x	x		x	x		x				x		x	60.0
Resilience → Retail performance	x		x	x	x	x	x			x	x	x	x	x	x	86.6
Leanness → Agility → Retail performance						x		x	x			x	x		x	40.0
Leanness → Resilience → Retail performance						x		x	x	x	x	x				40.0
Agility → Resilience → Retail performance	x				x		x		x		x	x		x		46.6
Communication → Leanness			x	x	x									x		26.6
Communication → Agility			x	x	x		x									26.6
Communication → Resilience				x	x		x									20.0

4.4 The Field Study Model

After completing the content analysis, detected themes and sub-themes were retrieved to match them to the most pertinent factors and sub-factors. There were a total of five factors found, each having 4–12 sub-factors for a total of 23 sub-factors (see Tables 4.3–4.7).

The next phase in the qualitative data analysis was to link the elements and build a field research model (see Figure 4.2). All of the conceptual model's first connections were supported by field study data (see Table 4.8). Additionally, new relationships and variables were added to the field research model. Effective communication, according to interviewers, had a direct influence on their supply chain system and retail success. Consequently, three new links were established between communication and leanness, agility and resilience for enhancing the supply chain system and overall retail performance. Based on all of the factors found in the field interviews, a model was developed. This model defined the dimensions of the constructs so that they were both theoretically and contextually valid and reliable.

The approach taken in this study guaranteed the validity of the qualitative survey data. The questionnaire used in this study was written in English, and participants were given the opportunity to ask any questions they had in the event of any ambiguity in the content. Additionally, the use of a standardised process in conjunction with an audio-recording device during data collection helped to ensure the quality of the data collected in this study, which is beneficial (Roberts et al., 2006). This study also employed a content analysis technique, in which data were characterised using codes, which increased the trustworthiness of the results when using digital data analysis tools such as NVivo, which was used in this study (Roberts et al., 2006). This means that the findings of the current study are reliable and can be replicated in other settings under comparable conditions.

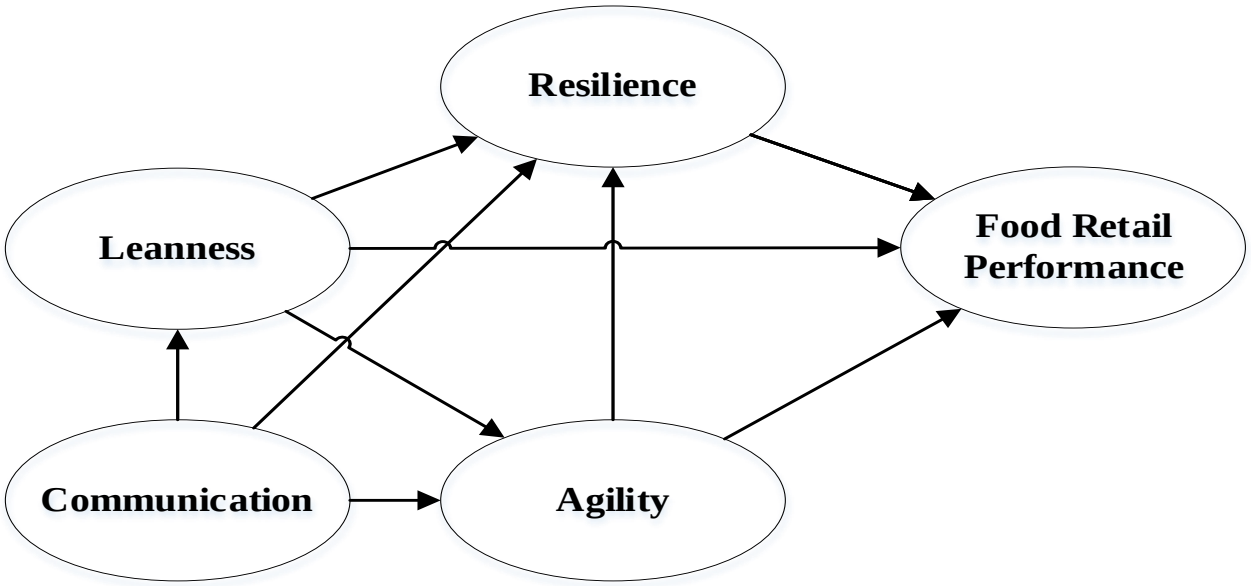

Figure 4.2: Field Study Model

4.5 Comparison between the Field Study and the Initial Model

At this phase in the process between the field study model and the initial model, a comparison was conducted. As a starting point, all of the objects found from the field research data were evaluated using the conceptual model's components. Each item in the conceptual model was determined to be correctly connected with the specified construct. It was necessary to go a further step by comparing the features and linkages of all constructs.

The links and connections between the constructs (factors) were examined at this stage. As a result of the interview data, it was discovered that the connections between constructs in the initial model were optimally supported. Thus, no constructs needed to be removed. Additionally, the interviewees identified several new directions for relationship development, which were explored in connection to existing research. Interviewees also expanded the scope of the research area by highlighting other factors (see Figure 4.2), which were incorporated into the research model. However, this incorporation of additional constructs into the comprehensive research model must be theoretically justified.

4.6 Justification of the Findings in the Literature Review

The current study supports the variables and sub-factors discovered during the field study. The justification process needed to be carried out in two stages: first, by supporting the constructs and dimensions of the conceptual model with the factors and sub-factors discovered from the interview data and second, by supporting the new factors and sub-factors discovered from the interview data

with existing literature, which implies the consultation of additional literature. Similarly, the connections and dimensions were developed. This entire procedure culminated in the validation of the comprehensive research model. Tables 4.9–4.13 summarise the evidence from the literature for the inclusion of particular items in their respective constructs.

Table 4.9: Leanness Supporting Factors and Sub-factors

Item	Field study %	Source
Total preventive maintenance	26.6	Basu (2009; p. 27); Bhasin & Burcher (2006); Shah & Ward (2003, 2007)
Just in time	53.3	Arif-Uz-Zaman & Nazmul Ahsan (2014); Green & Inman (2005); Shah & Ward (2007)
Total quality management	73.3	Azevedo et al. (2012); Qi et al. (2011); Talib et al. (2011)

Table 4.10: Agility Supporting Factors and Sub-factors

Item	Field study %	Source
Quickness	40	Christopher & Peck (2004); Lee (2004); Li et al. (2009); Sharifi & Zhang (1999); Swafford et al. (2006b)
Response	46.6	Christopher & Peck (2004); Fayezi et al. (2017); Lee (2004); Li et al. (2009); Swafford et al. (2006b)
Flexibility	40.0	Christopher & Peck (2004); Jain & Benyoucef (2008); Lee (2004); Li et al. (2009); Seyedhoseini et al. (2010).
Competency	53.3	Christopher & Peck (2004); Jain & Benyoucef (2008); Lee (2004); Li et al. (2009); Seyedhoseini et al. (2010); Swafford et al. (2006a)

Table: 4.11: Resilience Supporting Factors and Sub-factors

Item	Field study %	Source
Visibility	6.6	Blackhurst et al. (2005); Braunscheidel & Suresh (2009); Jüttner & Maklan (2011); Peck (2005); Pettit et al. (2013)
Collaboration	53.3	Braunscheidel & Suresh (2009); Cao & Zhang (2011); Pettit et al. (2013)
Recovery	53.3	Christopher & Peck (2004); Dalziell & McManus (2004); Sheffi & Rice (2005); Vugrin et al. (2011)
Response	46.6	Boin & McConnell (2007); Norrman & Jansson (2004); Sheffi & Rice (2005)

Item	Field study %	Source
Flexibility	33.3	Braunscheidel & Suresh (2009); Gunasekaran et al. (2008)

Table 4.12: Communication Supporting Factors and Sub-factors

Item	Field study %	Source
Internal communication	60.0	Jacobs et al. (2016); Narasimhan & Kim (2002); Paulraj et al. (2008)
External communication	53.3	Narasimhan & Kim (2002); Paulraj et al. (2008)

Table 4.13: Retail Performance Supporting Factors and Sub-factors

Item	Field study %	Source
Sales	86.6	Drew (1997); Gupta & Govindarajan (1984)
Profit margin	26.6	Drew (1997); Gupta & Govindarajan (1984)
Revenue growth	66.6	Miller & Friesen (1983); T. C. Powell (1994)
Market share	86.6	T. C. Powell (1994); W. W. Powell (1996)
Customer satisfaction	40.0	Maltz et al. (2003); T. C. Powell (1994); W. W. Powell (1996)
Customer retention rate	46.6	Levesque & McDougall et al. (1996); T. C. Powell (1994)
Service quality	33.3	Levesque & McDougall et al. (1996); T. C. Powell (1994)
On-time delivery	26.6	Bolat & Yılmaz (2009); Maltz et al. (2003)
Degree of overall success	46.6	Bolat & Yılmaz (2009); Levesque & McDougall (1996); Maltz et al. (2003)

4.7 The Comprehensive Research Model

As previously stated, a comparison was made between the initial model and the results of the field study to offer support for the structures and variables that were selected. Figure 4.3 shows a complete model for the current research in this section. The great majority of variables and sub-factors discovered in field study data have previously been verified in the literature. Additionally, three new relationship connections were incorporated into the comprehensive research model. Furthermore, the new element, communication, and its link to the field study data were incorporated into the comprehensive research model due to the broad consensus that effective communication throughout the supply chain system benefits retail performance: 60% and 53.3% of interviewees mentioned internal and external communication, respectively, in the field study.

Using existing literature and data from the field study, a comprehensive research model, 'Supply Chain Food Retail Performance', was developed in accordance with the initial model, which was then refined. The model has five major constructs: leanness, communication, agility, resilience and food retail performance. It shows that the supply chain system must include leanness, agility, resilience and communication to have good food retail performance. It provides readers with information on the factors that establish exchange relationships, the processes by which they are formed and sustained, and the ramifications in immediate, moderated and mediated relationships. The model was developed sequentially: first through a preliminary research model (Figure 2.2), followed by its contextualisation and confirmation based on the results of the field study. During this second stage, the field research model (Figure 4.2) was developed. In the third step, the original research model was compared to the field study model to create a full and final testable model (Figure 4.3), which was then tested.

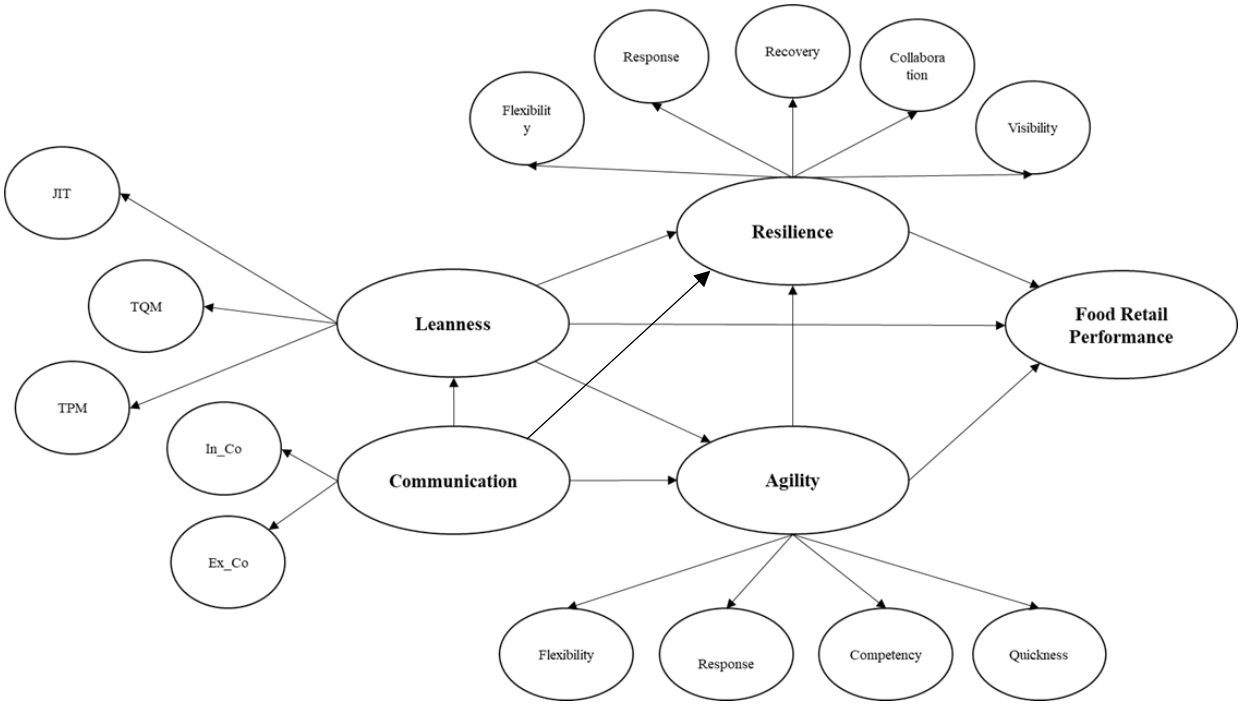

Figure 4.3: Supply Chain Food Retail Performance

Note. JIT = just in time; TQM = total quality management; TPM = total preventive maintenance; In_Co = internal communication; Ex_Co = external communication.

4.8 Summary

This chapter explained the field study methodology and the findings' significance with respect to the current research. The field study's main goal was to contextualise the initial research model developed from a review of the literature. This chapter had two parts: the inductive and deductive phases. The inductive phase included interviewing, data analysis, identifying variables and factors, and building

relationships between constructs. In this step, the conceptual model was compared with field study data, and a comprehensive research model was developed. The content analysis found a total of 23 variables that were classified into five factors. Additional literature was searched to validate all of the factors and variables. The ‘Supply Chain Food Retail Performance’ model, which was developed based on the comparison of the two models, was used to conduct this research.

Chapter 5: Hypotheses and Questionnaire Development

5.1 Introduction

The preceding chapter described the process of developing the final and integrated research model. A literature review and qualitative data analysis were used to create this integrated model. In this chapter, hypotheses are developed based on the relationships among the variables in the proposed study model (as shown in Chapter 4, Figure 4.3). The hypotheses that are to be developed in this chapter are with respect to the relationships from leanness to resilience, leanness to agility, leanness to food retail performance, communication to leanness, communication to agility, communication to resilience, agility to resilience, agility to food retail performance, and resilience to food retail performance. Mediation and moderation hypotheses are also developed. This chapter also identifies and develops measurement instruments for each of the study model's constructs, and finally develops the survey questionnaire.

5.2 Hypotheses Development

5.2.1 Effect of Leanness on Food Retail Performance

The present study found that leanness had an effect on organisational performance by decreasing and avoiding quality defects, allowing for quality improvement. Additionally, JIT was found to have a substantial and favourable effect on quality, confirming Belekoukias et al.'s (2014) claim that JIT has a major impact on organisational performance. This means that JIT assists organisations in reducing their inventory, thereby addressing and resolving all issues at their source.

The present study also indicated that leanness leads to quality improvement and therefore has a positive effect on quality; this is consistent with Imai (2012). This implies that quality measures assist organisations in reducing defects, customer complaints, rejection levels and warranty claims, thereby satisfying their consumers. According to Cua et al. (2006), lean systems such as JIT and TPM have a positive and substantial influence on the delivery, cost, quality and flexibility of organisations. This seems to suggest a connection between lean tools and organisational performance. These lean systems are already being used by businesses to increase responsiveness and performance (Bortolotti et al., 2013).

According to Teece et al. (1997, p. 516), a dynamic capability is a firm's capability to integrate, build and restructure internal and external competences in response to dynamically changing circumstances. The dynamic capabilities view is characterised by the view of an organisation's ability

to recognise opportunities effectively, followed by its ability to rearrange its assets and operational capabilities in response to a rapidly changing external environment (Teece et al., 1997). Cua et al. (2006) established a strong correlation between leanness and organisational performance. This demonstrates that leanness is a capability that, when sufficiently developed, may aid organisations in becoming more successful in today's economy, hence boosting the organisation's profitability. Additionally, managers may receive feedback on their effectiveness through the use of lean technologies. This indicates that lean practices have a significant impact on the overall performance of the organisation. This is also supported by the results of the field study. Based on the above arguments, it is hypothesised that:

- **Hypothesis 1 (H1)**—A high level of leanness in the supply chain will have a direct positive impact on food retail performance.

5.2.2 Effect of Agility on Food Retail Performance

Supply chain agility is regarded as a critical component of a company's competitive strategy (Nayyar & Bantel, 1994; Sheel & Nath, 2019; Teece et al., 1997). It is deliberately developed by obtaining skills that allow the supply chain to respond to environmental and competitive changes in a timely and diversified manner (Yusuf et al., 2004). Researchers have demonstrated favourable relationships between agility and flexibility, speed, responsiveness and performance (Hallgren & Olhager, 2009; Inman et al., 2011; Narasimhan et al., 2006; Vázquez-Bustelo et al., 2007). Agile supply chains provide lower-cost products with better service and delivery due to shorter lead times. They are also adaptable to fluctuations in demand volume and cycle time, resulting in improved competence and performance.

In terms of the link between agility and time to reaction and recovery, Christopher and Peck (2004) contended that quickly responding to unforeseen events is a capacity of agility. Similarly, Lee (2004) discussed methods for dealing with both short- and long-term change through the use of agility, flexibility and alignment. Enhancing competitive performance, according to Yusuf et al. (2004), necessitates the development of external competence via supply chain integration to facilitate smooth resource coalition flows. Furthermore, their research showed that supply chain agility has a significant influence on cost leadership.

Supply chain integration is also thought to be linked to a variety of factors for operational success, including cost advantage and product quality, delivery and customisation (Kim, 2009). As an agile supply chain becomes connected, business processes are simplified and lead times are shortened,

allowing the company to be more proactive in adapting and executing its strategy throughout the supply chain ahead of rivals when opportunities arise (Wu et al., 2006).

A McKinsey poll of 161 firms in 2015 included dynamic capabilities in its definition of agility (Bazigos et al., 2015). This illustrates that agile and high-performing firms have strong organisational structures for competency as well as dynamic procedures for quick adaptability to new issues and opportunities (Aghina et al., 2015). Furthermore, Baškarada and Koronios (2018) examined and operationalised the construct of organisational agility using five micro-foundations of dynamic capabilities.

The capability of a corporation to dynamically integrate, increase and reconfigure internal and external competences in response to market changes is, according to the dynamic capabilities viewpoint, a source of competitive advantage (Cepeda & Vera, 2007; Fawcett et al., 2011). As a result, agility may have a good impact on food retail performance. The preceding considerations led to the formulation of the following hypothesis:

- **Hypothesis 2 (H2)**—A high level of agility in the supply chain will have a positive impact on food retail performance.

5.2.3 Effect of Resilience on Food Retail Performance

In light of increasing difficulties in global business, supply chains remain unprotected from many disturbances and risks, including natural disasters, loss of critical suppliers, plant accidents, terrorist acts, economic recession and so on (Christopher & Peck, 2004; Chowdhury & Quaddus, 2017; Pettit et al., 2013; Sheffi & Rice, 2005; Wu et al., 2006). These interruptions and risks call for resilient and sustainable supply chains (Christopher & Lee, 2004). Otherwise, the effect of the interruption of the supply chain activities will be that the whole chain is affected in terms of both income and expenses (Ponomarov & Holcomb, 2009). Turbulence in one member of the supply chain may have an impact on the whole supply chain if it is not handled effectively and on time (Chowdhury & Quaddus, 2017). Similarly, the announcement of supply chain disruptions, such as operational problems or shipping delays, can result in a significant loss of shareholder value (Hendricks & Singhal, 2003). Operational interference in the supply chain network can have a broad influence: for example, supplier plant disruptions can affect an enterprise's production and distribution sales. Operating disruptions can also result in massive financial losses for supply chain players: as one example, a provider's factory burned the supply of chips to Ericsson's manufacturing facility, leading Ericsson to lose millions of dollars in revenue (Tomlin, 2006).

Companies and their supply networks must be strong to avoid disruptions from a range of causes (Pettit et al., 2010). The mitigation of present risks in supply chain resilience (Christopher & Peck, 2004) is crucial because resilience allows a supply chain to be restored to a previous or better state after an interruption (Christopher & Peck, 2004; Pettit et al., 2010). Thus, implementing a supply chain resilience strategy will help improve food retail performance and reduce risks. Such resilience is also required to combat operational hazards inside the supply chain.

The core concept of the dynamic capabilities view is that a company's ability to integrate, expand and rearrange organisational resources via its processes allows it to adapt to environmental changes and uncertainties and create new value-creating strategies (Eisenhardt & Martin, 2000; Teece et al., 1997). The dynamic capabilities view may be used to examine the need for resilience capabilities in the context of disruptive occurrences (Teece et al., 1997). Similarly, firms' supply chains must build dynamic capacities to minimise risks in uncertain environments, which necessitates the development of resilience capabilities to thrive in the long run.

According to the dynamic capabilities view, companies must be capable of adapting, integrating and reconfiguring their resources and talents in response to rapidly changing conditions. They must also be proactive in scanning for environmental changes and in acquiring the necessary flexibility and adaptability (Teece et al., 1997). This capability corresponds, in the present study, to the supply chain's resilience capability for adapting to environmental changes and avoiding potential supply chain risks. The dynamic capabilities view (Teece et al., 1997) highlights the need for competitive enterprises to immediately reorganise their resources and talents to recapture competences during difficult times.

The outcomes of the field study are similarly comparable. The capacity of resilience contributes to operational sustainability via the reduction of operational interruptions. Based on this argument, it is hypothesised that:

- **Hypothesis 3 (H3)**—A high level of resilience in the supply chain will have a positive impact on food retail performance.

5.2.4 Effect of Leanness on Resilience

Over the past several decades, multinational organisations in a variety of economic sectors have successfully used Lean concepts in their day-to-day operations. Lean management has been implemented across the supply chain, not only in internal operations. When supply chain partners completely embrace lean management and use an integrated strategy, excellent end products may be generated (Panizzolo, 1998; Ruiz-Benítez et al., 2018). It has been shown that extending Lean

methodologies improves supply chain competitiveness and sustainability (Govindanet al., 2014; Martínez-Jurado & Moyano-Fuentes, 2014). Regardless, lean management is not a panacea for all ills. Its enhancements to operational processes have rendered supply chains more susceptible to disruptions (Kamalahmadi & Parast, 2016; Ponomarov & Holcomb, 2009). However, making supply chains more resilient will help firms cope with unanticipated scenarios (Christopher & Peck, 2004; Sheffi & Rice, 2005). Thus, managers are becoming more concerned with building strong supply chains.

Previous studies have looked at the robust practices that must be implemented in a coordinated way across enterprises in a supply chain to support this workforce. These essentially aim to give the supply chain flexibility, redundancy, collaboration, visibility and diverse sources (Hohenstein et al., 2015; Pettit et al., 2010). Wieland and Wallenburg (2013) have emphasised the need for communication and collaboration in the supply chain to build resilience. Mohammaddust et al. (2017) provided a combined lean and responsive strategy for finding the best supply chain design based on an organisation's uncertainty and performance goals. Their study identified points of both convergence and divergence between the Lean and resilience paradigms. Lean thinking emphasises producing just what is required and when it is required, eliminating all sorts of waste in industrial operations (i.e., raw materials, works in process and the final product inventory). Nonetheless, if organisations had enough supply on hand, managers would use them as an immediate response to the effects of an unanticipated event. Indeed, Sezen et al. (2012) noted that, in Turkey, due to presence of uncertainty, enterprises in its auto supply chain have embraced lean management to maintain substantial inventory levels.

Despite the 'dispute' between Lean and resilience paradigms in the literature, there have been new studies that support a synergistic connection between Lean and resilience paradigms. In fact, Birkie (2016) demonstrated that most Lean techniques may aid in improving resilience to unforeseen occurrences. Lotfi and Saghiri (2018) have demonstrated that a greater degree of leanness may result in a faster recovery time and, as a result, a higher level of resilience in a system. However, the trade-offs between lean and resilient techniques in the supply chain should be thoroughly explored:

- **Hypothesis 4 (H4)**—A high level of leanness in the supply chain will have a direct positive impact on its resilience.

5.2.5 Effect of Leanness on Agility

According to Harrison (1997), agility is connected with long-term plans, but leanness is associated with short-term strategies; for a supply chain to achieve its long-term strategies of responding to

market changes, it must first achieve its short-term leanness strategies. Since the global business environment has grown more complicated and dynamic, organisations face the risk of disruptions caused by difficulties throughout the supply chain (Faisal et al., 2006). Lean supply chains and agile supply chains are both dynamic capabilities that increase skills by building on processes. Thus, leanness and agility, as dynamic capacities (Mandal, 2018; Qamar et al., 2018), may improve the effectiveness and competency of a supply chain system. Thus, according to Harrison (1997), leanness can be viewed as an 'enabling element' for agility. According to Robertson and Jones (1999), achieving agility demands developing leanness.

The contemporary business climate has put tremendous pressure on supply networks to move from lean, functional supply chains to agile, customised supply chains (Christopher & Towill, 2000). The foundations of agility are leanness and flexibility (Vinodh et al., 2009, p. 573); thus, a company must first possess these two traits to achieve agility. Similarly, Narasimhan et al. (2006) concluded from their review that leanness is a performance/practice condition that comes before agility. This is supported by the findings of the field study. Based on this above argument, it is hypothesised that:

- **Hypothesis 5 (H5)**—A high level of leanness in the supply chain will have a direct positive impact on its agility.

5.2.6 Effect of Communication on Leanness

There is a significant link between the communication process and the implementation of leanness: both operate in tandem. If the communication process fails, the implementation of leanness will be a failure and will not accomplish its goal. According to Forrester (1995), leanness is typically followed by a move towards exposure and issue resolution. This shift necessitates a fresh approach to issue resolution.

TQM and JIT rely heavily on collaboration and group problem-resolution (Puvanasvaran et al., 2009). Teamwork and group problem-solving work together to break down barriers and enhance the flow of information across a business, resulting in increased production. Effective cooperation necessitates effective communication to track down and resolve systemic issues (Gunasekaran, 2008). Working in groups while using suitable problem-solving methods can boost efficiency and pleasure in job improvement outcomes (Puvanasvaran et al., 2009). Variable communication will influence the success rate of leanness adoption: when communication fails, quality may suffer, and employee discontent may arise (Hancock & Zayko, 1998). Leanness requires good communication across all value streams (Storch & Lim, 1999) and necessitates effective and wide communication channels (Worley, 2006). Based on this argument, it is hypothesised that:

- **Hypothesis 6 (H6)**—A high level of communication in the supply chain will have a direct positive impact on leanness.

5.2.7 Effect of Communication on Agility

The sharing of information is often regarded as incredibly important for building collaboration and cooperation in the supply chain. Sharing information enhances connections and promotes integration across supply chain suppliers and firms, resulting in increased performance (Dehgani & Jafari Navimipour, 2019; Khan & Wisner, 2019). Many studies have been undertaken to investigate the reasons for improved supply chain agility. According to Roscoe et al. (2020), supply- and demand-side expertise increase supply chain agility and operational effectiveness. Additionally, the use of IT promotes firm success by increasing supply chain agility (DeGroote & Marx, 2013). Likewise, communication has been experimentally demonstrated to be a predictor of improved supply chain agility and to be positively associated with operational and relationship performance (Gligor & Holcomb, 2012).

Through logistic integration, buyer–supplier interactions and communication are positively associated with agility (Paulraj et al. 2008). Chiang et al. (2012) demonstrated empirically that strategic sourcing has a direct positive influence on the agility of a company's supply chain. Efficient information flow helps organisations to stay on top of market demands and predict prospective changes that may need action to sustain competitive advantages. Additionally, efficient material flow allows a company to transfer resources swiftly in response to market changes. Finally, the continuous quest for knowledge can develop an organisational culture in which changes are seen as opportunities for advancement. Consequently, a company's mastery of the aforementioned competences will have a substantial impact on supply chain agility (Chen, 2019; Dehgani & Jafari Navimipour, 2019; Flynn et al., 2010; D. Kim & Cavusgil, 2009; Wong and Boon-Itt, 2008; Zailani & Rajagopal, 2005). Based on this argument, it is hypothesised that:

- **Hypothesis 7 (H7)**—A high level of communication in the supply chain will have a direct positive impact on agility.

5.2.8 Effect of Communication on Resilience

Breakdowns in the supply chain may be caused by potential or actual disturbances in the transfer of goods, materials or services (Craighead et al., 2007). Resilience enables a supply chain to be prepared for such events, minimises the impact of interruptions and enhances its ability to recover quickly from them by maintaining operations at the optimal level of connection and control over structure and

function (Ponomarov & Holcomb, 2009). Communication throughout the supply chain allows the establishment of partnerships, supports cooperative planning and promotes the real-time information-sharing essential to prepare for, react to and recover from supply chain interruptions while minimising their effect (Houston, 2018). Many researchers have pointed to mutual benefits, incentives, risk-sharing and information exchange as the foundations of communication (Sterbenz, 2010).

Jüttner and Maklan (2011) and Jüttner (2005) have emphasised the importance of communication to be more resilient when transferring supply chain information and risk. However, if supply chain participants do not take responsibility for risk-sharing, they suffer (Jüttner, 2005). As a result, primary corporations try to reduce risks in the downstream supply chain by cultivating more trusting relationships and emotional communication (Ritchie & Brindley, 2007). It is also worth emphasising that supply chain professionals need the cooperation of senior management to take action, via the use of a robust communication system, to decrease risk (Giunipero & Aly Eltantawy, 2004). The analysis of the field study showed that internal and external communication are required for companies to communicate risks, decrease risk chances, reduce risk impacts and build resilience capacity. These arguments led to the following hypothesis:

- **Hypothesis 8 (H8)**—A high level of communication in the supply chain will have a direct positive impact on resilience.

5.2.9 Effect of Agility on Resilience

In terms of agility and resilience, researchers like Christopher and Peck (2004) believe that many organisations are at risk because their response time to changes in demand or disruptions in supply is too long; the more flexible a company is to respond quickly to unpredictable demand or supply changes, the less time is expected to respond to the changes. They have thus proposed that resilience and agility are two of the four characteristics that directly lead to resilience. Pettit et al. (2013) have added that the supply chain may develop capabilities, such as adaptability, that enable long-term survival in the face of threats. Christopher et al. (2006) identified agility as one of the most effective means for creating supply chain resilience. According to Christopher et al. (2006), one of the processes of resilience is agility, which allows the system to respond quicker, resulting in greater business performance. Panomarov and Holcomb (2009) have also proposed agility as a formative resilience component.

Increasing supply chain trust is one of the most successful ways to manage supply chain risk (Christopher & Lee, 2004). Confidence cannot be built in the supply chain unless it is capable of promptly rebounding from or adapting to adversity or change and thereby exhibiting agility and

resilience. Under these conditions, the concepts of agility and resilience are engaged. This shows that agility and resilience are critical for maintaining dynamic capabilities, the relationship between dynamic capabilities and competitive advantage within the supply chain system. This point is reinforced further by the nature of supply chain operations, which are subject to rapid change and uncertainty.

In conclusion, the ease of reaction to changing circumstances leads to an agile supply chain, which leads to increased resilience. This argument led to the following hypothesis:

- **Hypothesis 9 (H9)**—A high level of agility in the supply chain will have a positive impact on resilience.

5.2.10 Hypotheses regarding Mediation Relationships

As previously stated, existing research has revealed a clear relationship between leanness and food retail performance, between agility and food retail performance and between resilience and food retail performance (Belekoukias et al., 2014; Christopher & Peck, 2004; Cua et al., 2006; Nayyar & Bantel, 1994; Sheffi & Rice, 2005; Teece et al., 1997; T. Wu et al., 2006; Vázquez-Bustelo et al., 2007). The current model also shows indirect relationships between leanness, agility, resilience and food retail performance through agility and resilience as mediating constructs. Based on logical and objective deductions from the extant literature (Foerstl et al., 2010) and support from the field study, the present study drew hypotheses regarding mediation relationships among the aforementioned factors, which directed the researcher to investigate the effects of those constructs as mediators. The hypotheses as described in the following sub-sections were put forward in this study.

5.2.10.1 The Mediating Role of Resilience between Agility and Food Retail Performance

Supply chain agility is an important part of a company's strategic approach (Nayyar & Bantel, 1994; Teece et al., 1997). It is built up by the ability to quickly and flexibly respond to environmental and competitive changes in the supply chain (Yusuf et al., 2004). Inman et al. (2011), Hallgren and Olhager (2009) and Vázquez-Bustelo et al. (2007) have confirmed the link between agility and flexibility, quickness, response and performance. One benefit of agile supply chains is that they can provide goods faster with better service and at a lower cost. Because of their capacity to adjust to shifting demands and improve performance, they are more equipped to handle challenges in the future. Christopher and Peck (2004) asserted that quick responses are vital in the face of unexpected circumstances and that agility plays a role in achieving these quick responses. Additionally, several studies have shown a link between supply chain agility and business performance. Furthermore,

demand response, according to Ralston et al. (2015), has a positive influence on a company's operational and financial performance.

All of the research agrees that businesses must have a unique capability to deal with market changes; they must react quickly to deal with sudden and unexpected changes. In other words, they must be agile (Ganguly et al., 2009): agile systems have an important effect on firm performance. Additionally, agility allows a company to detect any changes in demand and adapt to them quickly and cost-effectively. According to Lee (2004), there are also strategies, such as agility, flexibility and alignment, for addressing both short- and long-term transformation difficulties.

If a disruption in a supply chain function is not managed effectively and in a timely manner, it may have a chain effect on the entire supply chain. Supply chain interruptions, such as an operational difficulties or a shipment delays, can result in a considerable drop in business performance (Hendricks & Singhal, 2003). Justifying the current risk in a supply chain's resilience capability is critical (Christopher & Peck, 2004) because resilience capability assists a supply chain in regaining its original condition. Furthermore, the capability for resilience encourages a company to establish a varied range of routines and resources, or perhaps a better condition, as a result of an interruption (Christopher & Peck, 2004; Pettit et al., 2010).

Agility and resilience capabilities have shared foundations and are created in part from complementary competences and assets; additionally, both anticipated and unexpected changes may be sources of opportunity for these capabilities. They are, however, unique structures intended for adaptation to different environmental situations. Strategic agility is required when meeting constant and relentless change, whereas a resilience capability is required for adapting to extremely disruptive and unexpected change (Deevy, 1995; McCann, 2004).

Since resilience also strongly influences a firm's performance, the indirect link from agility to performance via resilience may be stronger than the direct link from agility to firm performance. This is because the indirect link also helps to enhance resilience, which is an important capability of the supply chain. Therefore, every company needs to develop a resilience capability, which is enhanced by agility. This setup suggests that:

- **Hypothesis 10 (H10)**—Resilience will mediate the relationship between agility and food retail performance.

5.2.10.2 The Mediating Role of Resilience between Leanness and Food Retail Performance

Leanness in a supply chain describes how a well-conceived supply chain should function: efficiently and with minimal waste to the end consumer. Any company that tries to become leaner and more efficient may benefit from a lean supply chain (Carvalho et al., 2011; Gligor et al., 2015; Katayama & Bennett, 1996). Studies have verified that leanness is linked to cost, flexibility and delivery (Hallgren & Olhager, 2009). The removal of all waste elements helps to reduce cost and therefore enhances total retail output; this can be achieved through several techniques, such as JIT, TPM and TQM.

A resilient supply chain develops the capacity to react to unintended occurrences and to respond and to resolve disturbances (Ponomarov & Holcomb, 2009). One definition of resilience is the capability to deal with externalities and return operations to their original condition or to transition to a more desired state following a disruption (Chen & Miller-Hooks, 2012; Christopher & Peck, 2004; Sheffi, 2005). It is critical for supply chains to adopt leanness to increase resilience when confronted with a severe interruption in the system. Since resilience also strongly influences food retail performance, the indirect link from leanness to food retail performance via resilience could be stronger than the direct link from leanness to food retail performance. This is because the indirect link also helps to enhance resilience, which is an important capability of the supply chain. As a result, every business must create resilience capabilities that are facilitated by leanness. The field study provided evidence for a resilience-mediated link between leanness and food retail performance. With this, it is hypothesised that:

- **Hypothesis 11 (H11)**—Resilience will mediate the relationship between leanness and food retail performance.

5.2.10.3 The Mediating Role of Agility between Leanness and Food Retail Performance

Lean supply chains emphasise the fast delivery of goods to the end consumer and minimising waste in the process. Any company that wants to become leaner and more efficient should seek a lean supply chain (Carvalho et al., 2011; Gligor et al., 2015; Katayama & Bennett, 1996). Studies have shown a correlation between being lean and cost-effectiveness, flexibility and delivery time (Hallgren & Olhager, 2009). Many of lean manufacturing's techniques, such as JIT, TPM and TQM, assist with cost reduction while also helping to improve the overall performance of the retail business.

Agility in the supply chain is an essential component of a company's strategic plan (Nayyar & Bantel, 1994; Teece et al., 1997). It is built up by the ability to quickly and flexibly adapt to external and competitive changes in the supply chain (Yusuf et al., 2004). To remain competitive in the market,

the supply chain system must quickly respond to any changes in the market; thus, a lean supply chain is essential. Towill (2000) has stated that both leanness and agility have the potential to boost a firm's success by strengthening its supply chain. Similarly, Harrison (1997) demonstrated the direct impact of leanness and agility on organisational performance, as well as the critical nature of leanness implementation as a prerequisite for agility. According to Narasimhan et al. (2006), the principle of agility is first and foremost a reduction in waste and a focus on savings in all areas because this enables the business to focus on its customers, handle changes and adhere to other agility principles.

The field study validated the connection between leanness and food retail performance, which was seen in the agility mediation. The majority of interview respondents agreed that leanness and agility capabilities in a firm can have a favourable impact on its supply chain. When confronted with market shifts, it is critical that the supply chain uses leanness to improve agility. Because agility has a strong influence on food retail performance, the indirect link from leanness to food retail performance via agility may be stronger than the direct link from leanness to food retail performance. This is because the indirect link also helps to improve agility, which is an important supply chain capability. Therefore, every company needs to develop agility capabilities, which are enhanced by leanness. This setup suggests that:

- **Hypothesis 12 (H12)**—Agility will mediate the relationship between leanness and food retail performance.

5.2.10.4 The Mediating Role of Agility between Leanness and Resilience

International corporations across a range of economic sectors have successfully applied Lean concepts in their day-to-day operations, across the supply chain, internal and external operations. Excellent end products can be created via full adoption and integration of lean management (Ruiz-Benítez et al., 2018). Extending Lean techniques has been demonstrated to enhance supply chain competitiveness and sustainability (Govindanet al., 2014; Martínez-Jurado & Moyano-Fuentes, 2014). However, lean management is not a cure-all, and its enhancements to operational processes make supply chains more susceptible to disruptions (Kamalahmadi & Parast, 2016). This can be mitigated by making supply chains more resilient (Christopher & Peck, 2004; Sheffi & Rice, 2005), and, consequently, managers are increasingly concerned with developing robust supply chains.

Despite the seeming conflict between Lean and resilience paradigms in the literature, recent studies have shown a synergistic relationship between the two. Birkie (2016) demonstrated that most Lean techniques aid in improving resilience to unforeseen occurrences. Lotfi and Saghiri (2018) showed

that a greater degree of leanness may result in a faster recovery time and, as a result, a higher level of resilience in a system.

Christopher et al. (2006) identified agility as one process of resilience and one of the most effective ways to create supply chain resilience. Agility allows the system to respond more quickly, resulting in better business performance. Panomarov and Holcomb (2009) have also posited state agility as a formative resilience component. Pettit et al. (2013) added that the supply chain may develop capabilities such as adaptability that enable long-term survival in the face of threats. One aspect of confidence in supply chains is their capability to quickly recover from or adapt to adversity or change—that is, their agility and resilience. Agility and resilience are critical for maintaining dynamic capabilities, the relationship between dynamic capabilities and competitive advantage within the supply chain system.

The field study's findings confirm the link between leanness and resilience observed in the agility mediation. Most interviewees believed that a firm's leanness and agility capabilities can benefit its supply chain. When faced with market volatility, it is vital that supply chains employ leanness to enhance agility. Because agility has a strong influence on resilience, the indirect link between leanness and resilience via agility may be stronger than the direct link between leanness and resilience. This is because the indirect link also helps to improve agility, which is an important supply chain capability.

- **Hypothesis 13 (H13)**—Agility will mediate the relationships between leanness and resilience.

5.2.11 Hypotheses regarding Moderation Relationships

As previously stated, the available evidence demonstrates a direct relationship between leanness and food retail performance, between agility and food retail performance and between resilience and food retail performance (Belekoukias et al., 2014; Christopher & Peck, 2004; Cua et al., 2006; Nayyar & Bantel, 1994; Sheffi & Rice, 2005; Teece et al., 1997; T. Wu et al., 2006; Vázquez-Bustelo et al., 2007; Yusuf et al., 2004). The initial research model also shows a moderating effect of resilience on the relationship between leanness and food retail performance and between agility and food retail performance. However, based on logical and objective deductions from the extant literature (e.g., Foerstl et al., 2010; Seeger, 1997) and support from the field study, the present study drew hypotheses regarding moderation relationships among the aforementioned constructs, which created the opportunity for the researcher to look into the effects of those constructs as moderators. The hypotheses as described in the following sub-sections were put forward in this study.

5.2.11.1 The Moderating Role of Resilience on the Link between Leanness and Food Retail Performance

Efficiency in a supply chain characterises how a well-constructed supply chain should work: delivering goods to customers promptly with little waste. A lean supply chain helps organisations become leaner and more efficient (Carvalho et al., 2011; Katayama & Bennett, 1996). Academic research has shown a favourable connection between leanness and cost, flexibility and delivery (Hallgren & Olhager, 2009). Lean management helps lower costs by eliminating waste, and several of its methods, like JIT, TPM and TQM, affect the lead and cycle times of customers, improving overall retail performance. Resilience in a supply chain improves its capacity to react to unforeseen events and interruptions by preparing for them (Ponomarov & Holcomb, 2009). Adopting resilience capabilities is a requirement for increasing business performance; otherwise, disruptive events may harm organisations and their supply chains, potentially resulting in major financial consequences to the firm (Pettit et al., 2013).

According to Govindan et al. (2015), when resilience is implemented, the direct relationship between leanness and firm performance improves, and firm's performance also improves. According to Birkie (2016), resilience and Lean are predominantly synergistic paradigms for improved performance in the face of disruption: a company that has both a high deployment of resilience functions and a high degree of Lean implementation is more likely to perform well. Previous studies have shown that, when resilience capability is developed, the interaction of leanness and resilience will further enhance performance because leanness will have an extra boost in affecting performance due to its interaction with resilience. With this backdrop, it is hypothesised that:

- **Hypothesis 14 (H14)**—Resilience will positively moderate the relationship between leanness and food retail performance.

5.2.11.2 The Moderating Role of Resilience on the Link between Agility and Food Retail Performance

A supply chain's agility is regarded as one of the most crucial components of an organisation's competitive strategy (Nayyar & Bantel, 1994; Teece et al., 1997). It is built up by the ability to quickly and flexibly respond to external and competitive changes in the supply chain (Yusuf et al., 2004). Narasimhan et al. (2006), Inman et al. (2011), Hallgren and Olhager (2009) and Vázquez-Bustelo et al. (2007) have all indicated that agility has a favourable relationship with flexibility, quickness and response time, which has an effect on a firm's performance. One of the benefits of agile supply chains is that they can provide goods faster with better service and at a lower cost. Because of their capability

to adjust to shifting demands and improve performance, they are more equipped to handle challenges. Christopher and Peck (2004) maintain that agility is crucial for reacting to unexpected occurrences. Additionally, according to Lee (2004), techniques exist to combat both short- and long-term changes in agility, adaptability and alignment. Thus, it is reasonable to think that food retail performance may be strongly impacted by agility. Resilience improves the supply chain's capacity to recover from interruptions and disasters (Ponomarov & Holcomb, 2009). Additionally, the capability for resilience is a prerequisite for improving a firm's performance; otherwise, organisations and their supply chains will be impacted by disruptive events, which could result in enormous financial costs to the firm (Pettit et al., 2013).

According to Chowdhury and Quaddus (2017), supply chain resilience has a considerable beneficial influence on performance. When resilience is applied, the direct link between agility and firm performance improves, and firm performance improves (Dolgui et al., 2020). Resilience and agility are predominantly synergetic paradigms for increased performance in the face of disruption (Blackhurst et al., 2011; Brandenburg & Rebs, 2015; Choi et al., 2018; Dubey et al., 2015; Dolgui et al., 2020). A business that has both a high level of deployed resilience functions and a high degree of agility implementation is more likely to perform better. Previous research has indicated that, when resilience capability is developed, the interaction of agility and resilience further improves performance because agility receives an additional boost in affecting performance as a result of its interaction with resilience. The field study data further supports resilience being a moderator of the relationship between agility and food retail performance. With this backdrop, it is hypothesised that:

- **Hypothesis 15 (H15)**—Resilience will positively moderate the relationships between agility and food retail performance.

Table 5.1 summarises the present study's hypotheses, which were supported by both interviews and extant literature.

Table 5.1: Sources of Hypothesised Relationships

Hypothesis	Link
H1: A high level of leanness in the supply chain will have a direct positive impact on food retail performance.	Leanness → Food retail performance
H2: A high level of agility in the supply chain will have a positive impact on food retail performance.	Agility → Food retail performance
H3: A high level of resilience in the supply chain will have a positive impact on food retail performance.	Resilience → Food retail performance

Hypothesis	Link
H4: A high level of leanness in the supply chain will have a direct positive impact on its resilience.	Leanness → Resilience
H5: A high level of leanness in the supply chain will have a direct positive impact on its agility.	Leanness → Agility
H6: A high level of communication in the supply chain will have a direct positive impact on leanness.	Communication → Leanness
H7: A high level of communication in the supply chain will have a direct positive impact on agility.	Communication → Agility
H8: A high level of communication in the supply chain will have a direct positive impact on resilience.	Communication → Resilience
H9: A high level of agility in the supply chain will have a positive impact on resilience.	Agility → Resilience
H10: Resilience will mediate the relationship between agility and food retail performance.	Agility → Resilience → Food retail performance
H11: Resilience will mediate the relationship between leanness and food retail performance.	Leanness → Resilience → Food retail performance
H12: Agility will mediate the relationship between leanness and food retail performance.	Leanness → Agility → Food retail performance
H13: Agility will mediate the relationship between leanness and resilience.	Leanness → Agility → Resilience
H14: Resilience will positively moderate the relationship between leanness and food retail performance.	Leanness → Resilience → Food retail performance
H15: Resilience will positively moderate the relationships between agility and food retail performance.	Agility → Resilience → Food retail performance

5.3 Measurement of the Constructs

As indicated in Chapter 3, the constructs of the research model were to be assessed using reflective indicators. Each construct's indicators were established using a 6-point Likert scale, with 1 being the negative extreme and 6 being the positive extreme. A survey of literature explored the constructs' applications in a variety of research contexts. The next sub-sections summarise the measuring items for the constructs in the present current study.

5.3.1 Leanness

This section's aim is to determine and measure the characteristics of the lean supply chain: JIT, TQM and TPM. Table 5.2 lists the components associated with the lean supply chain. The parts that follow depict the first-order latent constructs of JIT, TQM and TPM.

5.3.1.1 Just in Time

JIT is an essential component of the lean supply chain; it has a significant and beneficial effect on the quality of the lean supply chain. According to Belekoukias et al. (2014), JIT has a substantial effect on organisational supply chain performance. It also has the potential to assist the supply chain department in matching documents and in on-time delivery (Arif-Uz-Zaman & Nazmul Ahsan, 2014; Cua et al., 2006; Shah & Ward, 2007). Table 5.2 shows seven different indicators of JIT gathered from the current supply chain and logistics literature (i.e., Arif-Uz-Zaman & Nazmul Ahsan, 2014; Azevedo et al., 2012; Ballou, 1981; Cua et al., 2006; Shah & Ward, 2007).

5.3.1.2 Total Quality Management

TQM is an essential component of the lean supply chain; it has a significant and beneficial influence on the level of the lean supply chain. In their research, Azevedo et al. (2012) demonstrated that TQM has a substantial effect on continuous improvement in organisational supply chain performance. In the present study, TQM was assessed using 10 items, as shown in Table 5.2: customer complaints, supplier rejection rate, customer rejection rate, meeting customer requirements, process integrity, elimination of waste, continuous improvement, customer satisfaction, performance feedback and total system (taken from Azevedo et al., 2012; Behrouzi & Wong, 2011; Naylor et al., 1999; and Vonderembse et al., 2006).

5.3.1.3 Total Preventive Maintenance

TPM is regarded as an essential component in the present study for determining leanness. Four TPM items were used to measure TPM in leanness, as shown in Table 5.2: maintain equipment regularly, maintain records of all equipment, share equipment records and technology emphasis. These items were taken from Basu (2009), Bhasin and Burcher (2006), Hofer et al. (2012), and Shah and Ward (2007). The corresponding statements were also given by field study participants when discussing TPM in their relationships with others.

Table 5.2: Measurement Items and Related Statements of Leanness

Item	Dimension	Statement	Source
Just in time			
JIT1_L	Matches in documentation	Our suppliers' quantity always matches documentation quantity.	Arif-Uz-Zaman & Nazmul Ahsan (2014); Cua et al. (2006); Shah & Ward (2007)
JIT2_L	On-time delivery	Our suppliers ensure the correct time of delivery as per the documentation.	Arif-Uz-Zaman & Nazmul Ahsan (2014); Cua et al. (2006); Shah & Ward (2007)
JIT3_L	Right delivery place	Our suppliers deliver the order at the right place as per the documentation.	Arif-Uz-Zaman & Nazmul Ahsan (2014); Ballou (1981); Cua et al. (2006); Shah & Ward (2007)
JIT4_L	Regular orders	We receive regular orders daily as per schedule.	Arif-Uz-Zaman & Nazmul Ahsan (2014); Azevedo et al. (2012); Ballou (2005)
JIT5_L	Supplier selections	Our supply chain department selects suppliers based on their performance on low cost and high quality.	Arif-Uz-Zaman & Nazmul Ahsan (2014); Azevedo et al. (2012); Ballou et al. (2000)
JIT6_L	Decision cooperation	Our supply chain department takes joint decisions for cost savings.	Arif-Uz-Zaman & Nazmul Ahsan (2014); Azevedo et al. (2012); Ballou et al. (2000); Shah & Ward (2007)
JIT7_L	Reduce lead time	Our supply chain seeks to reduce lead time, provided it does not increase costs.	Arif-Uz-Zaman & Nazmul Ahsan (2014); Azevedo et al. (2012); Ballou et al. (2000); Shah & Ward (2007)
Total quality management			
TQM1_L	Customer complaints	We have measurement of quality by customer complaints in place.	Azevedo et al. (2012); Behrouzi & Wong (2011); Vonderembse et al. (2006)
TQM2_L	Supplier rejection rate	We have measurement of quality by supplier rejection rate in place.	Azevedo et al. (2012); Naylor et al. (1999)
TQM3_L	Customer rejection rate	We have measurement of quality by customer rejection rate in place.	Azevedo et al. (2012); Naylor et al. (1999); Qi et al. (2011)

Item	Dimension	Statement	Source
TQM4_L	Meeting customer requirements	We have measurement of quality by meeting customer requirements in place.	Azevedo et al. (2012); Shah & Ward (2003); Vonderembse et al. (2006)
TQM5_L	Process integrity	We have measurement of quality by process integrity in place.	Azevedo et al. (2012); Naylor et al. (1999); Qi et al. (2011)
TQM6_L	Elimination of waste	We have measurement of quality by eliminating waste from the total operation process in place.	Azevedo et al. (2012); Naylor et al. (1999); Shah & Ward (2003)
TQM7_L	Continuous improvement	Having process of continuous improvement is considered as quality in our organisation.	Azevedo et al. (2012); Qi et al. (2011); Vonderembse et al. (2006)
TQM8_L	Customer satisfaction	We focus on customer satisfaction.	Narasimhan et al. (2006); Qi et al. (2011); Shah & Ward (2003)
TQM9_L	Performance feedback	Our supply chain frequently offers feedback to suppliers on their quality and delivery performance.	Basu (2009); Qi et al. (2011); Sanchez et al. (2001)
TQM10_L	Total system	We treat the organisation as a total system.	Azevedo et al. (2012); Fullerton & Wempe (2008); Qi et al. (2011)
Total preventive maintenance			
TPM1_L	Maintain equipment	We maintain our equipments regularly (trucks, refrigerators and warehouse equipment).	Hofer et al. (2012); Shah & Ward (2007)
TPM2_L	Equipment records	We maintain excellent records of equipment maintenance–related activities.	Hofer et al. (2012); Shah & Ward (2003, 2007)
TPM3_L	Share equipment records	We post equipment maintenance records on shop floors for active sharing with employees.	Bhasin & Burcher (2006); Shah & Ward (2003, 2007)
TPM4_L	Technology emphasis	We use information technology system in all phases in supply chain.	Basu (2009); Bhasin & Burcher (2006); Shah & Ward (2007)

5.3.2 Agility

This section contains the components for measuring supply chain agility. The following items were used to assess the higher-order concept of agility: flexibility, responsiveness, competency and quickness. The measurement items and related statements for each dimension are shown in Table 5.3. Because the indicators are manifestations of the construct and are expected to vary with one another, reflective indicators were used to assess all of these aspects (Jarvis et al., 2003). The next sections further specify the measurement of these agility dimensions.

5.3.2.1 Flexibility

Flexibility indicates an organisation's and its supply chain's capacity to adapt to and react to market requirements. It was measured by six items: flexibility in numerous available suppliers, flexibility in the variety of sourcing, flexibility in quick response to customer customisation requirements, flexibility in response to key suppliers' requests, flexibility in shortening supplier lead times, and flexibility in adapting orders to requested specifications. These items were selected from prior research because of their relevance to the topic (i.e., Christopher & Peck, 2004; Jain & Benyoucef, 2008; Li et al., 2009; Seyedhoseini et al., 2010) and were contextualised through comparison with the field study's findings.

5.3.2.2 Responsiveness

The construct of responsiveness refers to an organisation's and its supply chain's capacity to deal with and react quickly to market changes. It was measured by six items: adaptability to delivery times by suppliers, supplier relationship management, responsiveness to market changes, delivery responsiveness, sensing and anticipating changes, and recovery from market change. These elements were selected from the prior literature (i.e., Jain & Benyoucef, 2008; Li et al., 2017; Seyedhoseini et al., 2010; Sharifi & Zhang, 1999) and were contextualised through comparison with the field study's results.

5.3.2.3 Competency

Competency is a construct that represents the capability of businesses and supply chains to be competitors in the market. It was measured by five items: quality of products or services, capabilities of human resources, strategic vision, sufficient technological ability, and knowledgeable and high-skilled employees. These items were selected from the previous literature (i.e., Christopher & Peck, 2004; Jain & Benyoucef, 2008; Seyedhoseini et al., 2010; Sharifi & Zhang, 1999) and were contextualised by comparison with the field study's results.

5.3.2.4 Quickness

Quickness refers to the ability of a supply chain to react quickly to market changes. To evaluate this construct, the following four items were used: quick delivery and service, fast operation time, short lead time and efficient supply chain system for on-time delivery. These were adapted from earlier research (see Table 5.3) and were contextualised based on the findings of the field study.

Table 5.3: Measurement Items and Related Statements of Agility

Item	Dimension	Statement	Source
Flexibility			
Flex1_A	Numerous suppliers	We have many available suppliers.	Christopher & Peck (2004); Jain & Benyoucef (2008); Seyedhoseini et al. (2010)
Flex2_A	Sourcing flexibility	We have variety of supply schedules for meeting customers' needs.	Christopher & Peck (2004); Jain & Benyoucef (2008); Seyedhoseini et al. (2010)
Flex3_A	Quick response	Our capability for responding quickly to order customisation requirements is very high.	Christopher & Peck (2004); Jain & Benyoucef (2008); Seyedhoseini et al. (2010)
Flex4_A	Response flexibility	We are flexible in response to any request changes with our key suppliers.	Christopher & Peck (2004); Lee (2004); Li et al. (2009); Swafford et al. (2006a)
Flex5_A	Lead time	Our company strives to shorten supplier lead time, in order to avoid inventory and stockouts.	Christopher & Peck (2004); Lee (2004); Li et al. (2009); Swafford et al. (2006a)
Flex6_A	Adjust orders	We can adjust the specification of orders as requested by our customers.	Christopher & Peck (2004); Lee (2004); Li et al. (2009); Swafford et al. (2006a)
Responsiveness			
Resp1_A	Suppliers' delivery time	We are able to accommodate variation in supply delivery time.	Jain & Benyoucef (2008); Seyedhoseini et al. (2010)
Resp2_A	Supplier relation management	We have suppliers relation management team.	Jain & Benyoucef (2008); Seyedhoseini et al. (2010)
Resp3_A	Responsiveness to market changes	We respond quickly to market changes.	Jain & Benyoucef (2008); Seyedhoseini et al. (2010)
Resp4_A	Delivery responsiveness	We respond fast to any delivery order.	Jain & Benyoucef (2008); Seyedhoseini et al. (2010)

Item	Dimension	Statement	Source
Resp5_A	Anticipating changes	Our supply chain system can recognise and anticipate any changes to order process.	Li et al. (2017); Sharifi & Zhang (1999); Swafford et al. (2006a)
Resp6_A	Recovery from change	Our supply chain system is able to recover fast from market changes.	Li et al. (2017); Sharifi & Zhang (1999); Swafford et al. (2006a)
Competency			
Comp1_A	Quality	We ensure a high level of products quality and service.	Jain & Benyoucef (2008); Seyedhoseini et al. (2010)
Comp2_A	Capabilities of human resources	We have capable human resources.	Jain & Benyoucef (2008); Seyedhoseini et al. (2010)
Comp3_A	Strategic vision	We have a strategic vision to manage our supply chain.	Jain & Benyoucef (2008); Seyedhoseini et al. (2010)
Comp4_A	Technological ability	We have sufficient and appropriate technological ability in supply chain.	Christopher & Peck (2004); Sharifi & Zhang (1999)
Comp5_A	Skilled employees	Our employees are knowledgeable, competent and empowered.	Christopher & Peck (2004); Sharifi & Zhang (1999)
Quickness			
Quik1_A	Quick in delivery and service	Our products and services delivery system is quick and operates in timely fashion.	Sharifi & Zhang (1999); Swafford et al. (2006b)
Quik2_A	Fast operation time	Our operation time is fast.	Sharifi & Zhang (1999); Swafford et al. (2006b)
Quik3_A	Lead time	We can adapt supply chain processes properly to reduce lead time.	Christopher & Peck (2004); Li et al. (2017)
Quik4_A	On-time delivery	We can adjust supply chain processes properly to increase on-time delivery.	Christopher & Peck (2004); Li et al. (2017)

5.3.3 Resilience

Prior research and field studies both helped inform the findings of this study and contributed to the conclusion that flexibility, response, recovery, collaboration and visibility are antecedents of supply chain resilience. Flexibility was consequently measured by four items: flexibility in production, contract flexibility, flexibility in sourcing and flexibility in distribution. Response was measured by three items: response to disruptions, responses to crisis and crisis response team. Recovery was measured by four items: fast recovery, absorb losses, ability to handle crises and recovery from crises at least cost. Collaboration was measured by five items: forecasting of demand, collaborative planning and decision with the supply chain partners, investing in suppliers' plants to collaborate operations, sharing resources with suppliers and good communication with suppliers. Visibility was measured by four items: sharing information with supply chain partners, tracking information of different operations, gathering information through business intelligence, and real-time information of the supply chain. These items were adapted from earlier research (see Table 5.4) and contextualised in light of the field study's findings.

Table 5.4: Measurement Items and Related Statements of Resilience

Item	Dimension	Statement	Source
Flexibility			
Flex1_R	Flexibility in production	We have flexibility in production in terms of volume of order and production schedule.	Braunscheidel & Suresh (2009); Gunasekaran et al. (2008)
Flex2_R	Contract flexibility	We have contract flexibility such as partial order, partial payment, partial shipment etc.	Braunscheidel & Suresh (2009); Gunasekaran et al. (2008)
Flex3_R	Flexibility in sourcing	We have flexibility in sourcing.	Braunscheidel & Suresh (2009); Gunasekaran et al. (2008)
Flex4_R	Flexibility in distribution	We have flexibility in distribution.	Braunscheidel & Suresh (2009); Gunasekaran et al. (2008)
Response			
Resp1_R	Response to disruptions	We can respond quickly to disruptions.	Boin & McConnell (2007); Norrman & Jansson (2004); Sheffi & Rice (2005)
Resp2_R	Response to crisis	We can undertake adequate responses to crisis.	Boin & McConnell (2007); Norrman & Jansson (2004); Sheffi & Rice (2005)
Resp3_R	Crisis response team	We have response team for mitigating crisis.	Boin & McConnell (2007); Norrman & Jansson (2004); Sheffi & Rice (2005)
Recovery			
Reco1_R	Fast recovery	We have the ability to get recovery in short time.	Christopher & Peck (2004); Sheffi & Rice (2005); Vugrin et al. (2011)
Reco2_R	Absorb losses	We have the ability to absorb huge loss.	Christopher & Peck (2004); Sheffi & Rice (2005); Vugrin et al. (2011)
Reco3_R	Handle crisis	We can reduce impact of loss by our ability to handle crisis.	Christopher & Peck (2004); Sheffi & Rice (2005); Vugrin et al. (2011)

Item	Dimension	Statement	Source
Reco4_R	Recovery from crisis	We can recovery from crisis at less cost.	Christopher & Peck (2004); Sheffi & Rice (2005); Vugrin et al. (2011)
Collaboration			
Colla1_R	Demand forecasting	We have collaborative forecasting of demand with supply chain partners.	Braunscheidel & Suresh (2009); Pettit et al. (2013)
Colla2_R	Cooperative supply chain partners	We have collaborative planning and decision-making practice with the supply chain partners.	Braunscheidel & Suresh (2009); Pettit et al. (2013)
Colla3_R	Collaborate operations	We invest in our suppliers' plant to collaborate operations.	Braunscheidel & Suresh (2009); Pettit et al. (2013)
Colla4_R	Sharing resources with suppliers	We have resource-sharing with our suppliers.	Cao & Zhang (2011)
Colla5_R	Communication with suppliers	We have good collaborative communication with our suppliers.	Cao & Zhang (2011)
Visibility			
Visi1_R	Share information with supply chain partners	We share information with supply chain partners.	Blackhurst et al. (2005); Braunscheidel & Suresh (2009); Jüttner & Maklan (2011); Pettit et al. (2013)
Visi2_R	Track information	We track information of different operations.	Blackhurst et al. (2005); Braunscheidel & Suresh (2009); Jüttner & Maklan (2011); Pettit et al. (2013)
Visi3_R	Gather information through business intelligence	We have business intelligence to gather information.	Blackhurst et al. (2005); Braunscheidel & Suresh (2009); Jüttner & Maklan (2011); Pettit et al. (2013)
Visi4_R	Real-time information	We have real-time flow of information throughout the supply chain.	Blackhurst et al. (2005); Braunscheidel & Suresh (2009); Jüttner & Maklan (2011); Pettit et al. (2013)

5.3.4 Communication

On the basis of the previous literature and with the help of the field study, internal communication and external communication were considered as measurements of the communication construct. Internal communication was measured by six items: integration of data between internal functions, real-time integration and connection between internal functions, communication and information-sharing between departments within the firm, communication and information-sharing within business processes, inventory management systems, and periodic inter-departmental meetings. External communication was measured by 12 items: customer feedback, relationship with suppliers, strategic partnership, improving inter-organisational processes with suppliers, association with suppliers over IT, sharing information with suppliers, customers' strategic partnership, improving inter-organisational processes, connection with customers through IT, sharing information with customers, sharing forecasting information with supply chain partners, and developing contingency plans to increase supply chain stability. Table 5.5 details the items for each construct.

Both the internal communication and external communication constructs were as developed primarily from the field study. The field study participants emphasised the need for internal communication and external communication for helping the supply chain system with any challenges and for improving the supply chain system. The items for these constructs, obtained from the field study, were also supported by the appropriate literature. The indicators of each of the antecedent dimensions of communication were operationalised in the reflective mode, which is aligned with the decision rules of Jarvis et al. (2003).

5.3.5 Food Retail Performance

Based on the previous literature and with support from the field study, food retail performance was measured by nine items: sales, profit margin, revenue growth, greater market share, customer satisfaction, customer retention, service quality, on-time delivery and degree of overall success. These items were adapted or borrowed from extant literature (see Table 5.6) and contextualised by the field study's findings.

Table 5.5: Measurement Items and Related Statements of Communication

Item	Dimension	Statement	Source
Internal communication			
InCo1_C	Integration of data	We have data integration among internal functions.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)
InCo2_C	Real-time integration	We have real-time integration and connection among all internal functions from shipping, warehousing and sales.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)
InCo3_C	Communication between departments	We have good communication and information flow with different departments in our firm (e.g., supply chain and other departments).	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)
InCo4_C	Communication within business processes	Our firm is better than competitors in connecting (e.g., communication and information-sharing) parties within a business process.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Wamba et al. (2017)
InCo5_C	Inventory management system	We have an integrated inventory management system.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Wamba et al. (2017)
InCo6_C	Periodic inter-departmental meetings	We apply the use of periodic inter-departmental meetings among internal functions.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Wamba et al. (2017)
External communication			
ExCo1_C	Customer feedback	We collect customer feedbacks for quality improvement.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)
ExCo2_C	Supplier relationships	We have long-term relationship with suppliers.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)

Item	Dimension	Statement	Source
ExCo3_C	Strategic partnerships	We have a strategic partnership with suppliers.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)
ExCo4_C	Improving suppliers' processes	We are working with suppliers to improve inter-organisational processes with suppliers.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)
ExCo5_C	Connection with suppliers	We have linkage with suppliers through information technology.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)
ExCo6_C	Share information with suppliers	We share information with suppliers.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)
ExCo7_C	Customer partnerships	We have a strategic partnership with customers.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)
ExCo8_C	Improve inter-organisational processes	We work with customers to improve inter-organisational processes with customers.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)
ExCo9_C	Connection with customers	We have linkage with customers through information technology.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)
ExCo10_C	Share information with customers	We share information with customers.	Chen & Paulraj (2004); Narasimhan & Kim (2002); Stank et al. (2005)
ExCo11_C	Sharing forecasting information with supply chain partners	Our business unit frequently shares forecasts, sales data and plans with our supply chain partners.	Li et al. (2017)
ExCo12_C	Increase supply chain stability	Our business unit develops contingency plan jointly with supply chain partners for increasing supply chain stability.	Li et al. (2017)

Table 5.6: Measurement Items and Related Statements of Food Retail Performance

Item	Dimension	Statement	Source
Food retail performance			
RePerf1	Sales	Over the last 3 years, our food retail performance in the sales has improved satisfactorily.	Bolat & Yılmaz (2009); Drew (1997); Gupta & Govindarajan (1984); Maltz et al. (2003); Miller & Friesen (1983)
RePerf2	Profit margin	Over the last 3 years, our food retail performance in the profit margin has improved satisfactorily.	Bolat & Yılmaz (2009); Drew (1997); Gupta & Govindarajan (1984); Maltz et al. (2003); Miller & Friesen (1983)
RePerf3	Revenue growth	Over the last 3 years, our food retail performance in the revenue growth has improved satisfactorily.	Bolat & Yılmaz (2009); Drew (1997); Gupta & Govindarajan (1984); Maltz et al. (2003); Miller & Friesen (1983)
RePerf4	Greater market share	Over the last 3 years, our food retail performance in the market share has improved satisfactorily.	Bolat & Yılmaz (2009); Drew (1997); Gupta & Govindarajan (1984); Maltz et al. (2003); Miller & Friesen (1983)
RePerf5	Customer satisfaction	Over the last 3 years, our food retail performance in the customer satisfaction has improved satisfactorily.	Bolat & Yılmaz (2009); Drew (1997); Gupta & Govindarajan (1984); Maltz et al. (2003); Miller & Friesen (1983)
RePerf6	Customer retention	Over the last 3 years, our food retail performance in the customer retention has improved satisfactorily.	Bolat & Yılmaz (2009); Drew (1997); Gupta & Govindarajan (1984); Maltz et al. (2003); Miller & Friesen (1983)
RePerf7	Service quality	Over the last 3 years, our food retail performance in the service quality has improved satisfactorily.	Bolat & Yılmaz (2009); Drew (1997); Gupta & Govindarajan (1984); Maltz et al. (2003); Miller & Friesen (1983)
RePerf8	On-time delivery	Over the last 3 years, our food retail performance in the on-time delivery has improved satisfactorily.	Bolat & Yılmaz (2009); Drew (1997); Gupta & Govindarajan (1984); Maltz et al. (2003); Miller & Friesen (1983)
RePerf9	Degree of overall success	Over the last 3 years, our food retail performance in the degree of overall success has improved satisfactorily.	Bolat & Yılmaz (2009); Drew (1997); Gupta & Govindarajan (1984); Maltz et al. (2003); Miller & Friesen (1983)

5.4 Survey Questionnaire

Quantitative data were collected via structured questionnaires to test the hypotheses of this study. The questionnaires represented the research objectives and hypotheses and were divided into two sections. Section A asked respondents for socio-demographic information over nine variables. Section B asked about the variables used in the study model. The data collected in Section B were used to evaluate the hypothetical relationships between the study model's components.

In developing Section B of the questionnaire, all theoretically supported and contextualised constructs were added. Similarly, based on existing literature and field study results, the questionnaire's questions for measuring each construct were developed and contextualised. The key phrases for each measurement item were derived from existing literature and the field study's findings. The measurement items were used in the questionnaire after they had been allocated to their appropriate constructs. In total, Section B contained 15 different constructs; three to 12 items were assigned under each of the constructs.

The initial questionnaire, as described in Section 3.6.2, was modified following pre-testing. The comments and recommendations from the pre-testing participants were taken into account while creating the final version of the questionnaire (see Appendix B). Curtin University's ethics authority approved the final questionnaire (ethics approval no. HRE2018-0437). After completing all of the requirements for developing the quantitative questionnaire for this study, the final version of the questionnaire was ready for data collection.

5.5 Summary

The hypotheses stated in this chapter were developed in accordance with the previously outlined research model. The existing literature and the field study findings assisted in the development and support of the hypotheses, respectively. In this study, 14 different hypotheses were formulated to determine the relationship between the constructs of the research model. Further detail on the measurement items for each of the constructs was given in this chapter. Finally, this chapter also outlined the process of creating the final questionnaire for the study.

Chapter 6: Quantitative Data Analysis and Findings

6.1 Introduction

The survey data analysis and findings are presented in this chapter. This chapter begins with an overview of the pilot study's data screening procedures: the treatment of incomplete responses and missing data, checking non-response bias and assessing the common method bias. Next, the dataset is refined for both socio-demographic and SEM analysis. This is followed by the analysis of the pilot study data, which revealed particular trends. The section on data analysis is divided into two parts: descriptive statistics for understanding the socio-demographic profile of the respondents and the SEM for examining the structural links between constructs. SmartPLS was used for the SEM (Wong, 2013). The PLS-based SEM analysis was divided into two parts: analysis of the measurement model and analysis of the structural model analysis. The structural model of SEM was used to test the hypotheses of the study model.

6.2 Pilot Study

The pilot study helped to minimise the ambiguity of the questionnaire and to ensure data applicability. In the pilot survey, the researcher used face-to-face interviews to collect data. The pilot survey was administered to 30 respondents from the study research area. The respondents were asked and encouraged to give comments on the complexity of the questionnaire. Some of the respondents identified and commented on the understanding of some of the questions' wordings. Other feedback related to the length of the questionnaire: some reported that it was quite long. However, this problem could not be resolved owing to the intricacy of the study model.

The whole survey was subsequently reviewed, and a few changes were made to the general structure and language. For example, for item JIT6_L, the phrasing of the question was unclear to some participants, so it was changed from 'For cost reductions, our supply chain department makes shared decisions' to 'Our supply chain department takes joint decisions for cost savings'. The participants' understanding of the question improved after it was reworded. To address the issue of bias, both negative and passive statements were developed (Rossi et al., 1983). However, the length of the questionnaire was not reduced; to overcome the issue of length, the respondents for the final survey were asked to allow extra time to participate.

6.2.1 Demographic Information

In addition to the structured questions, respondents in the pilot survey completed questions about nine demographic questions relating to their age, gender, level of education, annual income, occupation, type of firm (supply chain or logistics), whether the firm was local or overseas and the period of their current occupation.

The demographic data show that the majority of respondents were between the ages of 31 and 39 years. About 53% were male, and 46% were female, indicating that both were involved in the supply chain and logistics business. Regarding the level of education, 90% of the participants held a tertiary degree. Additionally, 40% of participants earned between US$45,000 and $55,000 a year, 30% earned less than $45,000 a year, and 30% earned more than $55,000 a year. Thus, it could be assumed that people who worked in supply chain and logistics firms had satisfactory incomes.

This study considered respondents' occupations as being either in supply chain–related or logistics-related businesses. The data show that the majority of respondents (63%) worked in the latter. Additionally, 60% of the respondents worked in a local firm, while the remainder worked with an overseas company (multi-national company). Additionally, most of the respondents (46%) worked in a medium-size firm. Furthermore, 73% of respondents had had their current occupation for more than 10 years.

Overall, the results from the analysis of demographic data show that many participants who worked in supply chain or logistics firms in Saudi Arabia had a good education background, earned a good annual income, were from the middle age group and had worked for the same firm for a long time (see Table 6.1).

Table 6.1: Demographic Profile of Pilot Study Participants

Demographic feature	*n*	%
Age (years)		
18–22	1	3.3
23–30	6	20.0
31–39	13	43.5
> 40	10	33.3
Gender		
Male	16	53.3
Female	14	46.7
Level of education		
Secondary	2	6.7

Demographic feature	*n*	%
Higher secondary	1	3.3
Tertiary	27	90.0
Annual income ($)		
< 45,000	9	30.0
45,000–55,000	12	40.0
> 55,000	9	30.0
Occupation		
Supply chain–related business	11	36.7
Logistics-related business	19	63.3
Type of firm		
Retailing	14	46.7
Logistics	16	53.3
Firm location		
Local	18	60.0
Overseas	12	40.0
Size of firm (number of employees)		
Huge (≥ 3000)	6	20.0
Large (500-2999)	9	30.0
Medium (50–499)	14	46.7
Small (10–49)	0	0
Very small (≤ 9)	1	3.3
Period of current occupation/business (years)		
< 5	0	0
6–10	8	26.7
> 10	22	73.3

Note. $N = 30$.

6.2.2 Descriptive Statistics of Pilot Survey Data

The pilot study performed an additional essential role by helping evaluate uncertainty in the questionnaire. Means, standard deviations and kurtosis were evaluated as descriptive statistics. The overall findings showed a high score and low standard deviations. Kurtosis values were less than 2 for each item and therefore appeared to be appropriate (also see Table 6.2.). As a result, it was expected that the data would give significant findings for future research.

Consequently, the researcher examined the questionnaire and made adjustments to the phrasing of questions, such as by changing active sentences to passive sentences and by changing positive terms

to negative terms, or vice versa, to counterbalance any bias (Arndt & Crane, 1975). For example, question TPM1_L was originally, 'We maintain our equipment regularly'. The researcher added further explanation to clarify the question: 'We maintain our equipment regularly (trucks, refrigerators and warehouse equipment)'.

Table 6.2: Descriptive Statistics of Pilot Study Data

Item code	*M*	*SD*	Item code	*M*	*SD*	Item code	*M*	*SD*
JIT1_L	3.9856	0.94443	Resp1_A	4.8452	0.69149	Visi1_R	4.1283	0.82606
JIT2_L	4.1258	0.74664	Resp2_A	4.7571	0.75266	Visi2_R	3.5680	0.72793
JIT3_L	4.2530	0.83045	Resp3_A	3.9632	0.70221	Visi3_R	3.4262	0.73946
JIT4_L	3.2153	0.88668	Resp4_A	4.2541	0.59142	Visi4_R	3.9832	0.73946
JIT5_L	3.9862	0.79148	Resp5_A	4.9531	0.65126	InCo1_C	2.4875	0.94772
JIT6_L	3.1025	0.72793	Resp6_A	4.7856	0.58329	InCo2_C	3.2014	0.76832
JIT7_L	4.8564	0.71438	Comp1_A	4.5601	0.58329	InCo3_C	3.5426	0.71116
TQM1_L	3.1257	0.86834	Comp2_A	4.9658	0.56695	InCo4_C	4.8753	0.86832
TQM2_L	4.9832	0.97321	Comp3_A	4.2563	0.76081	InCo5_C	4.9861	0.92083
TQM3_L	4.8564	0.71116	Comp4_A	4.9689	0.71231	InCo6_C	4.7564	0.89184
TQM4_L	4.0125	0.78329	Comp5_A	4.9521	0.67503	ExCo1_C	5.0142	0.73968
TQM5_L	3.7946	0.89149	Quik1_A	3.9648	0.74664	ExCo2_C	4.8701	0.83031
TQM6_L	3.3109	0.78221	Quik2_A	3.8947	0.78492	ExCo3_C	3.1024	0.71438
TQM7_L	4.3562	0.71197	Quik3_A	5.6321	0.54667	ExCo4_C	4.0123	0.86868
TQM8_L	4.1451	0.79148	Quik4_A	4.3658	0.63556	ExCo5_C	3.4270	0.73031
TQM9_L	3.2489	0.71841	Flex1_R	5.0021	0.55605	ExCo6_C	4.8023	0.99893
TQM10_L	3.0325	0.85501	Flex2_R	3.9514	0.52083	ExCo7_C	3.2154	1.00145
TPM1_L	4.2154	0.80872	Flex3_R	4.7485	0.71842	ExCo8_C	4.0454	0.97891
TPM2_L	4.8974	0.84690	Flex4_R	4.3263	0.85029	ExCo9_C	4.5123	0.86531
TPM3_L	4.8845	0.73968	Resp1_R	4.2354	0.74664	ExCo10_C	4.0425	1.00188
TPM4_L	4.1158	0.91287	Resp2_R	4.1245	0.63968	ExCo11_C	4.7843	0.96176
Flex1_A	5.0458	0.71197	Resp3_R	5.0548	0.69149	ExCo12_C	4.5237	0.73968
Flex2_A	4.9865	0.74664	Reco1_R	5.0325	0.69893	RePerf1	3.8546	0.93067
Flex3_A	4.8569	0.77608	Reco2_R	4.6458	0.73030	RePerf2	3.0197	0.98329
Flex4_A	5.0142	0.72793	Reco3_R	4.9775	0.65126	RePerf3	3.0124	0.87303
Flex5_A	4.2195	1.04664	Reco4_R	4.4124	0.73968	RePerf4	3.5447	0.81931
Flex6_A	3.9841	0.86037	Colla1_R	4.3658	0.75868	RePerf5	3.4570	0.73108
			Colla2_R	3.9015	0.86868	RePerf6	4.7895	0.93556
			Colla3_R	4.1295	0.86436	RePerf7	3.4783	0.81851
			Colla4_R	3.7845	0.79596	RePerf8	4.6548	0.94772
			Colla5_R	4.9682	0.92146	RePerf9	3.3147	0.80301

6.3 Administration of Survey Data

Face-to-face personal interviews using a structured questionnaire were used to collect the final dataset. The initial plan was to gather 350 responses from employees working in supply chain and logistics activities in the Saudi food retail industry. However, only 307 respondents could be reached; the data collection team could not contact more respondents due to time constraints and difficulty in finding appropriate respondents.

At the beginning of data collection, three final year undergraduate students and one postgraduate student were employed as research assistants to assist the researcher in this survey. The research assistants had qualifications in research methods. They were also trained in the data collection procedure by the researcher prior to distribution of the questionnaires. The team distributed questionnaires to 30 targeted respondents, with a turnaround time of 10 days. However, 13 of the 30 questionnaires were returned with mostly incomplete responses, which led the researcher to use face-to-face interviews instead. As a result of this, the data collection team were able to collect the 307 total responses (which excludes the pilot survey). There were 120 early responses and 176 late responses (see Table 6.3).

Table 6.3: Survey Response Rate

Respondents	***n***	**%**
Pilot study	30	8.57
Total target population	350	100
Total responses	307	87.71
Early responses	120	34.28
Late responses	176	50.28
Unusable samples	11	3.14
Total usable samples	296	84.57

6.3.1 Data Examination

Prior to performing PLS analysis, it was necessary to examine the qualities of the acquired data. Some issues were found in relation to missing values and outliers in the dataset. Before transferring the data from the questionnaires to statistical software, researchers must review each response (Neuman, 2000). Thus, the researcher reviewed all questionnaires for inappropriate responses or incompleteness and to verify the data's usefulness. Out of the 307 responses, the researcher found seven incomplete

responses and eliminated these questionnaires from the dataset. The researcher additionally reviewed the remaining data for missing values; 43 questionnaires were found with a total of 62 missing values, which were replaced with a value of –99 in the dataset (Wong, 2013; see Table 6.4). During the review process, the researcher also found four responses with outliers; these questionnaires were also deleted from the final dataset for better data quality. In the end, there were 296 viable responses.

Table 6.4: Identifying Missing Data

Item	Missing case #	Item	Missing case #	Item	Missing case #
Demo2	131, 152	Resp4_A	26	InCo4_C	258
Demo5	48, 79, 253	Resp6_A	44	InCo5_C	243, 285
Demo6	203, 222	Comp2_A	2, 18	ExCo3_C	79, 282
Demo7	101	Comp3_A	2	ExCo6_C	34, 256
JIT1_L	160	Comp4_A	2	ExCo7_C	189
JIT3_L	113	Comp5_A	2	ExCo9-C	20, 94
JIT4_L	54, 106, 260	Quik4_A	5, 139, 240	ExCo10_C	2, 97, 267, 276
JIT6_L	251	Resp1_R	209	ExCo11_C	282
JIT7_L	176	Resp2_R	209	RePerf1	83
TQM4_L	50	Resp3_R	209	RePerf4	186, 282
TQM5_L	54	Reco4_R	160, 243	RePerf5	2, 94
TQM7_L	140	Colla5_R	160	RePerf6	2
Flex4_A	284	Visi2_R	263	RePerf7	2
Resp2_A	29	Visi3_R	2		
Resp3_A	52	Visi4_R	2		

6.3.2 Sampling Errors and Non-response Bias

Non-response bias can affect the ability of the study; in fact, non-response bias is not rare. In this study, the researcher used the Mann–Whitney test to check for non-response bias between the two independent samples (Malhotra et al., 2004). In SPSS, data were divided into two groups: Group 1 was the early responses (n = 120), and Group 2 was the late responses (n = 176). The hypothesis was that, if there were no variations in important data between these two groups, then response bias was unlikely to exist in the data. The Mann–Whitney test values are summarised in Table 6.5.

The findings show that the z scores for all items were negligible. Hence, the alternative hypothesis was accepted, and the null hypothesis was rejected: there were no differences between the answers of the two groups. Consequently, there was no non-response bias in the dataset, and the dataset was suitable for further investigation.

Table 6.5: Addressing Non-response Bias—Mann–Whitney's *U* Test

Construct/items	*U*	*z* score	*p*	Decision
Leanness				
JIT1_L	10626.00	–0.19	0.85	Not significant
TQM1_L	9995.50	–1.13	0.26	Not significant
TPM1_L	9476.50	–1.90	0.06	Not significant
Agility				
Flex1_A	9742.50	–1.52	0.13	Not significant
Resp4_A	9694.50	–1.61	0.11	Not significant
Comp4_A	10067.50	–1.03	0.30	Not significant
Quik1_A	9853.50	–1.36	0.17	Not significant
Resilience				
Flex1_R	9987.00	–1.19	0.23	Not significant
Resp1_R	10468.00	–0.43	0.66	Not significant
Reco1_R	9813.00	–1.44	0.15	Not significant
Colla1_R	10571.50	–0.28	0.78	Not significant
Visi1_R	10618.50	–0.21	0.83	Not significant
Communication				
InCo1_C	10136.50	–0.98	0.33	Not significant
ExCo1_C	9654.00	–1.71	0.09	Not significant
Retail performance				
RePerf1	10475.00	–0.46	0.65	Not significant
Blue attitude				
BAtti1	10245.00	–0.71	0.48	Not significant

Note. Mann–Whitney's *U* test (two-tailed).

6.3.3 Common Method Variance

One of the limitations of survey data is the prevalence of common method bias, which poses a possible danger to the validity of survey findings (Podsakoff et al., 2003). Several efforts were taken in this investigation to reduce the risk of common method bias. Initially, information was acquired from respondents with relevant expertise in the topic. First, participants were supply chain or logistics managers or staff working with supply chain or logistics operations for an institution. Second, participants were assured that their responses would be kept private. Third, to eliminate ambiguity, the questions were designed to be basic and specific. Fourth, because this survey was conducted through face-to-face personal interviews, the data gathering team was able to provide any necessary explanation. Fifth, this survey did not include any double-barrelled questions, which might have

confused respondents. Finally, the order of the survey's independent and dependent variables was split (Podsakoff et al., 2003).

To test for common method variance, this study used a confirmatory factor analysis marker approach (Simmering et al., 2015). According to Richardson et al. (2009), the confirmatory factor analysis marker technique can also be used to describe spontaneous mistakes in marker and substantive structures. Hence, this study used 'Blue Attitude' as a marker variable and estimated its influence on retail performance. This marker variable was introduced by Lindell and Whitney (2001) as a way to capture common method variance. Their notion was that, if a variable that is measured in the same way as substantive study variables (e.g., on a Likert scale) is perceptual and is theoretically unrelated to the substantive variables in a study, then any relation between the marker and substantive variables could be reasonably determined to be method variance.

The results as shown in Table 6.6 suggested that there was no significant influence of blue attitude on the ultimate dependant variable, food retail performance ($\beta = 0.13$, $p = 0.24$). Therefore, it could be said that the study finding was free from common method bias.

Table 6.6 Marker Result

Relationship	β	*t*	*p*
BAtti → RePerf	0.13	1.18	0.24

6.3.4 The Socio-demographics of the Respondents

Table 6.7 shows the socio-demographic information of the research sample in terms of age, gender, level of education, annual income, occupation, type of firm, size of firm and period of current occupation. With respect to age, data were collected based on age groups: 18–22, 23–30, 31–39 and age of 40 years and over. Most of the respondents were over 22 years of age: 36.8% were aged 23–30 years, 31.0% were aged 31–39 years, and 21.6% were over 40 years of age. In terms of gender, 53% of respondents were male, and 46.28% were female, which is a good increase in the number of female workers in Saudi Arabia. The majority of the respondents (53.3%) had completed tertiary education, and 40.8% had a higher-secondary education. This indicates that people with a higher education are involved in supply chain and logistics work in Saudi Arabia.

With regard to annual income, 38.5% of respondents earned between US$45,000 and $55,000 yearly, and 38.8% earned above $55,000 a year. This indicates that supply chain and logistics work in Saudi Arabia provides sufficient income. Table 6.7 also shows that 54.9% of respondents worked in a supply chain–related business, and 44.6% worked in logistics-related business. In terms of the type

and size of firm the respondents work for, 55% of respondents worked in retailing firms, and 44% worked in logistics firms. The majority of respondents (60.5%) worked in a local firm, which indicates that most of the food retailing businesses in Saudi Arabia are local firms. Additionally, most of the respondents worked for huge (over 3000 employees), medium (50–499 employees) or large (over 500 employees) firms: 31.4%, 28.3% and 24.3%, respectively, the company size being categorised under Saudi Arabia ministry of commerce and investment. Finally, it was found that 67.2% of respondents had been working in the current occupation for more than 10 years.

Table 6.7: Demographic Profile from Survey Data

Demographic feature	*n*	%
Age (years)		
18–22	31	10.5
23–30	109	36.8
31–39	92	31.0
≥ 40	64	21.6
Gender		
Male	157	53.0
Female	137	46.28
Missing	2	0.7
Level of education		
Secondary	17	5.7
Higher secondary	121	40.8
Tertiary	158	53.3
Annual income ($)		
< 45,000	67	22.6
45,000–55,000	114	38.5
> 55,000	115	38.8
Occupation		
Supply chain–related business	161	54.9
Logistics-related business	132	44.6
Missing	3	1.0
Type of firm		
Retailing	163	55.0
Logistics	131	44.2
Missing	2	0.6
Firm location		
Local	179	60.5

Demographic feature	*n*	%
Overseas	116	39.1
Missing	1	0.3
Size of firm (number of employees)		
Huge (≥ 3000)	93	31.4
Large (500-2999)	72	24.3
Medium (50–499)	84	28.3
Small (10–49)	43	14.5
Very small (≤ 9)	4	1.3
Period of current occupation/business (years)		
< 5	0	0
6–10	97	32.8
> 10	199	67.2

Note. N = 296.

6.4 Partial Least Squares-Based Structural Equation Modelling

Following the socio-demographic analysis, data were analysed using SEM. PLS-based SEM was employed in this study (Gefen et al., 2000; Santosa et al., 2005). The analysis was divided into two stages: analysing the measurement model and assessing the structural model. The validity and reliability of the constructs were verified during the measurement model analyses prior to examining the relationships between constructs in the research model. After analysis of the measurement model was completed satisfactorily, the structural modelling phase of the study was carried out to check the links between the research model's constructs. The process is summarised in Table 6.8.

Table 6.8: Structural Equation Modelling Process

Stage	Analysis		Constructs
1	Assessment of measurement model	i. Item reliability	Reflective
		ii. Internal consistency reliability	Reflective
		iii. Discriminant validity	Reflective
2	Assessment of structural model	i. Amount of variance explained (R^2)	Reflective
		ii. Path coefficient (β)	Reflective
		iii. Statistical significance of *p* values	Reflective

6.4.1 Assessing the Measurement Model

The measurement model was assessed using all of the constructs and variables from the 'Supply Chain Food Retail Performance' model (see Figure 6.1). There were 15 measurement constructs in

this study model. As mentioned in Table 6.8, the reflective model was examined in terms of item reliability, internal consistency reliability and discriminant validity for both the item and construct levels. The sub-sections that follow detail the process of evaluating the measurement model: first the first-order measurement model, then the higher-order measurement model.

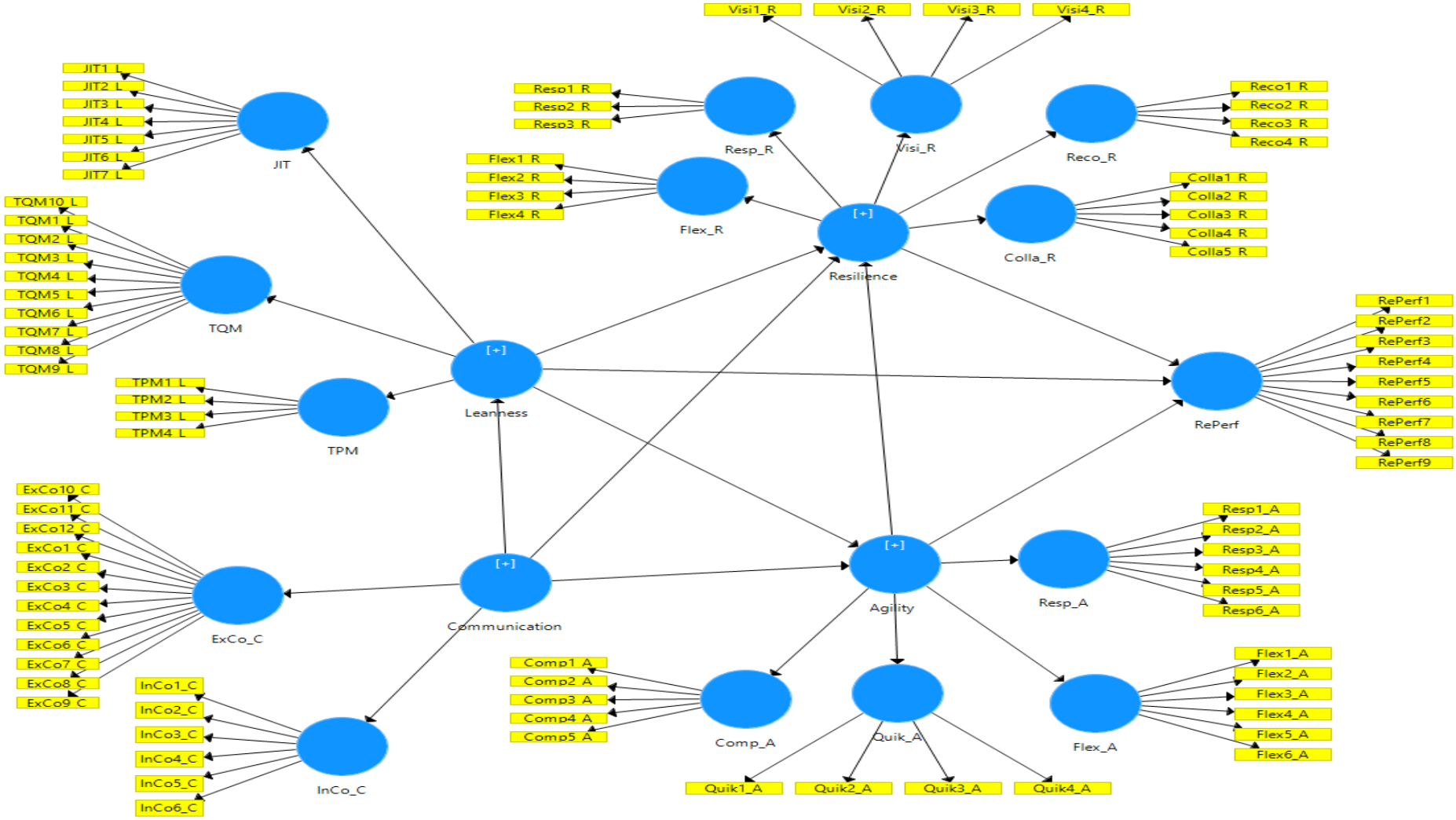

Figure 6.1: Complete Model

Note. JIT = just in time; TQM = total quality management; TPM = total preventive maintenance; ExCo_C =External communication; InCo_C =Internal communication.

6.4.1.1 First-Order Measurement Model

The research model comprised 15 first-order reflective constructs (see Figure 6.1). All of the model constructs and their measurement items were assessed by analysing item reliability, composite reliability and discriminant validity in line with previous studies (e.g., Hair et al., 2011, 2013; Ringle et al., 2012). The reflective measurement model is described in the following sections.

6.4.1.1.1 Item Reliability

The loading of an item on a construct determines that item's item reliability. Loading reflects how the measurement elements relate to their associated constructs. Items with high loadings on the construct for which they are indicators are items with good measurement qualities. Items with low loadings on a construct must therefore be identified and removed to ensure that operational measures are free of random error and that the construct is measured consistently (Fornell & Larcker, 1981). These loadings are presented in Table 6.9.

Researchers have proposed a few guidelines for determining the optimal value of item loading. A value of 0.40 has been considered an acceptable minimum loading by Igbaria et al. (1995). Hair et al. (2010) considered item loadings above 0.30, above 0.40 and above 0.50 to be significant, more significant and extremely significant, respectively. Barclay et al. (1995) set the lowest reliability level at 0.70; similarly, Hair et al. (2011) argued that item loadings should be more than 0.70. However, the majority of researchers have proposed that loadings be at least 0.6 but preferably at least 0.70 (Chin, 1998). Nevertheless, loadings of 0.40 are acceptable in exploratory research (Hair et al., 2013). Low-loading items are occasionally kept because of their contribution to content validity (Hair et al., 2011). For convergent validity, Li et al. (2010) employed item loading values of 0.60 or higher and significant *t* values as criteria.

This study set a minimum value of 0.60 for item loading to maximise the measurement model's ability to meet the requirements of convergent validity, based on recommendations from the literature and the exploratory nature of the study. Nine items (TPM3_L, Flex4_A, Reco4_R, ExCo1_C, ExCo10_C, ExCo12_C, RePerf1, RePerf3 and RePerf8) failed to meet this condition. After discarding these items, the PLS was run again. As a result of this technique, all of the remaining items had loading values greater than 0.60 and significant *t* values for their respective latent constructs (see Table 6.9). Thus, all of these reflective items had convergent validity. It should be noted that items with loadings less than 0.60 were not considered in the analysis.

6.4.1.1.2 Internal Consistency Reliability

The internal consistency of a structure is a measure of its reliability. This study used composite reliability to assess internal consistency reliability (Fornell & Larcker, 1981). A minimum value of 0.70 has been advised for composite reliability (Chin, 1998; Gefen et al., 2000; Hair et al., 2011). All constructions met this threshold for internal consistency, as shown in Table 6.9. TQM had the greatest internal consistency (composite reliability = 0.94), while response had the lowest (composite reliability = 0.83). The high internal consistency scores for all constructions demonstrate the constructs' reliability.

6.4.1.1.3 Average Variance Extracted (AVE)

Finally, convergent validity was tested by assessing AVE, which measures the amount of variation recorded by a set of items on a scale in relation to measurement error (Netemeyer et al., 2003, p. 153). AVEs for constructs have been advised to be at least 0.50, which means that the measurement items of a construct explain 50% or more of the variance in that construct (Chin, 1998; Fornell & Larcker, 1981; Hair et al., 2011). In Table 6.9, it can be seen that the AVE value of each construct surpassed this threshold, indicating convergent validity.

Overall, the measurement model satisfied all three of the essential criteria and was found to be valid in terms of convergence level. These data indicate clearly that all of the reflective items were of high quality and reliability.

Table 6.9: Assessment of Item Reliability

Construct/item	Loading	*t*	*CR*	*AVE*
Just in time			0.93	0.58
JIT1_L: Matches in documentation	0.80	25.57		
JIT2_L: On-time delivery	0.83	36.90		
JIT3_L: Right delivery place	0.84	40.07		
JIT4_L: Regular orders	0.85	40.41		
JIT5_L: Supplier selections	0.81	34.82		
JIT6_L: Decision cooperation	0.83	36.54		
JIT7_L: Reduce lead time	0.81	34.86		
Total quality management			0.94	0.64
TQM1_L: Customer complaints	0.78	29.84		
TQM2_L: Supplier rejection rate	0.80	35.40		
TQM3_L: Customer rejection rate	0.78	29.00		
TQM4_L: Meeting customer requirements	0.79	27.94		

Construct/item	Loading	*t*	*CR*	*AVE*
TQM5_L: Process integrity	0.78	32.17		
TQM6_L: Elimination of waste	0.79	29.27		
TQM7_L: Continuous improvement	074	22.06		
TQM8_L: Customer satisfaction	0.76	25.27		
TQM9_L: Performance feedback	0.80	30.15		
TQM10_L: Total system	0.83	39.51		
Total preventive maintenance			0.89	0.67
TPM1_L: Maintain equipment	0.84	41.37		
TPM2_L: Equipment records	0.81	35.26		
TPM4_L: Technology emphasis	0.83	35.72		
Flexibility			0.90	0.60
Flex1_A: Numerous suppliers	0.71	13.55		
Flex2_A: Sourcing flexibility	0.78	26.93		
Flex3_A: Quick response	0.79	32.67		
Flex5_A: Lead time	0.80	35.56		
Flex6_A: Adjust orders	0.80	28.09		
Responsiveness			0.91	0.63
Resp1_A: Suppliers' delivery time	0.83	33.93		
Resp2_A: Supplier relation management	0.84	37.22		
Resp3_A: Responsiveness to market changes	0.79	26.01		
Resp4_A: Delivery responsiveness	0.74	18.72		
Resp5_A: Anticipating changes	0.80	27.81		
Resp6_A: Recovery from change	0.78	25.84		
Competency			0.90	0.65
Comp1_A: Quality	0.82	30.34		
Comp2_A: Capabilities of human resources	0.83	31.84		
Comp3_A: Strategic vision	0.82	35.80		
Comp4_A: Technological ability	0.81	27.69		
Comp5_A: Skilled employees	0.75	23.45		
Quickness			0.85	0.59
Quik1_A: Quick in delivery and service	0.77	26.18		
Quik2_A: Fast operation time	0.78	28.16		
Quik3_A: Lead time	0.81	29.79		
Quik4_A: On-time delivery	0.71	18.24		
Flexibility			0.85	0.58
Flex1_R: Flexibility in production	0.75	23.20		
Flex2_R: Contract flexibility	0.76	22.72		

Construct/item	Loading	*t*	*CR*	*AVE*
Flex3_R: Flexibility in sourcing	0.76	24.18		
Flex4_R: Flexibility in distribution	0.79	29.93		
Response			0.83	0.64
Resp1_R: Response to disruptions	0.78	26.92		
Resp2_R: Responses to crisis	0.83	33.69		
Resp3_R: Crisis response team	0.79	33.66		
Recovery			0.84	0.57
Reco1_R: Fast recovery	0.79	34.11		
Reco2_R: Absorb losses	0.79	29.32		
Reco3_R: Handle crisis	0.73	22.96		
Collaboration			0.87	0.56
Colla1_R: Demand forecasting	0.77	24.72		
Colla2_R: Cooperative supply chain partners	0.75	20.42		
Colla3_R: Collaborate operations	0.72	18.06		
Colla4_R: Sharing resources with suppliers	0.77	21.42		
Colla5_R: Communication with suppliers	0.73	24.10		
Visibility			0.87	0.62
Visi1_R: Share information with supply chain partners	0.79	29.52		
Visi2_R: Track information	0.76	22.30		
Visi3_R: Gather information through business intelligence	0.81	29.43		
Visi4_R: Real-time information	0.78	2276		
Internal communication			0.88	0.55
InCo1_C: Integration of data	0.75	14.30		
InCo2_C: Real-time integration	0.76	15.73		
InCo3_C: Communication between departments	0.74	16.04		
InCo4_C: Communication within business processes	0.72	15.71		
InCo5_C: Inventory management system	0.75	18.30		
InCo6_C: Periodic inter-departmental meetings	0.74	16.08		
External communication			0.92	0.52
ExCo2_C: Supplier relationships	0.74	19.80		
ExCo3_C: Strategic partnerships	0.72	15.14		
ExCo4_C: Improving suppliers' processes	0.75	21.54		
ExCo5_C: Connection with suppliers	0.73	18.85		
ExCo6_C: Share information with suppliers	0.77	16.72		
ExCo7_C: Customer partnerships	0.73	15.86		
ExCo8_C: Improve inter-organisational processes	0.72	16.92		
ExCo9_C: Connection with customers	0.70	15.47		

Construct/item	Loading	*t*	*CR*	*AVE*
ExCo11_C: Sharing forecasting information with supply chain partners	0.70	14.54		
Food retail performance			0.89	0.57
RePerf2: Revenue growth	0.70	16.25		
RePerf4: Customer satisfaction	0.73	19.10		
RePerf5: Customer retention	0.71	15.94		
RePerf6: Service quality	0.72	17.87		
RePerf9: Degree of overall success	0.70	16.92		

Note. CR = composite reliability; AVE = average variance extracted.

6.4.1.1.4 Discriminant Validity

Discriminant validity measures the degree to which the constructs in a model vary from one another (Barclay et al., 1995). It prevents items representing one construct from conceptually overlapping with those representing another construct. Two analytical procedures were used to assess discriminant validity: AVE analysis at the construct level and cross-loading matrix evaluation at the item level (Barclay et al., 1995; Hair et al., 2011).

Discriminant Validity of the Constructs. To establish the discriminant validity of the constructs, the square root of the AVEs and the correlations among the constructs' AVEs should be greater than their correlation with other constructs in the model (Fornell & Larcker, 1981; Henseler et al., 2009). The correlations between the constructs and the AVEs were obtained from SmartPLS.

In this process, seven items (JIT_L, TPM_L, TQM_L, Flex_A, ExCo_C, InCo_C and RePerf) had problems and were selected for further evaluation. After deleting these items, PLS was run a second time. Table 6.10 shows the results of the re-examination of the correlations between the constructs and the AVEs. The table shows that the square roots of AVEs were greater than the correlations between the latent constructs and their associated row and column values. This shows that none of the constructs shared more variance with other constructs in the model than with their assigned indicators, indicating construct-level discriminant validity.

Discriminant Validity of the Measurement Items. In this study, the discriminant validity of the constructs and associated items was investigated. To examine discriminant validity at the item level, loading and cross-loading matrixes were generated using Smart PLS using all of the retained items. To demonstrate that they are distinct from one another, all measurement items in this matrix should load more strongly on their respective constructs than on other constructs (Lowry & Gaskin, 2014). During this procedure, two items (TQM7_L and TQM8_L) had problematic cross-loadings and were

eliminated. The matrix was then generated, and the results of this are shown in Table 6.11. The table demonstrates that all remaining items had a higher load on their respective constructs than on other constructs in the model. This indicates discriminant validity for all of the reflective constructs in the model, indicates their uniqueness and independence and indicates that there was no issue with discriminant validity.

Table 6.10: Inter-correlations of the First-Order Constructs and Square Roots of Average Variance Extracted

Fornell–Larcker criterion	Colla_R	Comp_A	ExCo_C	Flex_A	Flex_R	InCo_C	JIT_L	Quik_A	RePerf	Reco_R	Resp_A	Resp_R	TPM_L	TQM_L	Visi_R
Colla_R	**0.749**														
Comp_A	0.625	**0.829**													
ExCo_C	0.660	0.474	**0.761**												
Flex_A	0.486	0.680	0.398	**0.871**											
Flex_R	0.704	0.646	0.587	0.566	**0.792**										
InCo_C	0.712	0.539	0.705	0.407	0.655	**0.813**									
JIT_L	0.506	0.653	0.471	0.616	0.520	0.439	**0.857**								
Quik_A	0.590	0.736	0.501	0.628	0.657	0.528	0.585	**0.852**							
RePerf	0.622	0.437	0.694	0.368	0.516	0.643	0.434	0.421	**0.753**						
Reco_R	0.648	0.540	0.486	0.507	0.698	0.556	0.403	0.486	0.505	**0.881**					
Resp_A	0.540	0.742	0.472	0.709	0.598	0.480	0.651	0.698	0.424	0.478	**0.885**				
Resp_R	0.662	0.685	0.591	0.597	0.714	0.644	0.572	0.639	0.524	0.631	0.621	**0.799**			
TPM_L	0.574	0.683	0.507	0.692	0.603	0.461	0.699	0.648	0.468	0.554	0.732	0.656	**0.891**		
TQM_L	0.501	0.627	0.483	0.653	0.553	0.452	0.796	0.585	0.439	0.433	0.655	0.579	0.705	**0.867**	
Visi_R	0.724	0.535	0.704	0.442	0.611	0.712	0.421	0.526	0.671	0.578	0.467	0.567	0.452	0.468	**0.824**

Table 6.11: Cross-Loadings Matrix

	Colla_R	Comp_A	ExCo_C	Flex_A	Flex_R	InCo_C	JIT_L	Quik_A	RePerf	Reco_R	Resp_A	Resp_R	TPM_L	TQM_L	Visi_R
Colla1_R	0.77	0.50	0.50	0.41	0.57	0.58	0.41	0.48	0.47	0.66	0.41	0.55	0.49	0.43	0.60
Colla2_R	0.75	0.50	0.56	0.42	0.56	0.59	0.37	0.48	0.51	0.54	0.44	0.53	0.46	0.39	0.58
Colla3_R	0.72	0.43	0.46	0.40	0.47	0.47	0.38	0.45	0.42	0.48	0.34	0.42	0.44	0.39	0.50
Colla4_R	0.77	0.44	0.58	0.38	0.53	0.60	0.39	0.50	0.56	0.50	0.41	0.46	0.42	0.39	0.56
Colla5_R	0.73	0.50	0.47	0.44	0.53	0.51	0.43	0.58	0.51	0.55	0.49	0.48	0.49	0.47	0.54
Comp1_A	0.53	0.82	0.41	0.66	0.59	0.46	0.56	0.62	0.40	0.56	0.68	0.60	0.65	0.61	0.49
Comp2_A	0.55	0.83	0.46	0.62	0.59	0.50	0.57	0.64	0.39	0.54	0.66	0.58	0.62	0.56	0.44
Comp3_A	0.50	0.82	0.42	0.63	0.55	0.44	0.53	0.66	0.34	0.51	0.65	0.54	0.59	0.57	0.45
Comp4_A	0.49	0.81	0.38	0.61	0.53	0.47	0.51	0.66	0.34	0.50	0.62	0.54	0.57	0.56	0.41
ExCo2_C	0.48	0.36	0.74	0.37	0.44	0.60	0.38	0.43	0.57	0.47	0.38	0.46	0.41	0.42	0.59
ExCo4_C	0.48	0.40	0.75	0.43	0.45	0.61	0.38	0.43	0.53	0.46	0.39	0.48	0.45	0.42	0.58
ExCo6_C	0.53	0.40	0.77	0.35	0.47	0.62	0.36	0.46	0.62	0.43	0.35	0.44	0.39	0.36	0.60
ExCo7_C	0.46	0.34	0.73	0.33	0.41	0.57	0.37	0.41	0.54	0.38	0.32	0.42	0.39	0.38	0.49
ExCo8_C	0.54	0.38	0.72	0.38	0.49	0.62	0.40	0.50	0.54	0.48	0.41	0.47	0.43	0.43	0.53
ExCo9_C	0.53	0.36	0.70	0.36	0.42	0.62	0.41	0.41	0.55	0.44	0.35	0.42	0.39	0.41	0.55
Flex2_A	0.51	0.63	0.46	0.78	0.58	0.44	0.57	0.61	0.44	0.54	0.59	0.57	0.66	0.64	0.42
Flex3_A	0.46	0.60	0.39	0.79	0.52	0.38	0.54	0.57	0.39	0.52	0.57	0.54	0.62	0.61	0.39
Flex5_A	0.40	0.59	0.37	0.80	0.54	0.36	0.56	0.62	0.34	0.49	0.67	0.50	0.62	0.64	0.39
Flex1_R	0.55	0.50	0.49	0.48	0.75	0.53	0.42	0.56	0.44	0.61	0.47	0.62	0.47	0.44	0.50
Flex2_R	0.59	0.52	0.51	0.50	0.76	0.58	0.41	0.59	0.51	0.61	0.50	0.55	0.47	0.48	0.55
Flex3_R	0.51	0.54	0.45	0.54	0.76	0.49	0.45	0.58	0.44	0.50	0.52	0.56	0.53	0.50	0.47
Flex4_R	0.53	0.53	0.43	0.58	0.79	0.44	0.48	0.55	0.44	0.55	0.52	0.59	0.55	0.50	0.48
InCo1_C	0.58	0.42	0.63	0.38	0.58	0.75	0.36	0.47	0.58	0.56	0.41	0.50	0.40	0.38	0.65
InCo2_C	0.60	0.48	0.65	0.43	0.54	0.76	0.38	0.48	0.57	0.53	0.44	0.56	0.45	0.44	0.59
InCo3_C	0.55	0.42	0.61	0.37	0.49	0.74	0.37	0.43	0.55	0.47	0.41	0.51	0.40	0.39	0.58
JIT3_L	0.40	0.53	0.37	0.54	0.46	0.37	0.84	0.55	0.37	0.42	0.56	0.50	0.63	0.65	0.33

	Colla_R	Comp_A	ExCo_C	Flex_A	Flex_R	InCo_C	JIT_L	Quik_A	RePerf	Reco_R	Resp_A	Resp_R	TPM_L	TQM_L	Visi_R
JIT4_L	0.45	0.54	0.43	0.54	0.48	0.42	0.85	0.51	0.42	0.42	0.57	0.45	0.62	0.67	0.38
JIT5_L	0.41	0.58	0.38	0.60	0.43	0.40	0.81	0.55	0.35	0.43	0.60	0.46	0.61	0.70	0.35
JIT6_L	0.47	0.60	0.47	0.62	0.52	0.46	0.83	0.57	0.43	0.49	0.62	0.55	0.65	0.73	0.39
Quik1_A	0.54	0.66	0.49	0.57	0.59	0.48	0.52	0.77	0.42	0.52	0.63	0.56	0.56	0.58	0.51
Quik2_A	0.51	0.58	0.51	0.59	0.57	0.49	0.53	0.78	0.44	0.54	0.62	0.55	0.57	0.53	0.49
Quik3_A	0.47	0.62	0.40	0.60	0.59	0.46	0.53	0.81	0.41	0.48	0.65	0.52	0.60	0.56	0.42
Quik4_A	0.54	0.58	0.44	0.55	0.55	0.46	0.49	0.71	0.42	0.53	0.58	0.52	0.60	0.52	0.47
RePerf2	0.41	0.31	0.55	0.34	0.40	0.54	0.33	0.39	0.70	0.40	0.36	0.40	0.35	0.35	0.52
RePerf4	0.45	0.39	0.54	0.30	0.38	0.53	0.30	0.35	0.65	0.37	0.38	0.39	0.31	0.35	0.56
RePerf5	0.45	0.34	0.55	0.33	0.39	0.48	0.35	0.36	0.73	0.39	0.34	0.41	0.40	0.38	0.50
RePerf6	0.50	0.35	0.53	0.36	0.40	0.47	0.34	0.35	0.71	0.43	0.32	0.40	0.38	0.34	0.52
Reco1_R	0.58	0.50	0.46	0.49	0.62	0.51	0.38	0.52	0.43	0.79	0.46	0.61	0.51	0.43	0.51
Reco2_R	0.56	0.45	0.45	0.48	0.58	0.49	0.36	0.46	0.47	0.79	0.42	0.50	0.49	0.43	0.55
Reco3_R	0.53	0.47	0.48	0.49	0.53	0.48	0.47	0.51	0.47	0.73	0.44	0.53	0.49	0.51	0.53
Resp1_A	0.42	0.64	0.38	0.67	0.54	0.42	0.59	0.64	0.40	0.49	0.83	0.54	0.66	0.65	0.38
Resp2_A	0.46	0.66	0.42	0.69	0.57	0.44	0.61	0.67	0.36	0.53	0.84	0.56	0.67	0.65	0.41
Resp3_A	0.43	0.61	0.39	0.60	0.50	0.45	0.53	0.64	0.34	0.44	0.79	0.51	0.61	0.61	0.39
Resp4_A	0.42	0.58	0.36	0.54	0.46	0.41	0.52	0.60	0.36	0.41	0.74	0.49	0.58	0.58	0.34
Resp5_A	0.50	0.67	0.47	0.66	0.54	0.50	0.60	0.66	0.48	0.48	0.80	0.54	0.64	0.64	0.44
Resp6_A	0.44	0.65	0.38	0.62	0.52	0.42	0.57	0.62	0.42	0.44	0.78	0.50	0.60	0.59	0.45
Resp1_R	0.46	0.60	0.41	0.52	0.55	0.47	0.49	0.53	0.46	0.56	0.57	0.78	0.53	0.51	0.44
Resp2_R	0.53	0.53	0.53	0.51	0.61	0.56	0.44	0.56	0.46	0.54	0.49	0.83	0.50	0.45	0.50
Resp3_R	0.58	0.55	0.53	0.60	0.66	0.59	0.49	0.59	0.49	0.63	0.53	0.79	0.60	0.55	0.50
TPM1_L	0.48	0.64	0.44	0.71	0.56	0.42	0.69	0.65	0.46	0.58	0.70	0.59	0.84	0.77	0.40
TPM2_L	0.54	0.61	0.50	0.69	0.58	0.46	0.63	0.62	0.46	0.53	0.65	0.57	0.81	0.70	0.43
TPM4_L	0.51	0.63	0.42	0.68	0.54	0.46	0.60	0.62	0.44	0.54	0.66	0.57	0.83	0.68	0.40
TQM1_L	0.44	0.58	0.44	0.64	0.53	0.44	0.71	0.56	0.41	0.48	0.60	0.53	0.65	0.79	0.42

	Colla_R	Comp_A	ExCo_C	Flex_A	Flex_R	InCo_C	JIT_L	Quik_A	RePerf	Reco_R	Resp_A	Resp_R	TPM_L	TQM_L	Visi_R
TQM2_L	0.45	0.55	0.46	0.63	0.49	0.42	0.73	0.57	0.42	0.47	0.61	0.51	0.66	0.80	0.43
TQM3_L	0.41	0.54	0.41	0.63	0.45	0.38	0.72	0.52	0.40	0.46	0.60	0.46	0.65	0.78	0.40
TQM6_L	0.45	0.59	0.46	0.64	0.52	0.46	0.63	0.56	0.36	0.51	0.65	0.48	0.69	0.79	0.43
Visi1_R	0.64	0.47	0.59	0.41	0.52	0.62	0.37	0.50	0.57	0.61	0.41	0.53	0.42	0.43	0.79
Visi2_R	0.55	0.39	0.58	0.38	0.51	0.58	0.31	0.46	0.54	0.53	0.37	0.48	0.37	0.40	0.76
Visi3_R	0.57	0.43	0.64	0.38	0.52	0.63	0.35	0.49	0.56	0.53	0.40	0.41	0.37	0.39	0.81
Visi4_R	0.57	0.45	0.60	0.40	0.50	0.60	0.38	0.45	0.57	0.51	0.40	0.45	0.40	0.39	0.78

6.4.1.2 Higher-Order Reflective Measurement Model

At this level, the study evaluated the measurement properties of the higher-order reflective constructs: leanness, agility, resilience and communication. As described in Chapter 3, the reflective constructs' measuring properties were tested in terms of reliability, internal consistency and AVE, as shown in Table 6.12. The hierarchical linkages of food retail performance with leanness, resilience and agility are shown in Figure 6.2. Conceptual studies and the field study's findings validate these constructs as hierarchical reflective constructs, as demonstrated in the explanation of the measurement constructs in Chapter 5.

Hierarchical constructs contain several dimensions, each of which represents a subset of the principal higher-order latent variable (Edwards, 2001; MacKenzie et al., 2005; Netemeyer et al., 2003; Petter et al., 2007; Wetzels et al., 2009). The essential qualities of these constructs, in theory, comprise more than one different conceptual component or dimension, and deleting any one of them would change the construct's conceptual scope (MacKenzie et al., 2011). Hierarchical construct modelling is thought to improve theoretical parsimony while lowering model complexity (Becker et al., 2012; Edwards, 2001; Law et al., 1998; MacKenzie et al., 2005). Empirical validation of the model's reliability, construct validity and nomological validity of higher-order latent constructs supports the conceptual grounding for such modelling (Becker et al., 2012; Wetzels et al., 2009).

As described in Chapter 3, this study estimated higher-order structures for a reason: in the absence of first-order constructs, a more parsimonious model can be generated using second-order analysis (Becker et al., 2012). PLS-SEM was used to calculate construct scores for latent variables contained in a path model. These latent variable scores for lower-order constructs can be obtained and then employed in the second stage of analysis as indicators for higher-order constructs (Becker et al., 2012; Wetzels et al., 2009). Thus, a two-stage approach was used to estimate second-order construct scores using observed variables that measured first-order constructs (Becker et al., 2012; Ringle et al., 2012; Wetzels et al., 2009).

Leanness, agility and resilience were assessed using the first-order constructs linked to second-order constructs. The latent variable scores of each first-order construct were retained and then used as reflective indicators for the respective second-order constructs, resulting in a measurement model that was found to be accurate. In the second stage of analysis, the second-order construct of leanness comprised three first-order constructs: JIT_L, TQM_L and TPM_L.

Agility had four first-order constructs: Comp_A, Flex_A, Quik_A and Resp_A. Resilience had five first-order constructs: Colla_R, Flex_R, Reco_R, Resp_R and Visi_R. Finally, communication had two first-order constructs: InCo_C and ExCo_C.

Analysis showed that the loadings of the first-order latent variables on the second-order constructs were all greater than 0.80 (see Table 6.12). All of these loadings were proven to be substantial. Additionally, the analysis confirmed that the second-order model's composite reliability and AVE values were all either equal to or greater than 0.80 and 0.50, respectively. In general, these findings demonstrate the reliability and validity of the higher-order measurements (see Table 6.12).

Table 6.12: Assessment **of the Higher-Order Measurement Model**

Construct					
Higher-order	**First-order**	**Loading**	***t***	***CR***	***AVE***
Leanness				0.937	0.832
	JIT_L	0.907	63.36		
	TQM_L	0.928	82.07		
	TPM_L	0.902	65.59		
Agility				0.932	0.774
	Comp_A	0.901	51.14		
	Flex_A	0.852	34.29		
	Quik_A	0.871	42.09		
	Resp_A	0.895	49.68		
Resilience				0.930	0.725
	Colla_R	0.884	47.38		
	Flex_R	0.879	38.53		
	Reco_R	0.822	29.53		
	Resp_R	0.844	37.47		
	Visi_R	0.827	33.17		
Communication				0.933	0.872
	ExCo_C	0.933	55.84		
	InCo_C	0.938	73.36		

Note. CR = composite reliability; AVE = average variance extracted

The connections between the latent variables in the second-order measurement model and the square roots of their AVEs are shown in Table 6.13. This shows that the square roots of AVE

values are greater than the correlations between each latent construct and its associated row and column values, demonstrating the construct-level discriminant validity of the second-order measurement model. As illustrated in Table 6.12, the second-order constructs of leanness, agility, resilience and communication all have strong connections to their first-order constructions. JIT_L, for example, is strongly linked with leanness (loading = 0.907, t = 63.36); the other items can be read similarly.

Table: 6.13: Inter-correlations of the Second-Order Constructs and Square Roots of Average Variance Extracted

Construct	Agility	Communication	Leanness	Resilience
Agility	0.881			
Communication	0.578	0.935		
Leanness	0.809	0.551	0.912	
Resilience	0.751	0.798	0.671	0.852

Note. Square root of the average variance extracted on the diagonal.

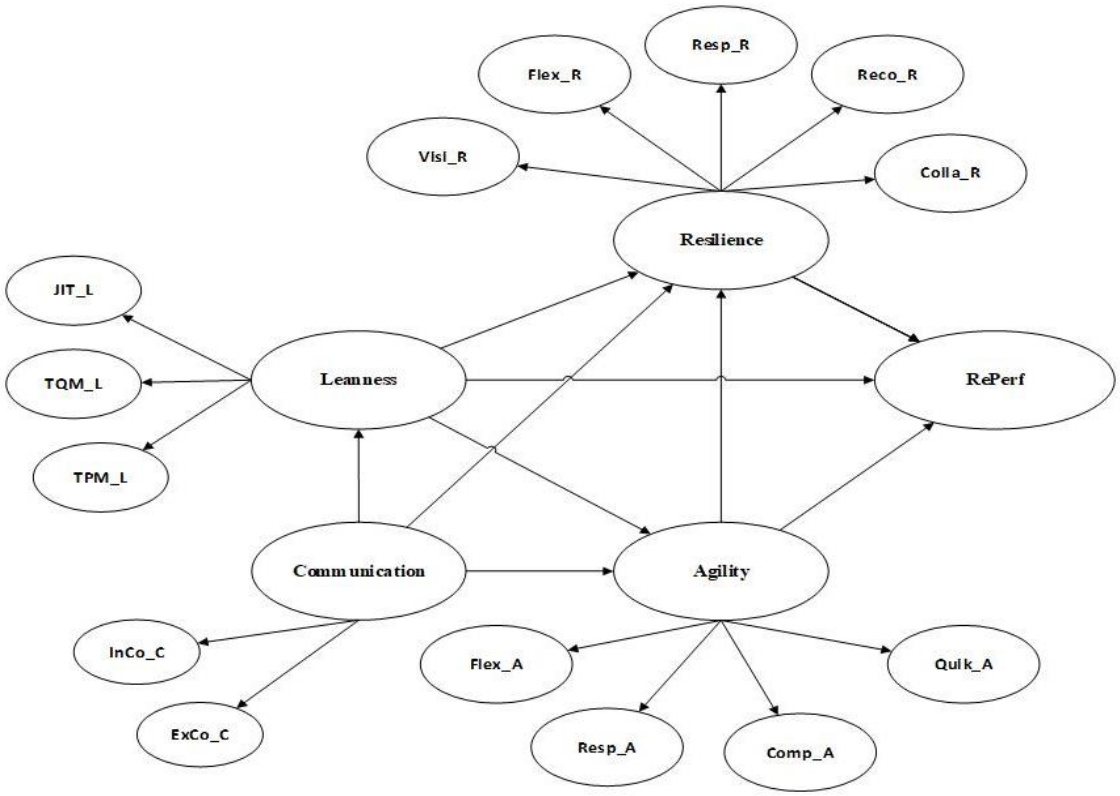

Figure 6.2: Higher-Order Structural Model

According to the results shown in Tables 6.9–6.13, the assessment of the measurement model offered appropriate experimental evidence for reliability, consistency and validity. The structural model was then evaluated using PLS analysis; the evaluation is described in the following section.

6.4.2 Assessing the Structural Model

This study then progressed to the structural model to examine the correlations between the constructs after analysing the measurement model and refining the measurement items. The structural model analysis included a calculation of the path loadings' statistical significance and the path coefficients (Hair et al., 2011, 2013; Lowry & Gaskin, 2014). This was done to evaluate the model's predictive capabilities as well as the relationships between the variables as predicted by the research model's hypotheses. The amount of variance explained and statistical significance were analysed using three criteria: the path coefficients, β; the statistical significance of *t* values; and the amount of variance explained, R^2 (Hair et al., 2013; Santosa et al., 2005; Hair et al., 2011). The structural model was checked for collinearity before it was examined (Hair et al., 2013). Power analysis ($1 - \beta$; Cohen, 1988) and the calculation of predictive relevance (Q^2; Hair et al., 2011) were also performed. To acquire all of this information, a bootstrapping process—that is, the non-parametric approach (Chin, 1998)—was used.

6.4.3 Path Coefficient (β) Values and *t* Statistics

To evaluate the hypothesised correlations among the constructs, path coefficient betas and *t* values were individually calculated using PLS-SEM and bootstrapping processes (Hair et al., 2011, 2013; Ringle et al., 2012). A *t* value greater than 1.65 was regarded as significant at $p < 0.05$, a *t* value greater than 1.96 was considered significant at $p < 0.025$, and a *t* value greater than 2.32 was considered significant at $p < 0.01$. Figures 6.3 and 6.4 provide the *t* values and path coefficients of the correlations between constructs. In the evaluation of the path coefficients, PLS bootstrapping was performed with 5,000 sub-samples, as indicated by Hair et al. (2011). Table 6.14 summarises the path coefficient betas and *t* values relating to the structural relation hypotheses examined in this research.

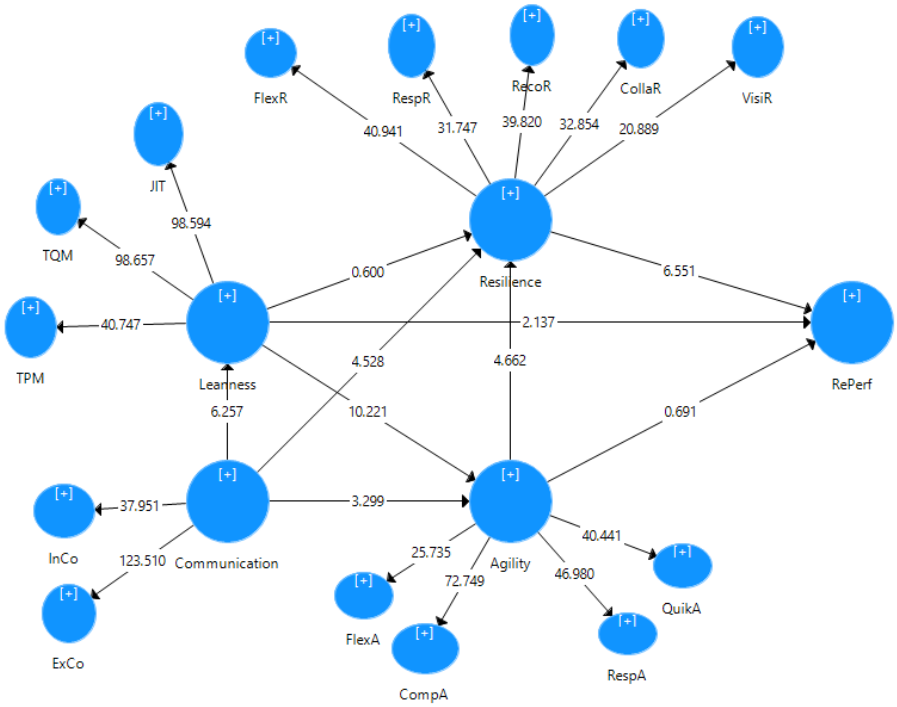

Figure 6.3: *t* Values from Partial Least Squares Bootstrapping

Note. JIT = just in time; TQM = total quality management; TPM = total preventive maintenance.

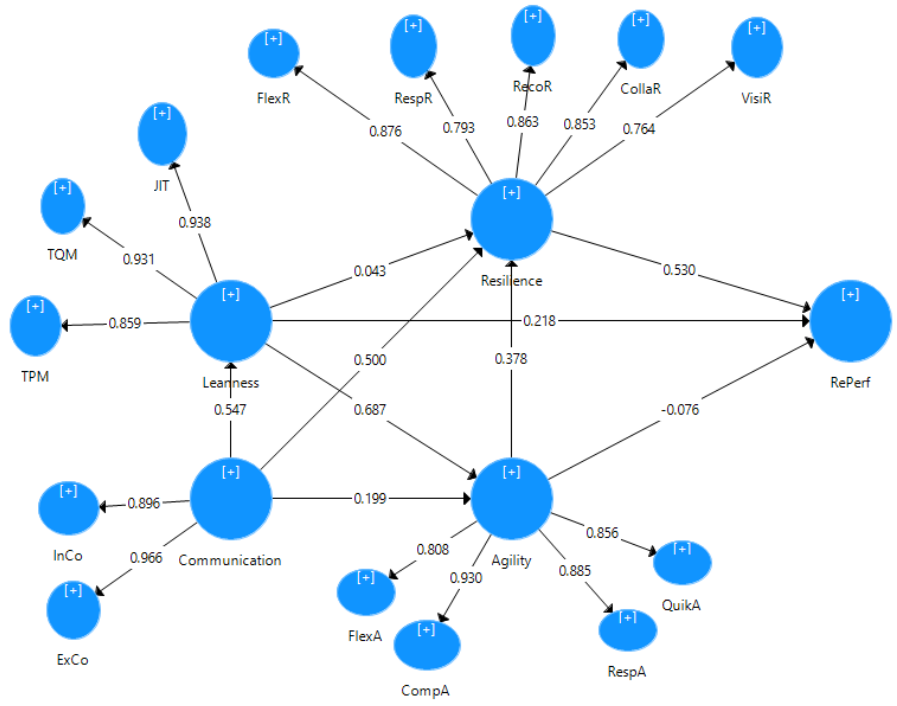

Figure 6.4: Path Coefficient Values from the Partial Least Squares Algorithm

Note. JIT = just in time; TQM = total quality management; TPM = total preventive maintenance.

Table 6.14: Path Coefficient β Values and *t* Values

Hypothesis	Path relationship	β	*t*	Decision
H1	Leanness → RePerf	0.213	2.137**	Supported
H2	Agility → RePerf	–0.076	0.691	Not Supported
H3	Resilience → RePerf	0.530	6.551***	Supported
H4	Leanness → Resilience	0.043	0.600	Not Supported
H5	Leanness → Agility	0.687	10.221***	Supported
H6	Communication → Lean	0.547	6.257***	Supported
H7	Communication → Agility	0.199	3.299***	Supported
H8	Communication → Resilience	0.500	4.528***	Supported
H9	Agility → Resilience	0.378	4.662***	Supported

Note. RePerf = food retail performance. Significant *$p < 0.05$, **$p < 0.01$, ***$p < 0.005$ and critical values are 1.645 at p=.05; 1.96 at p=0.025; and 2.32 at p=0.01.

Hypotheses H1, H2 and H3 each refer to the relationship between leanness, agility and resilience, respectively, and food retail performance. Hypothesis H3 predicted that an increase in the level of resilience in the supply chain system would lead to an increase in the level of food retail performance. This hypothesis was supported with a path coefficient of 0.530 and *t* value 6.551. Hypothesis H1 predicted that there would be a significant influence of leanness on food retail performance. This was supported with a path coefficient of 0.213 and a *t* value of 2.137. Agility was not found to be a significant factor affecting food retail performance ($\beta = -0.076$, $t = 0.691$); however; when all other variables are removed, H2 becomes highly significant.

Hypothesis H5 predicted that an increase in the level of leanness in the supply chain system would lead to an increase in the level of agility in the supply chain system. This hypothesis was supported: there was a significant influence of leanness on agility, with the highest path coefficient of 0.687 and the highest *t* value of 10.221 in the overall model.

Hypotheses H6, H7 and H8 each refer to the impact of communication on leanness, agility and resilience, respectively. Hypothesis H6, which predicted an effect of communication on leanness in the supply chain system, was substantially supported with a path coefficient of 0.547 and a *t* value of 6.257. Hypothesis H8 predicted the impact of communication on resilience; this was also strongly supported, with a path coefficient of 0.500 and a *t* value of 4.528.

Finally, Hypothesis H9 predicted a positive relationship between agility and resilience. This hypothesis was supported; the standardised path coefficient was 0.378, and the *t* value was 4.662. These results are further discussed in Chapter 7.

6.4.3.1 Coefficient of Determination (R^2)

In PLS analysis, the variance explained is an important criterion for model assessment (Barclay, 1991). The R^2 value for each endogenous component is determined to measure a model's explanatory power (Santosa et al., 2005). This value is close to the variance of endogenous constructs. The R^2 is understood in the same manner as in conventional regression models (Jackson, 2008). Falk and Miller (1992) calculated the minimum cut-off value for R^2 to be 0.10. According to Hair et al. (2011), R^2 values of 0.75, 0.50 and 0.25 for the endogenous latent variables in the structural model are substantial, moderate and weak, respectively. As shown in Table 6.15, the predicted integrative model accounted for 46.3% of food retail performance, the model's ultimate dependent construct; 68% of agility; 30.2% of leanness; and 76.3% of resilience. All of the R^2 values suggest that the endogenous constructs have substantial or at least significant explanatory power (Hair et al., 2011). They also support the nomological validity of endogenous constructs in regards to external constructions. Therefore, there is evidence that the structural model is suitable because it explains a major percentage of the variation in the endogenous constructs.

6.4.3.2 Predictive Relevance (Q^2)

In this study, Q^2 was calculated to determine the predictive relevance of the PLS model; the size of R^2 was also calculated as a criterion of predictive accuracy (Chin, 2010; Geisser, 1975; Hair et al., 2013; Stone, 1974). This approach reveals how effectively a model and its parameter estimations can reproduce observed values (Chin, 1998). This study obtained a cross-validated redundancy Q^2 of 0.518 for agility, 0.249 for leanness, 0.532 for resilience and 0.242 for food retail performance using the blindfolding procedure with an omission distance of 7 (Hair et al., 2011; see Table 6.15). All of the endogenous components in the model had Q^2 values greater than 0, indicating a highly predictive model (Chin, 2010).

Table 6.15: R^2 and Q^2 Values

Endogenous construct	R^2	Q^2
Agility	0.680	0.518
Leanness	0.302	0.249
Resilience	0.763	0.532
Food retail performance	0.463	0.242

6.4.4 Mediation Analysis

The study's mediation hypotheses were examined using a statistical technique proposed by Judd and Kenny (1981) and Baron and Kenny (1986). They claimed that if the following conditions are met, a particular variable can operate as a mediator:

- The predictor variable is related to the outcome variable in a significant way.
- The predictor variable is related to the mediating variable in a substantial way.
- The mediating variable is related to the criterion variable in a substantial way.
- When the mediating variable is controlled, the link between the predictor variable and the independent variable is no longer significant if full mediation occurs but is still significant if partial mediation occurs.

The results of these analyses are discussed in the following sub-sections.

6.4.4.1 Assessing the Mediating Role of Resilience

To verify whether resilience mediates the relationship between agility and food retail performance, tests were conducted on two different PLS models, and the results were compared (see Table 6.16). The first model, without a mediating variable and shown in Figure 6.5, shows the direct effects of agility on food retail performance. The model of the hypothesised mediated effect—showing the predictor, criteria and mediator variables and measurements of their direct and indirect effects—is shown in Figure 6.6. This analysis verified the following criteria for mediation as proposed by Baron and Kenny (1986): A significant relationship exists between agility and food retail performance ($\beta = 0.468$, $t = 5.850$). A non-significant relationship exists between agility and food retail performance with resilience mediating the indirect relationship ($\beta = 0.127$, $t = 1.267$). Since these conditions were met, it was assumed that resilience fully mediates the relationship between agility and food retail performance.

Two PLS models were also tested to verify whether resilience mediates the relationship between leanness and food retail performance, and the results of testing are shown in Table 6.16. Figure 6.7 shows the direct effect of leanness on food retail performance (β = 0.483, *t* = 5.894): that is, without the mediating variable (resilience). Figure 6.8 shows the same relationship but with resilience as a mediating variable (β = 0.206, *t* = 2.165). These models suggest that resilience partially mediates the relationship between leanness and food retail performance.

6.4.4.2 Assessing the Mediating Role of Agility

This study additionally evaluated and verified whether agility mediates the association between leanness and food retail performance using two PLS models. The results of their comparison are shown in Table 6.16. The first model assessed the direct effects of leanness on food retail performance (see Figure 6.7). The model of the hypothesised mediated effect—showing the predictor, criteria and mediator variables and measurements of their direct and indirect effects—is shown in Figure 6.9. As shown in these figures, this study adequately verified the following criteria for mediation as proposed by Baron and Kenny (1986): A significant relationship exists between leanness and food retail performance (β = 0.483, *t* = 5.894). A significant relationship exists between leanness and food retail performance with agility as a mediating variable (β = 0.301, *t* = 3.063). Since these conditions were met, it was assumed that agility partially mediates the relationship between leanness and food retail performance.

Two PLS models were also tested to verify whether agility mediates the relationship between leanness and resilience, and the results of testing are shown in Tables 6.16. Figure 6.10 shows the direct effects of leanness on resilience (β = 0.610, *t* = 9.348); that is, without the mediating variable (agility). Figure 6.11 shows the same relationship but with agility as the mediating variable (β = 0.164, *t* = 2.300). These models suggest that agility partially mediates the relationship between leanness and resilience.

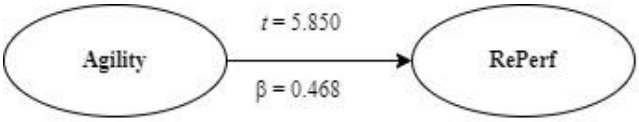

Figure 6.5: Model with Direct Effect of Agility on RePerf

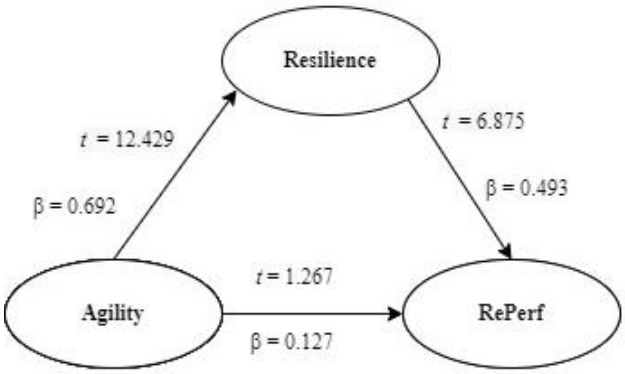

Figure 6.6: Model with Mediated Effect of Resilience between Agility and RePerf

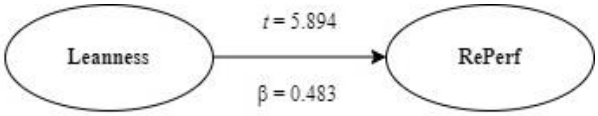

Figure 6.7: Model with Direct Effect of Leanness of RePerf

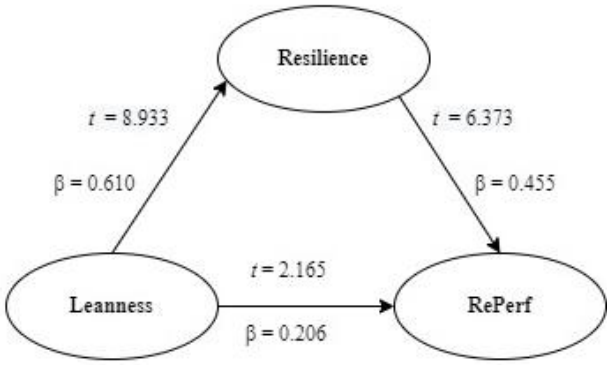

Figure 6.8: Model with Mediated Effect of Resilience between Leanness and RePerf

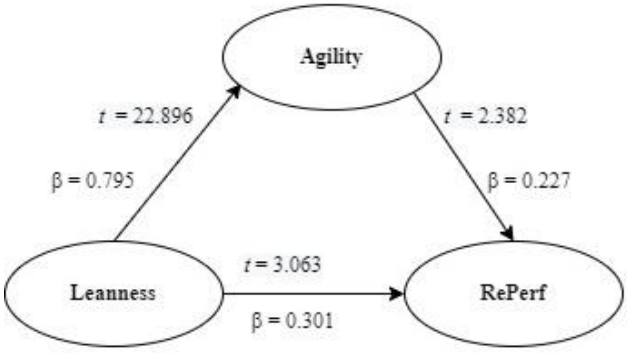

Figure 6.9: Model with Mediated Effect of Agility between Leanness and RePerf

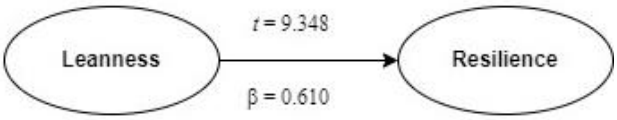

Figure 6.10: Model with Direct Effect of Leanness and Resilience

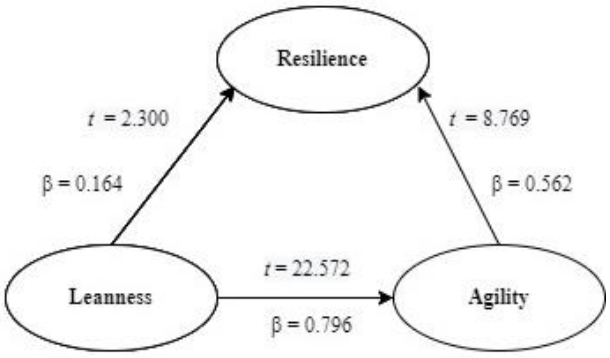

Figure 6.11: Model with Mediated Effect of Agility between Leanness and Resilience

Table 6.16: Results of Mediation Analysis

Hypothesis	Path coefficients, effect		Mediation effect	Decision
	Direct	Indirect		
H10: Resilience mediates Agility → RePref	β = 0.468, *t* = 5.850	β = 0.127, *t* = 1.267	Fully	Supported
H11: Resilience mediates Leanness → RePref	β = 0.483, *t* = 5.894	β = 0.206, *t* = 2.165	Partial	Supported
H12: Agility mediates Leanness → RePref	β = 0.483, *t* = 5.894	β = 0.301, *t* = 3.063	Partial	Supported
H13: Agility mediates Leanness → Resilience	β = 0.610, *t* = 9.348	β = 0.164, *t* = 2.300	Partial	Supported

6.4.5 Moderation Analysis

After analysing the mediation relationships, this study examined the moderation model. In this analysis, PLS was used (Ramayah et al., 2018) to estimate the moderating effect of resilience on the relationship between leanness and food retail performance and the moderating effect of resilience on the relationship between agility and food retail performance. Table 6.17 shows that resilience does not have a significant moderating effect on the relationship between leanness and food retail performance (β = –0.049, *t* = 0.69) or on the relationship between agility and food retail performance (β = –0.088, *t* = 1.32).

Table 6.17: Results of Moderation Analysis

Hypothesis	Moderation	β	*t*	Decision
H14: Leanness → RePref	Resilience	–0.049	0.69	Not Supported
H15: Agility → RePref	Resilience	–0.088	1.32	Not Supported

6.5 Statistical Power Analysis

This study also conducted a power analysis using G*Power software (version 3.1.9.2). The power analysis shown in Figure 6.12 explains the sample size determination. With reference to the figure, this study required a sample size of 270 participants. In fact, this study considered 296 samples, which meant that the overall power of the model was 82.5% with a *t* value of 1.65, $p = 0.1$. Thus, this study had greater statistical power than was required for the sample size—greater than 80%, as suggested by Cohen (1988)—to confirm the hypothesised relationships of the model.

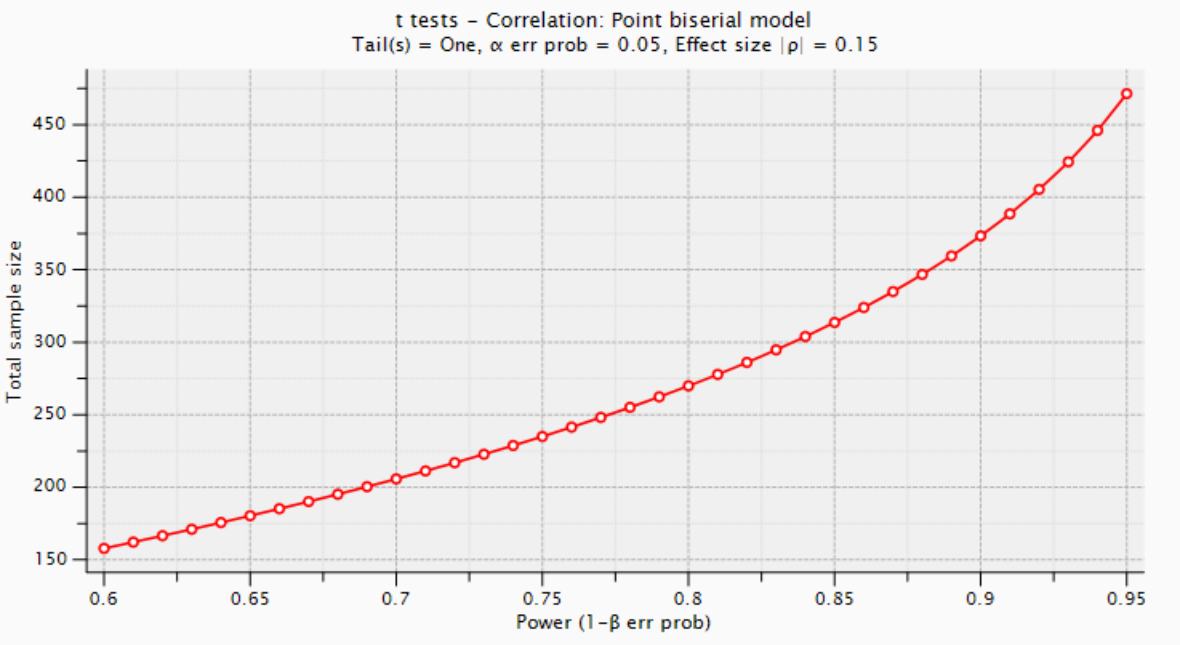

Figure 6.12: Statistical Power of the Research Model

6.6 Summary

This chapter discussed the quantitative data, comprising three sections: the pilot study data analysis, the socio-demographic data analysis and the SEM analysis of the data related to the research model's constructs.

The results of the pilot study showed a trend of data that assisted the researcher in effectively managing data quality and helped in developing the survey instrument for the study. The findings from the analysis of socio-demographic data helped to generate an understanding of the socio-demographic profile of the respondents and their involvement in the food supply chain. Finally, the SEM results provided evidence regarding the relationships among the constructs of the research model.

This chapter also covered the assessment of data validity and reliability in the SEM analysis. As a result of the data treatment, some of the items in the measuring model were removed. After the measurement model was confirmed, the analysis moved to the evaluation of structural relationships. Seven of the nine hypotheses were found to be significant and were therefore supported.

This chapter also explicated the examination of mediation effects. The results of the analysis showed that resilience is a full mediator in the relationship between the agility construct and the food retail performance construct. It also showed that agility can positively and significantly mediate the relationship between leanness and food retail performance.

Moderation effects were also assessed. The results of the analysis showed that the moderating role of resilience in the relationship between leanness and food retail performance is non-significantly. There was also no evidence for a moderating effect of resilience in the relationship between agility and food retail performance.

This chapter ended with a statistical power analysis of the research model. The result of the power analysis showed that, by having 296 completed cases in the sample, this study has genuine power for assessing the hypothesised relationships.

Chapter 7: Discussion of the Findings

7.1 Introduction

This chapter discusses the findings of this study by examining the quantitative and qualitative data analysis in the practical context of this study and discusses their implications. The results are first discussed in relation to the research hypotheses, findings from earlier research, empirical evidence and the practical circumstances of the phenomenon. The chapter then discusses the mediation and moderation analyses used to assess indirect impacts in some of the hypothesised relationships. To conclude the chapter, the results of this research are discussed in more depth in light of the study's objectives.

7.2 Findings in Light of the Hypotheses

7.2.1 The Relationships Associated with Food Retail Performance

7.2.1.1 Hypothesis H1: Relationship between Leanness and Food Retail Performance

This study investigated the influence of leanness on food retail performance. Qualitative and quantitative studies were conducted to empirically establish the link between leanness and food retail performance. The quantitative findings demonstrated a favourable and significant correlation between a lean supply chain and food retail performance. There was a statistically significant finding regarding the direct positive impact of leanness in the supply chain on food retail performance ($\beta = 0.213$, $t = 2.137$). This finding supports Hypothesis H1, providing strong empirical evidence for the influence of leanness in the supply chain on food retail performance. This hypothesis is also supported by findings from existing studies (e.g., Azevedo et al., 2010; Chavez et al., 2012; Eroglu & Hofer, 2011). This has therefore demonstrated that various aspects of leanness directly improve firm performance. The findings also support the findings of Hofer et al. (2012), who have shown that leanness has a direct impact on firm performance.

The findings of the field study in the context of this industry indicate that implementing a good, lean system in the supply chain will result in improved food retail performance. Thirteen of the 15 participants in the in-depth interviews reported the role of leanness in positively impacting food retail performance.

The findings also support the contention in the literature that the leanness capabilities JIT, TQM and TPM are required for improving firm performance, and that implementing them will aid in continuous improvement and the elimination of all forms of waste, including processes or activities that do not add value and cause organisations to waste time, resources and money (Narasimhan et al., 2006). According to the findings from the current study, leanness in supply chains is an important factor in the food retail supply chain industry. Since a lean supply chain is an important factor for improving the retail food performance, a firm's supply chain department needs to implement leanness in the supply chain system to have better food retail performance outcomes.

7.2.1.2 Hypothesis H2: Supply Chain Agility and Food Retail Performance

The results of this study reject the hypothesis about a positive relationship between an agile supply chain and food retail performance because their coefficient of association was negative ($\beta = -0.076$, $t = 0.691$). This finding can be interpreted to mean that agile supply chains do not directly affect food retail performance. This corroborates Yang (2014), who did not find a significant direct effect of agility on performance but reported a significant mediating effect of cost-efficiency between agility in the manufacturer's supply chain and performance. Thus, Hypothesis H2 is not supported, but agility significantly affects firm performance when all other variables are taken from the model. In fact, resilience removes all of the significant impact of agility on performance when it is included in the model, and this is consistent with Brooks and Goldstein (2003), who, in their book, mentioned the power of resilience. Existing research (e.g., Al Kharasheh, 2019; Azevedo et al., 2010; Carvalho et al., 2012; Hallgren & Olhager, 2009; Lee, 2004; Narasimhan et al., 2006) supports the view that agility in the supply chain system will have a positive impact on the food retail performance.

For example, in the event of a disruption, agility would be valuable in reducing the likelihood and impact of risk. Agility could also help the company's overall performance, especially during sales seasons, because the company may face turbulence during these times if the supply chain is not agile, which will have a negative impact on the company's performance. After all, the supply chain team needs to be very responsive to market changes to be competitive. However, the findings from the current study's qualitative phase are consistent with the literature. Nine of the 15 interview participants mentioned the importance of agility for good performance in the retail food business and in the supply chain system. The participants highlighted that a supply chain cannot maximise its performance without implementing agility

in the supply chain system, which helps the business to recover quickly from any market crises. Long-term survival and short-term competitive advantage can both be achieved by increasing efficiency and profitability, which are, in turn, beneficial for the company's performance.

7.2.1.3 Hypothesis H3: Supply Chain Resilience and Food Retail Performance

This study investigated the influence of supply chain resilience on food retail performance. To empirically establish the relationship between resilience and food retail performance, both qualitative and quantitative studies were carried out. The quantitative part of this study demonstrated a positive and substantial relationship between supply chain resilience and food retail performance. The findings show that resilience has a statistically significant impact on food retail performance ($\beta = 0.530$, $t = 6.551$). This finding supports Hypothesis H3 and provides strong empirical evidence for the influence of supply chain resilience on food retail performance. This result is also supported by the findings of existing studies (e.g., Azevedo et al., 2010; Carvalho et al., 2012; Carvalho & Machado, 2009; Ponomarov & Holcomb, 2009; Sheffi & Rice, 2005; Sodhi & Tang, 2012). This finding can be interpreted to mean that a supply chain system that emphasises empowering resilience capability would be able to mitigate any disruptions to the system, such as poor quality, supply issues, logistical issues and so on (Blos et al., 2009; Pettit et al., 2013). Thus, resilient supply chains would be able to achieve high levels of performance in terms of fulfilling planned lead times, maintaining quality standards, and recovering from system shocks.

The field study findings support the hypothesis regarding the influence of supply chain resilience on food retail performance. The food retail supply chain has been observed to be vulnerable to operational disruptions, such as those in farm labour, processing, transportation and updated regulations. Food will not be available to people if supply chains are not resilient against unexpected disruptions, nor can product quality and on-time delivery be maintained in accordance with expectations.

According to the field study, implementing a good resilience system in the supply chain will result in improved food retail performance. For example, 86.6% of the interview participants agreed that resilience had a positive impact on food retail performance. A resilient supply chain is an important factor in the food retail supply chain industry. Since supply chain resilience is an important factor in improving retail food performance, a firm's supply chain department needs to implement resilience in the supply chain system to have better outcomes for food retail

performance. Therefore, it can be inferred from the field study and survey that supply chain resilience is required to achieve better firm performance.

7.2.2 The Relationships Associated with Leanness

This research examined the relationships between leanness and both agility and supply chain resilience with respect to Hypotheses H4 and H5. The outcomes of this hypothesis testing are discussed below.

7.2.2.1 Hypothesis H4: Supply Chain Leanness and Supply Chain Resilience

The study investigated the influence of a supply chain's leanness on its resilience. To empirically establish the link between leanness and resilience, both qualitative and quantitative studies were performed. The findings from the quantitative study were that non-significant statistical support exists for the influence of leanness on supply chain resilience ($\beta = 0.043$, $t = 0.600$). This finding means that Hypothesis H4 is not supported: that is, leanness does not directly affect resilience. This is not consistent with the results of similar studies. For example, Trabucco and De Giovanni (2021) empirically demonstrated that firms' ability and probability of being resilient do not depend on internal quality, which is unaffected by external shocks. Instead, they suggested that firms aiming for resilience should not focus on internal ability to recover from shocks. The lack of a significant relationship between leanness and resilience may be attributed to their neutral effect on the supply chain system: whereas leanness is important in normal system activity, resilience benefits the system during times of turbulence.

Other existing literature supports the argument that leanness should be incorporated into the supply chain to positively affect supply chain resilience (Birkie, 2016; Ruiz-Benítez et al., 2018; Martínez-Jurado & Moyano-Fuentes, 2014). Lotfi and Saghiri (2018), for example, argued that a higher level of leanness would lead to greater resilience in the supply chain system. According to this study, supply chain leanness is an antecedent of supply chain resilience. Furthermore, Mohammaddust et al. (2017) investigated the benefits of integrating lean and resilient practices in a supply chain with a forward-flow logistic, and their findings confirmed the importance of incorporating lean and resilient practices in SCM. Therefore, lean and resilient approaches can be complementary. The field study results, in the context of food retail, support these findings by also revealing that implementing a good, lean system in the supply chain will lead to more resilience in the firm supply chain. Twelve of the 15 interview participants supported the idea that leanness positively affects supply chain resilience.

According to the current field study and literature review, supply chain leanness is an important antecedent of supply chain resilience in the retail food industry. These results suggest that, to recover more quickly from shocks, a firm's supply chain department should implement leanness in the supply chain system to achieve resilience. Thus, it can be inferred from the field study that leanness and resilience are required to improve firm performance.

7.2.2.2 Hypothesis H5: Supply Chain Leanness and Supply Chain Agility

The study investigated the influence of supply chain leanness on supply chain agility. Qualitative and quantitative studies were conducted to empirically establish the link between leanness and agility. Consequently, this study quantitatively demonstrated a positive and significant correlation between the leanness and agility of a supply chain. The results revealed a highly statistically significant finding of a direct positive impact of supply chain leanness on supply chain agility ($\beta = 0.687$, $t = 10.221$). This finding provides substantial evidence for Hypothesis H5 and is also supported by prior research (e.g., Christopher & Towill, 2000; Narasimhan et al., 2006; Vinodh et al., 2009). The findings from the hypothesis testing actually validate the theoretical assumption, as stated in the literature, that leanness leads directly to better supply chain agility (e.g., Van Hoek et al., 2001; Yusuf et al., 2004, 2014).

It is said that the agility of a supply chain cannot be increased on its own but rather accomplished via the interplay of lean systems (Yusuf et al., 2004). The present study addresses this gap by demonstrating a strong relationship between leanness and agility. Based on the literature review, this study hypothesised that leanness capability would have a positive effect on agility capability because agility can be an externally driven concept or objective that shows a firm's capability to adjust or react rapidly and effectively to changes in market demands in partnership with its external supply chain members (Braunscheidel & Suresh, 2009). The field study findings support the quantitative finding of an influence of supply chain leanness on supply chain agility. According to the field study, implementing a good, lean system in the supply chain will result in a more agile supply chain. Nine of the 15 interview participants reported that leanness had a positive impact on supply chain agility.

According to the findings of the current study, supply chain leanness is an important antecedent of supply chain agility in the retail food industry. Firms should implement leanness in the supply chain system to promote agility because leanness is an important factor in the agility of supply chains to recover faster from unexpected customers and market-changing behaviours.

7.2.3 The Relationships Associated with Communication

This study investigated the relationships between communication and various supply chain constructs: leanness, agility and resilience. The relationships among the constructs were examined by testing Hypotheses H6, H7 and H8, which meets the second research objective. The outcomes of the hypotheses tests are explained further below.

7.2.3.1 Hypothesis H6: Communication and Leanness in Supply Chains

A relationship between communication and leanness was found in the qualitative field study. Regarding the findings from this phase, the researcher was interested in assessing the genuineness of this relationship and, hence, Hypothesis H6 was designed for the subsequent quantitative investigation. The results of the quantitative study revealed a statistically significant relationship between communication and leanness ($\beta = 0.547$, $t = 6.257$). Thus, Hypothesis H6 is supported. This result is in line with previous studies (e.g., Campos & Vazquez-Brust, 2016; Handhal, 2020; So, 2010; So & Sun, 2010). The findings of this study empirically support the notion that effective internal and external communication leads to improved supply chain quality through leanness, as suggested in the literature.

This result is well supported by the literature (e.g., So, 2010; Campos & Vazquez-Brust, 2016; So & Sun, 2010), in which it is argued that communication within the supply chain department, as well as with major suppliers and customers, assists in timely delivery, quality and keeping the overall supply chain process more efficient. Several field study participants indicated that their organisations had enhanced the quality of interactions with their key customers and key suppliers through a good communication channel, and this positive communication was a significant factor in the leanness function.

This thesis contributes to the existing literature by advancing the idea that communication improves a firm's supply chain department. The reason for this is that, when a firm's supply chain department implements good communication, the supply chain system's leanness improves, which also improves the firm's performance. The results of the field study corroborate this viewpoint. This hypothesis was created as a result of analysing field study data, in which 26.6% of interview participants mentioned that communication improves the leanness of the supply chain system, resulting in improving retail food performance.

7.2.3.2 Hypothesis H7: Communication and Agility in the Supply Chain

The relationship between communication and agility was also further illuminated in the field study. The researcher was interested by the findings of the field study in determining the validity of this relationship, and, because of this, Hypothesis H7 was developed for quantitative analysis. The analysis of quantitative data revealed that the association between communication and agility was statistically non-significant. The findings suggest a negative relationship path from communication to agility ($\beta = 0.199$, $t = 3.299$). Communication and agility appear to be linked in a significant way, and thus, Hypothesis H5 is supported. This finding confirms the results of Gligor and Holcomb (2012), who explored the relationship between communication and supply chain agility and stated that communication had been empirically revealed as an antecedent of improved supply chain agility and positively associated with operational and relational performance. The literature (e.g., Dehgani & Jafari Navimipour, 2019; García-Alcaraz et al., 2017; M. Kim & Chai, 2017) also supports the view that good internal and external communication systems will encourage agility by enabling more flexibility and responsiveness to market changes. This result is consistent with earlier empirical studies, which have demonstrated that higher levels of communication within the supply chain department and with the primary suppliers and customers lead to increased agility and ability to adapt to any changes in the consumers' needs. For a number of field survey participants, their companies enhanced their relationships with significant customers and key suppliers by maintaining open lines of communication, and this positive communication played a large role in acting quickly in response to any demand changes.

Moreover, the findings of the present study's qualitative phase are consistent with the literature. Four interview participants mentioned the importance of communication in the supply chain system for good agility. The participants highlighted that the supply chain could not be agile without implementing a good communication system.

7.2.3.3 Hypothesis H8: Communication and Supply Chain Resilience

The association between communication and resilience was also identified in the field study. In light of the findings from the field study, the researcher wanted to examine the validity of this relationship; hence, Hypothesis H8 was developed for quantitative assessment. The quantitative data analysis revealed a statistically significant relationship between communication and resilience. The findings pointed to a positive and strong link between

communication and resilience (β = 0.500, *t* = 4.528), which supports Hypothesis H8. The findings are consistent with existing research (e.g., Chowdhury & Quaddus, 2015; Elzarka, 2013; Rajesh & Ravi 2015; Scholten & Schilder, 2015; Soni et al., 2014; Stecke & Kumar, 2009). The findings from the hypothesis testing also align with the findings of Rendon et al. (2021), who revealed strong favourable relationships between the installation of external communication with the main suppliers and key customers. The findings are also similar to those from Ta et al. (2009), who revealed that effective communication was necessary for the adoption of resilience. In terms of Hypothesis H8, the findings basically emphasise that firms with good internal and external communication will be more likely to adopt resilience and overcome unforeseen events.

Additionally, the field study results support the notion of communication being significant in ensuring the success of resilient supply chains in Saudi Arabia's food retail industry. As these organisations operate in a dynamic business climate, they need to ensure a robust supply chain system. This finding emphasises the necessity of a good communication system—both internally and externally—to a firm's ability to survive in dynamic market conditions and minimise financial damage for the firm and its suppliers. This study adds to the existing literature by suggesting that communication will improve a firm's supply chain. The argument is that, when the supply chain department communicates well, the supply chain system's resilience improves, allowing it to adapt rapidly to market turbulence, which has a positive effect on the firm's performance. In the field study, 20% of interviewees believed that better communication would increase supply chain resilience and boost food retail performance.

7.2.3.4 Hypothesis H9: Supply Chain Agility and Supply Chain Resilience

In this research, the correlation coefficient between supply chain agility and resilience was positive (β = 0.378, *t* = 4.662), supporting the hypothesis of a positive association between these two supply chain characteristics, Hypothesis H9. This finding implies that supply chain agility has a direct influence on supply chain resilience. The literature (e.g., Carvalho et al., 2011, 2012; Christopher & Peck, 2004; Lenort & Wicher, 2012; Lotfi & Saghiri, 2018; Ponomarov & Holcomb, 2009; Towill, 2005) also generally supports the view that agility in the supply chain system will have a positive impact on supply chain resilience. The results of the study are not consistent with Carvalho et al. (2012), who presented agility and resilience as independent elements. However, the results are consistent with other studies, such as that by Christopher and Peck (2004), who argued that many organisations are at risk because their

response time to changes in demand or disruptions in supply is too long. Because agility is the ability to respond quickly to unpredictable changes in demand or supply, the more agile an organisation is, the shorter the response time to changes; thus, the organisation is more resilient. Christopher and Peck (2004) presented a framework for resilience and identified agility as one of four variables that contributes to resilience. Furthermore, according to Pettit et al. (2010), to overcome vulnerabilities, supply chains should develop attributes such as flexibility to ensure long-term survival. Panomarov and Holcomb (2009) also mentioned agility as a formative component of resilience.

Moreover, the qualitative results of the present study are consistent with the literature: 60% of the interview participants referred to the importance of agility for good resilience in the supply chain system. Participants highlighted that a supply chain could not be resilient without implementing agility in the supply chain system to help to recover quickly from any market crises. For example, agility would be valuable in the case of interruptions for reducing both the risk of interruptions and the impact of that risk. There is sufficient data to draw a conclusion that implementing agility positively influences resilience.

7.2.4 Hypotheses Related to Mediation Effects

7.2.4.1 Impact of Mediation Variables (Hypotheses H10–H13)

Based on the qualitative and quantitative findings, this study established direct relationships between leanness and food retail performance, between agility and food retail performance and between resilience and food retail performance. In addition, the study outcomes led to the exploration of the indirect relationships between leanness and food retail performance, between agility and food retail performance and between leanness and resilience; Hypotheses H10–H13 were developed accordingly. Serial mediation analysis was used to test these hypotheses (Hamby et al., 2015).

7.2.4.2 Hypothesis H10: Mediation Effect of Resilience between Agility and Food Retail Performance

The current study argued that resilience has a mediating effect on the impact of agility on food retail performance (Hypothesis H10). According to the results of analysis, agility has a significant direct effect on food retail performance ($\beta = 0.468$, $t = 5.850$) but a non-significant indirect effect when resilience is added in the model as a mediator ($\beta = 0.127$, $t = 1.267$) via

the addition of resilience in the model as a mediator (see Figure 6.6). As the relationship between agility and food retail performance was non-significant and indirect, this may confirm that resilience can fully mediate the relationship between agility and food retail performance. The result of this analysis also confirms Sheffi's (2015) claim about the power of resilience in the supply chain system, affecting all other factors in the supply chain system. Conversely, the findings do not align with McCann et al.'s (2009) study, in which resilience was found to be only a partial mediator.

Nonetheless, the findings suggest that resilience is capable of taking over the power of agility during crises, transforming the supply chain system into greater value for a firm. That is, resilience takes over any supply chain activity that occurs during turbulence to assist the organisation in remaining competitive in the market. This is one of the important findings of this study, since earlier research had connected resilience directly to a firm's survival (e.g., Carvalho & Machado, 2009; Carvalho et al., 2012; Ponomarov & Holcomb, 2009; Sheffi & Rice, 2005; Sodhi & Tang, 2012). The results of this study, therefore, validate the mediating effect of resilience between agility and food retail performance and supports Hypothesis H10.

This finding has significant implications for supply chain managers in the food retail industry. It implies that enterprises can obtain a competitive advantage only when they consider supply chain resilience capability, which eventually results in sustained robust benefits (Barney, 1991). To acquire and keep a competitive advantage, firms should thoroughly comprehend the dynamics of their market environment and have the skill to adapt to market uncertainty through turbulence. An extensive assessment of the literature also supports this recommendation: studies conducted in many contexts have found evidence of resilience's mediating role, as well as its many individual dimensions.

7.2.4.3 Hypothesis H11: Mediation Effect of Resilience between Leanness and Food Retail Performance

This study's results revealed a statistically significant link between leanness and food retail performance, mediated by resilience, relating to Hypothesis H11. Analysis of the quantitative data showed a significant direct effect of leanness on retail food performance ($\beta = 0.483$, $t = 5.894$) and a significant indirect effect when mediated by resilience in the model ($\beta = 0.206$, $t = 2.165$; see Figure 6.8). Because the relationship between leanness and food retail performance remains significant, this confirms that resilience partially mediates the

relationship between leanness and food retail performance. This result also confirms what has been mentioned in the existing literature regarding the importance of resilience in the supply chain system for a firm's competitive advantage and its effect on a firm's performance (e.g., Azevedo et al., 2010; Carvalho & Machado, 2009; Carvalho et al., 2012; Sheffi & Rice, 2005; Ponomarov & Holcomb, 2009; Sodhi & Tang, 2012).

This is an important finding of this study, as earlier research had directly related resilience to company success. In contrast, the findings of the current study provide empirical support for the role of leanness as a critical variable leading to better performance for the food retailer in Saudi Arabia via resilience capabilities. Food retail companies should continually improve their supply chain resilience skills to remain competitive. This demonstrates the critical need to include resilience as a mediator, particularly in this study. It is hoped that the current study offers practical contributions for food retail firms in Saudi Arabia. In short, leanness, in conjunction with resilience, creates a stronger supply chain system to help firms stay competitive in today's market.

7.2.4.4 Hypothesis H12: Mediation Effect of Agility between Leanness and Food Retail Performance

This study's quantitative findings and existing literature show a direct positive relationship between leanness and food retail performance ($\beta = 0.483$, $t = 5.894$) and an indirect positive relationship through agility ($\beta = 0.301$, $t = 3.063$). Because the relationship between leanness and food retail performance remains significant, this confirms that agility partially mediates the relationship between leanness and food retail performance and thereby confirms Hypothesis H12. This also supports what has been mentioned in the existing literature regarding the importance of agility in the supply chain system for a firm's competitive advantage and the effect of agility and leanness on a firm's performance (e.g., Al Kharasheh, 2019; Azevedo et al., 2010; Carvalho et al., 2012; Hallgren & Olhager, 2009; Lee, 2004; Narasimhan et al., 2006). In previous research, agility had been linked to improved company performance. The present research, conversely, empirically demonstrates the importance of leanness as a significant variable contributing to greater performance for food retailers in Saudi Arabia through agility capabilities. To remain competitive, food retail companies should continually improve their agility in the supply chain. This, consequently, highlights the relevance of integrating agility as a mediator, particularly in this study. It is envisaged that the current study provides practical

assistance to Saudi food retail firms. In brief, leanness, when combined with resilience, results in a better supply chain system that can compete in today's market.

7.2.4.5 Hypothesis H13: Mediation Effect of Agility between Leanness and Resilience

In the current study, agility was also argued to have a mediating effect on the impact of leanness on resilience. Analysis of the quantitative data indicated that the direct influence of leanness on resilience was significant ($\beta = 0.610$, $t = 9.348$) and that its indirect relationship through agility was also significant ($\beta = 0.164$, $t = 2.300$), though the effect was significantly reduced in the latter case. Because the relationship between leanness and resilience remains significant, this confirms that agility partially mediates the relationship between leanness and resilience and supports Hypothesis H13. This result also confirms what has been mentioned in the existing literature regarding the importance of agility in the supply chain system for a firm's competitive advantage and the direct effect of agility and leanness on resilience (e.g., Birkie, 2016; Carvalho et al., 2011; Jüttner, 2005; Lenort & Wicher, 2012; Lotfi & Saghiri, 2018; Ponomarov & Holcomb, 2009).

This is one of the study's important findings, as previous research had established a direct link between agility and a firm's performance. As evidenced by the current study, however, leanness plays a vital role in ensuring resilience for improved capabilities. To be competitive, food retail companies should continually improve their agile supply chain capabilities. This study demonstrates the importance of including agility as a mediator. The current study is intended to provide meaningful contributions to Saudi Arabia's food retail industry. In summary, leanness, combined with agility, results in a more robust supply chain system capable of remaining competitive in today's competitive environment.

7.2.5 Impact of Moderation Variables (Hypotheses H14 and H15)

This study also examined and confirmed the moderating role of resilience between leanness and food retail performance and between agility and food retail performance. The relationships between these constructs were examined by testing Hypotheses H14 and H15, respectively.

The results of this testing verified that, with no moderation, the direct effect between leanness and food retail performance is significant ($\beta = 0.483$, $t = 5.894$), as is the direct effect between agility and food retail performance ($\beta = 0.468$, $t = 5.850$). However, analysis did not support resilience having a moderating effect in either the former ($\beta = –0.049$, $t = 0.69$) or latter case

(β = –0.088, t = 1.32; see Table 6.17). Therefore, Hypotheses H14 and H15 were rejected. Agility and leanness were selected due to the possibility that resilience levels may have a moderating effect on them based on the dynamic link between supply chain elements (Carvalho et al., 2011; Christopher & Peck, 2004; Lenort & Wicher, 2012; Lotfi & Saghiri, 2018; Ponomarov & Holcomb, 2009). This result is in contrast with the assumption of Sheffi's (2015) study that resilience in the supply chain system strongly affects all other factors in the supply chain system.

7.3 Findings in the Light of the Research Objectives

A discussion of the results in light of research objectives is presented in this section. Research Objective 1 focused on the impact of leanness, resilience and agility in retail supply chains on retail food performance. Research Objective 2 aimed to assess the impact of communication on leanness, agility and resilience. Research Objective 3 aimed to evaluate the mediating effects of agility and resilience in the relationship between leanness and food retail performance. Research Objective 4 aimed to examine the mediating effects of resilience in the relationship between agility and food retail performance. Research Objective 5 sought to assess the mediating effects of agility in the relationship between leanness and resilience. Finally, Research Objective 6 focused on the moderating effects of resilience in the relationship between leanness and agility, and retail food performance. Sub-section 7.2.3, above, discussed the model's hypothesised relationships, which addresses Research Objective 2. Accordingly, this section will focuses on the five remaining research objectives.

7.3.1 Research Objective 1: To Investigate the Impact of Leanness, Agility and Resilience in the Retail Supply Chain on Food Retail Performance

This study attempts to develop a multidimensional and hierarchical measurement construct for food retail performance. The supply chain system is theoretically influenced by leanness, agility and resilience (Azevedo et al., 2010; Eroglu & Hofer, 2011; Hallgren & Olhager, 2009; Narasimhan et al., 2006). Thus, the current study integrates all three of these components as second-order formative constructs to explain the factors of a good supply chain for food retail performance. Each second-order construct has its first-order reflective indicators; leanness is measured by three indicators; agility, by four indicators; and resilience, by five indicators.

This study assessed the multicollinearity issue in measuring retail food performance using the three formative second-order constructs. Using collinearity analysis, it appeared that the second-order formative constructs of the exchange relationship were not multicollinear in nature. The validity and reliability of the constructs and their indicators were also examined in this study, and they were found to be valid and reliable. After this, the path relationships to food retail performance in the structural model were assessed following Hypotheses H1–H3. The analysis showed that resilience had the highest *t* value (6.551; see Table 6.14). In the next sections, the empirical and theoretical views on the relationships between food retail performance and its dimensions are discussed.

7.3.1.1 Leanness

The empirical analysis confirmed the path coefficients and *t* values of TQM (β = 0.931, *t* = 98.657), JIT (β = 0.938, *t* = 98.594) and TPM (β = 0.859, *t* = 40.474) in the formation of the construct of leanness (see Figures 6.3 and 6.4). A number of studies in the supply chain literature have contended that TQM, JIT and TPM are important dimensions of leanness in the supply chain (e.g., Azevedo et al., 2010; Chavez et al., 2012; Eroglu & Hofer, 2011; Hallgren & Olhager, 2009; Narasimhan et al., 2006). Thus, the findings of this study are in line with those of past supply chain studies. From the findings, it can be observed that leanness, which comprises TQM, JIT and TPM, is an important element of an effective supply chain.

The results of this research also give substantial evidence for the relevance of the reflective measuring items for the construct of leanness. It was shown that all the components were significant, either based on their *t* value or path coefficient (see Figures 6.3 and 6.4), in forming the construct of leanness, with reference to Hair et al. (2011). Furthermore, following the requirements for assessing a reflective measurement construct (Hair et al., 2011), it was evident that the multicollinearity issue did not exist among the construct's items: the path coefficients and *t* values met the threshold values. Consequently, combining TQM, JIT and TPM as dimensions of leanness is both logical and empirically valid, and, therefore, the assessment of leanness is valid in terms of all of the reflective items used to measure it. The findings show that leanness has a direct positive impact on food retail performance (β = 0.213, *t* = 2.137), which supports Hypothesis H1 and is worth highlighting.

7.3.1.2 Agility

The empirical analysis confirmed the path coefficients and *t* values of flexibility (β = 0.808, *t* = 25.735), responsiveness (β = 0.885, *t* = 46.980), competency (β = 0.930, *t* = 72.749) and quickness (β = 0.856, *t* = 40.441) in the formation of the construct of agility (see Figures 6.3 and 6.4). A number of studies in the supply chain literature have contended that flexibility, responsiveness, competency and quickness are important dimensions of agility in the supply chain (e.g., Al Kharasheh, 2019; Azevedo et al., 2010; Carvalho et al., 2012; Hallgren & Olhager, 2009; Lee, 2004; Narasimhan et al., 2006). Thus, the findings of this study are in line with those of past supply chain studies. From the findings, it can be observed that agility, which comprises flexibility, responsiveness, competency and quickness, is a key component of a successful supply chain.

The study's findings also give strong evidence for the significance of the construct's reflective assessment items. It was found that all of the items were significant, either based on their *t* values or path coefficients (see Figures 6.3 and 6.4), in forming the construct of agility, with reference to Hair et al. (2011). Furthermore, following the requirements for assessing a reflective measurement construct (Hair et al., 2011), it was clear that the construct's items did not have a problem with multicollinearity: the path coefficients and *t* values met the threshold values. Consequently, including flexibility, responsiveness, competency and quickness as dimensions of agility is both logical and scientifically valid, and, therefore, the assessment of agility is acceptable in terms of all of the reflective items used to evaluate it.

It is noteworthy that the direct positive impact of supply chain agility on food retail performance was statistically non-significant (β = −0.076, *t* = 0.691). However, agility significantly affected firm performance when all other variables were removed from the model, which shows the direct positive effects of agility on food retail performance. Also, the mediation section (5.2.10.1) explained how the power of resilience has an effect on the function of agility in the supply chain system.

7.3.1.3 Resilience

The empirical analysis confirmed the path coefficients and *t* values of flexibility (β = 0.876, *t* = 40.941), response (β = 0.793, *t* = 31.747), recovery (β = 0.863, *t* = 39.820), collaboration (β = 853, *t* = 32.854) and visibility (β = 0.746, *t* = 20.889) in the formation of the resilience construct. A number of studies in the supply chain literature have contended that flexibility,

response, recovery, collaboration and visibility are important dimensions of resilience in the supply chain (e.g., Azevedo et al., 2010; Carvalho & Machado, 2009; Carvalho et al., 2012; Ponomarov & Holcomb, 2009; Sheffi & Rice, 2005). Thus, the findings of this study are in line with those of past supply chain studies. From the findings, it can be inferred that resilience, which comprises flexibility, response, recovery, collaboration and visibility, is one of the most crucial elements of a successful supply chain.

The study's findings also demonstrate the significance of the construct's reflective measuring items. It was found that all of the items were significant, either based on their *t* values or path coefficients (see Figures 6.3 and 6.4), in forming the construct of resilience, with reference to Hair et al. (2011). Furthermore, following the requirements for assessing a reflective measurement construct (Hair et al., 2011), it was clear that the construct's items did not have a problem with multicollinearity: the path coefficients and *t* values met the threshold values. Therefore, incorporating flexibility, response, recovery, collaboration and visibility as dimensions of resilience is both logical and empirically valid.

It is worth noting that the findings showed a statistically significant direct positive impact of supply chain resilience on food retail performance ($\beta = 0.530$, $t = 6.551$). This finding supports Hypothesis H3, giving strong empirical evidence for the impact of supply chain resilience on food retail performance. It can be explained that supply chain systems that emphasise and empower resilience capabilities would likely be able to mitigate any disruptions to the system, like poor quality, supply problems, logistical troubles and so on (Blos et al., 2009; Pettit et al., 2013;). Such resilient supply chains would be capable of improving firm performance in terms of meeting planned lead times, quality standards and recovering from system shocks.

The above findings show positive and statistically significant path coefficients for food retail performance in Hypotheses H1 and H3. However, the finding for Hypothesis H2 was a negative path coefficient. The analysis of the field study data confirms the direct effect of all three supply chain components (leanness, agility and resilience) on food retail performance. It also suggests that retail supply chains should implement leanness, agility and resilience to improve food retail performance. It can thus be said that Research Objective 1 of this study was met with the support of the empirical findings.

7.3.2 Research Objectives 3, 4 and 5: To Investigate the Impact of Mediation Relations

This study investigated the mediating role of resilience between leanness and food retail performance and between agility and food retail performance. It also examined the mediating role of agility between leanness and food retail performance and between agility and food retail performance. The relationships were examined to test Hypotheses H10–H13 and fulfil Research Objectives 2–4.

Analysis of data confirmed that resilience can fully mediate the relationship between agility and food retail performance. The analysis of quantitative data revealed that agility has a significant direct effect on food retail performance ($\beta = 0.468$, $t = 5.850$) and a non-significant indirect effect when mediated by resilience ($\beta = 0.127$, $t = 1.267$). This relationship suggests the strong power of resilience in the supply chain system during disaster events. No empirical study confirming the mediating role of resilience in the relationship between agility and food retail performance has been found, which makes this result from the present study unique.

Analysis also confirmed the mediating role of resilience in the relationship between leanness and food retail performance. Leanness has a significant direct effect on retail food performance ($\beta = 0.483$, $t = 5.894$), and this remains significant when mediated by resilience in the model ($\beta = 0.206$, $t = 2.165$). This emphasises the significance of including resilience as a mediator, particularly in this study. It is envisaged that the current study provides practical insights to Saudi food retail firms. In brief, leanness, in combination with resilience, provides a better supply chain system to remain competitive in today's market.

There was also a significant, direct and positive relationship between leanness and food retail performance ($\beta = 0.483$, $t = 5.894$), which was similarly significant when indirect and mediated through agility ($\beta = 0.301$, $t = 3.063$). This confirms that agility partially mediates the relationship between leanness and food retail performance. These results confirm what has been mentioned in the literature regarding the importance of agility in the supply chain system for a firm's competitive advantage and regarding the effect of agility and leanness on a firm's performance. In short, leanness, when combined with resilience, results in a more resilient supply chain system that can help food retailers compete in the market.

Finally, this study showed that the direct effect of leanness on resilience was significant ($\beta = 0.610$, $t = 9.348$), as was its indirect relationship through agility ($\beta = 0.164$, $t = 2.300$). This confirms the partially mediating role of agility between leanness and resilience. There is

a dire need for food retail firms to constantly build their supply chain agility capabilities to stay competitive. These findings, therefore, highlight the importance of incorporating agility as a mediator, particularly in this study.

7.3.3 Research Objective 6: To Investigate the Impact of Resilience as Moderator

The data in this study did not support a finding of resilience having a moderating effect on the relationship between leanness and food retail performance ($\beta = -0.049$, $t = 0.69$) or on the relationship between agility and food retail performance ($\beta = -0.088$, $t = 1.32$; see Table 6.17). Therefore, the theoretical moderating power of resilience is less pronounced (Dagger & Sweeney, 2006). Overall, the findings support the presence of direct effects but not moderating effects.

7.4 Summary

This chapter discussed the findings from the PLS from Chapter 6 and the qualitative data from Chapter 4. These were interpreted in light of the study's objectives and hypotheses. Supply chain components—leanness, agility and resilience—were shown to influence food retail performance. Additionally, mediation and moderation effects were also addressed in this chapter: significant indirect effects between the particular factors were found. Lastly, this chapter showed how the study objectives were effectively addressed through qualitative and quantitative empirical evidence.

Chapter 8: Conclusion and Future Research Directions

8.1 Introduction

The current study was carried out to explore the effects of lean, agile and resilient elements of supply chains on retail performance in the food sector in Saudi Arabia. The study objectives were defined in Chapter 1 following an examination of the research problems and the significance of the study area. In Chapter 2, the conceptual research model was established based on a review of relevant literature and theory. The research methodology was then outlined in Chapter 3, highlighting the reasons for using a mixed-methods approach (with an emphasis on the quantitative aspect). In Chapter 4, field study results were used to contextualise the basic model and build the complete research model from the data. Chapter 5 then followed with the quantitative phase, developing formal connections and hypotheses from the study model. Chapter 6 presented the findings from the analysis of the quantitative data. Both the qualitative and quantitative findings were then the focus of discussion in Chapter 7.

This final chapter now summarises the research. The summary includes the study's subject, methodology, analysis, results and interpretations. Next, the study's contribution to current knowledge is discussed from both theoretical and practical viewpoints. Then, the study's limitations are discussed before suggestions for future research agendas in the field are made in the chapter's conclusion.

8.2 Summary of Research

In the face of several challenges and ever-expanding competition, retailers are being compelled to focus on effective SCM to maintain a competitive edge and improve overall company performance. To give competitive net value to consumers and maintain their competitive position, organisations nowadays recognise that they must strive for more than just effectiveness and efficiency (Fugate et al., 2010). Maintaining profitability while expanding market presence has become increasingly difficult for retail food companies. Despite rising academic and practitioner interest in SCM concerns, there is little research to assist organisations' supply chain practices to the extent necessary to achieve the goal of competitive performance. By combining the three elements of a supply chain into a single system, this study intended to fill this research gap and provide fresh insights for academics and practitioners.

The study began with an in-depth review of the literature, developing the theoretically based, comprehensive yet cost-effective initial research model. The model incorporated the antecedent factors of SCM and explained the process of implementation, practice and the impact of SCM in a single framework.

A mixed-methods strategy was adopted for this work. In mixed-methods research, data are gathered and analysed using both qualitative and quantitative methodologies. In the first stage, a qualitative field study was undertaken to contextualise and improve on the basic research model. The data for this phase were acquired via semi-structured interviews with supply chain managers from retail food enterprises in Saudi Arabia. The data gathered were analysed using content analysis. In light of the results from the field study, the initial research model was fine-tuned (see Chapter 4). As a result of this procedure, a new construct, communication, was added to the research model (see Figure 4.3). Justification for the inclusion of this new construct was based on the literature. Overall, the new comprehensive model included dimensions of main constructs; structural relations among antecedents, SCM implementation and practice; and field study outcomes. The model's hypotheses were then created.

A quantitative approach was employed in the second stage to examine these hypotheses. This phase involved the design of a questionnaire for a large-scale survey. The results of previous studies, relevant literature and field studies were used to develop the questionnaire (see Chapter 5). The questionnaire was then pre-tested and slightly adjusted based on the results of this pre-testing. Following this pilot study, a total of 296 valid questionnaire responses were analysed PLS-SEM (see Chapter 6). The PLS analysis was carried out in two steps, involving the assessment of the measurement model and then the structural model (hypothesis testing). Overall, the findings confirmed the significant constructs, sub-constructs and associated factors. With two exceptions, all hypotheses were accepted (see Table 6.14). The hypotheses regarding mediating effects were also supported. The important contributions of this work are now summarised in the following section.

8.3 Contributions

8.3.1 Theoretical Contributions

The findings of this research offer several theoretical contributions. One of the major contributions is a better understanding of the supply chain elements of leanness, agility and

resilience through the combination of these factors into a single framework for empirical validation. The research explains their relationship and their impact on food retail performance. An extensive literature search on the relationship between these supply chain elements identified significant research gaps. Building on previous research and addressing the gaps in the existing literature, this research brings new and valuable insights through the development of a research model that is contextualised through a qualitative field study. The final research model addresses the supply chain's three elements—leanness, agility and resilience—to strengthen the supply chain system for Saudi retail food firms and ensure their better performance.

Consequently, the research contributes to the body of knowledge because no previous research model has combined supply chain leanness, agility and resilience into one framework in the context of the food retail sector in Saudi Arabia. As a result, the formulation of these three supply chain elements in relation to retail food performance is a unique addition to the supply chain literature in general and to the Saudi Arabian food supply chain in particular. Despite the numerous supply chain studies of elements in isolation or in combinations of two, this research has identified and measured all three supply chain elements of the food retail sector in Saudi Arabia. Further, this study tested the moderation effects of resilience on the relationship between leanness and food retail performance and between agility and food retail performance. These mediation and moderation relationships have not been empirically tested to the best of the researcher's knowledge, but all of these relationships between constructs were investigated in this study.

In addition to the current literature, this study investigated an important construct based on the findings of the field study: communication, with two sub-constructs, internal communication and external communication. The construct and sub-constructs and their relationships with the supply chain elements were validated based on relevant existing empirical evidence and literature (e.g., Jacobs et al., 2016; Narasimhan & Kim, 2002; Paulraj et al., 2008; Stank et al., 2001).

Finally, the comprehensive research model is unique because it integrates the dynamic capabilities view in justifying the combination of the three supply chain elements (leanness, resilience and agility) in one model. Hence, this work expands the dynamic capabilities view of the food supply chain sector in Saudi Arabia and contributes significantly to the existing literature, opening new dimensions for applying dynamic capabilities theory.

8.3.2 Managerial Contributions

From the perspective of management, it is critical to comprehend the dynamics that impact the stability of the business and the supply chain and remove wastages from the system, respond quickly to market changes and reduce the negative effects of disruptions in the supply chain system. For supply chain systems that are not lean enough and facing some turbulence and uncertain events, particularly the supply chain of the food retail sector in Saudi Arabia, this study gives a greater insight into the elements of the supply chain and their effects on performance.

This research has various important implications from a practical perspective. It is hoped that this study gives retail food managers a better idea of the variables they need to secure and establish in a supply chain system, such as ensuring the implementation of leanness, agility and resilience in the supply chain system for better performance. More precisely, the decision-makers in the supply chain could also use the model developed in this study to enhance their understanding of the requirements for leanness, agility and resilience.

It is clear from the findings of this research that the advantages of an efficient supply chain system implementation and practice are very important for a firm's success. A key finding of this research is that a company's competitive advantage may be significantly enhanced via the use of its supply chain and its many elements: leanness, agility and resilience. It is critical from a management perspective to understand the elements that drive supply chain best practices and the performance of companies in a dynamic business environment. This research on supply chain leanness, agility and resilience, as well as their impact on Saudi Arabian food retail performance, is an important contribution to the field's current body of knowledge.

The study's findings offer significant insights into the aspects that influence a firm's performance in supply chain practice. The proposed model is expected to help food supply chain managers to secure a better supply chain system in their firm by overcoming any expected turbulence in the market, being more competitive and minimising wastage to maximise their profit. Secondly, the proposed model and the research findings provide Saudi Arabian managers with better insight into the interrelationships between supply chain elements in the context of retail food performance, specifically regarding the relative roles of leanness, agility and resilience in achieving retail performance. Moreover, the research model helps improve Saudi Arabian food retailers' performance in terms of profits and effectiveness.

The model will provide decision-makers with useful information about the facilitating measurements for improving leanness, agility and resilience in the supply chain system. As the model shows, the practices for leanness—JIT, TQM and TPM—are significant information for supply chain managers in improving their lean supply chain. The model demonstrates, in more detail, that supply chain managers should enhance JIT technique, maximise the overall effectiveness of their equipment and focus on quality for continued improvement. In terms of supply chain agility, supply chain managers could also use the model to develop the items needed for improving agility—such as flexibility, quickness, responsiveness and competency their system faces any changes in the customers' demand. For example, decision-makers might emphasise a quick response to changes in customer demand. More specifically, the model indicates that supply chain managers need to improve visibility, collaboration and recovery to allow them to create an effective supply chain resilience system to be able to overcome and respond to external environmental pressures and increase their performance.

As food retailers in Saudi Arabia have several internal issues and external difficulties in properly managing their supply chain, this study emphasises the effective implementation and practice of SCM to improve overall supply chain system performance. This study also provides supply chain managers with essential methods for completely reviewing their current state of supply chain implementation practice. Overall, this study will help to ensure a better supply chain system and retail performance in the context of the food sector in Saudi Arabia.

8.4 Limitations

There are, however, problems and limitations in all study techniques and strategies (Breakwell et al., 2006). Despite the fact that this research provides substantial theoretical and practical contributions, some limitations must be noted when evaluating the study's findings.

First and foremost, this study uses a cross-sectional research design. One major limitation of this design is that it is only possible to investigate supply chain elements at a single moment in time. However, the supply chain system cannot be fully evaluated without evaluating the impacts of various supply chain disruptions over time; thus, the extent to which cause–effect relationships may be established is limited (Fugate et al., 2010). Conversely, longitudinal research methodologies might capture the dynamic nature of the phenomenon of interest as well as the different implications of any supply chain disruptions on supply chain elements and

a firm's performance outcomes over time. Future research can overcome this limitation by collecting longitudinal data.

Second, the study adopts a mixed-methods approach. Qualitative and quantitative data were gathered at two distinct points in time, which does not meet the data collection time horizon (Saunders et al., 2009). The study used a cross-sectional research design as the single instance, which may have the normal limits of observing comparable phenomena across time. As a result, the current study has this methodological limitation.

Third, this study was undertaken from inside a specific industry: food retail in Saudi Arabia. The results may therefore be limited in their generalisability due to industry- and/or country-specific conditions.

Retail food businesses are the study's unit of analysis, which leads to the final point. This study examined SCM approaches from the point of view of retail businesses—the major company in a supply chain—and did not explore data collected from other essential parts of the food supply chain, such as suppliers and buyers. A comprehensive approach would also collect additional data from customers and suppliers.

Finally, this study was carried out at the business level, with only a few employees from each corporation participating in the survey. Supply chain system concerns were only raised by a single respondent. Although the respondents were carefully picked with the intention of educating them in the survey topics, whether these respondents had appropriate knowledge of the complete supply chain was not ascertained, which may have created errors in measurement.

8.5 Future Research Directions

The current study's findings, limitations and implications open various avenues for future study.

First, to address the methodological limitations of the cross-sectional study design, a longitudinal approach to this issue is advocated for future research. The real impact of SCM adoption and practice in an organisation could take a long time to be noticed. The relationships between supply chain element practices, competitive advantage and company performance may be examined in future research. Moreover, longitudinal research on the elements that

impact and influence leanness, agility and resilience in supply chains could potentially overcome the methodological limitations of cross-sectional research.

Second, this study was limited to a single sector: the food retail sector in Saudi Arabia. The study's findings might be expanded or replicated in other sectors or nations. Cross-industry or cross-country research may increase the applicability of the research model. To gain a better understanding of how supply chain elements affect food retail performance, it would be fascinating and beneficial to compare outcomes from various contexts.

Third, using a greater number of participants from each participating organisation may also help future studies overcome the limitations mentioned above. Future studies may also explore data collected from other critical sections of the supply chain network, including suppliers and customers.

Fourth, the conceptual model obtained from the literature was contextualised using a qualitative study, and the research model was validated using a quantitative method. Using a case study method, more research could be undertaken to apply the validated model at the firm level.

Fifth, the data for this study were collected prior to the COVID-19 pandemic outbreak. To overcome this limitation in future research, researchers may consider addressing the same study topic and comparing data collected after the pandemic.

Finally, the study's analysis could be extended in several dimensions. Due to the fact that SEM analysis was the primary emphasis of this research, the study of moderating effects, moderated mediation and mediated moderation models are all possible research topics for the future. Instead of SEM analysis, future studies might be conducted using a new type of modelling approach called case-based modelling.

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Appendixes

Appendix A: Interview guide for field study

Effects of Lean, Agile and Resilient Supply Chain on Retail Performance – The Case of Food Sector in Saudi Arabia

☐ I have received information regarding this research and had an opportunity to ask questions. I believe I understand the purpose, extent and possible risks of my involvement in this project, and I voluntarily consent to take part.

Semi-structured Questions

1. What is your understanding of retail supply chain?

2. How does supply chain influence your organization's retail performance? Give some examples.

- *Probe as necessary*

3. What is your understanding of lean supply chain?

- *Probe as necessary*

4. How do you ensure leanness in your supply chain system?

- *Probe as necessary*

5. What is your understanding of agile supply chain?

- *Probe as necessary*

6. How do you ensure agility in your supply chain system?

- *Probe as necessary*

7. What is your understanding of resilient supply chain?

- *Probe as necessary*

8. How do you ensure resilience in your supply chain system?

- *Probe as necessary*

9. In your opinion how does leanness affect retail performance of your organization? Give some examples.

- *Probe as necessary*

10. In your opinion how does leanness affect agility in the supply chain system of your organization? Give some examples.

- *Probe as necessary*

11. In your opinion how does leanness affect resilience in the supply chain system of your organization? Give some examples.

- *Probe as necessary*

12. In your opinion how does agility affect retail performance of your organization? Give some examples.

- *Probe as necessary*

13. In your opinion how does agility affect resilience in the supply chain system of your organization? Give some examples.

- *Probe as necessary*

14. In your opinion how does resilience affect retail performance of your organization? Give some examples.

- *Probe as necessary*

Last question:

Do you have any other relevant information that you think important for effective supply chain system of your organization?

Demographic Questions

Please tick from the following which is best applicable to you:

Age: □18-22 years □23-30 years □31-39 years □above 40 years

Gender [Please tick]: □Male □Female

Level of Education [Please tick]: □Primary □Secondary □Higher secondary □Tertiary

Annual income: □ Less than 45,000 □ $45,000-$55,000 □ Above $55,000

Occupation: □Supply chain related business □logistics related business

Type of your firm: □ Retailing □ Logistics

Period of current occupation/business: □Below 5 years □6 – 10 years □Above 10 years

Appendix B: Survey questionnaire

Effects of Lean, Agile and Resilient Supply Chain on Retail Performance – The Case of Food Sector in Saudi Arabia

Questionnaire

☐ I have received information regarding this research and had an opportunity to ask questions. I believe I understand the purpose, extent and possible risks of my involvement in this project and I voluntarily consent to take part.

Section A:

Demographic Questions

Please tick from the following which is best applicable to you:

Age: □18-22 years □23-30 years □31-39 years □above 40 years

Gender [Please tick]: □Male □Female

Level of Education [Please tick]: □Primary □Secondary □Higher secondary □Tertiary

Annual income: □ Less than 45,000 □ $45,000-$55,000 □ Above $55,000

Occupation: □Supply chain related business □logistics related business

Type of your firm: □ Retailing □ Logistics

Period of current occupation/business: □Below 5 years □6 – 10 years □Above 10 years

Section B

Please mark your choice with each of the following statement about ecotourism in your area using '√' in the appropriate box for each statement where 1 denotes strongly disagree and 6 stands for strongly agree.

Item Code	Question/Item	Strongly Disagree	Disagree	Moderately Disagree	Moderately Agree	Agree	Strongly Agree
Leanness	**What is your understanding of the following leanness measures in your supply chain system**						

Just in Time JIT		**1**	**2**	**3**	**4**	**5**	**6**
Lean1	Suppliers' quantity always matches documentation quantity.						
Lean2	Suppliers ensure the correct times of delivery as matches in the documentation.						
Lean3	Suppliers deliver the order at the right place as matches in the documentation.						
Lean4	We receive regular orders daily as per schedule.						
Lean5	We have a daily schedule adherence.						
Lean6	Our supply chain department selects suppliers based on their performance on low cost and high quality.						
Lean7	Our supply chain adopts joint decisions toward cost savings.						
Lean8	Our supply chain seeks to reduce lead time providing it does not increase costs.						
Total Quality Management TQM		1	2	3	4	5	6
Lean9	We measure our quality by customer complaints.						
Lean10	We measure our quality by Supplier rejection rate.						
Lean11	We measure our quality by Customer rejection rate.						
Lean12	We measure our quality by meeting customer requirements.						
Lean13	We measure our quality by process integrity.						
Lean14	We measure our quality by eliminating waste from the total operation process.						
Lean15	Having process of continuous improvement will be considered as quality in our organization.						
Lean16	We focus on customer satisfaction.						
Lean17	Our supply chain frequently offers feedback to suppliers on their quality and delivery performance.						
Lean18	We treat the organization as a total system.						
Total preventative maintenance (TPM)		1	2	3	4	5	6
Lean19	We maintain our equipment regularly.						
Lean20	We maintain excellent records of equipment maintenance related activities.						
Lean21	We post equipment maintenance records on shop floors for active sharing with employees.						
Lean22	We apply emphasis on Technology.						
Agility	**What is your understanding of the following Agility measures in your supply chain system**						
Flexibility		**1**	**2**	**3**	**4**	**5**	**6**
Agile1	We have numerous available suppliers.						
Agile2	We have variety of sourcing.						
Agile3	We have variety of supply schedules for meeting customers' needs.						
Agile4	Our capability for responding quickly to customization requirements is very high.						
Agile5	Flexibility in response to requests for changes is a characteristic of our relationship with our key suppliers.						
Agile6	Our company strives to shorten supplier lead time, in order to avoid inventory and stock outs.						
Agile7	We can adjust the specification of orders as requested by our customers.						
Responsiveness		1	2	3	4	5	6
Agile8	We are able to accommodate variation in supply delivery time by the suppliers.						
Agile9	We have Suppliers relation management team.						
Agile10	Our responsiveness level to the market changes is high.						
Agile11	We respond pond fast to our delivery.						
Agile12	Our supply chain system can sense, perceive and anticipate any changes.						
Agile13	Our supply chain system is able to recover fast from market changes.						
Competency		1	2	3	4	5	6

Agile14	There is a balance in internal-external cooperation.							
Agile15	We ensure a high level of products quality and service.							
Agile1	We have enough Capabilities of human resources.							
Agile20	We have a strategic vision to manage our supply chain.							
Agile21	We have sufficient and appropriate technological ability.							
Agile26	Our employees are knowledgeable, competent, and empowered.							
Quickness		1	2	3	4	5	6	
Agile29	Our products and services delivery quickness and timeliness.							
Agile30	We are fast in operations time.							
Agile31	We Adapt supply chain processes properly to reduce lead time.							
Agile32	We Adjust supply chain processes properly to increase on-time delivery.							
Resilience	**What is your understanding of the following Resilience measures in your supply chain system**							
Flexibility		**1**	**2**	**3**	**4**	**5**	**6**	
Resi1	We have flexibility in production in terms of volume of order and production schedule.							
Resi2	We have contract flexibility such as partial order, partial payment, partial shipment etc.							
Resi3	We have flexibility in sourcing.							
Resi4	We have flexibility in distribution.							
Response		1	2	3	4	5	6	
Resi5	We can respond quickly to disruptions.							
Resi6	We can undertake adequate response to crisis.							
Resi7	We have response team for mitigating crisis.							
Recovery		1	2	3	4	5	6	
Resi8	We have the ability to get recovery in short time.							
Resi9	We have the ability to absorb huge loss.							
Resi10	We can reduce impact of loss by our ability to handle crisis.							
Resi11	We can recovery from crisis at less cost.							
Collaboration		1	2	3	4	5	6	
Resi12	We have collaborative forecasting of demand with supply chain partners.							
Resi13	We have collaborative planning & decision-making practice with the SC partners.							
Resi14	We invest in our suppliers' plant to collaborate operations.							
Resi15	We have Resource-sharing with our suppliers.							
Resi16	We have good Collaborative communication with our suppliers.							
Visibility		1	2	3	4	5	6	
Resi17	We share information with supply chain partners.							
Resi18	We track information of different operations.							
Resi19	We have business intelligence to gather information.							
Resi20	We have real-time flow of information throughout the supply chain.							
Communication	**What is your understanding of the following Communication measures in your supply chain system**							
Internal Communication		**1**	**2**	**3**	**4**	**5**	**6**	
Comm1	We have Data integration among internal functions.							
Comm2	We have Real-time integration and connection among all internal functions from shipping, warehousing, and sales.							
Comm3	We have good Communication and information flow with different departments in our firm (e.g. supply chain and other departments).							
Comm4	Our firm is better than competitors in connecting (e.g. communication and information sharing) parties within a business process.							
Comm5	We have Integrated inventory management system.							
Comm6	We apply the use of periodic interdepartmental meetings among internal functions.							
External Communication		1	2	3	4	5	6	

Comm8	We collect customer feedbacks for quality improvement.						
Comm9	We have long-term relationship with suppliers.						
Comm10	We have a strategic partnership with suppliers.						
Comm11	We are working with suppliers to improve inter-organizational processes with suppliers.						
Comm12	We have linkage with suppliers through information technology.						
Comm13	We share information with suppliers.						
Comm14	We have a strategic partnership with customers.						
Comm15	We work with customers to improve inter-organizational processes with customers.						
Comm16	We have linkage with customers through information technology.						
Comm17	We share information with customers.						
Comm18	Our business unit frequently shares forecasts, sales data and plans with your Supply chain partners.						
Comm19	Our business unit develops contingency plan jointly with supply chain partners for increasing supply chain stability.						
Retail Performance	**Please state how important is it for you the following aspects of the improve of Food Retail Performance**	1	2	3	4	5	6
RetP1	Sales						
RetP2	Profit margin						
RetP3	Revenue growth						
RetP4	has a greater market share						
RetP5	Customer Satisfaction Index						
RetP6	Customer retention rate						
RetP7	Service quality						
RetP8	On-time delivery						
RetP9	Degree of overall success						

Appendix C: Sample Script

Q1: What is your understanding of retail supply chain?

A1: Retail supply chain is the system of moving goods from point a to point b.

Q2: How does supply chain influence your organization retail performance? Give some examples if you want so.

A2: In our company most of the work depends on supply chain, we are food retailer company we have multiple location and all of the works relay on supply chain, so if the supply chain is good the company would do well and this is what is happening actually. … The process of the supply chain in our company is very systematic every employee knows what they have to do and when for example the warehouse receive a shipment from the suppliers and then they replace it on a specific place inside the warehouse after that the warehouse receive an order from one store from our company specific contritely then the logistic team take the order in their trucks and deliver the order the store team receive the products and replace them in their warehouse after that they organize it on the shelve as needed.

Q3: What is your understanding of lean supply chain?

A3: Lean is very important part of the supply chain it helps the company safe the goods not to go waste and stop any unwanted activities in the warehouse and in the delivery.

Q4: How do you ensure leanness in your supply chain system?

A4: The company must be flexible to have good supply chain on top of that they have to stop any waste to gain more money because retail sometimes they do not make much profit from certain goods and if the company system has leaking in certain area they will lose money or if they are lucky they would not make much profit.

Interviewer: Thank you, do you think quality is important for lean supply chain?

Interviewee: sure. quality is one of the keys to have a successful supply chain and business and to draw more attention to the company.

Q5: what is your understanding of agile supply chain?

A5: The supply chain must be agile to be a strong competitor in the market because it safe the company during any changes in the order and to fulfil the customer needs.

Q6: How do you ensure agility in your supply chain system?

A6: For the company to be agile they must be fast to accommodate the market needs mainly when customer have changed their order … also the company must be ahead in information and they have a good forecasting and knowledge to be able to have a satisfied customer.

Q7: What is your understanding of resilient supply chain?

A7: To be able to continue the business and remain in the market with less damage the company should be resilient because resilience will save the company from beaning bankruptcy. it is the system where the company needs during crisis time. and some company have a risk management team to work hand in hand with the operation department and other department for example finance department to save the company.

Interviewer: What I understood form you are that resilience will save the organization if any serious matter happens to your company and to the supply chain system.

Interviewee: completely true.

Q8: How do you ensure resilience in your supply chain system?

A8: The department of supply chain must have risk management team to establish a good plan to help the business to respond and recover faster…. Because the main point for resilience is to get back to the normal routine as fast as possible.

Q9: In your opinion how does leanness affect retail performance of your organization? Can you shear an example?

A9: By removing the waste out of the process the company will grow faster and will make more profit, because leanness will help to remove any waste and that would affect the performance of our company. We require any supplier when they deliver a product to the warehouse must maintain a specific temperature degree especially the fresh food by doing that we do not have waste in the product and we never get shortage of goods, this will maintain the quality going to be in a good stander and the customer will be happy.

Q10: In your opinion how does leanness affect agility in the supply chain system of your organization? Give some examples if you can please.

A10: Lean supply chain has a good effect on the total process in the company, if the company has a good lean system and insure the delivery on time and the quality of the goods in the right stander of the company I believe in my opinion will make the supply chain system more agile and faster in responding to any changes to the market.

Interviewer: Does that means having a good lean system in the supply chain system would help agility to act quicker?

Interviewee: Exactly.

Q11: In your opinion how does leanness affect resilience in the supply chain system of your organization? Can you please shear an example?

A11: As I mentioned earlier leanness is affect the supply chain in all the stage in the company, if we have the leanness in a good stander definitely the resilience will benefit out of that and will do the recovery faster because lean supply chain requires a good communication also resilience so if the company have a good communication system for sure will help the fast recovery.

Q12: In your opinion how does agility affect retail performance of your organization? Give an example please.

A12: In the end of the day the company needs to make sales to gain profit, if the company does not have a good system to meet the client needs the company for sure will lose clients, also the company needs to compete with others they have to be ahead to satisfy the customers. thinking of an example here I tell you a general occasion it happen every year whenever there is a sale we get a cancelation in orders and we get a very customized orders so we have to accommodate these orders to run the sales and to keep our customers happy, believe every company need to know the behaver of their customers to know what to expect and be ready all the time, there is no mercy in the market, one of the best methods I believe it is working here in the Saudi market the company needs to have a good relationship with the customers and the suppliers to minimize waste and to make more profit.

Q13: In your opinion how does agility affect resilience in the supply chain system of your organization? Give an example please.

A13: Definitely there is a relationship both resilience and agility help the company when there is a crisis whether to the supply chain system of the company or to the operation system. the agile would help the system to respond very fast to the market changes and the resilience would help to rescue the company of being out of the market, it is going to be very difficult to save the company if the system is slow in responding and there is not good communications. When there is a serious issue happened, the company needs both system in place agility and resilience to save the organization to get back very fast to the normal process.

Q14: In your opinion how does resilience affect retail performance of your organization? If possible to shear an example please.

A14: As we have mentioned earlier the company needs a system that insure the continuity of the business, ... resilience has the capability to save the company during crises because having resilience system means that you have a team ready to establish a recovery plan and that going to help the company system to get back to normal routine. Actually, we had couple of serious issue and there is a team ready to make a plane to save the company the team mostly has some people for the operation and one or two from the finance department and some from the supply chain and logistics team so basically, they find a quick solution to secure the company.

Q15: Do you have any other relevant information that you think important for effective supply chain system of your organization?

A15: The best methods in to have an easy and good supply chain system to have a good relationship with the suppliers and the key customers to help the system move faster during any problem or market changes, in my opinion that would also save some money to the company.

Q1: what is your understanding of retail supply chain?

A1: The retail supply chain starts from the operation to deliver goods starting from the manufacturer to warehouse of the company then to the shelves on the market.

Q2: How does supply chain influence your organization’s retail performance? Give some examples

A2: Actually, supply chain has a big influence on our firm since supply chain department needs to take care of the proactivity as well as quality of the products to the final user.

Q3: What is your understanding of lean supply chain?

A3: Lean supply chain, it delivers supplies to customers with the minimum wastages which will have no surplus.

Q4: How do you ensure leanness in your supply chain system?

A4: Supply chain department should start from the first stage of the process which locate the lower cost resources … also to have a good lean system in the supply chain the company must manage the quality of the products on the whole process.

Q5: What is your understanding of agile supply chain?

A5: Agile supply chain is a system of a products distribution that concerns by doing the process quickly and saving cost by responding faster to any changes on the demand.

Q6: How do you ensure agility in your supply chain system?

A6: Agility system has to be very flexible to respond faster to any changes to the market disruptions.

Interviewer: do you think that do you think that integration different function in the company will help agility to respond faster to the changes on the market?

Interviewee: Yes.

Q7: What is your understanding of resilient supply chain?

A7: Company have resilience supply chain to make sure that they could survive in any major circumstances that might happened… any business could face some unwanted situation if it does not have a quick recovery plan the company will lose a lot it might end up losing the business in total.

Q8: How do you ensure resilience in your supply chain system?

A8: I believe it depends on the business for our business for example we needs to have a direct line for every level in the supply chain and the warehouse to make sure everyone on the same track and to follow up with shipments and of course during any major issue this communication line will help us to recover very fast… also there must be a team to help and solve the crises the company going through because it is unusual situation that happened and this needs a risk team from most of the department in the company to give the right decision.

Q9: In your opinion how does leanness affect retail performance of your organization? If you can give some examples.

A9: Leanness is very important to the company performance… the profit in retail sector in my opinion is very thin sometimes and that require a good planning to add more profit, if the company implemented the lean system by watching the quality if the work and the products all over the process and have a the philosophy of just in time delivery and being flexible for sure that will help the our company I believe in this case the company will have a good reputation of the quality of work and will have more customers also the profit will increase by lowering the waste .

Q10: In your opinion how does leanness affect agility in the supply chain system of your organization? Give some examples.

A10: I believe if lean supply chain is well set up in the supply chain system of course will help agility for faster responding … because agility needs the supply chain to be flexible to respond to the market changes.

Q11: In your opinion how does leanness affect resilience in the supply chain system of your organization? Give some examples.

A11: Leanness is needed at all stage in the supply chain especially during the time where the company facing some serious problem… lean will help the supply chain to be more organized and this going to have a good effect on resilience when any disruption happened by allow the department of supply chain set up a faster plan to come out of the bad situation.

Q12: In your opinion how does agility affect retail performance of your organization? Give some examples please.

A12: Every retail must be agile to stay in the business; every day we have situations we need to accommodate if we are not flexible enough and fast to respond to these situations we will not be at our position now.

Interviewer: Do you have an example to shear, please.

Interviewee: We receive sometimes orders from clients and once we do the delivery we find their warehouse is not ready yet to take the shipments so the driver have to wait for more time and of course this will affect us if we do not have a good back up for the next delivery.

Interviewer: So, what your company do in this situation how you solve it?

Interviewee: We have a good logistic team if we communicate with the first available truck to take over the next delivery if no one can do the delivery we contact a trucking company to deliver the order.

Q13: In your opinion how does agility affect resilience in the supply chain system of your organization? Give some examples please.

A13: If the supply chain not flexible and the communications between suppliers and the company is weak for sure the system will be lacking to have a fast recovery during any shocks or crises.

Q14: In your opinion how does resilience affect retail performance of your organization? Give some examples

A14: In my opinion there is a direct impact from resilience on our retail performance because we have to be ready when bad disruptions happen if we did not have a good plan I believe our company will face a serious losing.

Q15: Do you have any other relevant information that you think important for effective supply chain system of your organization?

A15: Supply chain is a very interesting field the department of supply chain could use a lot of methods to save money and for better performance supply chain team should always look into different technology to implants.