The Role of Quality Driven Sustainability (QDS) in Export Food Supply Chains: The Case of Food Industry in Jordan

Dr Lana Eed Essa Jreisat

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The Role of Quality Driven Sustainability (QDS) in Export Food Supply Chains: The Case of Food Industry in Jordan

By

Lana Jreisat

A thesis submitted to the University of Bedfordshire in partial fulfilment of the requirements for the degree of Doctor of Philosophy

October, 2022
Declaration

"I, Lana Jreisat declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

Title of thesis: The Role of Quality Driven Sustainability (QDS) in Export Food Supply Chains: The Case of Food Industry in Jordan

I confirm that:

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- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
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Lana Jreisat

October 2022
Abstract

The thesis is concerned with creating adaptive Sustainable Supply Chain Management (SSCM) in the Export Food Supply Chain (EFSC) in Jordan. Supply Chain Management (SCM) is an urgent problem in the Middle East. Supply chains are global, and their disruptions cause food shortages and insecurity of food supplies. Wars in Europe, Africa and the Middle East, plus pandemics such as COVID-19, financial crises and stagflation, threaten world export food supplies everywhere.

The main purpose of this research is to analyse the state of the EFSC in the export food industry in Jordan, using the concept of Quality-Driven Sustainability (QDS) and, as a result, develop a new Decision Framework for Sustainable Supply Chain Quality Management (SSCQM). The essence of SCM can be understood through three perspectives of Supply Chain Networks (SCN), Total Quality Management (TQM) and Sustainability (SUST). They have been extensively researched individually, but integration is rarely considered. The researcher shows that the underlying factors are closely related and integrates them into the concept of QDS. Within QDS, SCN is the platform for sharing and transmitting information relating to TQM and SUST.

This research is an empirical qualitative study undertaken in Jordan. First, a systematic literature review was conducted, evidencing research gaps and providing the initial conceptual framework. Second, a pilot Case was carried out to refine the initial framework. Third, the empirical work was based on Case Studies of four Triads showing network relationships between the supplier, Manufacturer, and customer. The Triad approach simplifies the complexity, and treating the Manufacturer as the focal actor reveals the essence of SCM. In total, 32 semi-structured interviews were supported by observations, tours and documents to individually explore each Case and examine the proposed framework for each Case at the exploratory stage. Fourth, the four Cases were cross-analysed to provide an empirical explanation and match findings to the proposed framework across all Cases at the explanatory stage. The evidence of data collected was triangulated, and further findings were elaborated with a literature review and validated using NVivo. Moreover, this research has developed a new conceptual framework validated through the Analytic Hierarchy Process (AHP) to prioritise the importance of the critical factors (key Themes ) based on five expert opinions. This derived continuous development toward the new Decision Framework for the conceptual framework of SSCQM incorporated with QDS in EFSCs.

This research has contributed to the theoretical, methodological, and practical knowledge pertaining to the three integrated perspectives. The theoretical contributions are related to the new framework that shows how to adapt and be sustainable in the face of disruptions by balancing social, economic and environmental issues in an Adaptive Sustainable SCM Performance (ASSCMP) in EFSCs in Jordan. The practical and managerial outcomes are achieving sustainable supply chain performance through QDS by formulating a practical framework (SSCQM). This provided managers and policymakers with the knowledge and practices for the focal actors in Triads along their EFSCs and similar industries in developing countries. A methodological contribution is substantial in that a Case is an appropriate approach combined with AHP theory, providing an analytical generalisation of EFSC.
Acknowledgments

I express my appreciation to my patient and supportive Director of study, Professor Robin Matthews, who, without his wise guidance, enthusiasm and encouragement, this research would not have been the same.

I am also grateful to all staff at the School of Business at the University of Bedfordshire in the United Kingdom for all the support and facilities to complete the research to this stage.

I thank those colleagues and staff at the Chamber of Industry, Amman, Jordan, who helped provide information sources of the manufacturing food industry in Jordan and facilitated access to these companies in this sector to participate in this study.

Most importantly, I would like to thank my family, particularly my three lovely sons, Karam, Awn and Taj, during my challenging PhD journey; their patience and their role in the success of this research cannot be forgotten. Karam understood what stole his time and became dependent on himself. Awn did not understand or find answers to his curiosity about why his mum was still studying at this age. The youngest, Taj, slept alone while his mum worked on the research till the early morning hours. He always tried to break her laptop or jump on it as that was the only thing that stole his mum's warm heart tenderness. I would also like to thank my beloved husband, Wesam, for his continuous support and motivation, especially when things were getting tough. He undoubtedly assisted me in every step, especially during difficult and stressful days. I must express my gratitude to my mum for her continued support and encouragement to work hard. To my beloved brothers and my sister, I am grateful for your endless support, encouragement and inspiration, and for taking care of my kids and accepting excuses for my social distance. The achievement of this degree is shared with yours.

The PhD journey has transformed not only my professional practice but also my worldview. As a consequence, I have learned the hard way that a doctoral project needs lots of motivation, passion and inspiration.
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## Abbreviations

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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AHP</td>
<td>Analytical Hierarchy Process</td>
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<tr>
<td>ASSCMP</td>
<td>Adaptive Sustainable Supply Chain Management Performance</td>
</tr>
<tr>
<td>COVID 19</td>
<td>Coronavirus Disease 2019</td>
</tr>
<tr>
<td>CSF</td>
<td>Critical Success Factors</td>
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<tr>
<td>EFSC</td>
<td>Export Food Supply Chain</td>
</tr>
<tr>
<td>HACCP</td>
<td>Hazard Analysis and Critical Control Point</td>
</tr>
<tr>
<td>ISO 14001</td>
<td>Environmental Management Systems-Requirements</td>
</tr>
<tr>
<td>ISO 9001</td>
<td>Quality Management System-Requirements</td>
</tr>
<tr>
<td>KSA</td>
<td>Kingdom of Saudi Arabia</td>
</tr>
<tr>
<td>LSCM</td>
<td>Lean Supply Chain Management</td>
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<tr>
<td>NT</td>
<td>Network Theory</td>
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<tr>
<td>NVivo</td>
<td>Computer-Qualitative Data Analysis Software</td>
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<tr>
<td>QA</td>
<td>Quality Assurance</td>
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<tr>
<td>QC</td>
<td>Quality Circles</td>
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<td>QDS</td>
<td>Quality Driven Sustainability</td>
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<td>QM</td>
<td>Quality Management</td>
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<tr>
<td>RFID</td>
<td>Radio-Frequency Identification Devices</td>
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<td>SC</td>
<td>Supply Chain</td>
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<td>SCM</td>
<td>Supply Chain Management</td>
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<td>SCN</td>
<td>Supply Chain Network</td>
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<td>SCQM</td>
<td>Supply Chain Quality Management</td>
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<td>SCR</td>
<td>Supply Chain Resilience</td>
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<td>SCRM</td>
<td>Supply Chain Risk Management</td>
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<tr>
<td>SDGs</td>
<td>Sustainable Development Goals</td>
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<tr>
<td>SLR</td>
<td>Systematic literature Review</td>
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<tr>
<td>SPC</td>
<td>Statistical Process Control</td>
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<tr>
<td>SSCM</td>
<td>Sustainable Supply Chain Management or Sustainability in SCM</td>
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<tr>
<td>SSCQM</td>
<td>Sustainable Supply Chain Quality Management</td>
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<tr>
<td>SUST</td>
<td>Sustainability</td>
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<tr>
<td>TBL</td>
<td>Triple Bottom Line</td>
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<tr>
<td>TQM</td>
<td>Total Quality Management</td>
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<tr>
<td>UAE</td>
<td>United Arab Emirates</td>
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<td>USA</td>
<td>United States of America</td>
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Chapter One: Introduction

1.1 Introduction
1.1.1 Brief Overview of the Thesis

The subject matter of this thesis is Supply Chain Management (SCM) in the context of the Jordanian export food supply chain (EFSC) concerning canned food - canned vegetables and fruit and canned meat and poultry. Supply chains (SC) are subject to disruptions from external and internal events. The principal role of managers is to create SCM systems that are adaptable and robust in the face of such disruptions. In other words, the task of managers is to create SC able to ride the wave of disruptions without drowning. The issue of creating adaptive SCM systems is the author's central concern. The practical task of the analysis in the thesis is to construct a Decision Framework that helps managers in the EFSC in Jordan to address the issue.

To what extent do the results and recommendations based on the Jordanian EFSC generally apply to other Supply Chains in Jordan and SCM. The author approaches the question by analyzing her empirical data, comparing them with the literature reported in Chapter 2 with those demonstrated in the thesis, and using her managerial experience to reflect on her results. In her reflection, she hopes to distinguish what might be construed as her opinions from the facts she derives from her analysis.

A brief outline of the author's empirical methods may be helpful to the reader. The author based her empirical work on four Multiple-Case Studies of Supplier - Manufacturer - Customer (S-M-C) Triads, composed of 32 semi-structured interviews with supply chain managers in the export food industry: observations, company visits, and secondary data from published sources triangulated interview data (Chapter 3, p.127). She adopted the views of independent experts to validate her Decision Framework (Chapter 6, p.305). An extensive literature review guided the four Case Studies investigations designed to reveal the underlying attributes of Quality-Driven Sustainability (QDS). The underlying attributes of QDS were identified by synthesising interviewee perceptions. The author was conscious of the inevitable subjectivity in basing her identification of the state of the export food supply chain (EFSC) on perceptions: perceptions of interviewees, her perceptions and the subjectivity of experts. She knows that triangulation, comparisons and synthesis of the perceptions cannot entirely neutralize subjectivity.
She makes every effort to make her empirical methods transparent and replicable. Bedfordshire University is in possession of her raw data. Chapter 3 gives a more complete account of the empirical methods.

The first Chapter demonstrates that this research addresses a problem of significance to Jordan. Firms invariably are part of supply chains consisting of external relationships and internal SC (value chains). SC are complex systems, defined below. However, her experience, intuition, and the investigation described in the thesis suggest they can be understood from the Supply Chain Network (SCN), Total Quality Management (TQM) and Sustainability (SUST) perspectives. The literature review and empirical work described in the thesis led to the author's proposition that the three perspectives are interdependent. Their close relationship is reflected both in scholarly research and the practices adopted by supply chain managers. Her literature review shows that the three perspectives are usually treated separately or in pairs. She found very little literature integrating the three perspectives, although close comparison implies the close relationship expressed in the three-way intersection QDS in Figure 1.1 below. The literature review will attempt to show that the outlying areas are relatively insubstantial. Hence, she placed the integrated concept of QDS at the centre of her empirical work and developed her analysis into a Decision Framework for supply chain managers.

1.1.2 Plan of the Chapter

Section 1.2 explains the research background, rationale and motivation for pursuing this research. Section 1.3 briefly explains the empirical context of the Jordanian EFSC. Section 1.4 identifies research problems and gaps in the literature targeted by the integrated perspective. Section 1.5 outlines the research aims, questions, and objectives. Section 1.6 shows how integrating the perspectives of SUST, TQM and SCN into the concept of QDS plays a significant role in supply chains generally and the context of EFSC in Jordan. Section 1.7 provides an overview of the Triadic approach. Section 1.8 briefly presents the research methodology. Section 1.9 indicates the academic, methodological and practical significance of contribution. Finally, Section 1.10 outlines the structure of subsequent Chapters of this thesis.
1.2 Research Background, Rationale and Motivation
1.2.1 Research Background

At the beginning of the 21st century, the academic discussion on SUST issues and quality orientation called for understanding their linkages (Kuei and Lu, 2013; Abbas, 2020; Vandenbrande, 2021). Globalization, climate change, resource scarcity, and increasing awareness of their social and environmental impact have induced companies to consider SUST. SUST issues extend beyond actions in individual firms to the entire EFSC network and have become critical to short-term competitive advantage and long-term survival (Schulz and Flanigan, 2016). The need to incorporate SUST into the notion of quality is also reflected in academic work (Kuei and Lu, 2013; Abbas, 2020; Vandenbrande, 2021).

Furthermore, since 2005, integrating SUST has been increasingly growing under holistic approaches in actors and SC, supporting the role of TQM and SCN and taking advantage of their common practices (Seuring and Muller, 2008; Rajeev et al., 2017). The improvement practices of actors, both internally and externally, facilitate SUST and enhanced collaboration and SCN by focusing on QDS (Beske et al., 2014; Bastas and Liyanage, 2018b). Hence, this research aims to understand QDS and examine the possible association between the perspective's SCN, TQM and SUST Themes.

The SUST perspective is integrated with quality perspectives transmitted via SCN, such as TQM, rather than treated as a stand-alone category (Fernandes et al., 2017; Sauer and Seuring, 2018). Many aspects of SUST have become an integral part of TQM, and the concept of QDS is intended to capture this. SCM has played a strategic role in reducing costs and managing the complexities of SCN (Glover et al., 2014; Govindan, 2018). TQM is a vital methodological perspective that has evolved to encompass many aspects of quality management (QM) and extends quality attributes to the role of SCN and broader aspects of SUST for capability development, employment and cultural transformation and the SUST and improvement of supply chain quality (Machado et al., 2016; Cho et al., 2017). Actors in EFSCs began to adopt a more holistic view of SUST, as illustrated by the emergence of the principles of Triple Bottom Line (TBL) strategies, which balance stakeholder interests, people, and the planet in addition to profitability and effectively integrate them in their SC (Chen et al., 2017; Sauer and Seuring, 2019).
There is a growing concern regarding the concept of QDS regarding quality initiatives addressing SUST in SCN (Siddh et al., 2017; Govindan, 2018; Bastas and Liyanage, 2018b; Do et al., 2019).

### 1.2.2 Rationale, Motivation of the Research

Rationale and motivation are two closely related concepts. The researcher's career experience in a quality infrastructure organization over the last 15 years, with knowledge and hands-on experience regarding government strategies and practical experience in the food industry, motivated this research. She has a long-standing ambition to carry out academic work. Increasing awareness of the urgency of achieving Adaptive Sustainable Supply Chain Management Performance (ASSCMP) motivated her research. ASSCMP in Jordanian EFSCs is particularly significant, but the topic is relatively under-researched. The components of the acronym of the ASSCMP are keywords that she will elucidate their significance as a whole as the thesis progresses. Recently, SUST has been a growing trend in sustainable development (SD) in various sectors in Jordan and globally. Jordan presented a new roadmap in 2015 to implement the 2030 Agenda and the United Nations (UN) Sustainable Development Goals (SDGs) (MoPIC, 2015). The government of Jordan has highlighted the issues and constraints and believes in its role in developing economic and export performance through joining free trade agreements with the World Trade Organization (WTO), strengthening the position of Jordanian exports, and expanding exports to new markets such as new western markets, America and Canada as the regional political instability requires the search for other markets (MITS, 2019).

The researcher's increasing awareness of global and local risks and disruptions motivated the research and provided a rationale. Resilient adaptations by organizations in SC all over the world are urgently needed. Furthermore, the EFSC is critical to national and international survival, well-being and food security, and the emphasis on climate change involves focusing on SUST. Managing supply chains is a significant topic; EFSC is a complex situation in Jordan and elsewhere. There are challenges due to recent events (presented as outside the box in Figure 1.2), such as the COVID-19 crisis, and further sudden shocks, such as wars in Europe, ever-present tensions in the Middle East, world stagflation and economic slowdown, food shortages, safety risks, and financial problems have disrupted supply chains, particularly those concerned with exports. As a result, opportunities have opened up to add to existing
research by taking a holistic approach that integrates three perspectives, SCN with TQM and SUST, in the context of SC in the Jordanian export food industry.

1.3 Empirical Context

The empirical context of this research is EFSC. Jordan is a developing country in the Middle East with a population of 10.203 million (DOS, 2020). The food processing of manufacturers, as one of the leading sectors in Jordan's economy since the year 2000 and the food supply export industry in Jordan, make a significant contribution to food security and economic and social development, with a GDP of 6.4 %, a 9.1 % share of total exports and revenues of 4 Billion JOD (JCI, 2019). This adds value through competitiveness in export markets within processed meats, processed fruit and vegetables and dairy products (MITS, 2019). In 2019, the total number of Jordan's food processing facilities as manufacturers (focal actors) was 2,666, with diversity in the sizes of companies. Approximately 1981 were considered microenterprises of less than ten employees based on traditional food processing capabilities. The remaining 685 enterprises were considered small or medium, with a few large companies (JCI, 2019), with a distribution of 365 in Amman, 165 in Zarqa, and 155 in Irbid and other geographical areas. Hence, these focal actors require better analysis and export guidelines to manage and improve their EFSCs.

The Jordan Vision 2025 (a national strategy) has targeted the food processing industry (MoPIC, 2015; MITS, 2019). This sector is considered the second sector in employment opportunities, with a tendency to employ women in activities that require patience and intensive manual work (JCI, 2019). Governmental organizations regulated their adherence to global standards and regulations and generated joint support with industry and private chambers (MOPIC, 2015; MITS, 2019).

This research focuses on one primary industry in Jordan: food processing for exports (JCI, 2019; MITS, 2019). Adapting these SDGs and enhancing competitiveness and value-added (MoPIC, 2015) is challenging because exports are one of the main drivers of adopting sustainable practices. The global food supply is affected by COVID-19, and solutions to such problems are required (Sarkis et al., 2020).
The EFSC context differs from other SCs and has different challenges (Diabat et al., 2019; Ghadge et al., 2017). Furthermore, EFSC disruption is prevalent, which has caused substantial losses for businesses (Nerín et al., 2016; Schmitt et al., 2017), justifying the need for more research.

- The dynamic and complex EFSCs require a Triad (Supplier - Manufacturer - Customer) to improve the quality of products for better SUST (Li et al., 2014; Mattevi and Jones, 2016). Food suppliers, manufacturers and customers are continuously under pressure to respond to the increased requirements for quality, safety and health standards in exporting and timely delivery of products in the right quantity, keeping better SUST ((MITS, 2014; Siddh et al., 2017). This is because developing countries are learning from the development and capabilities of their foreign competitors and developed countries (Christmann and Taylor, 2001) that balancing the needs of various stakeholders is required instead of just purely maximizing their financial success. Consequently, further research with a better Triad analysis is needed (Gadde and Amani, 2016).

- The complexity of the SCN is due to a long chain with various types of transportation, storage, and processing. These constraints could be vulnerable in exports due to weak management. There is a need for better capacity building with technology, innovation and the development of logistics in EFSCs and re-evaluating the recent loss of some export markets (JCI, 2019; MITS, 2019).

- Food SC has high product differentiation and variability between suppliers supplying the same product, which requires traceability and the visibility of products along the SC with strict international laws and regulations (Mattevi and Jones, 2016).

- Moreover, EFSCs are highly susceptible to climate change, and product seasonality results in frequent production and surplus, which needs a sustainable export strategy.

- Furthermore, the presence of significant capacity constraints, such as water and energy (inefficient use of resources, high energy consumption), expensive technical equipment and intensive labour skills. The food industry in Jordan is a major cause of the degradation of the environment and is the most energy-intensive industry, with economic loss, which is
unacceptable socially; therefore, Jordan needs to adopt environmental management practices and work towards sustainable development (SD).

- Moreover, previous research in Jordan has targeted the food industry as a general food industry or fresh fruit and vegetables (Al-Zu'bi et al., 2015; Al-Ghwayeen and Abdallah, 2018). Also, many companies indicated that those who export regularly are few (JCI, 2019).

This research focuses on the food industry for canned, processed food products for export. EFSCs are selected to be analyzed in detail based on specific criteria linked to:

- The capacity for employment, growth and innovation.
- Moreover, this food industry applies quality and SUST concepts and is interconnected with other sub-sectors (multi-tiers), such as input suppliers, producers, packaging, wholesalers and exporters in chain networks (MITS, 2019; JCI, 2019).
- This canned, processed food also ensures food security targeted with all government strategies. With the COVID-19 pandemic, canned food is in demand internationally, regionally, and locally, but the global SC problem needs good transportation, storage, technology, and innovation management.
- This food sub-sector is subject to uncertainty in weather conditions, seasonality and the sensitivity of food processing due to safety problems and quality programs.

1.4 Research Problems, Key Gaps and Originality

1.4.1 Research Problems

Arable land and water are relatively scarce in Jordan. The country is heavily dependent on food imports, and the export of canned food is an important contributor to economic growth and fostering trade relationships. Jordan is centrally located in a turbulent political area, but its location enables it to become a crossroad for trade between continents. A brief discussion, expanded in later Chapters, shows that Jordan's EFSC is complex. It comprises many suppliers (nodes), some with few and some with many connections. If hit by disturbances, nodes with many connections can be very vulnerable. The author's analysis shows it has proved to be stable in recent years despite the disturbances which she refers to frequently. She focuses on a relatively neglected area of research and, given the connectedness of the
EFSC in Jordan, plus the scarcity of resources and central location, highlights the significance and relevance of her research.

Hence, significant research problems emerged from the internal complexity of EFSC and disruptions, which present managers with new challenges. Hence, the research problem relates to this complex EFSC for better managing actors' networks and supply disruption. SUST and well-designed quality within the food processing industry led by manufacturers could ensure efficient and effective processing and exporting operations for the current and future export markets, especially after the pandemic of COVID-19 (RHC, 2020).

EFSC is a complex situation in Jordan. There are challenges due to globalization, risk, disruption, initial crisis, sudden shocks such as wars in Europe, and food quality and safety. Recent events such as COVID-19, food shortages and financial problems have disrupted SC, particularly exports.

SC consists of many different organizations working together with the connection of various stakeholders along SC so that the impact will be more significant. SC disruption caused stagnancy in Jordan. The impact is an undesirable outcome that will impact the organization, business, employment and revenue because all actors are connected; the impact will be more significant, so without sustainable SC, Jordan will suffer.

The same criticism is applied to the concept of SUST, which extends to people and the environment and balances stakeholders' interests in addition to profitability. SUST is gaining global attention related to changes and disruptions in food availability, security, and safety in Jordan and globally. There is a shift from traditional SC to sustainable SC by understanding stakeholders' roles and involving actors in SCN by focusing on quality.

Moreover, Jordan believes in developing economic and export performance (strengthening the Jordanian export position) and expanding to new markets due to political instability in the area. That focus on food security.

Thus, this thesis is critical; the findings will be a Decision Framework necessary to the Jordan context to build sustainable SC; without SSCQM, Jordan will suffer. So developing Sustainable SC responding to various actors' demands in SCN and planning the systematic implementation of SUST and TQM is
necessary to Jordan by involving all actors along SCN and understanding their needs also to assess their current SUST toward transformation to sustainable development through integration SUST in their quality systems.

1.4.2 Key Gaps

Key gaps relate to this complex EFSC in Jordan for better managing actors' networks and supply disruption. The key research gaps are the following:

- There have been very few studies integrating the three perspectives generally, and the researcher has not found any such research publication on SC in Jordan, particularly regarding food exports (e.g., Jraisat et al., 2013; Abdallah et al., 2014; Diab et al., 2015; Nimeh et al., 2018; Bani-Khalid, 2019). These studies are narrower than the approach adopted in this thesis as they focused on only a single actor's immediate supplier. They did not investigate the SUST concept, and their scope was not found to be related to non-perishable products (i.e. processed canned food) in Jordan.

- Several authors (Kuei and Lu, 2013; Bastas and Liyanage, 2018b; Pohlmann et al., 2020) have called for an in-depth study of the integration of quality and SUST and how focal actors such as manufacturers can extend applications from entire organizations to the supply chains and networks. This is to ensure the efficient movement of the required raw materials, inventory, and information from the manufacturers to the market across multiple tiers of suppliers and customers.

- There are shortcomings of holistic empirical frameworks in the literature in integrating the SCN, TQM and TBL SUST perspectives (Bastas and Liyanage, 2018b). Some authors, such as Agi and Nishant (2016) and Dubey et al. (2015), studied this integration; however, these studies have limited empirical results and implications (Govindan et al., 2014a).

- Most empirical research on SCN studied one or two SUST aspects, but very few evaluated integrated TBL for SUST performance in the context of SCN (Beske et al., 2014).
• There was very little empirical evidence, especially in developing countries' food supply chain context. There have been very few studies integrating the three perspectives generally, and the researcher has not found any such research publication on SC in Jordan, particularly regarding food exports (e.g., Jraisat et al., 2013; Abdallah et al., 2014; Diab et al., 2015; Nimeh et al., 2018; Bani-Khalid, 2019). These studies are narrower than the approach adopted in this thesis as they did not investigate the SUST concept, and their scope was not found to be related to non-perishable products (i.e. processed canned food) in Jordan. Furthermore, many previous empirical studies have been conducted in various industries and developed countries; however, there was limited in-depth research on the food industry in developing countries.

• Complexity Reduction: The point here is that SCs are complex systems. The boundaries of firms are not well-defined once we consider SC. There are many interdependent relationships which increase the complexity. The Triadic approach enables the author to focus on internal and external influences, with particular emphasis on the former internal influences. There are limited studies on multi-tier management from the focal actor perspective (Triadic relationships in EFSC and make better quality and SUST along with various actors (Mena et al., 2013; Gong et al., 2018; Mesic et al., 2018; Sauer and Seuring, 2019; Jaakkola and Aarikka – Stenroos, 2019; Lechler et al., 2019; Pohlmann et al., 2020).

The research gaps will be addressed, particularly in Chapter 6, and clear differentiation from the last literature will be presented in detail.

1.4.3 Originality

It is difficult for any researcher to claim originality because so much of any researcher's work builds on work that has been done previously. Nobody can do something completely new and original. This research is considered one of the few studies that adopt a holistic approach that integrates three perspectives, SCN, TQM and SUST, integrating their key Themes to understanding QDS and its impact on all concepts of TBL for ASSCMP. The key contribution is developing and validating a Decision Framework of SSCQM, focusing on QDS in EFSCs from the perspective of the Triads of Supplier-Manufacturer-Customer. Integrating the three perspectives with a focus on the QDS phenomenon brings
a new theoretical association of key Themes of the three perspectives, QDS phases and ASSCMP. Therefore, this research attempts to bridge these key gaps to provide original contributions to SCN, TQM and SUST knowledge.

Moreover, focusing specifically on the export food industry, it examines the factors affecting the SUST of EFSC of Triadic (Supplier-Manufacturer-Customer) from the perspectives of the Manufacturer and focal company, as it becomes urgent within the COVID-19 pandemic.

On the other hand, the AHP model is a theoretical contribution intended to deal with a complex situation with many players and find a way to clarify their priorities. Another contribution is the methodology of analytical generalization, which links data to the new theory, namely the Decision Framework of SSCQM, based on multiple Case studies, an abductive approach, triangulation methods, and research rigour. Furthermore, the theoretical framework developed from the study contributes to bridging the gap for SSCQM. This research also provides managerial implications to advance the knowledge and practices of multi-tier EFSCs. Finally, the research is a learning process, and new things emerged during the study and the three Themes that evolved, as presented in the final Chapter. Chapter 7 shows how the author has extended the SCM research paradigm from the point of theory, practice and methods. The research recorded in the thesis has been an evolutionary process.

1.5 Research Aim, Questions and Objectives
1.5.1 Research Aim

The overall aim of this research is as follows:

To develop a Sustainable Supply Chain Quality Management (SSCQM) Framework for the Export Food Supply Chain (EFSC) in Jordan using the concept Quality Driven Sustainability (QDS) based on the integration of three interrelated perspectives (TQM, SUST, SCN).

The research is based on an extensive literature review and empirical analysis that reveals the perspectives and processes underlying QDS, which are important phenomena that determine the state of Jordan's EFSC. Generally, through the SCN, TQM, and SUST perspectives and specifically in EFSC in Jordan, to propose, examine and validate a conceptual framework of Sustainable Supply Chain Quality
Management (SSCQM) to enhance the management of EFSCs in Jordan. This research used four empirical Triads, which are made up of Supplier-Manufacturer-Customer from the perspective of the focal actor, the Manufacturer, in the research. The unit of analysis is EFSC, including the meat and vegetables SC.

1.5.2 Research Objectives

This present research attempts to fill the gaps in the existing literature discussed in Section 1.4.2. To enable the accomplishment of this aim in Section 1.5.1. The research objectives have been formulated based on enabling the best answers to the research questions (Yin, 2018). The analysis is based on an extensive literature review and empirical analysis, resulting in a conceptual model that maps out the three perspectives (SCN, TQM, SUST) noted above into Themes and Sub-Themes that are key to QDS. The Decision Framework is described as an SSCQM designed to enhance the management of EFSCs in Jordan to achieve the aim. Accordingly, the objective of this research is:

1. Identify and Synthesize the three perspectives (SCN, TQM and SUST) in the academic literature, which are usually considered separately.
2. Develop a research design and identify primary and secondary data sources.
3. Identify appropriate Case Studies focusing on Triadic relationships in Jordan's EFSC.
4. Identify the current state and assess the performance of EFSC in Jordan with particular reference to the three perspectives of SCN, TQM and SUST in the Triad.
5. Construct a Decision Framework for sustainable supply chain quality management (SSCQM) that includes recommendations about implementing QDS in EFSCs in Jordan.

1.5.3 Research Questions (RQ)

Based on the management research problem presented in Section 1.4.1, with regards to analyzing the literature and the research scope and bridging the research mentioned above gaps. To achieve the research aim of assessing the phenomenon of QDS (Saunders et al., 2015), the researcher designed a set of questions to progress with the research aim to develop a framework to assist in SSCQM. Interview
responses and other data gathered by the researcher enabled her to address the propositions associated with the questions below. The propositions relating to the questions are addressed in Chapters 6 and 7.

**RQ1:** How are the existing supply chain management literature's three perspectives (SCN, TQM and SUST) interrelated?

**RQ2:** What SCN practices are applied by Triads to build QDS in EFSCs?

**RQ3:** What TQM practices are applied by Triads to build QDS into EFSCs in Jordan?

**RQ4:** What are TBL SUST practices applied by Triads to build QDS into EFSCs in Jordan?

**RQ5:** What are the implications of QDS (Integrating the three perspectives into QDS) in the context of EFSCs in Jordan?

**RQ6:** How do QDS practices impact the TBL sustainability performance of Triads in EFSCs in Jordan?

**RQ1** aims to define if the literature supports that the three perspectives (SCN, TQM and SUST) are closely related and can be integrated into the concept of QDS in EFSC, which is the foundation of a conceptual model. **RQ2** has been concluded from the SCN perspective to identify SCN practices for Triads to understand QDS in EFSC. **RQ3** is derived from the TQM perspective on how Triads apply TQM practices to build and improve QDS in EFSCs. **RQ4** is derived from the SUST perspective; TBL SUST practices associated with the category QDS by the manufacturers as focal actors and other Triadic actors. **RQ5**, with particular reference to EFSCs in Jordan, derived from Case analysis and the related analysis to illustrate that integrating the three perspectives into QDS enables the researcher to identify them. **RQ6** revealed if QDS practices by managers contribute positively to the SUST (e.g. environmental, social and economic) performance of EFSCs in Jordan.

### 1.6 Overview of Integrating Perspectives and Quality-Driven Sustainability (QDS)

This thesis analyses Supply Chain Management (SCM) through three perspectives: Supply Chain Network (SCN), Total Quality Management (TQM) and Sustainability (SUST). Therefore, the approach in this research is holistic in integrating the three perspectives, which are the essence of Quality-Driven
Sustainability (QDS) in EFSC (Wilhelm et al., 2016; Ghadge et al., 2017), as illustrated in Figure 1.1 below. QDS has been researched with limited empirical findings and in-depth analyses, as demonstrated in the literature review. Surprisingly, literature focused on an integrated view is scarce. The increased importance of and reliance on SC, often international and global, has extended firms' boundaries. Quality and Sustainability management extends beyond a manufacturer to its suppliers and customers through a network of relationships.

Figure 1.1: The Research Scope-Key Perspectives
(Source: The Researcher)

This research focuses on QDS in EFSCs of manufacturing for the export processing food industry (Ghadge et al., 2017; Wilhelm et al., 2016). The research identifies two key perspectives to be incorporated into the SCN perspective as the theoretical foundation: the TQM perspective (Kaur et al., 2019; Abbas, 2020) and the SUST perspective (Ansari and Qureshi, 2015; Rajeev et al., 2017; Heidari et al., 2021). The meaning of the three concepts in the context of the thesis is clarified in Chapter 2.

Regarding Figure 1.1, The SCN is a platform for sharing and transmitting information relating to Quality and SUST in the Triad. As the literature review demonstrates, TQM includes many practices that have developed over the years. The author's empirical work gives a detailed picture of how it is developed in the Jordanian export food industry. It includes the hard and soft factors. Supply chains are prone to disruption beyond their managers' control. (See Figure 1.2). Their task is complicated by the
need to re-orientate their focus on profit and focus on a triple bottom line: attention has shifted from shareholder value to the broader concerns of Sustainability (SUST). SUST includes economic, social, and environmental aspects that should be given equal attention to new initiatives and strategies.

This research attempts to understand QDS in EFSCs in Jordan from the perspective of the Triads of Supplier-Manufacturer-Customer. In the Triad, the Manufacturer is treated as the focal actor who needs to link and lead the other two Triadic actors in an EFSC. (See Figure 1.2) (Mena et al., 2013; Faisal et al., 2017; Lechler et al., 2019) to build better quality products and processes along the SC for better SUST (Gong et al., 2018a; Pohlmann et al., 2020). An outcome of the thesis is the development of a Decision Framework based upon a new perspective, Sustainable Supply Chain Quality Management (SSCQM), for supply chain managers attempting to achieve Quality Driven Sustainability (QDS).

The thesis argues that the three perspectives integrated into the concept of QDS enable their impact on SCM to be evaluated. Using this concept, the author designs a Decision Framework to help managers achieve long-term Adaptive Sustainable Supply Chain Management Performance (ASSCMP) based on social and environmental performance and economic goals. In this thesis, the ASSCMP is based on assessing the performance in terms of QDS (TQM, SUST, and SCN) in the face of changes, disturbances and disruptions to SC Triads coming from inside (endogenous), for example, the Internet of Things, blockchain and innovations, and outside (exogenous), regulations and standards are drivers for EFSCs (Büyüközkan and Göçer, 2018; Feng et al., 2020).

The researcher argues that QDS profoundly influences ASSCMP. Adaptability in SCM is similar to growth in developing countries and mature economies. The thesis focuses on adaptability in EFSCs in Jordan. It is a three-dimensional approach to long-term sustainable organizational development.
1.7 Triad Approach

![Triad Model of Supplier-Manufacturer-Customer with Internal and External Influences](image)

Figure 1.2: Triad Model of Supplier-Manufacturer-Customer with Internal and External Influences (Source: The Researcher)

The research attempts to identify a possible association between SCN, TQM and SUST from the perspective of Supplier- Manufacturer - Customer Triads. SCs are complex systems, and the way to simplify the complex picture of SCN was by adopting the Triad approach, which is the main focus of this thesis.

In later Chapters, the author shows a new triadic relationship (Supplier - Manufacturer - Customer) approach enables her to reduce the complexity associated with SC through a Triadic approach whilst retaining the critical features of SCM and enhancing their understanding of EFSC in Jordan and building a helpful Decision Framework.

Triad allows investigating SC’s structure to simplify the complexity of relationships and understand the characteristics of multi-directional relationships (Michalski et al., 2018; Stone and Rahimifard, 2018). Vedel et al. (2016) define Triads as three actors who are directly or indirectly connected to their
relationship. The Triad is considered the smallest unit of analysis of how one relationship affects another three associated actors in the network (Vedel, 2016; Siltaloppi and Vagro, 2017).

The researcher focuses on the Triad of relationships illustrated in Figure 1.2 embedded in large SCN and composed of a three-tier supply chain formed by three sequentially interconnected actors (Supplier, Focal Manufacturer, Customer) that establish linear product and information flows (Bastl et al., 2013; Yang et al., 2022) which are simplified in the Figure1.3 below.

![Triad in Supply Chain Network](image)

**Figure 1.3: Triad in Supply Chain Network**  
(Source: The Researcher)

The empirical work is based on Case Studies of four Triads showing network relationships between the Supplier, Manufacturer, and Customer. This Triadic relationship consists of the Manufacturer as the focal and middle actor linking both dyadic arrangements with the immediate direct first tire (Supplier-upstream; Customer - downstream) (Wuyts et al., 2004). Triads are depicted as focal companies from the Manufacturer's perspective (Fernández-Barcala et al., 2017). Among those actors in a Triad, the Manufacturer is the focal actor who needs to coordinate the network structure, link and lead the other two Triadic actors in an EFSC under internal and external influences. This research adopted (Mena et al., 2013) a Triad structure: **open, transitional and closed**, as depicted in Figure 2.4 and explained in detail later in Chapter 2.
1.8 Research Methodology

This research adopted a qualitative methodology and conducted four Case Studies as Triads of the EFSC in Jordan. EFSC is the unit of analysis that consists of a group of Triads. The Manufacturer is the empirical work's focus and the focal actor in the Triad of Supplier- Manufacture - Customer (Case Study) in the EFSCs. This research seeks to build a new theory that conceptually guides the analytical iteration levels between theory and data. This research consists of four stages. First, a literature review is systematically done to provide the initial conceptual framework. Second, a pilot Case aims to refine the initial framework. Third, four Case Studies of 32 semi-structured interviews, four observations, 12 tours and document analysis are conducted within the Triads of Supplier - Manufacture - Customer in their EFSCs. This is to individually explore each Triad to provide the empirical examination of the proposed framework for the exploratory stage in each Case. Fourth, the four Cases are cross-analyzed to provide an empirical explanation and match the findings to the proposed framework for the explanatory stage across all Cases.

The evidence of data collected for this empirical was triangulated during the analysis. The Analytic Hierarchy Process (AHP) is a multi-criteria decision tool applied to prioritize critical factors (key Themes ) after completing the cross-analysis in Chapter 5 based on expert opinions to enhance and modify the findings of the empirical work. This involves continuous development toward the final conceptual framework of SSCQM – Decision Framework for QDS in EFSCs.

1.9 Research Contributions

Research at this level should contribute to the literature, adding new ideas and taking account of existing contributions, particularly recent ones. A contribution to theory is particularly important. In the researcher's opinion, it is significant to determine where research gaps and contribute to resolving them and open up new research directions. The researcher hopes the reader will consider that the thesis makes little progress in these directions. The previous Section indicated the practical significance of the research. It addresses a problem of increasing urgency. Other practical and theoretical issues pointing
to the significance of the research are discussed in detail in subsequent Chapters. They are sketched out here, discussed in detail later in the thesis, and reviewed in the final Chapter.

This research provides theoretical, methodological and managerial contributions as follows:

a. Integration of theoretical underpinning that provides an integrated view of SCM for three perspectives, SCN, TQM and SUST, will provide a new association between their key Themes, QDS and ASSCMP.

b. This new association will be explored and examined with various actors based on Triad analysis in EFSCs, and an analytical generalization will be provided.

c. Development of a practical integrated conceptual framework (Decision Framework) framed under SSCQM built upon the holistic view that integrates the three important perspectives of SCM, SCN, TQM, and TBL SUST for SSCQM, focusing on QDS in EFSCs.

d. Extension of the QDS concept in relevance to Jordan and its food industry related to EFSC and the broad concept of QDS can be applied to SCM globally.

e. A theoretical contribution is enormous when the state of EFSC is approached through the lens of QDS; the author demonstrates that this increases the depth of understanding of the research issues.

f. The empirical evidence is conducted to enrich the context of developing countries, especially concerning Jordan's food processing industry.

g. This research will support managers and policymakers in integrating management systems practically regarding quality and SUST principles and policy deployment for continual SUST.

h. The research will provide managerial implications to advance the knowledge and practices of horizontal and vertical organizations in multi-tier EFSCs and also benefit the focal actors, Triads and their networks and similar industries in developing countries in a similar context.

1.10 Thesis Structure

Six Chapters follow Chapter 1 in the thesis and are briefly outlined below.

Chapter 1: Introduction: This provides the research background, the rationale behind the research topic, the research gaps, the research aim, questions and objectives, the empirical context of EFSC, the
theoretical context, the research's theoretical and methodological implications, and the structure of the thesis.

Chapter 2: Literature Review: This starts with the literature review strategy. SCN is a leading perspective reviewed to focus on QDS in EFSCs. An overview of TQM and its critical factors is discussed to understand how a TQM perspective is incorporated to understand QDS in EFSCs. Sustainability development and the SUST perspectives of TBL are reviewed. This justifies how these perspectives and their key Themes support understanding the QDS phenomenon in EFSCs. This is followed by identifying the research gaps in the extant literature to inform the research questions. A conclusion is provided with a discussion of the conceptual framework of SSCQM for guiding data collection and analysis.

Chapter 3: Research Methodology: This provides the research philosophy, methods, strategy, and justification. The methodology is to answer the research aim, questions and objectives. It explains the research design of this thesis and the qualitative Case Studies, including the data collection and analysis. It also explains triangulation, research rigour and quality. Ethics and risk assessment are also discussed.

Chapter 4: Case Analysis and Findings: This is an exploratory stage to provide analysis and findings on each Case (four Cases of Triads: Supplier-Manufacturer-Customer in EFSCs). It presents the analysis of the interviews, observations, documents, and findings for each Case Study. The conceptual framework is explored in each Case based on a Case agenda, triangulation methods and thematic analysis.

Chapter 5: Further Analysis and Findings: This is an explanatory stage to provide the analysis and findings across the four Cases of Triads in EFSCs. It presents similarities and differences across the Case Studies and provides the contributions of SCN, TQM, and SUST to QDS in EFSCs. Based on thematic matrixes, a replication logic, a thematic network, and building explanations and propositions, the final integrated conceptual framework of the SSCQM-Decision Framework was originally constructed for the present research.

Chapter 6: Final Decision Framework: This explanatory stage provides findings across the four Cases of Triads in FSCs. It provides propositions. The final integrated conceptual framework of SSCQM was originally constructed for the present research based on triangulation methods and
thematic analysis, the AHP method for validating the final conceptual framework - Decision Framework.

Chapter 7: Conclusion: This summarises all the Chapters, key findings, and how the research aim and questions are achieved. The research's theoretical, methodological and managerial implications are highlighted. The research limitations and suggested future research are outlined.

1.11 Conclusion

This introductory Chapter has offered an overview of the research topic and approach of the Jordanian EFSC. It explained the research Background, the rationale for pursuing this study and the key gaps addressed in the literature. This Chapter presented the aims and objectives and six research questions based on the gaps identified in the literature. However, there is a gap in knowledge of how to address their impact. An introduction of empirical context and a brief presentation of the methodology is presented. Moreover, it highlights the study's main theoretical and managerial contributions and concludes with the thesis structure. The next Chapter, the literature review, will provide the background and initial conceptual framework.
Chapter 2: Literature Review

2.1 Introduction

In the previous Chapter, the author set out the overall aim of the research as developing a Sustainable Supply Chain Quality Management (SSCQM) Framework for the Export Food Supply Chain (EFSC) in Jordan using the concept of Quality Driven Sustainability (QDS) based on the integration of three interrelated perspectives (TQM, SUST, SCN), (Section 1.6). She also proposed that a necessary condition for achieving this was to analyze the state of the EFSC at the time of the research. She set out a series of research questions relating to the relevant theoretical and analytic literature on SCM, particularly in the Jordanian EFSC. The literature reviewed forms the basis of her conceptual model and her approach to empirical research.

The aim of the Literature review (LR) is as follows: First, it aims to demonstrate the researcher's understanding and awareness of relevant issues in the SCM paradigm. Secondly, the LR provides the building blocks for an initial conceptual framework. Thirdly, the review surveys the theoretical constructs adopted. Finally, it is hoped that the LR provide the basis for extending the SC paradigm in the context of EFSC in Jordan and making an original and helpful contribution to Paradigm.

2.1.1 Outline Content of Chapter

Following the introduction, this Chapter describes the literature search, the criteria for choosing which areas to search and how relevant papers were selected. What the author means by a critical literature review is introduced in Section 2.2. The complexity of the SC is introduced in Section 2.3. SC are complex systems illustrated by networks that have become more extensive as companies globalize. To simplify the complexity, the author focuses on the Triad of relationships illustrated in Figure 1.2 and Figure 1.3 (Chapter 1). Figure 2.4 divides the SC into a Triad of Suppliers, Focal Manufacturer, and Customers.

The Chapter then progresses to outline the literature associated with the three perspectives. First, the Supply Chain Network (SCN) perspective is in Section 2.4, then the Total Quality Management (TQM) in Section
2.5, followed by the Sustainability (SUST) in Section 2.6. Sections 2.4 – 2.6 follow a pattern of a. Stating the underlying theory of each perspective as found in the literature. b. Key literature on the perspectives is reviewed separately concerning the other two perspectives; c. The insights from the literature are applied to EFCs. d. The most important Themes and Sub-Themes associated with each perspective are used to create a conceptual model.

In Section 2.7, The Chapter continues with a review of area D, which contains the author's concept of QDS, which is critical to understanding the nature of EFSC in Jordan. The Chapter highlights gaps in the literature this thesis addresses, followed by a brief content summary.

2.1.2 A Critical Literature Review

A critical literature review should build on scholars' work in the chosen research area. The first step is to gain a deep understanding of their work. The next step is developing and applying their ideas to new areas and problems. A critical review should also identify gaps in existing research. (See Chapter 1, Section 1.4.2) above. Gaps may exist in the theoretical and empirical approaches. Recent theories and methods may highlight the research problem. Another aim of a critical review is to use insights from existing literature to develop a conceptual model and hypotheses and to test against evidence. This Chapter is the foundation that links the theoretical and empirical aspects associated with QDS.
Figure 2.1 above is central to the thesis. It is the basis for the conceptual model. It also suggests a logical approach to the critical literature review from three perspectives (SCN, TQM and SUST), focusing on QDS in EFSCs.

The author will attempt to integrate the three perspectives (area D). In the literature, the three aspects are often treated separately or in pairs, but rarely are they treated together, as illustrated in Figure 2.1. It is somewhat surprising that the interdependence between the three perspectives has not been more addressed in the literature. Therefore, area D demonstrates a gap in the literature, which the thesis addresses via her concept QDS. The SCN perspective is an integrating factor since it is the medium in which the other two perspectives are transmitted between supply chain members. As the research progressed, the high degree of interdependence between the three perspectives in the literature theoretical and applied literature became clear. The researchers (Agi and Nishant, 2016; Dubey et al., 2015; Govindan et al., 2014; Jabbour et al., 2014) have discussed the practical benefits of integrated approaches to TQM, SCN and SUST.

As expected, the author found the area labelled QDS was substantial and justified further development of the conceptual model by data collection and analysis (Corbin and Strauss, 2015). The literature also suggested examining QDS in EFSCs from the perspective of Supplier-Manufacturer-Customer Triads in Jordan, which offered a usual approach to achieving her aims. Treating the SC in terms of Triads simplifies...
complexity. However, the author argues, it does not distort the essence of the entire SC if the relationships between Triad members persist for a reasonably long period. This is discussed and justified in Section 2.3.

2.2 Systematic Literature Review

2.2.1 Selection Strategy

Systematic Literature Review (SLR) is defined as "A systematic, explicit, and reproducible design for identifying, evaluating and interpreting the existing body of recorded documents" (Fink, 2019, p.6). A systematic review involves focused, in-depth scanning for selected literature and analysis (Tranfield et al., 2003; Aguinis et al., 2020). This methodology simultaneously reduces researcher bias and increases transparency and replicability (Crowther and Cook, 2007).

The literature review aims to identify knowledge gaps, clarify a specific problem, and ultimately contribute to developing or extending theory (Fink, 2019) to provide practical implications. After electronic searching, a manual SLR yielded articles related to the research subject and inclusion-exclusion criteria (See Table 2.1). Further, the literature's scope was narrowed, and some subjects were excluded based on a selected inclusion-exclusion criterion.

2.2.2 Search Criteria

SLR should set out guidelines for selecting literature emphasizing significant contributions and balancing broad general coverage and detailed exposition of key literature. A critical review should expose the leading paradigm theory in the chosen empirical area.

The literature search guidelines are based on selecting peer-reviewed articles in the evolution of the related research area (1987-2023), focusing on the related research area. As a result, 164 critical articles related to QDS in EFSC were deeply analyzed in terms of content, methods, and theory to identify the gaps and related perspectives and Sub-Themes to reach theory-building (Tranfield et al., 2003). These selected articles were classified: researcher name and year of publication, type of research method, key Themes and the conclusion (Table 2.1; Appendix A). The important aspects of the research and details of the criteria...
used to select relevant published materials are summarised in Table 2.1. The author provides further information in Table 2.6 and Appendix A.

Table 2.1: Literature Review Strategy in the Present Research

<table>
<thead>
<tr>
<th>Keywords and Main Themes</th>
<th>SCM, SCN, TQM, Sustainability, Quality, Sustainable development, Triple bottom line, 3BL, TBL, QM, SSCM, SQM, SSCQM, Manufacturing, Network, EFSCs, QDS, Supply chain.</th>
</tr>
</thead>
</table>
| Timeframe of Reviewed Papers | (1987-2021)  
1987 start of the sustainability concept  
1990-2004 "SSCM was published after 1990,  
1994 “Food supply chain” appeared  
1994 “TBL” appeared  
2000 is the starting point of integration  
2005-2022 (period of integration of QM and SCM and sustainability) |
| Literature Type | Academic journals, Peer-reviewed articles, Conference papers, and Book Chapters. |
| Fields | Title, Keywords, Abstract |
| Limiters | English language, Peer-reviewed |
| Frequency | Monthly search to ensure literature is constantly updated |
| Exclusion Criteria | , integrating sustainability, quality and SCN with other unrelated business models to ensure focus on and rigour concerning the specific relationships.  
QM, SCN and sustainability terms outside the “QDS”, cost modelling, regulation and law issues. |
| Inclusion Criteria | SCN, TQM and Sustainability terms related to QDS in EFSC |
| Search Strings | Keywords central to SCN, TQM and sustainability and their integration were adopted, such as:  
SQM: “QM” and “Sustainability”  
SCQM: “QM” and “SCM/SCN”  
SSCM: “Sustainability” and “SCM/SCN”  
SSCQM: “QM” and “SCM/SCN” and “Sustainability” and QDS in EFSC and including keywords fundamental to each research line with the combination "or" "and," |

(Source: The Researcher)
Recommended SLR procedures for selecting papers relating to perspectives are depicted in (Table 2.1). The literature on the three perspectives is reviewed, illustrated in Figure 2.1.

Literature on SC is extensive, but a proposition relating to this review is that many papers are devoted to individual sets (Chapter 2, Figure 2.1) and overlapping sets, but few in the area of A&B&C, which is the focus of this research. Articles tend to focus mainly on one perspective, and there is overlap among the key Themes. Few papers integrate all three perspectives (Appendix A, Table 2.2, Table 2.3, Table 2.4, Table 2.6).

The existing literature on (QDS) in (EFSC), particularly in the context of Jordan, has limited empirical research. No studies have specifically addressed QDS in EFSC in Jordan. Furthermore, there is a noticeable scarcity of empirical research that integrates the three perspectives of Supply Chain Networks (SCN), Total Quality Management (TQM), and Sustainability (SUST) along with their key Themes. However, there has been growth in research streams that integrate these perspectives since 2005, as indicated by Bastas and Liyanage (2018a) and Rajeev et al. (2017). The attached Table in Appendix A and Tables 2.2, 2.3, 2.4 and 2.6 present a growing body of research on SCN, TQM, and SUST. Most studies have examined sustainability's environmental, economic, or social aspects separately. Few articles, such as those by Govindan et al. (2014a), Dubey et al. (2015), and Agi and Nishant (2016), have explored all three aspects, but these studies limited comprehensive empirical results and implications. The dearth of empirical evidence is particularly pronounced in the context of developing countries' food supply chains, as highlighted by Abdallah et al. (2014), Diab et al. (2015), Nimeh et al. (2018), and Bani-Khalid (2019). The review process involved identification, eligibility, and screening criteria in addressing this gap, leading to the selection of 164 critical articles. These critical papers are reviewed in detail. Due to word count limitations, the orientation of these papers is summarized using tables, both within this Chapter and in the appendices. For a visual representation of the review process, refer to Figure 2.2.
2.3 Triads and Complexity of EFSC

2.3.1 Complexity of EFSC

The complexity of SCN may reduce SC efficiency, increase the risk of misinterpretation, and complicate management decision-making (Bozarth et al., 2009; Wang et al., 2021). Risk is likely to increase as interconnectedness and interdependencies increase and may lead to higher transport and inventory costs. Complexity makes it challenging to analyse SC since many variables are involved. Bozarth et al. (2009) defined SCN complexity as the unpredictability of a system's input response.

Supply chain complexity can adversely impact collaboration, trust, digitalisation, contracting and resilience (Christopher and Peck, 2004; Piya et al., 2020). The SC complexity increases due to globalisation, multifaceted customer expectations, quality management, resource scarcity, stricter regulatory
requirements, and SUST and innovation issues (Wang et al., 2018; Piya et al., 2020). Hence, the structure of the network complexity may be driven by two dimensions: horizontal and vertical dimensions for EFSC, as shown in Figure 2.3. The research literature examined by the author showed limited deep analysis of the structural and operational characteristics of the SCN (Wang et al., 2018). In her view, this revealed a gap in the literature addressed in her concept of QDS. There was a call to scholars for an integrated framework that includes key perspectives, Themes, Sub-Themes, and network structures that show how SC operates. Therefore, QDS in EFSC investigated how it operates in the Triads.

Therefore, the author confined her study to Triadic relationships: Supplier – Manufacturer – Customer (Eskandarpour et al., 2015; Sun et al., 2020). Triads across actors are vital to the flow of materials, information and money to achieve steadiness of supply and demand (Levner and Ptuskin, 2018). Figure 2.3 from Hearnshaw and Wilson (2013) illustrates the complexity of SC, including endogenous and exogenous influences and vertical and horizontal relationships. Figure 2.6 below is a more straightforward picture that illustrates the Triadic relationship.

![Figure 2.3: Horizontal, Vertical Complexity of the Supply Chain](source: Hearnshaw and Wilson, 2013)
The number of suppliers in each tier reflects the horizontal complexity, and the number of tiers in SCN reflects the vertical complexity (Tolbert and Hall, 2009; Hearnshaw and Wilson, 2013). However, various drivers could influence the complexity of the network structure. Examples encompass product, innovation, collaboration, resource constraints, technological innovation, and the number of suppliers and customers in EFSC (Bode and Wagner, 2015; Piya et al., 2020).

The following Sections introduce the most important key Themes related to understanding the Triads of Supplier- Manufacture (focal actor) - Customer as main units in SCN to better examine the QDS phenomenon in EFSC.

SCM is a complex process. It needs many practices to balance the SC's internal and external activities (Gorane and Kant, 2016). The literature revealed that most methods used to study SC are qualitative Case Studies (Touboullic and Walker, 2015). However, decision-making in real life is often complex due to uncertainties (Zhou et al., 2019). AHP is a recent trend among multi-criteria decision-making approaches for the involvement of managers in building a comprehensive decision and providing a clearer understanding of the problem (Zhou et al., 2019). Furthermore, the literature revealed Soft Systems Methodologies introduced by Peter Checkland (Checkland, 2000), which are used effectively to resolve COVID-19 and SUST problems. This method allows understanding of the unpredictable inherent complexities, and the rich picture of the system is hard and soft issues (Wilden et al., 2021).

2.3.2 Triads in EFSC

The literature emphasises the importance of the Triads. In this thesis, the Triad comprises (Supplier - Manufacturer- Customer) as depicted in Figures 1.2 and 1.3. above (Chapter 1). The Supplier is the direct first-tier actor upwards of the SC that supplies inputs such as raw materials, technology, and vegetable and meat producers and could be local and global companies. The Manufacturer is a focal actor who converts the inputs provided by the producers into products regarding consumers' requirements, has direct and indirect links, and leads the other two Triadic actors in an upstream and downstream EFSC under internal and external influences. The Customer is a direct first-tier actor directly linked with the focal actor and
connected with other actors downstream to deliver the final product to the final consumer. It could be a distributor, warehouse, or wholesaler.

The thesis is concerned with eliciting the conditions for creating stable SC, which are robust in the face of disturbances. The author chose four Case Studies representing relationships that have endured for up to 12 years and not less than five years. The Triad is the smallest unit in the SCN that enables the researcher to understand the network as a whole from the perspective of the focal actor, the manufacturer. Partitioning into Triads can usefully be carried out on relationships at many supply chain stages. The Manufacturer can play a critical role in maintaining stability in each Triad. The manufacturer is the link actor in the relationship of (Supplier-Manufacturer-Customer).

The author focuses on Triadic relations in the EFSCs to enable her to reduce the complexities of SC analysis without losing their essential features. Treatment as Triads simplifies, but the author argues, does not distort the essence of the entire SC if the relationships between Triad members persist for a reasonably long period. She considers at least five years a reasonably long period. The stability of a Triad is characterized by the length of time the relationship lasts. Accordingly, she selected four Triads that have endured for five to twelve years in the face of changes and disturbances affecting SC members coming from inside (within one of the Triads), outside the Triad, interactions between the four Case Studies (Triads), Interactions between Triad members and other members of the EFSC, as well as political, military, pandemic, eco-environment and regulations that affect all firms and supply chains. Suppose relationships in the triad have endured significantly despite changes that may have occurred elsewhere in the SC. Critical variables (as the thesis refers to them as Sub-Themes) can be elicited by focusing on four selected Case Studies. If what happens elsewhere in the SC has not affected relationships in the Triads, then an examination of the state of the Triad can be used to generate a Decision Framework for managers generally seeking stability.

Triads are important because suppliers' upstream operations will affect their customers downstream in SCN (Wu et al., 2010). According to previous research, dyadic relationships do not capture the chain's complexities (Kuhne et al., 2013; Dora, 2016). There are limited studies on Triadic relationships (Mesic et
al., 2018; Jaakkola and Aarikka–Stenroos, 2019). The Triad is the smallest unit in a network (Siltaloppi and Vargo, 2017), and it captures the connections, dynamics and behaviour of relationships as well as the complexities when a third actor is added to a dyad (Nyaga et al., 2010; Wynstra et al., 2015).

In a Triad, the relationships and dynamics will change; the relationship with the third actor is interdependent and interconnected, positively or negatively affecting other relationships in the SCN (Choi and Wu, 2009; Pardo and Michel, 2015; Gadde and Snehota, 2019). It becomes a Triad under various conditions (Portier et al., 2014), where suitable dyads are connected under the influence of mediator actors (Chen et al., 2017).

In this study, the role of the intermediary in the Triad is depicted from the manufacturer's perspective as a focal actor. The manufacturer's pivotal role identifies and transforms supply chain relationships to stabilise and strengthen the Triadic relationship (Portier et al., 2014; Tachizawa and Wong, 2014; Fernández-Barcala et al., 2017). A focal actor is the most important actor with long experience. He is responsible in the Triad for addressing direct and indirect dyadic relations and establishing high-quality collaborative relationships to coordinate activities and trust to resolve conflicts, control the flow of information and make decisions (Mena et al., 2013; Gong et al., 2018; Chae, 2019; Akrout and La Rocca, 2019; Swierczek, 2019). In this study, the manufacturer, who is taking the middle position in the structure of SC, its intermediary role for forming the Triad could be:

1. Brokerage, the focal actor using its position connects two otherwise disconnected actors without manipulating the relationships for its interest and facilitates interactions and cooperation, passing information from one actor to another that speeds up collaborative processes and negotiating conflict (Obstfeld et al., 2014; Portier et al., 2014).

2. Mediator, the manufacturer, bring the disconnected supplier and the customer together and fosters trust and a close collaborative relationship where mainly information relevant to the business will be shared (Siltaloppi and Vagro, 2017; Chae, 2018).
Coalition, two actors located on opposite sides of the Triad to be directly connected through their regular contact with the manufacturer. Consequently, forming high-quality relationships stabilizes and sustains the collaborative relationship toward a common goal (Ritter, 2000; Silitaloppi and Vagro, 2017).

Triads can vary in terms of the shape and strength of relationships (Vedel et al., 2016). This research investigated Triadic relationships based on TQM structural and relational embeddedness network relations (Vedel et al., 2016). However, structural embeddedness shapes relational embeddedness for creating new knowledge (Wu et al., 2017). Embeddedness can be defined as the extent to which a firm relies on other actors under the influence of other actors in a network orientation toward information sharing, cooperation, and trust (Kim, 2014).

Structural embeddedness describes overall interaction configurations (presence or absence ties) to which and how an actor reaches other actors within a network (Donget al., 2015; Yan et al., 2015). In the Triads of EFSC, building relationships and connections between actors contributes to the complex network structure (Vandchali et al., 2021). The SCN structure affects behaviour, relationships and performance (Basole and Bellamy, 2014). From a structural perspective, the manufacturer's position determines to establish dyadic relationships with its suppliers and customers (Bastl et al., 2013; Mena et al., 2013).

The structural properties of the network influence disruptions (Bode and Wagner, 2015) and resilience to disruptions by restructuring their networks (Kim et al., 2015; Zhao et al., 2019). In this research, three types of Triads within the structure of EFSC (a position that the third actor) are identified: open (A), transitional (B), and closed (C) Triads (Mena et al., 2013).

A) The open Triad is a traditional structure of indirect interaction between three actors through one of the actors where both information and product flows are linear, and all SC actors try to make decisions that maximize their profit. The manufacturer establishes direct relationships with suppliers and customers in a Triad for new information, which will benefit performance. At the same time, the supplier and the customer
do not have a direct link with each other but know each other (Ritter, 2000). The absence of a link between two actors leads to competition (Wu and Choi, 2005).

B) The **transitional** Triad is a structure between the intransitive and the transitive Triadic of potential direct interaction between a supplier and a customer with whom the manufacturer already has a connection through the manufacturer's presence. The manufacturer mediates the Triadic relationship (Wynstra et al., 2015). Such a state helps supplier and customer to begin establishing a direct link to finally form the transitive Triad (Mena et al., 2013; Gong et al., 2018)

C) The **closed** Triad is a structure of direct contractual interaction between a focal actor, manufacturer, and both a supplier and a customer that indicates a cooperative relationship, trust in each other, and development of better communication skills and decisions are adopted with a holistic view (Havila et al., 2004; Wu and Choi, 2005)

In SCN, relationships are complex interrelationships that concentrate on Triadic relationships, particularly the three types mentioned above, which capture the essence of SCN. **Figure 2.4** illustrates the three types of possible Triads in EFSC. As a complex network system, SC can understand how Triads are formed and learn about other relations and the impact of environmental changes at all steps in SC (Eskandarpour et al., 2015; Swierczek, 2019; Sun et al., 2020).
Relational embeddedness highlights the quality of relationships of the Triad within SCN (Capaldo, 2014; Swierczek, 2019). Quality of relation is determined through trust and closeness (Moran, 2005; Crocker and Canevello, 2010). Relational closeness reflects the strength of Triadic relationships in terms of duration and frequency of interaction knowledge and resources among the actors in SCN who can be engaged in long-term contracts (Choi and Kim, 2008; Haugland et al., 2021). Relationships are either formal (contractual) or informal (relational or informational) (Cao and Lumineau, 2015; Roehrich et al., 2020). An informal relationship allows the exchange between actors aware of each other without direct interaction (Caldwell et al., 2017). Establishing strong, active, long-term relationships emphasises repeated interaction, trust and the degree to which exchange parties consider one another’s needs (Kim et al., 2015; Odongo et al., 2016; Li and Yang, 2017). Consequently, the lead organisation (manufacturer) establishes close, trusted, few,
long-lasting relationships to obtain stability, resulting in increased operational and financial performance (Kim, 2014; Kilfoyle and Richardson, 2015).

Trust is essential in developing a Triadic relationship in SCN, which strengthens cooperation into a long-term partnership, enhances confidence and facilitates the informal resolution of conflict (Kuhne et al., 2013). Relationships are influenced by joint goals (Kim, 2014) and reducing problems such as goal incongruence (goal conflict) (Delbufalo and Bastl, 2018), information asymmetry (inaccessible information) (Dahlmann and Roehrich, 2019) and power asymmetry (critical resources) (Yang et al., 2022).

### 2.4 SCM with focus on Supply Chain Network (SCN) - Area A

Christopher (2016, p.3) defined SCM as "The management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost". This Section identifies SCN as a leading perspective and is reviewed to focus on QDS in EFSCs. SCN is a complex network consisting of exchange relationships of various entities. The main unit of analysis is a Triad, including a focal actor and its two actors (upstream and downstream). They are involved in the flow of products, profit and information (Chen and Lin, 2012). Figure 2.5 illustrates the content of SCN. This research defines SCM as the SCN, SUST and TQM platforms.

![Figure 2.5: Perspective of SCN](Source: The Researcher)

#### 2.4.1 Key Prior Research Linked to SCN Perspective

In the field of SCN, there are many theoretical perspectives: Principal-Agent Theory (PAT), Transaction Cost Analysis (TCA), Network Theory (NT), Social Exchange Theory and Resource-Based View (RBV)
(Touboulic and Walker, 2015; Halldórsson, 2015). These perspectives are related to understanding SCM and SCN.

As the authors will show, networks have an essential role in QDS. The author is concerned not with the mathematical aspects of network theory. The researcher is concerned about the practical aspects of networks in the context of the EFSC in Jordan.

This research has identified **Network Theory (NT)** as the most valuable theory (Hearnshaw and Wilson, 2013; Wellenbrock, 2013) to support the selection of SCN as the foundation of this research. The NT operates to explain the complexity of relationships and activities, resources and actors, and they are linked to sharing experience, information and equipment for the benefit of all actors of SC (Lavassani and Movahedi, 2010). NT theory can help explore the collaboration of a focal company in its central position for SUST practices (Vurro et al., 2009). NT focuses on creating a blend of weak and strong ties in SC so weaker tiers can fulfill their activities with professional organisations' help (Ketchen and Hult, 2007).

Although the NT has been frequently adopted within SCM, Previous efforts have adopted dyadic relationships (Hearnshaw and Wilson, 2013; Halldórsson, 2015); it still offers further research opportunities, especially for examining Triads (Braziotis et al., 2013). The supply chain is broadly a network, so the researcher should move from the dyadic to the Triadic research approach.

The researcher has justified the NT as suitable for application in this research:

- Networks are the platforms which carry the other two components of QDS: TQM and SUST. They play a critical role in disseminating information relating to Quality and Sustainability across the Triad. The concentration on Triadic relationships reduces complexity.

  - SCN is a vehicle for transmitting soft and hard aspects of TQM.

  - SCN is a vehicle for transmitting profit, operational and SUST issues.

  - Firms operating within a network. Thus, networks are the total actors within an SC in an industry, which can work together with planned activities and available resources depending on actor positioning to add value to customers and other network actors (Omta et al., 2002).
- The network approach looks at understanding the nature and dynamics of actor activities and their position management within a social, economic and environment in the SCN structure.

- The central position of the focal actor in the network is considered a key competitive advantage.

- Firms in a network will enhance information sharing, increasing efficiency and creating significant partnerships, which will result in SUST performance (Wellenbrock, 2013).

- NT theory enables firms to understand the structure and interactions of their network (Hearnshaw and Wilson, 2013; Zuo et al., 2016) to maintain existing actors active and identify other potential actors for building trust-based relationships between actors in SCN to mitigate risk and building resilience and SUST (Wellenbrock, 2013; Baez, 2016).

The SC Triads of supplier-focal actor-customer are studied in the theoretical context of EFSC. Thus, the SCN perspective advances the initial conceptual framework of QDS in EFSC and contributes to our understanding of QDS in Triads. In the SCN structure, "nodes" that represent autonomous actors are classified by their positions (e.g. suppliers, manufacturers, distributors and customers) and "connections" represent exchange activities for creating products within supply and demand relations (Chen and Lin, 2012).

Companies must develop trust and confidence in inter-organisational relationships and Triads over time and create stable relationships to access external resources and enter new foreign markets (Halldorsson et al., 2015; Sharma et al., 2019). This is accomplished by combining the key Themes of SCN in EFSC based on NT to explore SCN influence and capture a more comprehensive understanding of the theory that impacts actor selection, monitoring, development, and trust gaining, which influence export performance. In Table 2.2, prior research was explored to identify the main Themes and research gaps related to the SCN perspective, which resulted in a need for further research to understand QDS in EFSC.
In prior research, the SCN perspective was understood based on the complexity of the SC from dynamic interactions between various interdependent actors of the supply chain system, different product characteristics, the actor position and network structure in ways that are not always under control (Wang et al., 2018).

Table 2.2: Literature Review for SCN Perspective in the Present Research

<table>
<thead>
<tr>
<th>Author</th>
<th>Type of Study</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>QM/TQM</td>
</tr>
<tr>
<td>Heidari et al. (2021)</td>
<td>Qualitative (AHP method)</td>
<td>●</td>
</tr>
<tr>
<td>Rajesh (2021)</td>
<td>Case Study and Grey Decision-Making</td>
<td>●</td>
</tr>
<tr>
<td>Vandchali et al. (2021)</td>
<td>Survey</td>
<td>●</td>
</tr>
<tr>
<td>Kittipanya-Ngam and Tan (2020)</td>
<td>Case Study</td>
<td>●</td>
</tr>
<tr>
<td>Narimissa et al.(2020)</td>
<td>Delphi technique</td>
<td>●</td>
</tr>
<tr>
<td>Azimifard et al.(2018)</td>
<td>Case study, AHP method, TOPSIS method.</td>
<td>●</td>
</tr>
<tr>
<td>Fritz and Silva (2018)</td>
<td>Literature Review</td>
<td>●</td>
</tr>
<tr>
<td>Oelze et al. (2018)</td>
<td>Empirical Case Study</td>
<td>●</td>
</tr>
<tr>
<td>Ocicka and Raźniewska (2018)</td>
<td>Literature Review</td>
<td>●</td>
</tr>
<tr>
<td>Agi and Nishant (2017)</td>
<td>Interpretive Structural Modelling (ISM) method (MICMAC) analysis</td>
<td>●</td>
</tr>
<tr>
<td>Ansari and Kant (2017)</td>
<td>Literature Review</td>
<td>●</td>
</tr>
<tr>
<td>Dubey et al. (2017)</td>
<td>TISM technique</td>
<td>●</td>
</tr>
<tr>
<td>Fallahpour et al. (2017)</td>
<td>Survey and Case Study by FPP, TOPSIS</td>
<td>●</td>
</tr>
<tr>
<td>Ghadge et al. (2017)</td>
<td>Descriptive Research (Survey)</td>
<td>●</td>
</tr>
<tr>
<td>Kim and Chai (2017)</td>
<td>Survey</td>
<td>●</td>
</tr>
<tr>
<td>Lee et al. (2016)</td>
<td>Survey</td>
<td>●</td>
</tr>
<tr>
<td>Wilhelm et al.(2016)</td>
<td>Case Study</td>
<td>●</td>
</tr>
<tr>
<td>Zhong et al. (2016)</td>
<td>Literature Review</td>
<td>●</td>
</tr>
<tr>
<td>Al-Zu’bi et al. (2015)</td>
<td>Survey</td>
<td>●</td>
</tr>
<tr>
<td>Diab et al. (2015)</td>
<td>Theoretical(Survey)</td>
<td>●</td>
</tr>
<tr>
<td>Eskandarpour et al. (2015)</td>
<td>Literature Review</td>
<td>●</td>
</tr>
<tr>
<td>Labrecque et al. (2015)</td>
<td>Case Study</td>
<td>●</td>
</tr>
<tr>
<td>Beske and Seuring (2014)</td>
<td>Conceptual (Literature Review)</td>
<td>●</td>
</tr>
<tr>
<td>Govindan et al.(2014a)</td>
<td>Case Study</td>
<td>●</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
As can be seen from Table 2.2 above, many authors (e.g., Beske and Seuring, 2014; Wilhelm et al., 2016; Wang et al., 2018; Rajesh, 2021) have studied SC and their Triads with a focus on the structural and operational complexity that deals with the transient or steady-state interaction of the system elements. These studies have used different qualitative or quantitative strategies; however, these methods have not been used to provide a holistic framework for QDS in EFSC. The analysis synthesised that SCN has examined key Themes such as customer-supplier relationships, multi-tier networks, lean supply chain, risk management, technology, innovation and contracts to understand the complexity of SCN and how these can impact the SC performance.

Scholars (e.g. Jraisat and Sawalha, 2013; Govindan et al., 2014a; Oelze et al., 2018; Galanakis, 2020) have studied quality in EFSCs from multiple perspectives. Their studies, for example, have focused on various concepts such as relationship and Triad management in SCN (Omta, 2002; Esfahbodi et al., 2016; Wilhelm et al., 2016), SUST in SCM (Beske and Seuring, 2014; Beske et al., 2014) and Quality in SCN (Siddh et al. 2017; Abbas and Sagsan, 2019). A study by Sharma et al. (2012) has concluded that 8% of the papers reviewed have pointed out the importance of quality in SCM. However, these studies did not consider SUST concepts. In the Jordanian EFSCs, studies have examined how focal actors and network Triads can influence the quality of products and processes in SCN. However, these studies (e.g. Jraisat and Sawalha, 2013; Abdallah et al., 2014; Diab et al., 2015; Nimah et al., 2018) focused on a single actor's immediate supplier only and did not investigate the SUST concept. Few studies have considered QDS for EFSCs, especially non-perishable products (i.e. processed canned food) in developing countries (e.g., Jordan). In the EFSCs, the quality levels are essential to delivering SUST by managing each link and player. Hence, this research will attempt to identify relevant practices as the SCN perspective's key factors (key Themes) to understand QDS in Triads of EFSCs in a developing country.
2.4.2 Export Food Supply Chains (EFSCs) and Supply Chain Network (SCN)- Pertaining to Area D

2.4.2.1 SCN in EFSC

EFSC is a management system of several actors involved in moving the food products, information and profit from producers to consumers, where the final consumer is globally dispersed (Ghadge et al., 2017). Its main actors are suppliers, manufacturers, distributors, retailers, wholesalers, exporters and customers (Roth et al., 2008). Therefore, it is difficult to predict and control such other SCs, where EFSCs are known for their complexity (e.g., various actors) and continuous changes in the quality of food products and processes throughout the SCNs (Bourlakis and Weightman, 2004). EFSCs are experiencing an increase in food quality and SUST demands. (Van der Vorst et al., 2013).

In EFSCs, SCNs are changeable regarding costs and disruption (Govindan et al., 2014b; Govindan, 2018). These networks consist of facilities, relationships and Triads that require developing and managing multiple relationships for creating products (Holmen et al., 2013). Focal actors (e.g. Manufacturers) along the EFSCs may be coping with complex networks, including the entire internal and external chain from suppliers of raw materials to end customers (Figure 2.6) (Glover et al., 2014). Focal actors are the most critical actors responsible for quality in EFSC and introducing new products, new services, technologies and processes, maximising productivity, and minimising time and inventories to satisfy new demands and profit in the long term (Potter and Wilhelm, 2020).
Recent challenges encompass frequencies (e.g. turndowns), disruptions such as the latest COVID-19 pandemic and sudden shocks such as disease and contamination (Nerín et al., 2016; Sarkis et al., 2020) and the growing number of food offences and economic crises (Matopoulos et al., 2019). Hence, there is a need for special attention and active management approaches of the EFSCs due to different safety and quality standards and short shelf-life products (Aggarwal and Srivastava, 2016; Siddh et al., 2017). Thus, ensure food quality, safety and security and low-cost products within a sustainable plan and structure key relationships and Triads to higher performance levels (Sun et al., 2020). Some of these approaches are the integration management of SCN (Ansari and Kant, 2017; Bastas and Liyanage, 2019), advanced quality tools (Sauer and Seuring, 2019), new technologies (i.e. Big Data and Blockchain) (Zhong et al., 2016) and accelerating SUST by introducing Just-In-Time (JIT), circular economy and lean practices (Tortorella et al., 2017).
SCN is a complex and dynamic network that consists of exchange relationships of various entities, where the manufacturer is a focal actor who can form Triads in its upstream and downstream sides and be involved in flows of products, money and information (Chen and Lin, 2012). Long-term SUST and stakeholders' satisfaction must design, develop and manage SCNs (Mohanty and Prakash, 2014). SCNs impact costs, risks, responsiveness and innovation (Sharma et al., 2019). The positions of the focal actor in the SCN between up and downstream enable partners' access to critical resources and increase network learning and innovation (Sharma et al., 2019; Potter and Wilhelm, 2020).

2.4.3 Key Themes of SCN
2.4.3.1 Supplier - Customer Management

Effective SCN indicates the importance of long-term SC relationships (dyads) among all members, such as suppliers and customers (Lambert and Cooper, 2000), where close buyer-supplier relationships create value (Hingley et al., 2015). A part of inter-firm relationships is supplier relationships. Supplier management can be defined as "Planning, implementing, developing, and monitoring company relationships with current and potential suppliers" (Wagner, 2000, p.21).

Supplier management has become increasingly vital in buyer-supplier dyads (Zhang and Cao, 2018). In this research, adequate supplier-customer management means ensuring that the right quality and quantity in low-cost products (Amoako-Gyampah et al., 2019) within the quality and flexibility of the supply chain (He et al., 2017), collaboration (Gunasekaran et al., 2015) and sharing information between suppliers and customers (Susanty et al., 2018), trust (Akrout and La Rocca, 2019). Thus, overall SC performance is improved (Amoako-Gyampah et al., 2019). In this research, focal actors as manufacturers should collaborate closely in dyadic relationships with their upstream suppliers and downstream customers. A step forward is complete supplier-customer management for better quality and SUST concerns (see Figure 2.6 above) (Sauer and Seuring, 2019; Potter and Wilhelm, 2020).

Previous studies about supplier-customer management in SCN have examined the TBL of SUST but mainly focused on just one of these three dimensions (Kumar and Rahman, 2016; Bag, 2018). However, very few
studies are in the context of developing nations (Seuring and Gold, 2013; de Sousa Jabbour et al., 2014). Many researchers have recommended further research on SUST in supplier-customer management (e.g. Esfahbodi et al., 2016; Wilhelm et al., 2016). Other researchers have noted the importance of examining supplier-customer management regarding supplier-focused quality practices. That is enhanced by transferring TQM practices to the SC since the quality of suppliers' products and the manufacturing process significantly affects the final products' quality and reduces waste (Sambasivan, 2009).

The three main supplier-customer management activities from the approach of seller-buyer relationships (dyads) are supplier selection (Kumar and Rahman, 2016), supplier monitoring (Kashmanian, 2015), and supplier development (Sanche et al., 2019).

**Supplier Selection:** The buyer-supplier relationship starts with selecting appropriate suppliers (Rao and Holt, 2005; Kumar and Rahman, 2016). Supplier support is required in capability, capacity, and SUST (de Sousa Jabbour et al., 2014). Poor supplier quality produces the most harmful impacts (Kumar and Rahman, 2016). This helps reduce the number of suppliers and identify the strategic suppliers to develop relationships with all the SC actors and improve the TBL SUST performance (Ho et al., 2015; Trapp and Sarkis, 2016). Moreover, it helps reduce the disruption and risks in relationships. Fallahpour et al. (2017) argued that selecting a suitable supplier depends on identifying multiple criteria and the pre-and post-selection method to prioritize suppliers (Brandenburg et al., 2014). Decision-makers depend on the supplier's selection for further development (Lee et al., 2016). The widely adopted conventional criteria are cost, quality, delivery, reputation, technology, and flexibility (Ho et al., 2015; Fallahpour et al., 2017). Hence, the economic aspect is still the essential one. Other researchers consider some environmental and social SUST attributes, such as resource consumption, environmental management system, human rights and health, that are still rare in developing countries (Grimm et al., 2014; Luthra et al., 2016; Azimifard et al., 2018).

**Supplier Monitoring:** It is an assessment to track compliance, supplier development, collaboration readiness, and adopting sustainable practices (Kashmanian, 2015). It will guide SUST (Dubey et al., 2017).
The focal actors use multiple methods, self-assessments or auditing. The self-assessment uses either questionnaires or site visits by the buyer according to selection criteria like quality, supplier capabilities and SUST (Fraser et al., 2020). Auditing is a systematic and independent assurance by a third party, although audits demand high costs, resources and time (Gimenez and Tachizawa, 2012). After that, suppliers communicate the results for improvement and development (Fallahpour et al., 2017). Suppliers consider environmental and social SUST assessments as hurting their economic performance due to the lack of support from buyers (Sancha et al., 2019).

**Supplier Development**: It is both indirect and direct practices by the customer and supplier jointly or from the buyer side to improve long-term relationships, trust, processes activities, and product quality and SUST (Busse et al., 2016; Sancha et al., 2019). These practices could be technical or financial investments in the supplier processes (Klassen and Vereecke, 2012), transferring knowledge through on-site visits and training programmes, team problem-solving (Srivastava and Shree, 2019), new product development (Kotzab et al., 2015). In indirect activities, there will be limited resources (Wagner and Krause, 2009). Studies in the literature have addressed development regarding environmental and social performance (Ağan et al., 2016). This development helps avoid supplier switching to achieve economic performance (Lo et al., 2018). The relationships between the focal actors, their suppliers, and customers in a Triad in EFSC are described in Figure 2.7.

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**Figure 2.7**: Supplier-Customer Management in Triad in EFSC  
(Source: Sauer and Seuring, 2019)
Trust: Trust is recognized as a key factor for establishing a relationship and partnership development, supply chain quality and, consequently, higher performance of SC (Kuhne et al., 2013; Odongo et al., 2016). Uddin et al. (2008) pointed out that mutual trust is a foundation in supplier-customer relationships. According to Molnár et al. (2010), long relationships in food SC result in trust, reputation, benefits, profits, and collaboration. Huotari and Livonen (2004) defined trust as an expectation to depend on a partner who is willing and able to fulfil others' needs. Trust is vital for relationships in SCN; thus, it improves coordination, information exchange, and understanding of the responsibilities. It seriously works without hesitation, influencing the success of SC integration and financial performance (Akrout and La Rocca, 2019). Trust reduces cost, increases flexibility, and enhances SC performance (De Almeida et al., 2016). Trust works towards improved supplier responsiveness, high-quality and efficient processes and lead time improvement (Abdallah et al., 2017). Commercial relationships and reputations are fostered through Personal relationships and trust (De Almeida et al., 2016; Akrout and Rocca, 2019).

2.4.3.2 Multi-Tier Network

SCN requires careful consideration of multi-tier networks to capture the complexities of SC with vertical and horizontal linkages (Choi and Wu, 2009). Triads are the critical unit of a network that fully captures the supplier-customer complex dyad's dynamics and structure to describe the fundamental Triad's relationship characteristics among three actors (Mena et al., 2013; Vedel et al., 2016; Lechler et al., 2019). The SCN and Triadic perspective are adapted to study dyadic relationships (Havila et al., 2004; Vedel, 2010). Triads can also be formed between different actors of a supply network.

In this research, introducing the network approach (Jraisat et al., 2013; Odongo et al., 2016; Busse et al., 2017) entails complex decision-making processes of direct and indirect collaboration between actor dyads in Triadic EFSCs (Esfahbodi et al., 2016). Quality and TBL SUST shifted the focus on sub-suppliers in FSC (Grimm et al., 2014; Wilhelm et al., 2016), specifically social SUST caused by more context-dependent sub-suppliers (Grimm et al., 2014). Hence, first-tier suppliers mainly focus on past studies and mostly neglect lower-tier suppliers (Gong et al., 2018; Jia et al., 2018a), as the first-tier supplier is a novel
phenomenon (Wilhelm et al., 2016). The focal actor, such as the manufacturer, is a tier that should focus on the multi-tiers of suppliers and customers in the Triads (Figure 2.8) (Mentzer et al., 2001). New studies (e.g. Mena et al., 2013; Gong et al., 2018; Lechler et al., 2019) have introduced multi-tier management from the focal actor perspective. Hence, this research should examine how a focal actor in the multi-tier network can manage Triads as a critical factor in EFSC and make better quality and SUST along with various actors (Gong et al., 2018; Sauer and Seuring, 2019; Pohlmann et al., 2020).

Collaboration: Collaboration is interaction and long-term relationships amongst multiple actors actively working together to share benefits and common objectives and improve goals (Mentzer et al., 2000; Soosay and Hyland, 2015). Collaboration is “A partnership process where two or more autonomous firms work closely to plan and execute supply chain operations toward common goals and mutual benefits” (Cao and Zhang, 2011, p.166). Collaboration prepares a platform for exchanging information, risks, profits and SUST (Mentzer et al., 2000; Labrecque et al., 2015). It requires joint efforts across actors in SC with highly effective trust, information sharing and capability with the lowest costs. (Ramanathan et al., 2014). Further studies have started investigating collaboration for SUST but are scarce in TBL SUST (Pero et al., 2017;
Hubeau et al., 2017). However, the characteristics of the food products, such as shelf life, the constraints on raw materials, seasonality and quality consistency, have presented a complex collaboration within EFSC. Collaboration is investigated from a Triadic perspective due to the complexity of SCN (Wu et al., 2010; Braziotis et al., 2013). There is limited empirical evidence of Triadic collaboration (Ramanathan and Gunasekaran, 2014). Triadic collaboration is built on a stable dyadic collaboration and is used to form Triads. Collaboration is dynamic (Touboulic and Walker, 2015), and many factors can impact building and maintaining relationships (Hertz, 2006). Collaboration is considered the primary capability for risk and resilience management (Harrison et al., 2013). In this regard, collaboration in the EFSC could be internal or external to achieve the expected outcome. The main activities of this collaboration are planning, forecasting, execution and analysis (Attaran and Attaran, 2007).

Internal collaboration is the upstream and downstream relationships among multi-tiered actors within SC (Mena et al., 2013; Soosay and Hyland, 2015). According to Kumar and Rahman (2016) and León-Bravo et al. (2017), internal collaboration includes planning activities such as delivery, design, shared assets and solving problems to facilitate SUST. Another example is forecasting demand and supply due to the high uncertainty to enhance product recovery, delivery performance, and the new market's development (Gao et al., 2017). In comparison, external collaboration is governmental and non-governmental joint planning and decisions to reduce supply risk and uncertainty (Sacha et al., 2016).

**Resilience:** Research studies have been conducted to investigate the risk of SCM (Um and Han, 2020). Consequently, Supply Chain Resilience (SCR) was introduced as a new strategy and is still a largely unexplored research area (Spiegler et al., 2012; Van Hoek, 2020). Resilience is “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” (Ponomarov and Holcomb, 2009, p.131). The three main SCR strategies are proactive, anticipate, monitor and prepare before disruption (Day, 2014); concurrent strategies are a quick reactive response to
unexpected events during disruptions (Wu et al., 2013); reactive strategies, recover after disruption and return to its original or state or move to a new state (Brandon-Jones et al., 2014;). SC flexibility helps firms be alert and rebuild SC capacity to respond rapidly to unanticipated and unplanned events and disruptions by maintaining supply resources within an acceptable time and cost and short product development times (Kamalahmadi and Parast, 2016).

SCR is increased with cooperation, information sharing, visibility and joint activities (e.g. Brandon-Jones et al., 2014; Durach and Machuca, 2018). Sharing correct information and management skills related to SC disruptions are significant for resilience (Durach and Machuca, 2018). Hence, different strategies are proposed for SCR, such as information sharing and collaboration, multiple sourcing, safety stocks, flexible transportation, effective teamwork and training on resilient strategies, opening new markets, innovation, and risk management (Christopher and Peck, 2004; Schmitt and Singh, 2012).

2. 4.3.3 Risk Management

Despite products, materials and information flowing through the complex SCN, they may face potential unexpected events or disruptions (Wagner and Bode, 2008). A disruption in SCN is “An event that disrupts the flow of goods or services in a supply chain” (Ambulkar et al., 2015, p.111). Thus, disruption constitutes a risk in SCN (Wiedenmann and Größler, 2021) that may be propagated through the supply chain and severely impact the focal actor due to an interconnected network (Van Der Vegt et al., 2015). A disruption may originate from sub-tier suppliers to a focal actor (Kim et al., 2015), which needs to maintain SC performance continuity in changing conditions through restructuring the SC (Hearnshaw and Wilson, 2013). Collaborative relationships in Triads reduce disruptions (Leat and Revoredo-Giha, 2013), where sources of these risks due to disruptions vary based on the supply chain's complexity and uncertainty (Bode and Wagner, 2015; Kamalahmadi and Parast, 2016).

Complexity and uncertainty in a network lead to many supply-demand problems, such as overstocking, stock out and delivery delays (Fayezi et al., 2012). Uncertainty in SC is “An internal or external source lacking information for effective control actions and accurately predicts the impact” (van der Vorst and

In a network, each actor in SCN can potentially add value and risk to the entire network. Thus, analysing SCN provides a holistic understanding of complexities and associated risks (Carter et al., 2015). Harland et al. (2003, p.53) defined risks as the “Chance of danger, damage, loss, injury or other undesired consequences”. Tummala and Schoenherr (2011, p.474) have conceptualised supply chain risk as “An event that adversely affects supply chain operations and hence its desired performance measures”. SC risk could be an internal risk that originates from inside the focal firm, and their SCN that affects upstream and downstream might be predictable and quantifiable.

On the other hand, the external risk is outside the focal company and external to the dyadic supply chain extending to the network that cannot be easily predicted and quantified (Busse et al., 2017). Internal risks are usually related to machine breakdowns or information technology (IT) problems. External risks are environmental, socio-political, technological or geographical reasons, extreme weather or natural disasters (Christopher and Peck, 2004; Larsson and Kamal, 2019).

According to Tang (2006), operational, disruption, and SUST risks could be classified as risks. For instance, operational risks include potentially disturbing production activities in each stage of the SC related to uncertainty (Sodhi et al., 2012). Disruption risks involve potential disturbances, either natural risks (earthquake, fire) or artificial risks (equipment breakdowns and labour strikes) (Kaufmann et al., 2016). Moreover, SUST risks expand Supply Chain Risk management (SCRM) in the context of Sustainable Supply Chain Management (SSCM), including risk factors associated with SUST aspects (Figure 2.9), such as (environmental, economic, and social) risks that affect the SUST performance (Xu et al., 2019).
SC has managed and mitigated different risk sources and uncertainties, such as supply and demand in volume and quality, delivery, technology and equipment failures, weather conditions, strikes, and the COVID-19 pandemic (Behzadi et al., 2018). Indeed, management strategies used for mitigating or preventing risks involve proactive (prior disruption) and reactive (post-disruption) approaches (Blackhurst et al., 2018). SCRM research has attracted attention recently since 2001, with emerging SUST risks. SCRM is “An inter-organisational collaborative endeavour utilising quantitative and qualitative risk management methodologies to identify, evaluate, mitigate and monitor unexpected macro and micro level events or conditions, which might adversely impact any part of a supply chain” (Ho et al., 2015, p.5036).

Fan and Stevenson (2018, p.213) stated that “Identification, assessment, treatment and monitoring “are the main steps for managing risks in SCN. Fan and Stevenson (2018) suggest that the SCRM strategy is started through supply chain risk identification. Notably, risk management restricted within focal actors is ineffective as multiple risks may be inherent in every tier of the SCN (Sawik, 2019). There is a shortage of empirical research on supply chain risk in a dyadic relationship (Chaudhuri et al., 2020).
However, multi-tier supply chain risk is still under investigation (Hofmann et al., 2018), and further research is recommended in developing countries' context that the threats and ways of mitigation threats may differ from the developed country (Tukamuhabwa et al., 2017). As a result, risks influence the relationships and Triads between actors in SCN, including collaborative Triads, knowledge sharing and joint problem-solving in an integrated SC (Wiedmer and Griffis., 2021). This, in turn, encourages risk-sharing through investment in assets and joint plans. This creates a resilient SC and helps reduce quality failure and unethical behaviour between actors (Hofmann et al., 2018).

2.4.3.4 Lean Supply Chain

Adapting quality lean management into SCN activities is not a simple process due to the difficulty of identifying and quantifying waste (Soni and Kodali, 2012). Incorporating SUST into SC and diverse customer demands results in adopting several SC strategies alongside innovative information technology to enable actors to improve the performance of SC (Raji and Rossi, 2019). For instance, the lean strategy has the core value of response to supplier-customer expectations, and continuous improvement focused on reducing waste, and these values are linked to TQM (Nimeh et al., 2018; Takeda-Berger et al., 2021). Consequently, the integration of lean management into SCM has shaped Lean SCM (LSCM) since 1990 (Tortorella et al., 2017). Conversely, LSCM research is relatively limited (Jasti and Kodali, 2015; Takeda-Berger et al., 2021).

The LSCM construct is still scarce (Chen and Paulraj, 2004). LSCM is a long-term commitment for supply chain actors in multi-tier networks, with a cooperative and systematic smooth flow of products, information and technologies for waste elimination and reducing costs (Takeda-Berger et al., 2021). LSCM results in managing uncertainty in EFSC, reducing inventory, and avoiding overproduction and other activities to achieve food quality and safety (Jasti and Kodali, 2015).

Organizations should adopt effective practices in their context. Waste identification and structured problem-solving to eliminate waste by improving material and information flow are required to guide continuous
systemic improvements along the SC (Jasti and Kodali, 2015; Tortorella et al., 2017). Since two-thirds of the wasted food has occurred in EFSCs (Fritz and Schiefer, 2008), in this sense, earlier researchers (Tortorella et al., 2017) showed a vector of the mutual attributes of lean concepts merging into TQM and SCN. There is an opportunity for developing countries to integrate SUST practices with lean practices combined with TQM (Sinha and Matharu, 2019). These features include a Just-In-Time (JIT) system, supplier relationship, customer relationship, waste elimination, TQM system, information technology and supply chain integration. There is value creation for customers and resources within lean management and vertical integration within organisational functions.

A few studies have shown that digitalization could support operationalizing LSCM strategies to improve performance (e.g., Bag et al., 2018; Raji and Rossi, 2019). As a result, a digital SC is an efficient process of adopting smart systems and implementing the most suitable technological solution, such as Big Data, Blockchain and intelligent decision-making systems and analytical methods (Bag et al., 2018).

In this research, this process is vital to empower actors with flexibility, enhance accessible data and continuous relationships, improve quality and QM systems improvement, improve food traceability in the food recall system, transparency, shorter processing times, and improve consistency of product quality, food security, SUST and controlling external risk such as trade wars, COVID-19 (Büyüközkan and Göçer, 2018; Feng et al., 2020). Hence, LSCM is a crucial factor to be examined in the present research.

**Lean and Waste Management:** the lean approach improves the efficiency and SUST of the SC (Jasti and Kodali, 2015). Implementing lean principles and tools increases employee engagement and motivates continuous improvement. Lean is defined as a multifaceted concept. It is a philosophy of various methods and tools for planning and continuous improvement through eliminating all kinds of waste (Miehe et al., 2016). Waste is categorized into four groups: people, process, information, and asset waste, overproduction, waiting, transport, unnecessary motion, over-processing, defects, excessive inventory and unused employee creativity are widely known types of waste (Tasdemir and Gazo, 2018). The Prominent lean approach is
Value Stream Mapping (VSM), 5S, Just-In-Time (JIT), Automation, Total Productive Maintenance (TPM) and Kaizen Improvement/Continuous Improvement (Garza-Reyes et al., 2018). Assessment, improvement, and monitoring are three lean management activities. Existing waste flow processes are determined in the assessment. Improvement is the process improvement activities measured in the monitoring phase (Sony, 2018).

In this research, the lean system can optimize costs, improve quality and delivery times, avoid disruption, and achieve a resilient system (Narayananamurthy and Gurumurthy, 2016). Digitization is often part of a lean process, eliminating inefficient processes and creating a continuous flow of information and resources (Haddud and Khare, 2020). Waste management in supply chains supports sustainable development by preventing the waste of land, water, energy, climate and other resources (Eskandarpour et al., 2015; Sony, 2018). Therefore, it influences food quality, security, and safety. Waste management principles are elimination, reduction, reuse, recovery, and waste disposal. (Dora, 2020).

According to Bellemare et al. (2017, p.1156), food loss is a “Loss of products along all stages of the SC for many different reasons but is sometimes still suitable for human or animal consumption”. SC’s initial and middle stages contribute to food waste (Bhat and Jõudu, 2019). The upper stream contributes to more waste, mainly caused by managerial and technical constraints in infrastructure and packaging, climate and environmental factors, and failure of quality or safety standards (Dora, 2020). Production, storage and transportation are critical loss points in the SC. There could be inefficient production processes, technology problems, waste materials, and packaging where the quality of the product is affected (Manzini et al., 2014; Bhat and Jõudu, 2019).

**Value Creation:** Value is the capacity of activities to provide benefits and customers’ interests that are directly delivered through products (Yrjola et al., 2017). Value-creation networks are supply chains of organisations, people, and technology (Welo and Ringen, 2015). Lean is one approach that encourages incremental improvement on value-added activities at each step and value creation for the whole chain.
actors through reconfiguring new or existing resources (Welo and Ringen, 2015; Willumsen et al., 2017; Madhani, 2018). When the input materials are transformed into the required product, they are considered Value-added activities. Waste is anything that absorbs resources and does not create value for the end product (da Luz Peralta et al., 2020). Hence, the structure of SC and organisational functions are reformed, and product flow is improved to create value and enhance quality, reduce lead times and increase profit (Welo and Ringen, 2015). Efficient value creation is the focus of SC, specifying the value of customer needs in their products (Soliman and Saurin, 2017) and understanding the value of a sequence of activities and processes (Welo and Ringen, 2015).

Value creation is applied in value stream mapping (Lermen et al., 2018) to create the flow of value and pull products on time, as required by actual demand and continuous improvement. Instead of maximising performance in financial metrics, adding value should be a financial success in unique innovation (da Luz Peralta et al., 2020).

2.4.3.5 Digitalisation

The digital approach is a strategic decision in response to the complexity of SCN and crisis, specifically within the COVID-19 pandemic, to improve SC efficiency and higher sustainable performance (Bag et al., 2021; Jones et al., 2021). Schwab (2016) and Ghouri et al. (2021) argued that digital technology emerged in the fourth industrial revolution (Industry 4), combining digital and physical information technology. While the first industrial revolution used steam power, the second optimised electrical power and the third used automation (Manavalan and Jayakrishna, 2019; Adebajo et al., 2020).

Digital transformation is a multidimensional concept of restructuring and managing the whole SC and its relationships in digital supply chains (Machado et al., 2020; Hanelt et al., 2021). Digital transformation (DT) is “A process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies” (Vial, 2019, p.121). Digitization SC is the implementation of advanced information and digital technologies
(Büyüközkan and Göçer, 2018; Buntak and Mutavdžija, 2021). Digital SC publications have been theoretical and rare since 2010 (Iddris, 2018; Sahara et al., 2021).

Digital SC increases transparency, responsiveness and collaboration between multi-tier SC, supporting better decision-making and resilience (Bienhaus and Haddud, 2018; Preindl et al., 2020). The digital supply chain is the “Development of information systems and the adoption of innovative technologies that strengthen the supply chain's integration and agility and thus improve customer service and sustainable organisation performance” (Ageron et al., 2020, p. 133).

Furthermore, authors Vial (2019) and Fletcher and Griffiths (2020) have suggested that digital transformation is done in phases, resulting in different digital maturity levels based on the adoption of digital technologies (Teichert, 2019). With a high level of digital maturity, organisations will have more value creation, trusted collaborative relationships, quality of data, product and process, save cost, increase efficiency and sustainable development (Mahmood et al., 2019; Stroumpoulis and Kopanaki, 2022).

Advanced digital technology is used along with information systems to support the digital transformation that allows the integration of physical infrastructure and communication into a network (Ebert and Duarte, 2018; Sony and Naik, 2019).

**Advanced Digital Technology** is the application of emerging digital transition technologies that facilitate information sharing and coordination between SC actors (Chiang et al., 2021; Yin, 2023). These technologies can shape transnational relationships (Scuotto et al., 2017) and create value-added partnerships (Song et al., 2021). The most advanced digital technologies in twenty century are the Internet of Things (IoT), Augmented Reality (AR), Blockchain, Cloud Computing, Internet Technologies, Big-Data Analytics and Artificial Intelligence (AI) (Warner and Wager, 2019; Hansen and Bøgh, 2020; Buntak et al., 2020). They include 3D Printing, Industrial Biotechnology, and Nanotechnology. (Büyüközkan and Göçer 2018) It is summarised in Figure 2.10.
Digital Technologies contribute directly to SUST (Nasir et al., 2022), including product traceability, lean practices in reducing food waste and efficiencies in transport and product quality can be improved (Xiaorong et al., 2015; Mattevi and Jones, 2016; Thomas et al., 2018; Sharma et al., 2021). Digital technology enables process automatization, flexibility, and quality management practices (Chiarini et al., 2019). Adopting advanced technology and extending digital innovation is a significant step in bringing about a product, new technology, process and knowledge innovations across SCN of dyads and Triads (Xiaorong et al., 2015; Ghasemaghaei and Calic, 2019; Sharma and Joshi, 2020). Wu et al. (2021) and Wimelius et al. (2021) suggested that technology ensures more efficient supply chains in disruption events. Hence, technology helps in timely decisions, increases trust between chain actors and solves numerous supply/demand problems such as excess inventories, stock-outs, and delivery delays (Feng et al., 2020).

Mobile technologies, social, cloud, and big data were seen as having the most significant impact on SC (Haddud and Khare, 2020; Ivanov et al., 2020). Automated systems and Artificial Intelligence (AI)
increased precision and accuracy and better traceability via Radio-Frequency Identification Devices (RFIDs), the Internet of Things (IoT), and Blockchains (Bag et al., 2018; Kittipanya-Ngam and Tan, 2020).

The Internet of Things (IoT) is an Internet-based network that links physical and digital objects with information-sensing technologies for visibility, responsiveness, real-time information exchange, and traceability (Song et al., 2019). Applications of Internet of Things (IoT) technologies promise solutions in SCN, such as Global Positioning Systems (GPS), Radio Frequency Identification (RFID), and Bar Codes, making data collection a more automated procedure. Consequently, improving coordination and tracking is leveraged with Artificial Intelligence (AI) and blockchain technology for visibility (Dweekat et al., 2017; Wang et al., 2019; Ivanov et al., 2020). **RFID** is a technique for identifying objects and electronic labelling using radio waves. Sensors, including wireless sensor networks, are devices capable of collecting, processing, analyzing and storing data in real-time in the food supply chain, which can reduce food waste (Pal and Kant, 2018). The **blockchain** is “A decentralised record-keeping system shared peer-to-peer across all computers within its network, eliminating the possibility of manipulating the transaction records “(Song, 2019, p.120). Blockchain technology provides a platform with digital interfaces that improve traceability, transparency, trust and sustainability in complex food SCN (Dede et al., 2021) and securing more confidence in product quality and safety, eliminating unnecessary intermediaries, auditing and paperwork, reducing risk, and cost reduction, (Aich et al., 2019).

**Information Systems (IS) and Applications** contain information technology components that enable communication between people and systems (Ciccullo et al., 2021). These systems allow access, integration and analysis of information generated from digital technology in real-time within SC (Iddris, 2018; Alieva and von Haartman, 2020). Information Systems (IS) and Applications are widely used in managing SCN relationships (Argyropoulou et al., 2015) to exchange timely information and enhance activities through actor relationships effectively and efficiently for long-term SUST (e.g., Tripathy et al., 2016; Pan et al., 2021).
An internal information technology system across functional areas (Vickery et al., 2003), such as the digitalized process (a standardized process in terms of workflow and electronic tracking systems) or computerized systems with integrated digital platforms, results in more cost-effective SC, fewer mistakes along the chain and collaboration with suppliers and customers to enable efficient material and information flows (Wang and Wei, 2007).

One of the most widely used information systems is Enterprise Resource Planning (ERP), which strengthen information and process for effective decision-making (Lečić and Kupusinac, 2013; Acar et al., 2017). Other systems are warehouse management systems (WMS), transportation management systems (TMS), Vendor Managed Inventory (VMI), Material requirements planning (MRP) systems, and supplier-customer relationship management systems (Guesalaga, 2016; Ancillai et al., 2019). The EDI provides a vital tool for adopting technology collaboration and making the right decision.

Internet technology enables different electronic means that facilitate two-way information exchanges over internal and external SCN (Lacoste, 2016) and build relationships (Trainor et al., 2014) ranging from personal communication channels, such as electronic mail (E-Mail), Mobile, Messengers, Facebook, LinkedIn and WhatsApp; electronic documents interchange leading to shorter lead times as billing and order quotes (Vanpoucke et al., 2017, Ancillai, et al., 2019).

E-commerce and digital platforms belong to the IS. E-commerce business is supported by an online system (platform), Internet of Things (IoT) and mobile to connect actors in SC (Chiang et al., 2021). E-commerce focuses on downstream supply integration processes or e-procurement assists in order fulfilment, and e-logistics improves buyer-supplier collaboration (Yu et al., 2016). Social commerce relates to e-commerce to enhance customer participation and ensure product attainability (Vanpoucke et al., 2017). E-commerce enables the development of a digital platform (Perboli et al., 2018).

The digital platform is an online platform (web-based or mobile application) consisting of information systems, interfaces and engines for real-time information from multiple sources and collaborating in whole
SCN (Shree et al., 2021; Pan et al., 2021a). Digital platforms as a decision-making tool share relationships with the whole SCN for planning and forecasting (Yee et al., 2021), bringing innovation and economic and social benefits (Sharma et al., 2021). Moreover, it leads to flexibility that reduces time, enhances quality and overcomes disruption risk for immediate responses and resilience (Sharma and Joshi, 2020).

2.4.3.6 Innovation

Innovation is “A multistage process whereby organizations transform ideas into new, improved products, processes to advance, compete and differentiate themselves successfully in their marketplace” (Baregheh et al., 2009, p.1334). Organisations in uncertain and fast-changing environments need to work with innovation to explore new markets and satisfy customers rather than continuous improvement (Lilja et al., 2017). Innovation is driven by SUST, quality improvement and cost reduction (Hong et al., 2019). SUST is achieved through innovation in the lean approach and an effective collaborative SC (Gao et al., 2017; Solaimani et al., 2019). In 2019, the International Organization for Standardization (ISO) released ISO 56000 about innovation management, addressing that innovation is QM's future (Lilja et al., 2017). Moreover, TQM positively affects product quality and innovation (Lilja et al., 2017; Hong et al., 2019).

Since 2017, studies have investigated the impacts of innovation on a general or particular type of innovation (Gao et al., 2017). They initially focused on a particular economic SUST dimension (Gao et al., 2017). Food innovation literature is limited (Baregheh et al., 2012). Innovation in the SC is driven by a focal actor (Hong et al., 2019). High-quality innovations can be obtained from upstream suppliers as sources of innovative ideas, critical technologies, and downstream processes to create new products that meet consumers' needs on time (Un and Asakawa, 2015; Hong et al., 2019).

Different types of innovation, including products, processes, and organizations, achieve three pillars of SUST outcomes (Gao et al., 2017). Pursuing more than one type of innovation is better, specifically product and organizational innovation (Tavassoli and Karlsson, 2016).
Atalay et al. (2013) defined **Product Innovation** as the ability of an actor to introduce different products that are new or significantly developed concerning their features. Innovative products penetrate a competitive export market, and green products contribute to environmental and economic SUST (Tavassoli and Karlsson, 2016).

**Process Innovation** is a new or changing methodology (equipment, techniques) for products created and delivered to achieve efficiency and product quality (Un and Asakawa, 2015). Process innovation intends to decrease logistics production costs, increase quality, and produce a new product.

**Organizational Innovation** is at the centre of other types of innovation. It combines the internal company’s managerial practices and new external relations to change processes and structure and add value (Kim and Lui, 2015). Appropriate organizational culture facilitates the implementation of new ideas and innovation management. Lean innovation management is a socio-technical system supported by a coaching leader to promote continuous analytical improvement and systemic problem-solving within effective collaborative learning (Solaimani et al., 2019). Employees' appreciation is a motivation to innovate in various non-financial (celebration, training) and financial ways (Solaimani et al., 2019).

### 2.4.3.7 Contracts

Contracts can be formal and informal (Mesquita and Brush, 2008). A contract is an agreement and negotiation of future activities between two or more parties to coordinate their interactions and provide trust (Knapp et al., 2019). Contracts facilitate trust and initial cooperation (Gulati and Nickerson, 2008). Contracts can facilitate communication and decrease uncertainty and risk (Mesquita and Brush, 2008; Lu et al., 2022). Informal cooperation plays a role in facilitating formal cooperation (Susanty et al., 2018).

**An Informal Contract** is an unwritten agreement conducted directly to set the expectations between parties (Handfield and Bechtel, 2002). Trust and reputation are the basis of the promise of repeated transactions rather than legal enforceability in an informal contract (Stevenson and Pirog, 2008).
**Formal Contracts** ensure that agreements fulfil expectations and standards through risk mitigation and information sharing (Wolf et al., 2001). Thus, a formal contract would effectively support information dealings, manage business processes, and overcome complex demands that might occur (Lu et al., 2022). There is limited comprehensive research on the effects of formal and informal cooperation on supply chain performance (Ratajczak-Mrozek and Malys, 2011).

### 2.5 Total Quality Management (TQM)-Area B

This Section explores the theoretical and conceptual lenses of TQM by which the phenomenon of QDS in EFSCs can be analysed and understood (Figure 2.11).

![Figure 2.11: Perspective of TQM](Source: The Researcher)

**2.5.1 Key Prior Research Linked to TQM Perspective**

Many management theories will be compared with TQM (Dahlgaard-Park et al., 2018). Among management schools are classical management paradigms such as Fayol’s administrative management theory, neo-classical theory as human relations theory, and modern management theories focus on system theories.

A **system theory** is a conceptual paradigm founded by Ludwig Von Bertalanffy (Boulding, 1977). The systems theory is an interdisciplinary theory and a framework that analyses a phenomenon as a whole (Capra, 1997). The systems perspective is essential for quality management in the coming decade (Fundin et al., 2020). This theory is a system that is appropriate for TQM implementation as it is a conceptual
framework for the integration and analysis of hard and soft factors in the real world. In an organisation’s systems theory, TQM views an organisation as a system that describes organisations' internal and external interrelationships and behaviour to understand the functioning and outcomes of organisations and environmental changes (Dahlgaard-Park et al., 2018). A system is a group of subsystems and their relations where these relationships are interdependent and can impact each other (Wilson, 2015).

In particular, large complex organisations can be subdivided into different divisions and sub-systems and consider hard and soft aspects along the SC. A broader systems perspective in TQM is vital in rapid changes and involving all stakeholders in the improvement activities for the value creation process (Fundin et al., 2020). TQM fits within the open systems view and comprises subsystems wherein chain actors interact dynamically with their environment (Scott, 1992). Inputs, transformation and output processes are system components (Bertalanffy, 1977). Economic, ecological and political aspects are considered for environmental analysis. The system theory views the chain actors as complex decisions. This system can be applied with the TQM perspective, where key elements such as leadership, resources, and processes can be applied in SCN. Systematic thinking for proper actions considered holistic quality management frameworks include tools and techniques.

In the present research, it is crucial to shed light on the critical Themes of TQM as a complex decision-making-process system in EFSC based on system theory that impacts on-chain actors to comprise system inputs, transformation processes, and outputs. System theory is an attempt within this research to understand technical (hard) and human resource (soft) aspects along the supply chains. In Table 2.3, prior research related to the TQM perspectives was explored to identify gaps, key Themes, and the relations to QDS that need further research to understand QDS in EFSC.
<table>
<thead>
<tr>
<th>Author</th>
<th>Type of Study</th>
<th>Factors</th>
<th>Country</th>
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<td>Abbas (2020)</td>
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<td>Pakistan</td>
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<tr>
<td>Feng et al. (2020)</td>
<td>Literature Review and Pilot Analysis</td>
<td>● ●</td>
<td>China</td>
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<td>Addis (2019)</td>
<td>Structured Survey Questionnaire</td>
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<td>Survey</td>
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<td>Nadae and Carvalho (2019)</td>
<td>Systematic Literature Review</td>
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<td>Survey</td>
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<td>Qualitative, Quantitative Literature Review</td>
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<td>Survey and Interviews</td>
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<td>Manzini et al. (2014)</td>
<td>Case Study</td>
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<td>Sadikoglu and Olcay (2014)</td>
<td>Survey</td>
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<td>Turkey</td>
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(Source: The Researcher)
2.5.2 Quality and Quality Management (QM)

Quality is essential to meeting customer and stakeholder satisfaction, which is at the core of QM (Fish, 2016; Bastas and Liyanage, 2018b). Quality should be attained first to other strategic capabilities as a successive precedent in the fast-changing business environment (Vandenbrande, 2021). Although quality is famous, it has a variety of meanings to different people and contexts (Fundin et al., 2020). The quality of a product is “Its ability to satisfy, or preferably exceed, the needs and expectations of the customers” (Bergman and Klefsjö, 2010, p.23). Meeting the customer requirements may include, among many other features, availability, delivery, reliability, maintainability, reducing costs and meeting pre-defined specifications (Oakland, 2003). Quality improves long-term financial performance (Addis, 2019). QM has no explicit definition or agreed content (Foley, 2006). QM is “A holistic management philosophy that strives for continuous improvement in all functions of an organization” (Kaynak and Hartley, 2005, p.256).

QM is a management philosophy of principles, practices, and tools to facilitate TQM implementation. (Dale et al., 2013). There is a need for a solid foundation for practices, tools, and techniques of quality management to achieve remarkable quality performance in the long term. Continuous improvement of QM within the context is a need to meet future needs (van Kemenade and Har djono, 2019; Fundin et al., 2020). Quality gurus like Deming, Juran, Crosby, and Feibeiumigh introduced QM principles and practices to drive change (Fernandes, 2017; Nguyen, 2018). QM practices evolved from inspection to quality control, then quality assurance (QA) to the TQM (Fundin et al., 2020).

TQM considered the QM's latest evolutionary stage as a philosophy and innovative quality relevant to competitive advantage and SUST (Krumwiede and Lavelle, 2000). This is part of stakeholders' expectations by involving more extensive approaches such as TQM, including quality award models such as the Deming prize and European Foundation for Quality Management (EFQM) model, Just-In-Time (JIT), Lean, Six Sigma, balanced business scorecard, 7S framework and ISO 9001 (Govindan, 2014a; Phan et al., 2019). Further, McKinsey’s 7-S framework was introduced by Peters and Waterman. It is a holistic framework
that integrates hard and soft aspects to capture the complex reality and qualitative and quantitative aspects (Dahlgaard-Park and Dahlgaard, 2007).

QM has matured and introduced QM systems (Sousa and Voss, 2002). Many international QM frameworks are accepted as ISO 9001 and Hazard Analysis and Critical Control Point (HACCP) (Vanichchinchai, 2019). These approaches are considered TQM methodologies (Foley, 2006). Most empirical research focused on ISO 9001 certification or TQM implementation to address QM (Wilson and Campbell, 2020). ISO 9000 certification is the first step in implementing TQM (Sahoo, 2018). The empirical research in developing countries has paid little attention to QM (Al-Khalifa and Aspinwall, 2000; Saleh et al., 2018). QM contributes to sustainable development, specifically environmental SUST (Allur et al., 2018; Carnerud et al., 2020).

2.5.3 Total Quality Management (TQM) Perspective

TQM has been established conclusively as one of the strategies still required at strategic levels alongside multiple strategies for business performance (Abbas and Sagsan, 2019). TQM is “A holistic management philosophy that strives for continuous improvement in all functions of an organization, and it can be achieved only if the total quality concept is utilized from the acquisition of resources to customer service after the sale” (Kaynak, 2003, p.406).

TQM embraced an international perspective through the International Standards Organization (ISO) in 1987, where TQM principles were adopted by standard ISO 9001. The quality management system (ISO 9001) promotes the implementation of TQM principles to influence the internal and external activities of the organization at soft and hard levels (Bastas and Liyanage, 2018a). ISO certifications contribute to successful TQM practices (Wilson and Campbell, 2020). TQM has gained popularity since the 1990s among firms (Sahoo, 2018). Therefore, TQM is a multidiscipline system, which requires managing the multi-cross relationships inside and outside the actor's boundaries, addressing quality and SUST in SCN (Weckenmann et al., 2015). TQM focuses on the whole organization as one unit (Broman and Robèrt,
Bergman and Klefsjö (2003) argued that TQM focuses on fulfilling customer expectations and requirements at the lowest cost through continuous improvement work.

Some researchers have pointed out that TQM is an abstract philosophy that lacks a standard definition because it is convertible by time and context as new ideas and methods are introduced and developed with no clear guidelines for their practical implementations (Vanichchinchai and Igel, 2011; Dale et al., 2013). Van Kemenade (2014) and Fundin et al. (2018) address that context influences how QM is applied. The development of TQM theory is still in the early stages, and TQM development is at different stages in firms due to the complex and challenging implementation process (Dale et al., 2013; Fundin et al., 2018). TQM is characterized by its principles supported by techniques and tools (hard TQM practices) (Hellsten and Klefsjo, 2000).

Few researchers have considered the relationship between QM systems to achieve sustainable development (Pozo et al., 2018; Magd and Karyamsetty, 2021). Siva et al. (2016) and Abbas (2020) have argued that there was a lack of literature on TQM as a driver of sustainable improvement. Other researchers studied the relationship between TQM and SCM without SUST to overcome weaknesses in performance and enhance collaboration across the SCN (Machado et al., 2016; Fernandes et al., 2017). The literature demonstrates the strong similarities between implementing quality and SUST in an SC (Fish, 2016). As a customer focus, continuous improvement involving all the stakeholders and the cultural shift practices of TQM are necessary to implement SUST (Sadikoglu and Olcay, 2014; Singh et al., 2018). The literature and empirical research have paid little attention to TQM in developing countries, especially Middle Eastern countries and Jordan (Al-Khalifa and Aspinwall, 2000; Abdallah et al., 2014; Saleh et al., 2018). However, according to Hellsten and Klefsjö (2000, p.243), TQM is “A management system that encompasses values, techniques and tools” (See Figure 2.12).
This research defined TQM as a management system facilitating continual improvement that considers hard and soft practices of quality and TBL SUST dimensions in supply networks to enhance all stakeholder satisfaction and accomplish the aim.

TQM is a continuous improvement tool in SC (Carnerud et al., 2018; Abbas, 2020). The TQM framework can support SUST by reviewing practices, methodologies and tools (Garvare and Isaksson, 2005). TQM supported economic sustainability and extended to social and environmental SUST (Singh et al., 2018). However, there is increasing interest in adopting TQM and employing efficient management of resources for an economical, social, and ecologically sustainable future (Ramanathan, 2021; Vandenbrande, 2021).

Effective QM and safety systems in the food industry focused on continuous improvement are directly related to quality and economic SUST performance (Pozo et al., 2018). Further, economic SUST is achieved by reducing the amount of raw materials inputs (Akanmu et al., 2021). On the other hand, TQM serves environmental SUST by applying the practices and tools of TQM equally to environmental issues (Hilman
et al., 2020). ISO 9001 has been used as a foundation for integrating the environmental requirements of ISO 14001 to help achieve environmental SUST (Pozo et al., 2018; Nadae and Carvalho, 2019). Statistical process control (SPC) monitors emissions to achieve zero waste.

TQM is intended to improve the quality of products, process quality, reduce costs, reduce waste and defects, competitiveness, teamwork, and productivity and create more satisfied stakeholders (Hilman et al., 2020). TQM is a holistic approach that integrates all organisational functions and employee participation in continuous improvement and improving overall quality, as Quality is the responsibility of everyone (Jurburg, 2019). However, there is still a fear of major changes in strategic priorities, the organization’s culture, processes, and modifications to TQM tools for implementing TQM (Bugdol, 2020).

TQM is an improvement process for the long term that focuses on the continuous improvement of work processes, requiring the input of both human and financial resources to deliver high-quality products (Mehra et al., 2001; Ooi, 2014). Generally, TQM is viewed as the process-oriented philosophy of enhancing customer satisfaction (Mehra et al., 2001). Quality is not considered only continuous improvement but also innovation that allows actors to enter markets, creating more satisfied customers and employees and resulting in less waste, reworking and scrap (Yusr et al., 2017).

From above, TQM is a combined system of hard and soft factors that require continuous long-term improvement. Muthusamy et al. (2021) argued that the AHP method could be introduced into the TQM process compared to other methods. Expert knowledge helps in synthesizing an optimal selection and decreasing imprecision in different critical success factors of TQM (Kumar and Mishra., 2020).

2.5.4 Critical Success Factors (CSFs) of TQM

Critical Success Factors (CSFs) of TQM are minimal internal or external conditions that need to be identified that can successfully encourage the firm to address the challenge (Kalra and Pant, 2013). TQM became the criteria for SUST (Talib and Rahman, 2012). CSFs are a few factors, including best practices prioritised for successful TQM implementation, which are critical for a company's success (Singh and
Sushil, 2013). They must receive careful and constant attention from the managers (Talib et al., 2014). These factors suit planning implementation and continual monitoring activities for high performance (Islam, 2017).

However, there are no universal CSFs due to the diversity of the definitions and approaches (Tasleem et al., 2019). Depending on their needs, CSFs are unstable for all organisations (Bajaj et al., 2019). Therefore, companies must address, prioritise and use several critical factors to succeed in the related market (Trang and Do, 2020). Successful implementation of TQM depends on CSFs, and recently, the AHP approach has been used to prioritise CSFs (Bajaj et al., 2019).

Companies focus on selecting and analysing the interaction of the best suitable CSFs to effectively implement TQM techniques and tools and determine the level of resources. Soft TQM practices are long-term elements that emphasize social managerial issues such as human resources, financial performance, and relationships that could apply to any organisation (Albuhisi and Abdallah, 2018; Saleh et al., 2018). Hard TQM practices are technical tools, techniques or technology which focus more on production and manufacturing for the specific industry or country that supports the soft TQM techniques (Saleh et al., 2018; Vanichchinchai, 2019). According to Khalili and Subari (2013), Abdallah (2013), and Saleh et al. (2018), hard and soft TQM practices should be applied as CSFs in developed and developing supply chain countries (e.g. Jordan) (Figure 2.13).

![Figure 2.13: TQM Critical Success Factors (CSFs) - Hard and Soft TQM Practices](Source: Saleh et al., 2018)
This research seeks the implementation of the TQM practices of CSFs holistically in developing countries such as Jordan to better understand their application within the entire EFSCs in order to deliver several benefits in the supply chain system (Abbas, 2020) and achieve the TBL of SUST (Albuhiisi and Abdallah, 2018; Singh et al., 2018). Some previous empirical studies (e.g., Yusr et al., 2017; Tasleem et al., 2019; Abbas, 2020) have holistically applied TQM practices of hard and soft factors based on quality award models to bridge the disparities in previous applications. Other studies (e.g. Robinson and Malhotra, 2005; Agi and Nishant, 2016; Bastas and Liyanage, 2018a) have examined the applications of ISO 9001 principles to include quality in SC.

2.5.5 Key Themes of TQM
2.5.5.1 Hard Practices

Continuous Improvement focuses on process thinking and identifying the root causes of problems, then taking action to maintain high quality and customer satisfaction (Fish, 2016). Organizations employ continuous activities and analytical ways to meet changing stakeholder needs in improved quality products and processes (Machado et al., 2016; Nguyen et al., 2018). Continuous improvement can be through the Deming cycle, Six Sigma, benchmarking, and various quality tools and techniques for problem-solving (Sutrisno and Ardyan., 2020). Reward and recognition systems are established as recognition efforts for continuous improvement (Kurdi et al., 2020).

Product Design: A product is designed to perform a particular function. Its effectiveness is seen in the fitness of use and compliance with specifications to be durable, safe, economic, and satisfy customer requirements (Schöggl et al., 2017). Designing high-quality and defect-free products to meet customers’ requirements is essential (Hu et al., 2021). As a result, it will reduce waste and material consumption through efficient process management, contributing to environmental SUST.

Tools and Techniques: Quality tools and techniques are required to analyse information and data due to the complexity of problem-solving and the importance of continuous improvement (Dale, 2013). TQM cannot be ensured without applying appropriate tools and techniques (Phan et al., 2019). Top management
and employees need to understand quality tools to facilitate continuous process improvement (Alemam and Li, 2016). According to Dale (2013), tools and techniques are applicable in different situations with no preference. The most common tools are control charts, fishbone diagrams, cause and effect diagrams, Pareto analysis, flowcharts and histograms. Techniques are an integrated approach that relies on several supporting tools with practical skill and training (Cho et al., 2017; Akanmu et al., 2021). Previous studies have revealed that tools and techniques are not widespread, and employees need more training (Alemam and Li, 2016).

**Statistical Process Control (SPC):** SPC is the “Integral part of monitoring, analysing, managing and improving the performance of a process (either manufacturing or service) and reducing variation through the use of statistical methods” (Antony and Taner, 2003, p.743). Statistical methods monitor and control the process and existence of problems in the early stages. This technique is a powerful problem-solving tool that depends on accurate information used for the quality of products and process improvement through enhancing corrective action and eliminating special causes of variation in processes (Lim and Antony, 2016). The ultimate advantage of implementing effective SPC is reducing waste by reducing defective products, reworking, scrap, and material consumption, thus enhancing economic and environmental performance (Oakland, 2003; Isaksson, 2016). The food industry lacks SPC application and an understanding of statistical thinking (Lim and Antony, 2016; Isaksson, 2016).

**Process Management:** A process is “A network of activities that, by the use of resources, repeatedly converts an input to an output for stakeholders” (Isaksson, 2004, p.20). Process management reduces variation by defining, measuring, and monitoring processes in a periodic review through techniques and tools, thus enhancing quality assurance and improving quality and SUST performance (Nguyen et al., 2018; Un and Asakawa, 2015). Process management practices are process control and preventive maintenance. This Process tracks processes and monitors data performance (Pozo et al., 2018). Continuous improvement is a control process that increases output uniformity and reduces reworking, time, and materials (Andriansyah et al., 2019).
2.5.5.2 Soft Practices

**Top Management Leadership:** leadership demonstrate more than traditional management among managers (Han et al., 2016). Top management Leadership and commitment are the most critical factors and prerequisites for other quality management practices to deliver quality transformation towards SUST (Aquilani et al., 2016; Agi and Nishant, 2016; Kumar and Sharma, 2017). Leaders are responsible for designing, planning and implementing quality goals (Abbas, 2020). Leaders support employees in understanding the meaning of quality, participating in decision-making, and designing for quality (Yusr et al., 2017). This involves setting up a quality committee and recognition and reward systems. Leadership improves innovation across SC, stakeholder satisfaction, social responsibility and financial performance (Bastas and Liyanage, 2018b; Zhang and Cao, 2018).

**Supplier Relationship:** It is defined as the “*Purposeful management of relationships between buyers and suppliers to ensure, at the minimum, needed supplies of the right quality and quantity are obtained in a timely fashion.*” (Amoako-Gyampah et al., 2019, p.160). Establishing collaborative relationships with suppliers' materials in product design and production processes is necessary to improve the quality of relationships and raw materials, reducing costs and risk and enhancing SUST (Aquilani et al., 2016). The quality of raw materials is a significant source of higher product quality (Modgil and Sharma, 2017).

**Training and Education:** Employees are key stakeholders (Zink, 2007). Training, the empowerment of employees, and recognition are critical success factors for improving SUST (Luburić, 2015; Aquilani et al., 2016; Nguyen et al., 2018). Effective training is a systematic way to provide sufficient knowledge and learning capability for all employees. Training employees enhances skills and proficiency in their tasks, especially regarding quality-related issues and team problem-solving (Stachová et al., 2019). Hence, effective training will produce high-quality products, reduce defects, and increase quality, environmental, social and economic SUST performance (Kaynak, 2003; van Assen, 2021).
Customer Focus: Focus on Customers' pointed customer satisfaction (Foley, 2005; Albuhiisi and Abdallah, 2017). Customers are defined as “Individuals or organisations that are downstream in the life-cycle process of a product; that is, customers are receivers of a product“ (Garvare and Johansson, 2010, p.5). TQM is required to satisfy customer needs and increase market responsiveness (Abbas, 2020; Kurdi et al., 2020). Focusing on customers and stakeholders is the priority in every decision to design the product, process, and SC to enhance quality and SUST (Siva et al., 2016). Being close to the customer is vital for getting feedback to determine their needs and market trends before implementing TQM (Elrehail et al., 2019). In addition, continuous improvement requires employees' involvement and commitment at all levels (Elrehail et al., 2019).

2.5.6 Quality in SCN/SCM -Supply Chain Quality Management (SCQM)

The year 2005 signals the inception of the QM and SCM integration, resulting in SCQM management (Kaynak and Hartley, 2008; Talib et al., 2011; Sharma et al., 2012; Kaur et al., 2019). High-quality performance needs an effective quality practice in SC or product quality (Abbas, 2019). The implementation of SCM could be facilitated and complemented through TQM practices to enhance SC performance (Kaynak and Hartley, 2008; Vanichchinchai and Igel, 2011). Previous research on SCQM focuses only on specific features of the upstream SC rather than overall levels (Dubey et al., 2017; Zhou and Li, 2020). Scholars have identified a need for conceptual frameworks on SCQM to be validated empirically in different industrial contexts, especially in EFSCs (Quang et al., 2016).

SCQM has been defined as “The process of integration between quality management in the supply chain network will have an impact both on the downstream and upstream sides of an organization” (Noor et al., 2020, p.223). SCQM is a systems-based approach to performance improvement (Kaur et al., 2019).

Many researchers have advocated integration, seeking advantages such as improved customer satisfaction, high product quality, and rapid responsiveness (Gu et al., 2017). Collaboration and coordination among all networks enhance the integration of SC, where QM concentrates on internal participation, and SCM looks
at external partnerships to achieve effective and efficient SCM at a low cost (Quang et al., 2016; Zhou and Li, 2020). Applying QM practices across SCN, such as quality and continuous improvement concepts, enhances overall SC performance (Quang et al., 2016; Kaur et al., 2019).

The focal actor, the manufacturer, must establish internal collaborative processes and quality integration to meet customers’ requirements and achieve higher quality levels (Huo et al., 2019). Monitoring systems and quality teams are examples of collaborative practices (Handley and Gray, 2013). Supplier quality practices such as certification, product design processes and communication of quality information contribute to financial and quality performance (Huo et al., 2019). Customer quality practices such as quality feedback, active involvement in development processes, and certification improve delivery performance (Wilson and Campbell, 2020).

TQM and SCN are complex concepts (Basheer et al., 2019). Literature in the context of SCQM has revealed two main research streams: TQM practices and SCN practices that overlap and have many common aims, which are “supplier quality management, customer focus and leadership” (Talib et al., 2011; Fernandes et al. 2017, Peng et al., 2020). Customer satisfaction is the ultimate goal for quick response to changing needs with minimum cost (Vanichchinchai and Igel, 2011).

2.6 Sustainability (SUST) - Area C

This Section aims to identify the importance of SUST in EFSCs and explore the theoretical and conceptual contributions by which the phenomenon of QDS in EFSCs can be critically understood. Figure 2.14 illustrates the content of SUST in the present research.
2.6.1 Key Prior Research Linked to Sustainability (SUST)

Understanding fundamental SUST theories is vital. This Section explores a brief of the main theory adopted for the SUST perspective and the concepts that would best work for QDS in the EFSC phenomenon. Several theories are relevant to SUST, including agency, institutional, and stakeholder (Freeman, 2010).

The stakeholder theory is most frequently adopted to view SUST (Montiel and Delgado-Ceballos, 2014). Stakeholder theory was put forward by Freeman (1984) and has gained importance in management literature due to the simplicity inherent to the model (Fassin, 2008). In particular, it significantly influences adopting environmental and social actions along SC to meet the key stakeholders’ requirements (Elia et al., 2020). At least its critical stakeholders' expectations are central to the stakeholder theory and should be considered for implementing sustainable supply chains and achieving SUST (Garvare and Johansson, 2010). Furthermore, the relationship between stakeholder theory, QM and SUST is still to be developed to understand the SC field (Garvare and Johansson, 2010).

There is no generally accepted definition of stakeholders (Friedman and Miles, 2006). Many studies adopted the definition of Freeman as "Any group or individual who can affect or is affected by the achievement of the organization’s objective” (Freeman, 1984, p.46). Foley (2005, p.138) defined stakeholders as “Those entities and/or issues, which a business identifies from the universe of all who are interested in and/or affected by the activities or existence of that business, and are capable of causing the enterprise to fail, or could cause unacceptable levels of damage if their needs are not met”.

Stakeholder theory captures multiple actors within SCN, as stakeholders influence actors’ behaviour (Hendry, 2005). Actors provide essential support for an organisation, and they could withdraw this support, causing failure of the organisation if their expectations fail (Garvare and Johansson, 2010). This leads organisations to manage internal and external actors and enable a broader collaboration to achieve SUST (Foley, 2005; Esfahbodi et al., 2016).
The stakeholder theory allows the shift from a traditional SC to a sustainable supply chain by understanding each stakeholder's role and involving various actors in SCN by focusing on a quality concept (Collier et al., 2014; Elia et al., 2020). Stakeholder theory states that firms are responsible for prioritising various stakeholders, specifically influential stakeholders, and responding to their claims (Freeman, 1984) due to limited resources. Hence, stakeholder theory suggests that actors within SCN must consider various actors' expectations and the creation of value for all of them through and take appropriate actions toward SUST and consider SUST performance (Freeman, 1984; Collier et al., 2014; Elia et al., 2020; Kayikci et al., 2022). Therefore, SC actors need high involvement and collaboration to achieve SUST in EFSC.

In the present research, it is vital to shedding light on the key Themes of SUST as a dimensional approach of TBL: economic, social and environmental Themes across all actors as stakeholders in EFSC. Previous studies have examined the three Themes; however, few have explored them, especially in SCN, focusing on the quality concept.

This present research attempts to understand the totality of SUST by integrating the three SUST Themes in a new framework linked to SCN and TQM perspectives. In Table 2.4, prior research on the SUST perspective was explored to understand the relations to QDS and identify their key Themes and gaps that need further research to understand QDS in EFSC.
2.6.2 Sustainability (SUST) Concept

Sustainability has moved toward developing countries over the past 25 years due to alignment with the guidelines of sustainable development goals (SDG) to be achieved by 2030 (UNDP, 2020), as well as more considerations for SUST after the present COVID-19 crisis (Sarkis et al., 2020). However, the definition of SUST varies because it has arisen from different areas, focusing on industry-specific aspects and SUST regulations (Rojas-Lema et al., 2021; Rajesh, 2021).

In this research, Sustainability is defined as “The long-term capability of well-being by encompassing the responsible management of all resources, which results in meeting the needs of the present without compromising the ability of future generations to meet their own needs” (Ahi and Searcy, 2014, p.1753). In 1987, the World Commission on Environment and Development (WCED) introduced Sustainable development (SD) as "A development that meets the needs of the present without compromising the ability
of future generations to meet their own needs" (WECD, 1987, p.8). A long-term capability is required to meet SUST (Ahi and Searcy, 2014). An effective balance of the three aspects of TBL requires awareness of sustainable development and implementation of sustainability management. Sustainability Management (SM) is a system of best management principles to achieve economic, social and environmental considerations (Bastas and Liyanage, 2019). This requires adopting best management practices throughout the operations system to achieve sustainable development (Kuei and Lu, 2013).

In this research, SUST needs the focal actors to consider direct and indirect actors along their EFSC and in multi-tier networks (Sauer and Seuring, 2019). The food industry and its EFSCs have significant SUST implications for the TBL: economic, environmental, and social (Yakovleva et al., 2012). This research argues that SUST is a cross-output between the TQM critical factors and the intensity of implementing practices from the SCM management system. This is because being efficient and effective can be a condition for EFSC performance.

The growing challenge of environment-conscious customers demands sustainable products and processes (Griggs et al., 2013). In order to address such demands, sustainable product development has appeared, focusing on QM practices and tools and environmental requirements in product design; this is a proactive approach to environmental SUST (Bovea and Pérez-Belis, 2012).

2.6.3 Sustainability Perspective: TBL of Sustainability

The absence of scholars' consensus on SUST (Smith and Sharicz, 2011) has resulted in a diversity of SUST perspectives and a shortage of the most suitable framework because of the complexity, context-dependency and multiple social values and political priorities of different measures of SUST between countries (Evans et al., 2017).

The SUST perspective in the mid-eighties mainly considered the environmental and economic dimensions (Partidario et al., 2010). However, in 1987, the Brundtland report strongly conveyed social considerations to balance the environmental and economic model (WECD, 1987). This perspective has been considered a
TBL in international trade, especially within the ongoing global crisis born in the 21st century in developed and developing countries (Mitchell et al., 2012).

The literature revealed a growing body of work and theories related to SUST. However, one crucial paradigm in SUST frameworks is the SUST paradigm of TBL: environment, social and economic factors. These factors are often symbolized as overlapping circles and are characterized by business, particularly the Triple Bottom Line, TBL or 3BL (Figure 2.15) (Parkin et al., 2003). TBL is the relationship between SUST's Economic, Social, and Environmental facets (Svensson et al., 2018). This framework helps achieve sustainability goals and improve SUST performance by SC actors by integrating and balancing the three dimensions of the TBL (Carter and Rogers, 2008; Purvis et al., 2019). This framework encourages companies to become socially and environmentally responsible (Schulz and Flanigan, 2016).

Thus, the TBL concept is commonly referred to as “The three Ps (i.e. People, Planet and Profit)” (Tsai and Chou, 2009, p.1444). It is a well-known concept that was developed by Elkington (1998). It has been operationalized through a framework of the intersection of social, environmental and economic factors and balanced to achieve long-run business performance (Elkington, 2013; Purvis et al., 2019). Therefore,
environmental SUST and social responsibility are introduced in the long run besides profit in evaluating business performance. This results in the risk of favouring specific dimensions over others being mitigated (Ansari and Qureshi, 2015; Reefke and Sundaram, 2016).

When developing a set of standardized and accepted metrics, the TBL SUST model is complicated, so there are problems measuring the environmental and social impact (Schulz and Flanigan, 2016).

Moreover, integrating these three SUST factors in industry or research is still scarce (Beske and Seuring, 2014; Reefke and Sundaram, 2016; Rajeev et al., 2017). Developing countries need to adopt TBL to benefit society and organizations (Jia et al., 2018b; Bastas and Liyanage, 2018b). Moreover, SUST is a multidimensional concept lacking consensus regarding what is included in TBL, and several definitions have emerged over the years (Ashby et al., 2012; Ali and Suleiman, 2016). The least developed dimension in research is Social SUST (Beske and Seuring, 2014; Venkatesh et al., 2020). However, adopting social SUST is crucial in improving the overall SC SUST performance (D’Eusanio et al., 2019; Venkatesh et al., 2020). On the other hand, environmental SUST was dominant. It results from external pressure and governmental regulations to resolve environmental problems (Siva et al., 2016; Elia et al., 2020; Kayikci et al., 2022). Some studies address the environmental and social SUST dimensions, with little research on economic SUST, assuming that the economic dimension is already developed in the industry (Gold and Schleper, 2017).

SUST, considering TBL dimensions, is complex. It is considered a multicriteria decision problem because economic, social, and environmental criteria naturally conflict with quantitative and qualitative alternative impacts and long-term evaluation of an uncertain future should be assessed (Kandakoglu et al., 2019). The SUST literature revealed that Case Studies dominated. However, recently, multiple criteria decision-making (MCDM), such as the analytic hierarchy process (AHP) and analytic network process (ANP), have been used to reach a consensus on the final decision (Kandakoglu et al., 2019).
2.6.4 Key Themes of Sustainability (SUST)

2.6.4.1 Economic Sustainability

Economic SUST refers to sustainable efforts, profit and economic contribution (Björklund et al., 2012). The economic dimension of the TBL is measured in terms of financial gains, working in parallel with social and environmental settings (Elkington, 2013). After deducting the operating costs, it refers to all stakeholders' financial and non-financial value. The economic dimension refers to the organisation's capabilities to increase efficiency and profitability through the supply chain and sustainable operations by reducing labour productivity, market concentration, revenue, production, and transportation costs (Gold and Schleper, 2017; Bastas and Liyanage, 2018b).

2.6.4.2 Social Sustainability

Social SUST addresses the social issues (ethics and values) and concerns that arise throughout all SC activities among all stakeholders, even local communities (Mani et al., 2016). It helps to engage in an acceptable quality of life and healthy society for all internal and external people (Awasthi et al., 2018; D'Eusanio et al., 2019) and the beneficial practices and human rights toward the labour and communities in which they are located (Faisal et al., 2017). This view explains how social values and belief systems affect a firm’s legitimate status and SUST (Freeman, 1984).

Social SUST criteria differ across industries (D'Eusanio et al., 2019). Actors support skills and capabilities through motivation, education and training. Social indicators mainly concern human rights issues, such as health and safety, wages and equal opportunity, diversity and child labour (Mani et al., 2016; Venkatesh et al., 2020). Other social impact measures can include societal development programs, such as health and social awareness programs, creation skills, donations, volunteerism and charitable contributions (Guerrero-Villegas et al., 2018b).

2.6.4.3 Environmental Sustainability

Environmental SUST investigates operational activities' impact on natural resources and the environment (land, water, air and ecosystem) to conserve and preserve the natural environment and the measures taken
Activities include waste, hazardous materials and pollution reduction, energy efficiency, and utilisation of resources to improve environmental performance with a practical environmental management system (ISO 14000) (Saberi et al., 2019). The environmental dimension enhances the status of the living environment and consideration of the environment within business activities (Gimenez et al., 2012) by collaborating with supply chain partners for the efficient improvement of processes and knowledge sharing for environmental protection (Ahmed et al., 2020; Qorri et al., 2020).

Reducing the environmental impact of the final product could not be achieved without considering the contribution of SC stages (Govindan et al., 2014b). Table 2.5 summarises the three key Themes of SUST and how they are important for SC actors to better build SCN and TQM in EFSC integrated with QDS.

**Table 2.5: Key Themes of SUST and the Integration of QDS**

<table>
<thead>
<tr>
<th>Key Themes</th>
<th>Explanation</th>
<th>Integration of QDS</th>
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| **Economic Sustainability** | Potential to increase sustainable, committed, and strong employment in sustainable and circular practices by providing employees with financial assistance. This driver also includes the concentration of environmental costs, such as expenses associated with the current or future deterioration of natural resources due to economic activity of smartness and a circular supply chain ecosystem vertically and horizontally. | ▪ Perspectives of sustainability, TQM and SCN.  
▪ Quality indicators  
▪ Product Quality  
▪ Process quality  
▪ Supply chain quality  
▪ Performance quality  
▪ Certifications  
▪ Value differentiation  
▪ Sustainable supply chain  
▪ Circular sustainable supply chain  
▪ Smart, sustainable supply networks  
▪ Technological supply chain networks  
▪ Quality supply chain  
▪ Sustainability performance |
| **Social Sustainability**   | Reducing harmful substances or using nonchemical materials and processes with proper standards for sustainable health and safety for employees. Also, a smart circular sustainable supply chain ecosystem reduces the consumption of hazardous materials in the vertical and horizontal supply chain operations to provide a pollution-free environment while increasing globalization and global awareness of the need for sustainability.     |                                                                                                        |
| **Environmental Sustainability** | Environmental responsibility for environmental sustainability is an immense concern to consumers. Thus, products and services of eco-design are designed via smart operations with the minimum amount of detrimental environmental effects as a result of cooperation in the supply chain ecosystem vertically and horizontally. |                                                                                                        |

Source: (Bastas and Liyanage, 2018b; Garay et al., 2021 and Kayikci et al., 2022)
2.6.5 Adaptable Sustainable Supply Chain Management Performance (ASSCMP)

Sustainability performance can be defined as “The combination of its economic, social and environmental performance” (Chardine-Baumann and Botta-Genoulaz, 2014, p.139). Adaptable Sustainable Supply Chain Management Performance (ASSCMP) is conceptualized as an overall outcome of integrated TBL sustainability management and practices and tracking progress in SUST (Ahi et al., 2018; Qorri et al., 2021). Measuring performance is essential for understanding their position in SUST and monitoring how effectively they could improve it for the future and transparently create values for all levels (Ahi and Searcy, 2014; Rajesh, 2021). In this research, the TBL could be considered a SUST performance framework (dos Santos et al., 2019; Pislaru et al., 2019). The researcher argues that QDS profoundly influences ASSCMP. Adaptable SCM is derived from sustainable development ideas in developing countries and applied to EFSC in Jordan. It is a three-dimensional approach to long-term sustainable organisational development. It includes economic, social, and environmental aspects that should be given equal attention practically combined with new initiatives and strategies.

The performance evaluation has an impact on all supply chain actors. It should be measured and monitored its impact on society, the economy, and the environment, which in turn can indicate its (positive or negative) contribution to sustainable development and the effectiveness of SUST activities (Büyüközoğlan and Karabulut, 2018; Giannakis et al., 2020). A holistic and integrated view of TBL SUST at different SC stages enhances ASSCMP (Ahi and Searcy, 2014; Esfahbodi et al., 2016; Geng et al., 2017). That requires engagement and collaboration on continuous improvement and long-term goals amongst all tiers in SC to seek higher performance from their suppliers and other stakeholders (Ahmed et al., 2020; Qorri et al., 2021). However, measuring ASSCMP is problematic because it is a multidimensional concept of SUST with multiple SC actors; it is challenging to quantify environmental and social aspects (Kandakoglu et al., 2019). The SUST indicators or metrics have been generally described specifically for the food industry (Van der Vorst et al., 2013). The responsibility of the focal company is taking into integrated management in terms of resource use and reducing waste for appropriate SUST performance (Singh and Rahman, 2021).
Sustainability performance assessments and their indicators are not common due to context-dependent and vary across industries and their associated supply chains (Rojas-Lema et al., 2020; Rajesh, 2021). However, ASSCMP has been scarce in previous studies (Büyükozkan and Karabulut, 2018; Osiro et al., 2018), specifically in developing countries (Jia et al., 2018b; Bastas and Liyanage, 2018b). In addition, the networks’ SUST assessment is limited (Mena et al., 2013; Tsolakis et al., 2018). Previous research is focused on evaluating dimensions of SUST performance separately, and fewer studies consider the integration of the TBL (Luthra et al., 2016; dos Santos et al., 2019; Pislaru et al., 2019). Several publications address economic performance and support environmental performance. However, the social dimension was given little attention (e.g. Brandenburg et al., 2014; Beske and Seuring, 2014; Venkatesh et al., 2020). With little empirical assessment of SUST performances (Abdul-Rashid et al., 2017).

Recently, SUST assessment methods in a supply-chain context extend an existing conceptual framework with quantitative assessment models such as multi-criteria decision-making (MCDM) models as analytical hierarchy process (AHP) and life-cycle assessment (LCA) and a multi-attribute utility theory (MAUT) (Brandenburg et al., 2014; Büyükozkan, and Karabulu, 2018). AHP is the most commonly employed semi-quantitative decision-making technique to quantify and study the conflicting social, economic and environmental criteria (e.g. Büyükozkan, and Karabulu, 2018). Furthermore, the McKinsey 7S Framework is a management model developed in the early 1980s by Perters and Waterman and used to improve sustainability performance (Perters and Waterman, 2004; Kumar, 2019).

ASSCMP increasingly depends on suppliers to achieve its objectives (Hofmann et al., 2014). So, companies need to select suppliers and monitor and evaluate good TBL SUST performance (Luthra et al., 2016; Giannakis et al., 2020), including issues in terms of working conditions for its employees or tax contributions to the local community, child labour, human right (Awasthi et al., 2018; D'Eusanio et al., 2019).
2.6.5.1 Economic Performance

Economic performance is economic growth with profits earned by the supply chain partners while concerning the environment, quality of life and reducing resource costs (Sloan, 2010; Micheli et al., 2020). The enhancement of economic performance could be value created for people. Therefore, Employee salaries will rise. Consequently, their loyalty to the company (Isaksson, 2019). The common factors that affect economic SUST performance are flexibility, cost and quality, responsiveness as investments for economic SUST, and reduction in the overall cost will enhance the company’s image and increase long-term profitability (Silvestre, 2015; Geng et al., 2017).

2.6.5.2 Environmental Performance

Environmental SUST performance is generally based on ecological goals to show impact and progress toward the environmental situation (Singh and Rahman, 2021). The factors that affect environmental performance have been proposed as a reduction in pollution emissions, waste, environmental accidents and efficient energy and resources consumption and reduction in hazardous materials consumption, and the use of recycled material (Esfahbodi et al., 2016; Geng et al., 2017; Sachin and Rajesh, 2022).

2.6.5.3 Social Performance

Social performance is the social consequences on humans of the supply chain, from organisation activities to improving quality of life and fairness to labour and the communities (Sloan, 2010; D’Eusanio et al., 2019). Social performance could increase an organization's image, customer satisfaction, and loyalty (Venkatesh et al., 2020). Social performance indicators are related to Human rights (Fair salary, health, safety, training, and Work conditions) and Societal issues (social projects, Community well-being, stakeholder engagement, social risk management, and partner relationships) (Geng et al., 2017; Guerrero-Villegas et al., 2018b; Sachin and Rajesh, 2022).
2.6.6 Sustainability in SCM (SSCM)

From the early 2000s, SUST was operationalized in SCM fields through the TBL (Seuring and Müller, 2008; Roy et al., 2018; Barbosa-Póvoa et al., 2018). There has been growing research since 2007 (Seuring, 2013; Ansari and Kant, 2017). However, empirical studies are still scarce on the integration of all TBL dimensions into SCM, specifically social and economic dimensions limited and even in the Jordanian context (Ali and Suleiman, 2016; Agi and Nishant, 2016; Barbosa-Póvoa et al., 2018; Govindan, 2018; Jia et al., 2018b; Tseng et al., 2019).

Few studies included quantitative models of multi-criteria decision-making (MCDM), such as an analytic hierarchy process (AHP) for SSCM (Seuring, 2013; Brandenburg et al., 2014). Thus, further investigation is needed to mature sustainable EFSCs (Fritz and Silva, 2018). SSCM has mostly focused on Europe and the USA. However, in developing countries, sustainable supply chain practices in various stages of SC are encouraged with increasing environmental problems and societal issues (Silvestre, 2015; Sánchez-Flores et al., 2020).

The SUST perspective integrated into SCM/SCN results in SSCM (Ansari and Qureshi, 2015; Dubey et al., 2017). The drivers of this integration are to manage SC SUST and consider the impact of environmental and social aspects on the supply chain to enhance the value generated to all stakeholders and to keep their global competitive position (Ahi and Searcy, 2014; Ghadimi et al., 2019; Narimissa et al., 2020).

Additionally, different stakeholders and internal and international legislative bodies are increasing pressure on focal actors, especially other actors in SC, on the adoption of SUST practices, specifically environmental practices, to reduce the harmful effects (Hofmann et al., 2014; Ansari and Qureshi, 2015; Luthra et al., 2016; Kim and Chai, 2017). Sustainable practices will bring benefits such as cost savings, product differentiations, and reputation (Micheli et al., 2020; Sarkis et al., 2020).

SSCM is defined as “The management of material, information and capital flow as well as collaboration among firms along the supply chain while taking goals from all three dimensions of sustainable
development, i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements” (Seuring and Müller, 2008, p.1700). Hence, a consistent definition of SSCM is missing due to complex supply chains and various issues between different sectors (Ansari and Kant, 2019; Piya et al., 2020). Empirical approaches are needed to capture the SSCM problems.

To sum up, SC integration is considered the first building block for the implementation and improvement of SSCM by considering (i.e., environmental, economic, and social) SUST dimensions and linking SUST from different perspectives (Ahi and Searcy, 2014). That needs collaboration with multi-tier suppliers, focal actors and customers in SCN and information sharing. (Govindan et al., 2014; Beske and Seuring, 2014; Rajeev et al., 2017). SUST is applied in manufacturing industries due to environmental regulations. Focal firms manage their SUST with reliable suppliers by broadening selection criteria from cost and price to social and environmental factors and building close collaboration (Theißen and Spinler, 2014). Consequently, the SUST of the downstream SC is enhanced with supplier SSCM practices (Kannan et al., 2014). However, SSCM practices result in long-term value for various stakeholders regarding profitability, economic SUST performance, and society and environmental impact (Ahi and Searcy, 2014; Li et al., 2019). Baojuan (2008) asserts that enterprises should strengthen the quality of implementation of SSCM and simplify environmental management's complexity by applying technology such as RFID, advanced Decision Support Systems, and Artificial Intelligence (AI).
2.7 Quality-Driven Sustainability (QDS) in EFSCs- Area D = A & B & C

![Figure 2.16: The Integrated Research Scope - Key Perspectives (same as Figure 2.1)](Source: The Researcher)

The discussion in Sections 2.4 – 2.6 shows the considerable overlap between the three perspectives in the literature, which justifies developing the integrated concept of QDS that contains SCN, the vehicle for transmitting TQM, and SUST. In this Section, the author considers QDS elements implied in the literature and applies them to the state of SCM in Jordan. It shows how focusing on QDS can create adaptable supply chains in the face of disruptive forces. She also hopes to show that discussion in the literature leads to the implication that consideration of QDS may positively impact SSCQM implementation for TBL SUST to help achieve adaptable, sustainable supply chain performance. QDS is central to understanding the state of the Triads and forms the basis of the Decision Framework.

The literature supports the author's view that focus on QDS provides a basis for her empirical research. QDS in EFSC is the phenomenon in the present research. QDS is the integrated perspective of the three perspectives (SCN, TQM, SUST) that are highly interdependent and theoretically associated. QDS (as a combined phenomenon) played an important role in the current state of the EFSC in Jordan. In brief, QDS is central to understanding the state of the Triads and forms the basis of the Decision Framework. QDS demonstrates the condition for creating SC that is adaptable to disruption and positively impacts SSCQM.
Implementation for TBL SUST to help achieve adaptable, sustainable supply chain performance. There is a great deal of literature on each of the three components of QDS separately and in pairs, but no literature encompasses all three components. The researcher's empirical work confirms the critical role played by the QDS phenomenon in the current state of the EFSC in Jordan, as illustrated by Figure 2.16 above. In this research, QDS is defined as a strategy for organisations repositioning themselves based on total quality management (TQM) principles and tools (quality of product, process and supply chain) as the building block and enhancing the capability of operating systems in SCN for sustainable development for sustainable practices (sustainable product, process, supply chain) to enhance the TBL SUST performance.

QDS in EFSC is the phenomenon in the present research. Improving product quality and processes is a need nowadays due to globalisation, technology, and stringent customer demands (Omta et al., 2002). It is challenging for actors to effectively move to the SUST agenda in a competitive export-business environment. Those actors have to work with various responsibilities (quality, economic, social and environmental) to satisfy the expectations of primary stakeholders with concerns about the quality concept (Abbas and Sagsan, 2019).

Researchers and actors today are aware of the QDS strategy for enhancing the capability of operating systems for sustainable development (Kuei and Lu, 2013; Alemam and Li, 2016). However, the fact remains that without a clear theoretical framework to underpin these, it will be challenging to move QM research to the next level linked with SCN and SUST (Reed et al., 2000). TQM is a management system; the SUST dimensions could be easily merged into the TQM framework. Continuous improvement focuses on TQM and long-term orientation to SUST in SC (Abbas, 2020). Continuous improvement in food quality and safety is related to the QM system (e.g., ISO 9000) and the safety system, such as HACCP (Vanichchinch, 2019).

In this research, achieving SUST in EFSCs, considering multi-tier supply chains requiring a transparent SC, relies on the focal actors, such as manufacturers and the extended network. Many scholars have called
for in-depth conceptual and empirical studies linking quality and SUST in SCN (e.g., Kuei and Lu, 2013; Bastas and Liyanage, 2018a; Sauer and Seuring, 2019). Hence, in this research, the importance of QDS in EFSCs can consider the following transformation towards sustainability management (SM) for the SUST paradigm (Ansari and Qureshi, 2015; Beske and Seuring, 2014; Gold and Schleper, 2017; Reefke and Sundaram, 2016). (Figure 2.17). This is supported by the Deming cycle PDCA (Plan-Do-Check-Act), which starts with a strategy of change for implementation and ends by creating a platform for learning for long-term SUST.

![Diagram](image)

**Figure 2.17: Phenomenon of QDS – Linking QM to SM**
(Source: Kuei and Lu, 2013)

### 2.7.1 Quality Practices

**Product Quality**: It has significant effects on determining customer satisfaction, customer loyalty, brand image and profitability (Choi and Lee, 2019). Product quality is a multidimensional (intrinsic and extrinsic) attribute (Cerjak, 2017). Prior research (Asioli et al., 2017) highlights that intrinsic and extrinsic product attributes determine consumers’ perceptions. Lamuka (2014) has emphasized that food quality and safety become opportunities for developing countries to access export markets. Food safety is a quality attribute (Mattevi and Jones, 2016; Zhou et al., 2022).
**Intrinsic attributes** are an objective measurement of product quality related to functionality and physical aspects and are specific to each product (Asioli et al., 2017). **Extrinsic attributes** are aspects modified without changing the physical composition of the product itself and its characteristics (Cerjak, 2017). These extrinsic attributes include price, brand name, nutritional facts and information about the production, quality labels, packaging, and SUST claims (Asioli et al., 2017; Morris et al., 2018). Furthermore, product certification ensures that declared product quality characteristics comply with specified requirements (Choi and Lee, 2019).

**Process Quality** is related to Quality Assurance (QA), certification, and Quality Circles (QC). **Process quality** is the “Quality of the process that causes the product to be either acceptable or not” (Arditi and Gunaydin, 1997, p. 236). QA and legislative standards are needed for continual improvement in product quality and safety. Process quality in SC, from raw material to finished product, is crucial for the total quality of final products before releasing them to the market (Abbas, 2020). Therefore, several QA systems have been adopted in food supply chains to ensure food quality and safety compliance (Alfian et al., 2020).

**Quality Assurance (QA)** is a systematic approach to identifying and eliminating the causes of quality and safety issues (Carmignani, 2009). A documented process procedure at every stage controls the process and verifies product quality and safety. Quality of production and distribution processes becomes a requirement not only for product quality but ensured through system certification (Andriansyah et al., 2019). Food safety and quality certification are identified as marketing tools and becoming a preRequirement to access a specific market through distinguishing products (Lamuka, 2014). Thus, certification makes effective and efficient operational activities and increases product control quality and safety (Kotsanopoulos and Arvanitoyannis, 2017).

**Certification** is an independent third-party audit for an evaluation system to the specified requirements and standards (Kotsanopoulos and Arvanitoyannis, 2017). International food quality safety standards help the food actors in the supply chain in commercial and contractual arrangements, minimise safety incidents,
improve QA systems and eliminate multiple audits (Labrecque et al., 2015). QA systems include Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP) (Lamuka, 2014). In addition, ISO 22000 is integrated with HACCP and ISO 9001 (Abebe et al., 2020). ISO 45001 (Occupational Health and Safety Management Systems) controls occupational health and safety risks at the workplace, leading to fewer accidents and reduced time. ISO 14001 (Environmental Management System): integrated managerial process to manage and assess environmental impacts with perceived TBL (Nadac and Carvalho, 2019). The British Retail Consortium (BRC) helps assure product safety.

**Quality/Lean Circles (QC)** is a systematic approach to select, identify, analyse and solve problems for quality improvement or waste reduction to improve performance (Kulkarni et al., 2018). QC helped develop employees’ skills, motivation, and customer satisfaction (Kumar et al., 2020b). The QC team comprises multi-disciplinary workers, typically 8 to 12, from a related area in an organization with voluntary participation and collaborative decision-making (Kulkarni et al., 2018). These QCs take different names and vary worldwide, like- HR Circle, lean Circles, Magic circles, and quality seekers (Lakshmi and Sucharitha, 2019). The basic structure of a QCs team is top management, a steering committee, a coordinator, a facilitator, a team leader, a deputy leader and members (Kulkarni et al., 2018).

**Supply Chain Quality** is related to digital platforms and traceability. Digital platforms help actors across SC with online purchasing with flexible, fast, on-time delivery instead of conventional shopping (Reim et al., 2022). For example, digital platforms of e-commerce typically optimize the existing operations with greening processes along the SC by reducing energy and material consumption to fulfil the customer requirements before a physical product is sent (Kunkel and Tyfield., 2021). A well-designed platform of an efficient, flexible and accessible system for integrated real-time data exchange publicly available in SC is necessary for the feasibility of multiple distribution channels. An integrated information system could be adopted for food inventory management by restructuring and automating the process along SC for monitoring activities and improving quality control and operational efficiency (Meacham et al., 2013).
Moreover, e-collaboration and e-transportation resulted from product complexity, increased transaction frequency, and product volume (Thöni and Tjoa, 2017). Customer orders can intelligently analyse the optimal facility to serve customers with order fulfilment flexibility. Hence, digital platforms allow for improving transportation with intelligent transport systems (ITS), running facilities operating costs, and monitoring SUST performance (Thöni and Tjoa, 2017).

**Traceability** tracks all information in real-time food operations along EFSC for higher visibility and transparency (Saberi et al., 2019). Traceability would strengthen quality management and improve the cooperation of all actors in EFSC (Mattevi and Jones, 2016; Zhou et al., 2022). Hence, Good Manufacturing Practices (GMP) and HACCP help manage and trace all operations efficiently and accurately (Lamuka, 2014). Food traceability systems provide information about the whole process in EFSC, such as product safety and quality, production and logistic information, shelf life, and product origin (Zhou et al., 2022). Traceability builds long-term sustainable benefits that enhance reputation, continuous learning, and response to product risks (Li and Chen, 2019). Traceability platform support at all levels in the EFSC by collecting, organizing, analysing and assessing the information. The product is traced based on obtaining and tracking information about raw material, production, distribution, sales and consumer-created in the whole food supply chain at any time. Traceability integrates tracking records from different sources or sensors using innovative technologies. For example, traceability could use RFID and Blockchain technology for visibility and real-time trace products (Feng et al., 2020). Blockchain technology in the SC is expected to bring various advantages, including efficiency, lower costs, security and SUST effectiveness (Saberi et al., 2019).

### 2.7.2 Sustainability Practices

**Product Sustainability:** Consumers are concerned about the importance of quality, healthy eating, organic food and sustainable products (Saba et al., 2019). Sustainable products are of higher quality, with environmental and social considerations (Maniatis, 2016). Since 1999, there has been a rapid market for
sustainable products concerning meat, fruit and vegetables, specifically organic products, in Europe, Asia and the USA (Zander and Feucht, 2018).

Healthy food is concerned with healthiness attributes, ingredients (natural additives and non-artificial ingredients) and nutritional facts (low fat, sugar, salt) (Petrescu et al., 2020). Resource (material, water and energy) consumption, using environmentally friendly technology, respecting animal welfare and wastes generated along the entire packaging cycle and production of sustainable products are considered for environmental food impact (Petrescu et al., 2020; Li and Kallas 2021). Organic food is concerned with safety and health risks during growing and production without adding synthetic fertilizers and chemicals (Saba et al., 2019). Organic attributes are mainly natural, with nutritional capacity and no pesticide residue (Van Loo et al., 2015). Either eco-friendly ingredients or eco-friendly packaging or both could produce eco-friendly products.

Sustainable packaging options include using less packaging (e.g., bulk products) or recyclable packaging. On the other hand, the packaging itself is made of environmentally friendly or recycled materials (Petrescu et al., 2020). Labelling displays ingredients and environmental and health product features (Dörnyei et al., 2022). For example, certification and specific labels and logos on packaging inform about intrinsic product SUST, such as organic ingredients and external product SUST (eco-friendly package), as well as environmental, social and ethical aspects through sustainable extrinsic attributes (Magnier et al., 2018). Among these labels are territorial attributes (e.g. concerning geographical indication, protected designation of origins), environmental impact (e.g. organic products) and animal welfare (Clark et al., 2017; Zander and Feucht, 2018).

**Process Sustainability: Clean Production:** Clean and efficient production was given attention concerning the concept of SUST aligned with resource efficiency, gender equality and poverty reduction (Leong et al., 2019; Awan, 2020). Sustainable processes are widely recognized as improving processes and products for managing impacts on the environment, society, the economy and enterprises (Zeng et al., 2017). Exports to
foreign customers and imitation of successful organizations drive sustainable processes in the SC (Glover et al., 2014). Sustainable food production studies are few (Ali and Suleiman, 2016; Hoek et al., 2021).

Leong et al. (2019, p.6) (quoted Abdul-Rashid et al., 2017) that Green manufacturing is a “Business strategy that focuses on profitability through reactive and proactive environmentally friendly operating processes”. Green manufacturing aims to improve production processes with an efficient flow of resources (material, energy, water, soil) at all stages, reduce pollution resulting in eco-friendly products, and enhance the environmental impact and financial performance (Abdul-Rashid et al., 2017; Gong et al., 2019). Furthermore, activities with the principles of 3R (Reduction, Recycling, Reusing) are greening the SC to reduce cost, scrap rate, and waste and gas emissions (Malik et al., 2022). In addition, effective mapping and monitoring of SC processes can enable more excellent stakeholder value (Kusi-Sarpong et al., 2022). Technology such as blockchain significantly enhances SUST and traceability (Feng et al., 2020).

Furthermore, product life cycle analysis assesses the relationship between the environment and a product (Schaubroeck et al., 2020). COVID-19 has illustrated the need for sustainable production (Sarkis et al., 2020) and localized input production (Naghshineh et al., 2021). Halal food concerns animal welfare, food safety, the environment, and fair trade that help in the transformation to sustainable production (Rezai et al., 2015).

**Green Purchasing:** Environmental (green) Purchasing is “An environmentally conscious purchasing practice that reduces sources of waste and promotes recycling and reclamation of purchased materials without adversely affecting performance requirements of such materials” (Min and Galle, 2001, p.1222). Focal actors along SC integrate environmental concerns in procurement that will encourage their suppliers to meet the green criteria and adopt technology (Sarwar et al., 2021). This encourages actors along the supply chain to switch to using non-toxic chemicals, environmentally friendly materials, and renewable energy resources for environmental and ethical considerations (Çankaya and Sezen, 2019). For example, simple packaging and eliminating excessive packaging are green procurements (Kung et al., 2012).
Furthermore, sustainable product development is to find engineering solutions to improve SUST performance (McAlone and Pigosso, 2017). Eco-design integrates environmental aspects into product design during the production products’ lifecycle, considering recycling, recovery, renewable resources and reducing emissions.

**Supply Chain Sustainability: Reverse Logistic:** Prahinski and Kocabasoglu (2006, quoted in Khor and Udin, 2013, p.72) defined reverse logistics as “The transportation of recoverable goods received from customers to reprocessing centre, inspection and disposition involve evaluating the product to determine the most appropriate disposition alternative whereas reconditioning is the actual work carried out to recover value from products”. The returned products are classified as either before-end-of-life products in good condition or non-conforming products (Khor and Udin, 2013).

The returned products are collected by: third-party logistics, collection centres and retailers (Prahinski and Kocabasoglu, 2006; Wang et al., 2019b). Selling retail center is collaborative centers for collecting several returnable products through contractual costs agreements (Savaskan et al., 2004). Recovery processes are usually divided into 3Rs: re-manufacturing, reuse and recycling (Khor and Udin, 2013; Malik et al., 2022). A reverse distribution channel depends on proper transport design. Third-party logistics (3PLs) also indirectly help the chain actors reduce risk, increase flexibility, and work on their essential processes (Kinobe et al., 2015).

**Circular Economy:** The circular economy is a new research approach that started in 2016 and lacked integration of SUST studies (Paes et al., 2019). It closes process loops and creates value for all chain actors by increasing process efficiency and reducing resource consumption (Paes et al., 2019). It reduces resource consumption, waste management, and recycling and turns them into valuable resources for other actors to enhance TBL SUST (Di Foggia and Beccarello., 2021). Actors are implementing various R’s (e.g., recycle, reuse, reduce, etc.) methods in production that are self-sustaining to reduce waste and pollution (Malik et al., 2022). The circular economy should consider necessary technologies, product design for recovery, reducing waste disposal, and environmental legislation (Geng et al., 2013; Scipioni et al., 2021).
2.8 Toward Research on Sustainability Supply Chain Quality Management (SSCQM)- Area D as a subset of A & B & C

The three parts above of the present literature review have reviewed prior research to explore the current topic. This research attempts to conduct empirical research to understand the EFSCs of supplier-manufacturer-customer Triads. The researcher argues that the SCM/SCN is a key perspective integrated with the theoretical perspectives of TQM and SUST to examine QDS in EFSCs.

2.8.1 Concept of SSCQM

Adopting SCN, TQM, and SUST perspectives and associated relationships and synergies resulted in new emerging research into SSCQM, with 2017 and beyond starting this research scope (Bastas and Liyanage, 2018b, 2019). This is mainly for actors in the manufacturing industry for higher quality performance and cleaner production for sustainable manufacturing (Bastas and Liyanage, 2018a). Kuei et al. (2011) and Fernandes et al. (2017) strongly suggest future research for integrating SUST with SCQM and the links with the three pillars of SUST. Previous studies focus on environmental sustainability among TBL SUST dimensions with limited empirical sectors and geographical regions (Jabbour et al., 2014; Dubey et al., 2015; Agi and Nishant, 2016).

Bastas and Liyanage (2018b) have finished a review of the literature (2005-2017), which revealed no or limited integration of research through the lens of all three perspectives. Those authors have pointed out that only one study by Govindan et al. (2014a) links the TQM perspective with the SCM perspective and all TBL SUST approaches incorporating the whole supply chain view, but this was limited to an automotive sector in a specific geographical region, Portuguese. Hence, the initial theoretical framework in the new study of Bastas and Liyanage (2018b) is established by integrating the three perspectives of QM, SCM and SUST (Figure 2.18). In the present research, the researcher builds on this review by incorporating the SUST perspective of TBL into future SSCQM frameworks for EFSCs in Jordan as a developing country.
Limited holistic conceptual and empirical research has been done focusing on the association and synergy of the three perspectives SCN, TQM and TBL SUST perspectives in the context of SCM (Kuei et al., 2011; Fernandes et al., 2017; Bastas and Liyanage, 2018b). Some authors, such as Dubey et al. (2015) and Agi and Nishant (2016), studied this integration; however, these studies have limited empirical results and implications (Govindan et al., 2014a). Thus, this research incorporates SCM as a platform for the other three perspectives. Previous studies focus on environmental sustainability among TBL SUST dimensions with limited empirical sectors and geographical regions (Jabbour et al., 2014; Dubey et al., 2015; Luthra et al., 2016; Agi and Nishant, 2016; Kim and Chai, 2017). Moreover, the empirical research focused on one actor or dyadic relationship with less focus on Triadic relationships. The previous research had not presented QDS as a main phenomenon in EFSC, especially in developing countries (Kuei and Lu, 2013; Govindan et al., 2014a; Bastas and Liyanage, 2018b; Sauer and Seuring, 2019). Furthermore, many previous empirical studies have been conducted in various industries and developed countries. However, there was limited in-depth research on the food industry in developing countries.

![Figure 2.18: The concept of SSCQM towards a Theoretical Framework](Source: Bastas and Liyanage, 2018b, p.727)
2.8.2 Key Themes (Factors) from SCN, TQM and SUST Perspectives

The literature associated with the three perspectives, Supply Chain Network (SCN) in Section 2.4, Total Quality Management (TQM) in Section 2.5, then Sustainability (SUST) in Section 2.6 and specifically for 164 articles included in the systematic literature review were re-evaluated the most relevant theoretical perspectives separately and concerning the other two perspectives. Some of these articles are summarised in Tables 2.2, 2.3, 2.4, 2.6 and Appendix A to identify relevant key factors (key Themes) and to identify specific research gaps to understand QDS in Triads of EFSCs in a developing country, which resulted in a need for further research to understand QDS in EFSC. A more precise analysis (presented in Table 2.6) for prior research was explored to identify the main Themes.
<table>
<thead>
<tr>
<th>Author</th>
<th>Type of Study</th>
<th>Factors</th>
<th>Key Themes Studied</th>
<th>Level of Analysis</th>
<th>Country</th>
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</thead>
<tbody>
<tr>
<td>Heidari et al. (2021)</td>
<td>Qualitative (AHP method)</td>
<td>QM/TM</td>
<td>SC M/SC N</td>
<td>Communication, training, recycling waste, knowledge management, supply procedures, product quality, market presence, green production, green logistics, green design</td>
<td>Supply chain through (expert opinion)</td>
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<td>Vandchali et al. (2021)</td>
<td>Survey</td>
<td>QM/ TM</td>
<td>SC M/SC N</td>
<td>SCN structure, transparency, power, supplier dependency, buyer dependency, distance, on-compliance, transactional, dictatorial, and collaborative relationships</td>
<td>manufacturers and suppliers within two large retailers’ SCN</td>
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<tr>
<td>Kittipanya-Ngam and Tan (2020)</td>
<td>Case Study</td>
<td>QM/ TM</td>
<td>SC M/SC N</td>
<td>digitalisation, transparency; visibility; digitalisation platforms, blockchain, Internet of Things (IoT), traceability-market/supply accessibility</td>
<td>food supply chains(upstream SC - manufacturer-downstream SC)</td>
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<tr>
<td>Abbas (2020)</td>
<td>Empirical (Survey)</td>
<td>QM/ TM</td>
<td>SC M/SC N</td>
<td>leadership, strategic planning, customer focus, process management, human resource management, information and analysis, and knowledge management.</td>
<td>Manufacturer</td>
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<tr>
<td>Feng et al. (2020)</td>
<td>Literature Review and Pilot Analysis</td>
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<td>SC M/SC N</td>
<td>blockchain-base food traceability, sustainability</td>
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<td>Narimissa et al. (2019)</td>
<td>Delphi method literature review</td>
<td>QM/ TM</td>
<td>SC M/SC N</td>
<td>Green supply chain management, Reverse logistics, recycling, Quality, cost, Supplier evaluation, Employment Non-discrimination and respect for justice, Customer satisfaction</td>
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<td>Andriansyah et al. (2019)</td>
<td>Survey</td>
<td>QM/ TM</td>
<td>SC M/SC N</td>
<td>Quality assurance, Continuous process improvement, environmental regulation, ERP</td>
<td>Company</td>
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<tr>
<td>Authors</td>
<td>Type of Study</td>
<td>Focus Areas</td>
<td>Methods</td>
<td>Country/Industry Details</td>
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<td>Nadae and Carvalho</td>
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<td>Integrated management systems (ISO 14001), OHSAS 18001, SA 8000, and ISO 26000</td>
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<td>Goyal et al. (2019)</td>
<td>Case Study</td>
<td>Six Sigma, Sustainable manufacturing, defects, Lean Six Sigma, QM systems</td>
<td>Electric Manufacturers (India)</td>
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<td>Mineral industry</td>
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<td>Bastas and Liyanage</td>
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<td>initial theoretical framework building on the integration of QM, SCM, and 3BL Sustainability</td>
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<td>Fritz and Silva (2018)</td>
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<td>green supply chain management practices, local development, stakeholder engagement, innovation, risk management, trust, power among SC members, supplier selection, environmental legislation, social capital, corporate social responsibility, working conditions, traditions, culture, SC integration,</td>
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<td>Quality management principles of ISO 9001 (leadership, engagement of people and improvement) and supply chain integration</td>
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<td>Focal company knowledge, resources, governance mechanisms, collaboration, third-party providers</td>
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<td>Ocicka and Raźniewska (2018)</td>
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<td>Case Study</td>
<td>• • • •</td>
<td>product-focused strategy, transparency, trust, audits, partnership product specification, certification regulation by governments, strategic planning, resource management</td>
<td>company</td>
<td>Canada</td>
</tr>
<tr>
<td>Kumara, and Rahmanb (2015)</td>
<td>survey</td>
<td>• • • •</td>
<td>Information sharing, Cross-functional team, Supplier development, buyer-supplier relationship Technology sharing, Supplier development, Risk, coordination, trust and Cooperation. Collaboration, top management Commitment</td>
<td>Manufacturing companies</td>
<td>Indian automobile supply chain</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
The following Table 2.7 summarises the significant Themes associated with each perspective from this critical identification and combination of key Themes, resulting in a conceptual framework SSCQM in EFSC that maps out the three perspectives (SCN, TQM, SUST) into key Themes that are key to QDS in order to achieve the objectives stated as well as help in identification of specific research gaps to inform the present research questions.

Table 2.7: Themes of Perspectives for the Present Research

<table>
<thead>
<tr>
<th>Key Themes</th>
<th>Description</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SCN Perspective</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplier-Customer Management</td>
<td>Long-term supply chain relationships among all actors with one or two partners who depend on</td>
<td>Wagner (2000) He et al. (2017)</td>
</tr>
<tr>
<td></td>
<td>one another in an EFSC.</td>
<td></td>
</tr>
<tr>
<td>Multi-Tier Network</td>
<td>Actors to interact with sub-suppliers in these supply chains, such as buyer, supplier and</td>
<td>Sauer and Seuring (2018) Soosay and Hyland (2015)</td>
</tr>
<tr>
<td>Lean SCM</td>
<td>Long-term commitment along supply chain partners, with a cooperative and systematic smooth</td>
<td>Tortorella et al. (2017) Willumsen et al. (2017)</td>
</tr>
<tr>
<td></td>
<td>flow of products, information, and technologies for waste elimination and reduce their losses</td>
<td>Madhani (2018)</td>
</tr>
<tr>
<td></td>
<td>to become leaner SCM and added value is created through the activities.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supply chain risks disruptions that from the outside environment uncertainties out of direct</td>
<td>Xu et al. (2019) Hofmann et al. (2018)</td>
</tr>
<tr>
<td></td>
<td>control of any actor</td>
<td></td>
</tr>
<tr>
<td>Digitalisation</td>
<td>Adoption of advanced digital technologies and advanced information technology to manage and</td>
<td>Pramanik et al. (2019) Büyüközkan and Göçer (2018)</td>
</tr>
<tr>
<td>Contracts</td>
<td>Written and unwritten agreements between parties in order to fulfil their needs</td>
<td>Mesquita and Brush (2008) Susanty et al. (2018)</td>
</tr>
<tr>
<td><strong>TQM Perspective</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SUST Perspective</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Research Phenomenon</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QDS in EFSC</td>
<td>TQM leads to sustainability advantage through applications along with the SCM through</td>
<td>Jraisat et al. (2013) Kuei and Lu (2013) Diab et al. (2015)</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
2.9 Key Research Gaps

There are research gaps in the current literature, missing the theoretical association between integrating the TBL of SUST into the SCM and TQM practices for actors in EFSCs. Table 2.7 summarises gaps in the present research. According to these gaps, the research questions have been derived (see Chapter 1, Section 1.4.3). Consequentially, this research attempts to solve research gaps based on the initial conceptual framework constructed (Figure 2.19) to guide the data collection and analysis that will answer the research question. The gaps that this thesis addresses became apparent as the research progressed - deep analysis in Chapter 6. The LR demonstrate that there is a gap. Research makes this gap more evident when comparing researcher results with existing LR.

<table>
<thead>
<tr>
<th>Research Gaps</th>
<th>Literature support</th>
<th>Suggested Research Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited research on QDS in EFSC from perspectives of SCN, TQM and SUST</td>
<td>Kuei and Lu, 2013; Sadikoglu and Olcay, 2014; Aquilani et al., 2016; Alemam and Li, 2016; Siddh et al., 2017; Govindan, 2018; Bastas and Liyanage, 2018b; Do et al., 219; Abbas, 2020; Vandenbrande, 2021</td>
<td>RQ1: How are the three perspectives (SCN, TQM and SUST) interrelated in the existing literature on supply chain management?</td>
</tr>
<tr>
<td>Limited studies on SCN perspective contributions to QDS</td>
<td>Talib et al., 2011; Vanichchinchai and Igel, 2011; Sharma et al., 2012; Glover et al., 2014; Ansari and Qureshi, 2015; Quang et al., 2016; Dubey et al., 2017; Dubey et al., 2017 Govindan, 2018; Roy et al., 2018; Barbosa-Póvoa et al., 2018; Zhou and Li, 2020</td>
<td>RQ2: What are the SCN practices applied by triads to build QDS in EFSCs?</td>
</tr>
<tr>
<td>Limited studies on TQM perspective contributions to QDS</td>
<td>Garvare and Isaksson, 2005; Carnerud et al., 2018; Singh et al., 2018; Pozo et al., 2018; Albuhi and Abdallah, 2018; Singh et al., 2018; Nguyen et al., 2018; Kaur et al., 2019; Abbas, 2020; Ramanathan, 2021; Vandenbrande, 2021; Akamnu et al., 2021</td>
<td>RQ3: What are the TQM practices applied by triads to build QDS in EFSCs in Jordan?</td>
</tr>
<tr>
<td>Limited studies on TBL sustainability perspective contributions to QDS</td>
<td>Elkington, 2013; Collier et al., 2014; Ansari and Qureshi, 2015; Rajeev et al., 2017; Chen et al., 2017; Svensson et al., 2018; Jia et al., 2018; Bastas and Liyanage, 2018b; Purvis et al., 2019; Sauer and Seuring, 2019; Elia et al., 2020; Ahmed et al., 2020; Qorri et al., 2021; Garay et al., 2021; Heidari et al., 2021; van Assen, 2021; Kayikci et al., 2022</td>
<td>RQ4: What are TBL SUST practices applied by triads to build QDS in EFSCs in Jordan?</td>
</tr>
<tr>
<td>Limited studies (conceptual and empirical) on QDS in EFSC in Triads</td>
<td>Mena et al., 2013; Hofmann et al., 2014; Ansari and Qureshi, 2015; Luthra et al., 2016; Abdul Rashid et al., 2017; Kim and Chai, 2017; Tsolakis et al., 2018; Bastas and Liyanage, 2018b; Do et al., 219; dos Santos et al., 2019; Pislaru et al., 2019; Sauer and Seuring, 2019; Giannakis et al., 2020</td>
<td>RQ5: What are the implications of QDS (Integrating the three perspectives into QDS) in the context of EFSCs in Jordan?</td>
</tr>
<tr>
<td>Limited studies on QDS in EFSC on sustainability performance in Triads</td>
<td>Chardine-Baumann and Botta-Genoulaz, 2014; Geng et al., 2017; Ahi et al., 2018; Büyükozkan and Karabulut, 2018; Osiro et al., 2018; Santos et al., 2019; Pislaru et al., 2019; D’Eusanio et al., 2019; Venkatesh et al., 2020; Ahmed et al., 2020; Qorri et al., 2021; Singh and Rahman, 2021</td>
<td>RQ6: How do QDS practices impact the TBL sustainability performance of triads in EFSCs in Jordan?</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
2.10 Initial Conceptual Framework-SSCQM for QDS in EFSCs

The critical literature review, grounded in the three perspectives of TQM, SCN, and SUST but integrated into a collective concept QDS, enabled the researcher to understand theoretical propositions in existing theories to develop research questions and objectives (Yin, 2003) and determine the research gap. Then, the most important Themes and Sub-Themes associated with each perspective are used to create a conceptual model (Miles et al., 2020). This initial conceptual framework will guide data collection and analysis. Therefore, key research questions (see Chapter 1, Section 1.5.3) have been derived, focusing on the interrelationships among the three perspectives.

The researcher developed a conceptual framework shown in Figure 2.19 mainly because when actors of an SC adopt sustainable supply chain practices and quality practices, they can move towards better SUST implementations in their EFSCs. As the platform, SCM facilitates integrating the theoretical perspectives of the SCN, SUST and TQM. The focus of this framework is QDS in EFSC as a new theory in the integrated research field of SSCQM supported by the proposed association of key Themes and Sub-Themes in these perspectives: SCM/SCN as a foundation, TQM as a methodological, and TBL's SUST perspective.

![Figure 2.19: An Initial Conceptual Framework of SSCQM for QDS in EFSCs](Source: The Researcher)
2.11 Conclusion

This Chapter has revised the key published literature on the critical phenomenon of QDS in the context of EFSC. The review was mainly undertaken toward addressing the research aim and objectives. This research aims to investigate the state of EFSCs with particular reference to QDS, basing the analysis on an extensive literature review and empirical analysis that results in a Sustainable Supply Chain Quality Management (SSCQM) framework to enhance the management of EFSCs in Jordan. The SLR was conducted from the perspectives of Supply Chain Management (SCM) and adopted a perspective centered around supply chain network (SCN), Total Quality Management (TQM) and sustainability (SUST) (Figure 2.1, Chapter 2). Through this approach, a critical research gap becomes evident, namely, the shortcomings of holistic empirical frameworks in integrating SCN, TQM and TBL SUST perspectives, particularly in the context of EFSC in Jordan, emphasizing the interactions of the Triads among supplier-manufacturer-customer. To bridge this gap, the present research introduces an initial conceptual framework, represented in Figure 2.19, which serves as a foundational basis for the subsequent investigation. This framework focuses on QDS as a new theory in the integrated research field of SSCQM: SCM/SCN as a foundation perspective, TQM as a methodological perspective, and TBL's SUST perspective. Chapter 3 presents the research methodology, encompassing data collection and analysis strategies employed for the empirical phase. These approaches are predicated on the initial conceptual framework outlined in (Chapter 2, Figure 2.19), guiding the subsequent stages of the study.
Chapter Three: Research Methodology

3.1 Introduction

The applied research method is qualitative. The empirical work consists of four multiple-case trials, whereby empirical evidence was gathered from 32 semi-structured interviews with managers in the food industry: observations, company visits, and secondary data from published sources triangulated interview data. In addition, uninvolved experts were contacted to provide validity for the final framework. The research has an empirical aspect guided by the existing literature, carried out through Case Studies designed to discover perceptions of key attributes by interviewees and the expert panel. Concerned with the management of supply chains – since the basis of the analysis is Case Studies and perceptions, is it possible to get an objective view of what governs the SUST and stability of SC; SUST is a long-term goal relating to satisfying - to some extent- the goals of different stakeholders – goals that often conflict, so the issue is one of the trade-offs).

Chapter 1 introduced an overview of this research and presented the Aim, Objectives and Questions. Adopting an evolutionary research process, this research integrates three perspectives of Supply Chain Network (SCN), Total Quality Management (TQM) and Sustainability (SUST). The need to integrate quality and SUST, particularly in the food supply chain, is highlighted by its economic implications for Jordan, where exported food contributes considerably to earnings and is subject to internal and external shocks. The literature review is used to formulate an initial conceptual model, followed by a pilot, then to refine the interview plan and prepare open interview topics, leading to the findings and mapping the findings into attributes for discussion with experts related to the propositions and attributes, re-formulating the propositions, prior to a refinement of propositions, design a framework, defining the role of the framework concerning managers, and the implementation of the framework.

Chapter 2 points out that a systematic literature review (SLR) was carried out to synthesise the fields of SCN, TQM and SUST in order to understand these perspectives and their key Themes, identify the research
gaps and reach the initial conceptual framework that is used in data collection and analysis for the present methodology.

To ensure reliability, the research made every attempt to outline the stages and processes involved in the research clearly and transparently. Also, findings were triangulated by considering a variety of perspectives: cross-analysis between Case Studies and related studies in the literature, discussions with experts, conducting pilot interviews and using NVivo software to check the researcher's interpretation of data.

Focus on perceptions and Case Studies implies using an interpretive philosophy and having an element of pragmatism. The approach is pragmatic because it is concerned with practical issues. Formulating propositions relating to the research questions also highlights the methodology associated with the empirical work. This Chapter describes the following aspects of the empirical work: the underlying philosophical approach (Interpretivism and some Pragmatism), research design, and some justifications behind choosing them. The Chapter also discusses data collection and analysis (sampling, pilot Case Study, primary and secondary data). The research method and strategy are explained, and the triangulation method is justified.

The research quality is presented (validity and reliability, trustworthiness). Finally, ethics and risk assessment are provided.

The SCM in this research focuses on the three perspectives, SCN, TQM and SUST, which are integrated into the area (Figure 2.1 in Chapter 2) under QDS. The empirical work maps the QDS attributes into an analytical hierarchy model to understand the Quality-Driven Sustainability (QDS) phenomenon in the Export Food Supply Chain (EFSC) context.

The researcher argues that theoretically integrating the three perspectives, analysing and generating new data, and applying key findings and insights to an essential industry in Jordan will significantly contribute to SC. The outcome of the research design will be a framework (blueprint) that will be practically useful to supply chain managers, related managers and policymakers in the future. In trying to ensure that the research is, to some extent, replicable, the author attempts to be as transparent as possible so, in principle,
other researchers could follow the same procedures. Ideally, replicability is impossible, hence the reliance on transparency and triangulation.

The unit of analysis is the EFSC. The focus is on manufacturers of food products in dyads and multi-tiers of the supply chain. The main manufacturers are considered the focal actors at the centre of the Triad relationship of upstream (main suppliers), manufacturers and downstream (main customers). Representative managers from Triads of tiers in SCN, supplier-focal actor-customer, were included in the sample interviewed in each Case Study.

Ethical approval was obtained from the University of Bedfordshire; then, a pilot Case was carried out to check the validity and reliability of the planned open-ended interviews. Pilot interviews were carried out early in the year 2020 on managers in the company, denoted as Case 1- Triad A and incorporated learning from the initial pilot, extending the pilot into a complete case. Later, in the first half of 2021, fieldwork was completed on other Cases: Case 2 - Triad B, Case 3 - Triad C and Case 4 -Triad D.

Provisional results are presented in Chapter 4. Further analyses were carried out on the empirical data collected in Chapter 5. It is envisaged that follow-up activity will be required as new issues arise: follow-up interviews and secondary data, with further clarification of the Case Study's methodology.

### 3.2 Research Design

The research design emphasis is placed throughout this thesis on transparency. It is crucial to enable the research to be replicated as far as possible. The literature review provided the foundation for investigating the phenomena of QDS in EFSCs by taking a holistic approach that integrates three perspectives to provide a new perspective and a novel conceptual framework for QDS in EFSCs in Jordan.

The following qualitative research has a roadmap of two phases: theoretical and empirical types, as shown in Table 3.1, which illustrates the integration, examination and validation of the conceptual framework developed through continuous feedback, triangulation and analytical generalisation. In underlying SCM,
the three perspectives are the network itself, TQM and SUST; the examination of relevant literature established that these three perspectives, as described in (Figure 2.1 in Chapter 2) are considered A, B, and C individually and in pairs AB, AC, and BC. However, three perspectives are not integrated as this thesis integrates the three perspectives in the area A&B&C (Figure 2.1, Chapter 2) under the title QDS, which is mapped into attributes via Case studies. This thesis generates the attributes through Case analysis and expert feedback, mainly focusing on attributes underlying QDS; having identified the key attributes using modified analytical hierarchy analysis (AHP), the thesis proposes actions by managers that enhance the management of the supply chain.

Table 3.1: Research Design Roadmap

| Theoretical Phase | Overview and Motivation (Key Terms and Concepts) | Research scope, background rationale and motivation are highlighted.  
| | | The research aim, questions and objectives are formulated. |
| | Systematic Literature Review (SLR) (Key Perspectives and Research Gaps) | Supply Chain Network (SCN)  
| | | Total Quality Management (TQM)  
| | | Sustainability (SUST)  
| | | Quality-Driven Sustainability (QDS)  
| | | Adaptable Sustainable Supply Chain Management Performance (ASSCMP) |
| | Initial Conceptual Framework (From Theoretical Phase to Empirical Phase) | Research overview and literature review synthesis |
| Empirical Phase | Data Collection (Multiple Case Studies- Triads) | Observations  
| | | Semi-structured interviews  
| | | Secondary data |
| | Links of data collection and analysis via triangulation method: theory, methodology, data and investigator | Within case analysis  
| | | Across case analysis  
| | | Using NVivo software to sort out and code data |
| | Data Analysis (Multiple Case Studies - thematic analysis) | Final Conceptual Framework - Decision Framework (Exploratory stage and Explanatory stage) | Case analysis: examining the initial framework in each case  
| | | Further analysis: refining initial framework across cases |
| | Links of key findings to form Final Conceptual Framework: analytical generalisation | Analytical hierarchy process (AHP) method (Validation Stage) | Prioritizing and ranking key themes for the final conceptual framework |
| | | Final Conceptual Framework of SSCQM for QDS in EFSC – Decision Framework |
| Thesis | Research Contributions | Theoretical contributions  
| | | Practical implications  
| | | Methodological contributions |
| | Writing Up |

(Source: The Researcher)
Research Phases:

Phase 1 - Theoretical Phase (Derivation of QDS)

This research entailed an extensive preliminary review to carry out empirical studies to understand the research context, frame the research problem, identify research gaps, and provide an initial conceptual framework (Chapter 2, Figure 2.19). This phase was theoretical underpinning, and the literature review showed that there was a need to understand how the perspectives of SCN, TQM and SUST can be integrated into a new perspective to develop an integrated initial conceptual framework of SSCQM for QDS in EFSCs (Bastas and Liyanage, 2018b; Nguyen et al., 2018). Then, this research included a pilot Case used to explore the main elements as key Themes in the initial framework. Hence, this stage was intended to clarify the initial framework and update the question of the Case protocol. The pilot Case findings were provided in Chapter 4, as it was considered Case 1-Triad A due to the richness of its data and findings.

Phase 2 - Empirical Phase (Mapping QDS into Attributes)

This research also had an empirical underpinning for mapping theory into attributes where four multiple Case Studies were conducted within Triads of supplier-manufacturer-customer in their EFSCs. This was intended to empirically examine each case's conceptual framework for the exploratory stage. In addition, this stage had a triangulation method to attain new knowledge about the important Themes and Sub-Themes that are not thoroughly defined (Robson, 2002). The four Cases were conducted and analysed using thematic analysis, and the findings were presented for each Case of Triads A, B, C and D, as shown in Chapter 4. Then, further analyses were a cross-analysis of the four Cases to explain the findings and match them to the Conceptual Framework. This was an explanatory stage to explain the reasons for the observed phenomena of QDS in EFSCs and make continuous development and refinement for the Final Conceptual Framework of SSCQM for QDS in EFSCs in Jordan to enrich the theoretical explanation or extend new theory with a replication logic (Miles et al., 2020). The fundamental activity of this research is theory building. Information about a phenomenon from previous literature, experience, and observation is essential for developing and expanding theory (Eisenhardt, 1989; Ritchie et al., 2014). Hence, the preliminary four
cross-case comparisons for Triads A, B, C and D were done. A comparative approach with a literature review was reached in a draft of a Final Conceptual Framework, as shown in Chapter 6 (Figure 6.2).

**Phase 3 – Cross-Analysis Comparison**

Finally, it was the writing up of the thesis. This was based on the preliminary cross-analysis and findings so far. This was after verifying the cross-analysis, as it was done manually at this stage, then elaborated with the literature, and NVivo was used to validate the findings. Finally, key Themes were prioritised by a modified AHP to reach a valid and final conceptual framework SSCQM for QDS in EFSCs.

**3.3 Triads as Case Studies in EFSC**

The literature about SCN, TQM and SUST separately and pairwise is extensive. However, there is little evidence of research (as illustrated in Chapter 2 above) on QDS and their interSection (Figure 2.1). However, it is significant to associate this evidence with other theories to produce a new theory on QDS from the viewpoints of the Triads in EFSCs. Each Triad consists of multi-tiers from the upstream and downstream tiers, forming a Supplier (upstream tier) - Manufacturer (focal actor) - Customer (downstream tier) in EFSCs. Therefore, a method of analytic generalisation was followed, where the empirical findings of the Multiple-Case Studies were compared with a prior theory (Yin, 2018).

In this thesis, SCM consists of three main elements; SCN is a platform for the two other elements: TQM and SUST. Integrating those three elements gives a conceptual framework. It uses SCM by focusing on SCN as the foundation perspective to accommodate the other perspectives: TQM and SUST. This enabled the development of a new integrated perspective, SSCQM, as a holistic framework to conceptually and empirically understand the possible links between these perspectives and how they impact QDS for better SUST performance in EFSCs. This research assumed the whole EFSC as a unit of analysis. A Case methodology is used to collect and analyse data for the four Triads (Case 1 - Triad A, Case 2 - Triad B, Case 3 - Triad C and Case 4 - Triad D). The Case is the Triad of supplier-manufacture-customer, where the
manufacturer of canned food products in Jordan is the focal actor in EFSC. Each selected Triad is a key source of data (Mena et al., 2013; Wilhelm et al., 2016; Jraisat et al., 2021).

### 3.4 Philosophy and Approach

Research design is strengthened by Philosophical consideration (Bryman, 2016; Halcomb, 2018). The foundations of research philosophy are ontological and epistemological (Bryman, 2016; Creswell and Creswell, 2017).

Ontological relates to *"The nature of reality and its characteristics"* (Creswell, 2013, p.20). Bryman and Bell (2011, p.15) stated that Epistemology is *"What is (or should be) regarded as acceptable knowledge in a discipline"*. Epistemological explains what we can know and how knowledge is created and understood.

#### 3.4.1 Research Philosophy / Methods Stances

Researchers considered two main Philosophical positions: positivism and interpretivism (Bryman, 2016; Bell et al., 2018; Saunders et al., 2019), as Table 3.2 explains different philosophical stances. The reader will notice that there are many similarities between research philosophies. As a result, research often uses a mix of philosophical approaches. Two standard requirements common to all research methodologies are

1. That any hypothesis and assertion should be falsifiable by evidence.
2. The researcher should make the approach transparent so that, at least in principle, it can be replicated.
Table 3.2: Views of Research Philosophy

<table>
<thead>
<tr>
<th>Philosophical Concept</th>
<th>Positivism</th>
<th>Realism</th>
<th>Interpretivism</th>
<th>Pragmatism</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ontology:</strong></td>
<td>Objective, External, independent of social actors, concerned with measurable observations</td>
<td>Objectivity. External reality is separate from the observer. It exists independently of human thoughts and beliefs or knowledge of realists and is interpreted by social conditioning</td>
<td>Subjective, Multiple Perspectives, Socially constructed, may change,</td>
<td>External, Multiple views chosen to enable answering of research question best</td>
</tr>
<tr>
<td><strong>Epistemology:</strong></td>
<td>Observable phenomena can provide credible data and facts. Focus on causality and law-like generalisations, reducing phenomena to the simplest elements</td>
<td>Observable phenomena provide credible data. Insufficient data means inaccuracies as direct realism. Phenomena create sensations that are open to misinterpretation</td>
<td>Subjective meanings and social phenomena. Focus on the details of the situation, the reality behind these details, subjective meanings and motivating actions</td>
<td>Either or both observable phenomena and subjective can provide acceptable knowledge by research question. Focus on practical research, integrating perspectives</td>
</tr>
<tr>
<td><strong>Axiology:</strong></td>
<td>Research is undertaken in a value-free way; the researcher is value-free and must state assumption explicitly independent of the data and maintains an objective stance</td>
<td>Research is value-laden, but the researcher should make value judgments explicit and conduct statistical tests. The researcher is biased by worldview, cultural experiences and upbringing.</td>
<td>Research is value bound; the researcher is part of what is being researched, cannot be separated, and so will be subjective; the researcher must acknowledge alternative points of view</td>
<td>Values play a large role in interpreting results; the researcher adopts both objective and subjective points of view. The researcher must make his values explicit.</td>
</tr>
<tr>
<td><strong>Data Collection Techniques</strong></td>
<td>Usually Highly structured, large samples, measurement, usually quantitative, but can use qualitative data that have measurable entities</td>
<td>Methods chosen must fit the subject matter, quantitative or qualitative</td>
<td>Often Small samples, in-depth investigations, mainly qualitative, Fine-grain case studies</td>
<td>Mixed or multiple methods. Both quantitative and qualitative</td>
</tr>
</tbody>
</table>

(Source: Easterby-Smith et al., 2012; Lincoln and Guba, 2018; Saunders et al., 2019)

**Epistemology (Interpretivism and some Pragmatism)**

This research adopted interpretivism and some pragmatism (Table 3.2). This research emphasises the need to establish a new framework as a theory-building for integrating the three perspectives of SCN, TQM and SUST with a focus on perspectives in the context of canned food with a focus on manufacturers as focal...
actors in the Triads of EFSCs. Hence, interpretivism allows a better understanding of the observed reality through the flexibility of triangulation viewpoints, interpretations and observation of the Triads (Bell et al., 2018).

This research uses interpretivism philosophy with some pragmatism influences (Saunders et al., 2016). Assuming that perceptions are reality based on the following three reasons: firstly, it is to gain an in-depth understanding and interpretation of phenomenon (QDS) in their natural context through the beliefs, communications and behaviours of the people (Chowdhury, 2014; Bryman and Bell, 2015); secondly, it is to gain insight observing actors in their lived experience, and social context where the researcher does not influence the object of study (Bryman and Bell, 2015; Kelly et al. 2017); and thirdly, the researcher's past experiences are used to provide valuable guides to the inquiry (Neubauer et al., 2019). In epistemology, interpretivism is that reality is constructed and explains the creation and understanding of what participants perceive and appropriate secondary data (Blaikie and Priest, 2019) and influenced by the researcher (Ormston et al., 2014).

Pragmatist epistemology is "That knowledge is always based on experience. One's perceptions of the world are influenced by our social experiences." (Kaushik and Walsh, 2019, p.4). Pragmatic focus on the research problem and contribute practical solutions and evidence that best answer the question (Tashakkori and Teddlie, 2016; Saunders et al., 2019). Pragmatist philosophy holds that "Human actions can never be separated from the past experiences and the beliefs that have originated from those experiences" (Kaushik and Walsh, 2019, p.3). Pragmatic is "Oriented towards real-world problem-solving and applies a pluralistic approach to concepts and methods "(Hakkarainen et al., 2020, p.12). Pragmatism has advantages: It can answer and explain exploratory research questions through different findings to provide valid conclusions to complex social phenomena (Tashakkori and Teddlie, 2008). Ansell and Geyer (2017) and Popa et al. (2015) address challenging SUST problems and emphasise that learning is an ongoing problem-solving process.
Generating knowledge in this research requires trust between respondents and the researcher. The researcher acknowledges that qualitative research can never be completely objective since the researcher is included in the research process. However, make every effort to be transparent, as transparency is important to scholarly work.

The researcher tries as far as possible to make the research methods, design and analysis to ensure transparency and rigour so that, at least in principle, other researchers could replicate this research.

### Ontology (Constructivism)

The ontology approach tends toward constructivism, in that the nature of reality is subjective, multiple and socially constructed (Bryman and Bell, 2015; Lincoln et al., 2018). SCN is complex and highly contextualised (Beske and Seuring, 2014; Brusset and Teller, 2017). The researchers can fully understand reality through a joint interpretation of participants' everyday lived experiences and close interaction reflected in their face-to-face responses in the entire EFSCs (Cunliffe and Locke, 2016; Lincoln et al., 2018). The inductive approach grasped the subjective reality and bias to build a theory (Yin, 2018). This research aims to establish a theory rather than seek external validity (Yin, 2018).

### 3.4.2 Research Approach (Abductive)

The interpretive philosophy is characterised by a qualitative study combined with an abductive method (Thanh and Thanh, 2015; Bell et al., 2018). It is based on interpreting qualitative data and participative observations, reinforced with secondary data concerning the three perspectives. An Abductive approach is applied in investigating complex supply chains (Manders et al., 2016; Reefke and Sundaram, 2017). The abductive approach incorporates characteristics from both an inductive (as the major approach) and a deductive approach for providing the best explanation of results (Bryman and Bell, 2015; Blaikie and Priest, 2019; Ghauri et al., 2020).

This research started in 2019 with a literature review on SCN, TQM and SUST to derive a logical understanding of the main theoretical Themes based on a deductive approach outlined in Chapter 2.
The deductive approach involves a theoretical proposition using literature to formulate Themes. Consequently, the initial Conceptual Framework was formed. Then, the inductive approach was mainly adopted for the fieldwork to emerge new concepts and develop a theory in the form of the Conceptual Framework (Ketokivi and Mantere, 2010; Saunders et al., 2019) on the phenomenon of QDS in EFSCs based on an in-depth investigation of the empirical findings of social and human problems supported by Case studies. The Case results were analysed inductively to yield deeper, more meaningful findings to inform theory (Mirza et al., 2014). This is a continuous analysis and comparison between the empirical findings, existing theory and literature for elaborating the new theory by introducing constructs or merging it with another theory (e.g., final conceptual Framework of SSCQM-Decision Framework) (Ketokivi and Choi, 2014; Bell et al., 2018).

3.5 Research Methods and Strategy

Two common methodological approaches are qualitative and quantitative (Saunders et al., 2019). This thesis aims to investigate how to build a sustainable EFSC. Many qualitative studies of TQM, SCN, and SUST also include quantitative aspects. See the literature review in Chapter 2.

3.5.1 Research Methods

This research has exploratory and explanatory features. The author uses the term exploratory to describe her approach to generating new empirical data, having generated new data to explain the phenomena underlying the data. The research method should be established carefully in terms of data collection and analysis and research rigour to achieve the aim of the research (Yin, 2018; Miles et al., 2020). Philosophical concepts help to choose suitable research methods (Lincoln and Guba, 2013). This research follows the qualitative method (see Table 3.2). It is interpretive – in the sense that the author uses it to interpret the perceptions of the 32 managers who took part in semi-structured interviews. Her approach is pragmatist in that she is concerned with practical outcomes that are useful to managers of SC and also to export the food industry, which is central to the Jordanian economy (Section 3.4.1). Hence, the philosophical approach of
this thesis has elements of pragmatism and interpretivism. The research method begins with examining relevant literature on the issue of SCM. One purpose of LR is to formulate the initial conceptual model.

The conceptual model suggests testable propositions. When the propositions are tested, the initial conceptual model often has to be adapted, and a new conceptual model emerges. In other words, propositions are deduced from the initial conceptual model (deduction). Then, as a result of testing them against evidence, new propositions are suggested or induced (induction). Therefore, the qualitative research reported in the thesis contains elements of both deduction and induction. The final chapter, Chapter 7, includes a brief note on abduction relevant to producing new insights (original contribution) to achieve the research's practical aim of understanding the phenomenon of QDS in EFSCs. This enables better understanding and building a holistic picture by interpreting multiple perspectives and interacting with participants to reveal their experiences in their natural settings (Creswell, 2012; Saunders et al., 2019). QDS has been shown in the literature review to be a concept that has to be conceptually and empirically evaluated in more detail (Fernandes et al., 2017; Bastas and Liyanage, 2018b; Nguyen et al., 2018). The researcher acknowledges that qualitative research can never be completely objective since the researcher is included in the research, but the researcher made every effort to preserve it. Indeed, the theoretical underpinning of perspectives such as SCN, TQM and SUST does not adequately capture QDS in EFSCs but provides a general representation of trends, with overlaps amongst the available Themes in prior research (Seuring, 2013; Fish, 2016). SC are highly contextualised and needs in-depth exploration of the phenomenon (Brusset and Teller, 2017).

Qualitative research emphasises the meaning and interpretation of the research problem and supports an in-depth understanding of the perspectives and beliefs of phenomena under practice and real-life context (Bryman and Bell, 2015; Denzin and Lincoln, 2018). This research empirically examines the possible interaction between the key Themes of the SCN, TQM and SUST perspectives. Hence, this leads to establishing a holistic framework for SSCQM. Qualitative research is appropriate for developing new theories. This research evaluates the events in real-life circumstances for how quality helps achieve SUST
in EFSCs. Therefore, inductive and explanatory research allows for collecting rich qualitative data linked with the Case strategy. The conceptual framework developed in Chapter 2 is essential to applying a Case (Mile and Huberman, 1994).

3.5.2 Case Studies

This research studied human phenomena, where a Case Study is a helpful approach to developing context-dependent knowledge (Awuzie and McDermott, 2017). The concept of QDS in EFSC is informed by empirical studies and theoretical understanding, where a Case Study strategy helps understand the problem (Basta and Lyinge, 2018a; Yin, 2018). A Case-Study strategy for this qualitative research will be applied using techniques of interviews and observations (Bryman and Bell, 2015; Yin, 2018). This is an attempt to empirically examine the possible associations between the Themes of the SCN, TQM and SUST perspectives. Hence, this leads to establishing a holistic conceptual framework for SSCQM. It evaluates the events in real-life circumstances for how quality helps achieve sustainable performance in EFSCs. Case Studies can provide in-depth insights into understanding what happens in the context and the reasons behind this and obtain different internal subjective views (Eisenhardt, 1989; Yin, 2018).

Robson (2002, p.178) defines a Case as "A strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real-life context using multiple sources of evidence". Therefore, evidence was drawn from multiple sources to provide an in-depth understanding and reasons behind accumulating understanding through triangulation, which enhances validity (Yin, 2014; Bryman, 2016). A Case focuses on specific phenomena and obtains different internal subjective views, so it is suitable for exploratory research and influential in theory building (Eisenhardt, 1989; Yin, 2018). Case Studies are a comprehensive method encompassing all methods for data collection and a particular approach to data analysis (Yin, 2014).

Case Studies can be broadly divided into Single or Multiple Case studies. Single Cases are applied critically, unique and based on well-formulated theory (Yin, 2009). Multiple Cases are when in-depth analyses are
required that enable comparison between particular phenomena with the availability of suitable time and resources (Saunders et al., 2012). This research attempts multiple Case Studies (Yin, 2018). The reader is reminded that the four Triads analysed in the thesis comprise many firms in EFSC in Jordan.

**Multiple Case Studies** were selected for this research, guided by the research questions shown in Section 1.5.3 is justified:

1. The phenomenon of QDS in EFSC limited empirical studies, so a Multiple-Case strategy is useful to understand the problem and enhance external validity (Patton, 2015; Bastas and Liyanage, 2018a; Yin, 2018) that help provide holistic views and findings for better research rigour.

2. Theoretical understating is still in its early stages (Eisenhardt, 1989). Previous studies had not offered well-developed research frameworks for studying QDS phenomena in the Triad in EFSC; a single Case Study was deemed insufficient to answer all the research questions.

3. In-depth insights into understanding what happens in the context and the reasons behind this and obtaining different internal subjective views (Eisenhardt, 1989; Yin, 2018) can help firms make more effective strategic changes toward sustainable development.

4. Since this research seeks analytical generalisation, a single Case is limited in generalizability and replication logic introduced for significant findings and a stronger foundation for building theory (Yin, 2009; Eisenhardt, 1989; Miles et al., 2020).

More specifically, **Multiple Case Studies** (multi-site) types are applied in this research. It consists of four Case Studies of Triads. It is multiple Case Studies; within one case, a Triad, a focal company and other companies in the supply chain (upstream-supplier) and (downstream-customer) are analysed as Case Studies. This type is proper for obtaining an in-depth understanding of QDS in EFSC (Denzin and Lincoln, 2018; Miles et al., 2020). The interaction between SCN, TQM and SUST was empirically understood holistically based on examining and evaluating QDS in Triads (Supplier-Manufacturer-Customer) in EFSC from the manufacturer (focal actor) perspective.
It will give confidence in the findings achieved by replication logic. It secures a stronger foundation for building theory and ensures reliability and internal and construct validity (Yin, 2018; Miles et al., 2020). This is based on cross-case analysis and triangulation methods to confirm a conceptual framework by searching cross-case patterns (Eisenhardt, 1989). This sheds light on analytical generalisation by extended analysis based on a selection of representative Cases (Miles et al., 2020). Hence, this research studied human phenomena, where a Case is a helpful approach for developing context-dependent knowledge (Awuzie and McDermott, 2017). The phenomenon of QDS in EFSC lacks empirical studies and theoretical understating, so a multiple-case strategy helps understand the problem and enhances external validity (Patton, 2015; Bastas and Liyanage, 2018a; Yin, 2018).

3.5.3 Cross-Sectional

Cross-Sectional and longitudinal are two types of time horizons. The researcher concentrated research into a relatively narrow period to study EFSC Triads to ensure that the Triads faced similar external influences. The empirical work for all four Cases was done between November 2020 to April 2021 in Jordan, and the AHP was conducted in May 2022. This cross-sectional empirical research studies a phenomenon at a particular period to get the best answers to research questions (Rose et al., 2015) due to limited time for academic research (Zahner and Steedle, 2015).

An exciting observation follows from this. Despite adverse circumstances (COVID-19), unlike many supply chains in other sectors worldwide, the EFSC in Jordan seemed to be relatively stable and resilient over a short interval. Later in this thesis, the researcher elaborates on this topic.

3.6 Triangulation

This research adopted mainly the interpretivism approach but was inevitably coloured by perceptions of interviews. The researcher mitigated that, acknowledged it, did not rely on a single perspective and used a pilot Case Study, observations, and feedback.
This research followed the four types of triangulation: theory, methodological, investigator and data triangulation. These approaches strengthen research findings by synthesising the similarities and differences of multiple sources to conclude (Robson, 2002; Carter et al., 2014).

**Triangulation** is a technique for improving qualitative research to look at the same phenomenon through using multiple methods, theories, data sources and researchers that facilitate the cross-verification of results to give a more detailed and critical understanding of the situation considering complex problems for a holistic picture of the phenomenon under examination (Carugi, 2016; Noble and Heale, 2019).

Triangulation is "The use of multiple sources that would increase confidence that your Case had rendered the event accurately." (Yin, 2014, p.122). The purpose is to generate a robust finding, exploring different perspectives to assist a comprehensive understanding of phenomena to minimise researcher bias and ensure confidence, high validity, and reliability of research (Denscombe, 2014; Saunders et al., 2019; Patton, 2015; Miles et al., 2020). In qualitative research, triangulation leads to an elaboration, providing more detail about multiple perspectives of the phenomenon and confirmation of findings to support data saturation (Fusch and Ness, 2015; Carugi, 2016) and increases the credibility and internal consistencies (Yeasmin and Rahman, 2012).

According to Denzin (1984) and Flick (2002), there are four techniques of triangulation to study the phenomenon: theory, methodology, investigator and data triangulation (Figure 3.1). These will be applied in this research to keep the researcher evaluating, refining, and modifying the research stages to identify Themes, data collection, interpretation and analysis (Yin, 2018).
**Figure 3.1: Triangulation Methods in Present Research**
(Source: The Researcher)

**Theory Triangulation** refers to the possibility of exploring multiple theories, leading to the synthesis or integration of theories into the analysis of the same phenomenon, providing a more holistic understanding of complex problems (Bechara and Van de Ven, 2011; Hoque et al., 2013). This research interpreted the three SCN, TQM and SUST perspectives to provide the initial conceptual Framework (Chapter 2, Figure 2.19). Key Themes are associated with the multiple-case data collection and analysis framework.

**Methodological Triangulation** is a multi-method approach to obtain complete and detailed data about the phenomenon. First, a pilot study was conducted to modify the approach and clarify the case-study protocol. Secondly, individual Case Studies were conducted to explore the topic. Thirdly, cross-case Studies were conducted in order to explain the topic and identify similarities and differences, enrich the research outputs with propositions about the EFSC, replications of QDS in EFSCs and increase the transferability of the findings and minimise the bias by checking the key Themes using AHP method by interviewing experts certainly to enhance results to allow for the development of a final Decision Framework (Saunders et al., 2016).
**Investigator Triangulation** uses multiple investigators, researchers, experts or observers in a study to reduce the potential bias inherent in employing only one person (Bans-Akutey and Tiimub, 2021). The researcher is the leading investigator as she has long-term industry experience, so she bears managerial experience in the scholarly work in this thesis. However, two evaluators who were not involved in the research from the manufacturer's side will be contacted to independently review the key findings and the final framework. Then, the researcher compared their different interpretations, and independent confirmation of data among investigators was used to enhance the credibility of the findings and decrease potential bias in gathering, reporting, coding and analysing for the richness of data (Järvinen and Taiminen, 2016). Experts were used to validate the final Decision Framework.

**Data Triangulation** is "Collect information from multiple sources but aimed at collaborating on the same finding" (Yin, 2014, p.120). In this research, data triangulation will be triangulated from three sources: semi-structured interviews as the significant data source, supported by the additional primary source of the participant and direct observations and secondary data (Patton, 2015; Denzin and Lincoln, 2018). Subjective bias will be avoided to ensure the accuracy and consistency of different data sources, resulting in enhanced analysis and a richer understanding of the phenomenon of QDS in EFSC (Yin, 2018).

**Analysis Triangulation** is applied to ensure the quality of the findings, increase validity, and mitigate bias by using the thematic analysis method and multiple data sources (Braun and Clarke, 2006). Using multiple-data analysis methods, it analyses the data separately, synthesises and identifies similarities and differences for patterns and checks the consistency. Case matrices, network models, building Themes and contextual factors, and quotations are some analysis techniques followed in this research (Nowell et al., 2017). Analysis was conducted at different levels (Triad: Supplier – Manufacturer - Customer) for Themes and Sub-Themes of the main perspectives to validate the findings. NVivo software will support this analysis by organising, storing and retrieving data (Bazeley and Jackson, 2013). In addition, evaluating the comparative assessment of multiple alternative aspects for the final conceptual framework is considered with a multi-criteria approach AHP (Figuera et al., 2005).
3.7 Data collection

The next, Chapter 4, is an exhausting description of the research Case Studies approach. The Case data collection should follow a well-defined protocol essential in multiple Cases to ensure research rigour and consistency (Yin, 2018).

This research was conducted by preparing and reviewing the organisational structure to identify the central management units, their Triads in EFSCs, the interviewees, and their contact details and positions. The researcher proceeded with a set of semi-structured Themes from the initial framework. A specific case-study protocol for research questions was used to conduct the interviews, observations and documents until it was confirmed that no new information was being revealed.

The author itemizes the challenges she faced in designing, executing and analysis Case studies, especially in the difficult circumstances of COVID-19. The author was aware of these challenges and always kept to achieve the rigour of research (See Section 3.9). The Case Study is a process of discovering surprising things and discovering ways to deal with complicated subjective extensive data, meeting the challenges of objectivity through approaching different angles of research (triangulation) and discovering the appropriate techniques, the amount of reading itself and synthesis it is challenging. that need to present a considerable amount of data in more comprehensive form when analysis and look to critical factors in managing SC. Analyzing the state of such Case Studies Triads elicited critical decision variables (themes and sub-themes) and priorities that underlie stable supply chain relationships. Findings about critical decision variables and priorities are discovered via the synthesis of managers' perceptions and triangulated with various data sources and against relevant parts of the SCM paradigm. Planning face-to-face interviews and visits, carrying them out, transcribing and triangulating them, and distinguishing critical variables presented challenges to overcome. Chapter 3 describes her research process step by step. An important was the selection of 4 Case Study Triads that demonstrated stability, robustness and adaptability During data collection through research protocol, pilot study (Section 3.7.2.3), data analysis (Section 3.8) and
triangulation techniques discussed above (Section 3.6) and consideration of ethical issues (Section 3.10.1) and risk management (Section 3.10.2) in the process of designing and conducting Case Studies. The author's experience and networks were critical in their completion. The author owes much of the success in this respect to the generous willingness of managers (and independent experts) to provide the information she sought. They also provided a sounding board for ideas. Also, the researcher recognised that her experiences and subjectivity influence their interpretations through reflexivity. The author describes her research process as transparently as possible to render the research replicable, at least in principle. No doubt, adhering strictly to the Ethical Protocol of the University facilitated the entire process. New things have emerged even now.

3.7.1 Research Protocol

The research protocol is an agenda to follow the same data collection procedures in each Case to ensure reliability (Yin, 2018). It ensures that research questions related to key Themes identified from previous literature are clearly presented. It allows flexibility in collecting data and responding to emerging issues during fieldwork and facilitates data analysis later (Patton, 2015). A protocol should concurrently have an introduction, procedures, instruments of case-study questions and a report guide, as in (Figure 3.2) below (Yin, 2014).

![Figure 3.2: Protocol of Case Study](Source: The Researcher)
The questions were standardised for all interviewees, allowing comparative research and validating the information from previous interviews. Questions were designed initially with participants' professional information and company history. Questions were structured to reflect each theme in the aim and objectives of the research and designed in such a way as to achieve open-ended responses. Open-ended questions allowed open discussion and probing during the interview. This also made it possible to add questions during the interview or about any emergent new theme (Bell et al., 2018).

3.7.1.1 Choices of Case Studies

Non-probability sampling was followed in this research. A purposive and snowballing sampling approach is adopted (Easterby-Smith et al., 2012; Bryman and Bell, 2015; Patton, 2015). Sample selection is relevant to the context rather than representativeness. Purposive sampling makes it possible to update the selection based on the interpretation of the data and participants' ability to answer research questions based on subjective researcher judgment (Matthew and Ross, 2014; Bryman, 2016).

The research aims, and the correct selection of Cases influences objectives. Cases are selected based on providing a deep understanding of the phenomenon and covering all related constituencies that are more replicated (Newman, 2006). Diversity in each Triad (Case Study) makes exploring QDS possible (Ritchie et al., 2014). This is supported by the researcher's work with a quality governmental organisation, which provides good networking access to food industries.

3.7.1.2 Sample Size and Data Saturation

There are no specific rules for the sample size in qualitative research (Bryman, 2016; Saunders et al., 2016). Sample Size is related to an in-depth understanding of the subject by interviewing the right participants, so the main indicator is not the number of a sample but data saturation (Malterud et al., 2016; Miles et al., 2020). Hence, data saturation signifies the end of data collection and the point of no additional information from subsequent interviews (Creswell, 2009; Ritchie et al., 2014; Saunders et al., 2018). The saturation point is "The data set is complete, as indicated by data replication or redundancy" (Bowen, 2008, p.140).
Case Studies do not contribute to statistical generalisation (Yin, 2018). Multiple Cases provide theoretical knowledge (analytical generalisation and literal replication) (Eisenhardt, 1989; Yin, 2018). Therefore, the researcher's skills in sampling Case Studies based on literal and theoretical replications and analysing data will increase the external validity (Eisenhard, 1989; Yin, 2018), not the sample size (Patton, 2015).

### 3.7.1.3 Scope of Sample Case Studies

Based on a discussion with industry chambers combined with purposive sampling, as the researcher has a good relationship with the industry chambers, there is no accurate framework and published statistics related to targeted samples. The target population was based on the Jordan Chamber of Industry data. They consist of 2,645 enterprises; 2,093 micro-enterprises were considered 79.13%. The remaining 552 small, medium or large enterprises were considered 20.87% (JCI, 2019). In this research, the targeted Case companies are large and small-medium according to a new classification of firm size in the Jordan Chamber of Industry (JCI, 2019). Hence, around 60 canned export food companies could be large or small-medium companies. However, the population of focal companies was limited to 20 companies that regularly export and have a mature supply and manufacturing system applying quality and SUST concepts. However, the population of focal companies was limited to 20 companies. Companies were contacted initially; only ten cooperated with the researcher in the empirical work. The criteria for selecting the focal company and the manufacturer were regularly exporting ensures that the manufacturers occupy a leader position in Triads and can relate with other actors effectively. They have a mature supply and manufacturing system and apply quality and SUST concepts and certification if possible.

Snowball sampling for the sample of suppliers and customers was used. The focal actor introduced their direct first-tier suppliers and first-tier customers to ensure their relevance in the Triad and provide contact information for them, as prior identification of suppliers and customers of the manufacturer is infeasible (Odongo et al., 2017). Then, the researcher contacted them, and a brief about the research and interview was conducted after the participants' written informed consent forms had been obtained (Saunders et al., 2019).
Focal companies introduced the non-focal companies (supplier and customer). They were selected upon discussion between the manufacturer and researcher based on the following criteria: Directly involved in supply chain activities for at least five years, have long cooperative relationships, and are well-linked with the manufacturer for joint activities. Share similar phenomena and mature supply systems with quality advancement and sustainable development. Moreover, they are supplied components that are input into the focal firm’s production process and form the end product received by a customer. They are focused on one SC in one country. Therefore, Suppliers and Customers in the Jordan region were only selected in the Triadic supply chain, making the Triad easier to manage and control in terms of culture, language, legal system and economic environment. Social responsibility may differ from country to country and among companies. Moreover, environmental behaviour may also differ from country to country.

3.7.1.4 Sampling Design

The sample population, frame, techniques, and size were good practice sampling designs (Onwuegbuzie and Collins, 2007). The sampling design for this research is presented below in Table 3.3.

<table>
<thead>
<tr>
<th>Table 3.3: Research Sampling Design</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample Population</strong></td>
</tr>
<tr>
<td><strong>Sample Frame</strong></td>
</tr>
<tr>
<td><strong>Sampling Techniques</strong></td>
</tr>
<tr>
<td><strong>Sampling Size</strong></td>
</tr>
</tbody>
</table>

(Source: The Researcher)
Hence, this research has four Cases as Triads (Supplier-Manufacturer-Customer) for canned food products in Jordanian EFSCs. Eight semi-structured interviews were conducted in each case, giving 32 interviews (Table 3.4). One participant observation was conducted for each Case at the Triad level, giving four observations combined with non-participant (tours) at each actor in the Triad and secondary data.

Table 3.4: Case Studies of Present Research

<table>
<thead>
<tr>
<th>Case</th>
<th>Case Study</th>
<th>Unit of Analysis</th>
<th>Interviewee</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Triad A: Supplier-Manufacturer-Customer</td>
<td>EFSC of Triad A</td>
<td>(8) Managers in each case -Triad</td>
<td>Triad A</td>
</tr>
<tr>
<td>2</td>
<td>Triad B: Supplier-Manufacturer-Customer</td>
<td>EFSC of Triad B</td>
<td>(4) Managers at Manufacturer (Focal Actor)</td>
<td>Triad B</td>
</tr>
<tr>
<td>3</td>
<td>Triad C: Supplier-Manufacturer-Customer</td>
<td>EFSC of Triad C</td>
<td>(2) Managers at each other Triadic Actors</td>
<td>Triad C</td>
</tr>
<tr>
<td>4</td>
<td>Triad D: Supplier-Manufacturer-Customer</td>
<td>EFSC of Triad D</td>
<td></td>
<td>Triad D</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

3.7.2 Data Collection Procedures

This research collected primary and secondary data through the following procedures: Case interviews, observations and documents in the context of Jordan EFSCs in 2020-2021.

3.7.2.1 Case Interviews

Primary data was collected from 32 Semi-Structured interviews in the four Triads of EFSCs. It enables the interpretation activities of people in the Triad and provides an in-depth understanding viewpoint of people experiencing the phenomena of SUST and quality in Jordanian EFSCs (Easterby-Smith, 2012; Yin, 2018). Semi-structured interviews provide flexibility in approaching respondents, rephrasing questions if needed and adjusting the Themes to raise new related issues. Semi-structured interviews depend mainly on oral narration, ensuring reliable information is obtained from respondents (Miles, 2020). The interviews were conducted in English; upon request, some questions were translated into Arabic for clarification.
The research was conducted in the author's own country - Jordan; therefore, the author's knowledge of her country helped her approach participants easily and understood their acultural setting with finesse (Karra and Phillips, 2008). However, the author's professional experience could help overcome interview difficulties (Bryman, 2016). The interviewees had the freedom to express their beliefs and share their knowledge. The participants were managers who were well-informed about SUST and quality perspectives and able to share reliable data and enhance confidence in findings (De Massis and Kotlar, 2014). The managers were Supply Chain, Quality, Production, and Marketing (Table 3.5).

**Table 3.5: Summary Case Studies Interviews in the Present Research**

<table>
<thead>
<tr>
<th>Case</th>
<th>Case Study</th>
<th>Interviewee</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Triad A</td>
<td><strong>Supplier 1</strong>: S1SCM, S1PnM-<strong>Manufacturer 1</strong>: Maf1PM, Maf1QM, Maf1BDOM, Maf1LM-<strong>Customer 1</strong>: C1SCM, C1MM</td>
<td>Amman</td>
</tr>
<tr>
<td>2</td>
<td>Triad B</td>
<td><strong>Supplier 2</strong>: S2MM, S2PnM-<strong>Manufacturer 2</strong>: Maf2QM, Maf2QC, Maf2SCM, Maf2BDOM-<strong>Customer 2</strong>: C2MM, C2SCM</td>
<td>Amman</td>
</tr>
<tr>
<td>3</td>
<td>Triad C</td>
<td><strong>Supplier 3</strong>: S3SCM, S3QAHSEM-<strong>Manufacturer 3</strong>: Maf3QM, Maf3MM, Maf3PnM-<strong>Customer 3</strong>: C3SCM, C3BDM</td>
<td>Amman</td>
</tr>
<tr>
<td>4</td>
<td>Triad D</td>
<td><strong>Supplier 4</strong>: S4SCM, S4PnM-<strong>Manufacturer 4</strong>: Maf4MM, Maf4BDOM, Maf4PnM-<strong>Customer 4</strong>: C4SCM, C4MM</td>
<td>Amman</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

Initially, telephone conversations were conducted with the manufacturer's general manager to gain permission to conduct the empirical work. The author and the general manager cooperated in selecting interviewees based on job responsibilities and knowledge about the phenomena. He suggested that interviewees in his organisation follow the brief about the research objective (Yin, 2018) and nominate the supplier and customer in their Triad.

The participants invited to participate were sent a cover letter with a brief information sheet and consent form (see Appendix C, D, E). These documents covered issues such as confidentiality and the right to withdraw within the agreed time. Face-to-face interviews were conducted in 2020-2021 after the participants' written informed consent forms had been obtained (Saunders et al., 2019). The participants
responded to open-ended questions detailed in the case-study interview protocol (Appendix B), illustrating the empirical inquiry (Table 3.6).

Table 3.6: The Empirical Inquiry for Case Study Interview Protocol of Present Research

<table>
<thead>
<tr>
<th>Protocol Item</th>
<th>Key Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case Study</strong></td>
<td>Case Study: Triad in EFSC</td>
</tr>
<tr>
<td></td>
<td>Unit of Analysis: EFSC of Manufacturer</td>
</tr>
<tr>
<td></td>
<td>Data: Information on Triads</td>
</tr>
<tr>
<td><strong>Interview</strong></td>
<td>Type: Semi-Structured Interviews</td>
</tr>
<tr>
<td></td>
<td>Data Source: Managers at different department</td>
</tr>
<tr>
<td></td>
<td>Data: Information from Interviewees (Managers)</td>
</tr>
<tr>
<td><strong>Perspective of SCN</strong></td>
<td>Focus: SCN Themes contribution to the topic</td>
</tr>
<tr>
<td></td>
<td>RQ support: RQ 1 and 2</td>
</tr>
<tr>
<td><strong>Perspective of TQM</strong></td>
<td>Focus: TQM Themes contribution to the topic</td>
</tr>
<tr>
<td></td>
<td>RQ support: RQ 1 and 3</td>
</tr>
<tr>
<td><strong>Perspective of SUST</strong></td>
<td>Focus: SUST Themes contribution to the topic</td>
</tr>
<tr>
<td></td>
<td>RQ support: RQ 1 and 4</td>
</tr>
<tr>
<td><strong>Phenomenon of QDS</strong></td>
<td>Focus: QDS Themes contribution to the topic</td>
</tr>
<tr>
<td><strong>Sustainability performance</strong></td>
<td>RQ support: RQ 5 and 6</td>
</tr>
<tr>
<td><strong>Conceptual Framework</strong></td>
<td>Focus: New Framework of SSCQM for QDS in EFSC</td>
</tr>
<tr>
<td></td>
<td>RQ support: RQ1-6</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

The interviews were performed in English, but upon request, some questions were translated into Arabic to clarify specific points (Yin, 2018). Each interview lasted for approximately one hour and was voice-recorded under the participant's approval to avoid losing accurate wording and meaning to reflect participants' views and retain the quality of data (Bryman, 2016; Miles et al., 2020). Later, the author listened to the audio twice and transcribed and read the transcript (Bell et al., 2018). Furthermore, the transcripts were shared with the interviewers to verify their accuracy and reliability. The participants and company names were confidential; their names were number-coded. A database for each Case script and written work-related documents were also labelled with the code and encrypted and saved securely (Yin, 2011).
Observation is useful in overcoming discrepancies between what people say and what they actually do (Miles and Huberman, 1994). Observation minimises losing data from participants' inability to recall facts or details they cannot describe at interview time. Employees' behaviour and interaction could only be noticed during non-participant observation (Merriam, 2009). Observation and understanding of action in natural situations and real-time. The observations capture the manufacturers' (focal actor) quality and SUST processes and other actors in a Triad in EFSC and understand how some documents are processed by walking the end-to-end processes (Sekaran, 2009). Those actors in a Triad are selected based on effective relationships with focal actors in joint activities related to quality and SUST (Table 3.7) (Roth et al., 2008).

The researcher is a participant-observer who would get into the dynamic organisational system as that enables the researcher to see and hear precisely how individuals act to attend a meeting, observe behaviour and manufacturer's processes, and be part, interact and active during this meeting with their two Triadic partners (Petty et al., 2012). Participant observation focuses on participants' natural settings without the researcher's prior knowledge of collected data (Yin, 2018). Other times, as a non-participant observer, the researcher had no role in the situation, and the author made tours of a Triadic actor to view the physical setting, process, and environment with a participant from the manufacturers (Creswell and Poth, 2017). The observation helps complement the interviewees for triangulation (Yin, 2003).

Trust and shared experiences create a friendly atmosphere between the researcher and other Triadic actors that help observe and better understand phenomena. Observations were conducted in 2020-2021 (Table 3.7) to collect data to support the key interview findings and construct more information (Yin, 2018). The case-study observation protocol guided the researcher in the fieldwork (Appendix B). This research applies key steps: the preparatory step by introducing the observation's purpose and gaining consent forms, collecting data, analysing data and writing up (Yin, 2018).
Table 3.7: Case Observations of Present Research

<table>
<thead>
<tr>
<th>Case</th>
<th>Case Study</th>
<th>Observation</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Triad A</td>
<td>Packaging Manufacturer-Manufacturer-Distributor</td>
<td>Meeting and tour at manufacture 1 in Amman Tour at packaging manufacturer and distributor in Triad A</td>
</tr>
<tr>
<td>2</td>
<td>Triad B</td>
<td>Vegetable Farm - Manufacturer-Distributor</td>
<td>Meeting and tour at manufacture 2 in Amman Tour at vegetable farm and distributor in Triad B</td>
</tr>
<tr>
<td>3</td>
<td>Triad C</td>
<td>Poultry Manufacturer - Manufacturer-Wholesaler</td>
<td>Meeting and tour at manufacture 3 in Amman Tour at poultry manufacturer and Wholesaler in Triad C</td>
</tr>
<tr>
<td>4</td>
<td>Triad D</td>
<td>Machine and Technology Company -Manufacturer - Warehouse</td>
<td>Meeting and tour at manufacture 4 in Amman Tour at machine and technology company and warehouse in Triad D</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

3.7.2.3 Pilot Case Study

A pilot Case is an exploratory study to test the feasibility and practicability of the methods applied to provide valuable data and identify possible boundaries in the Case (Bryman and Bell, 2015). It is used to assess the feasibility of researching in its cultural and local political context (Perry, 2001) to explore and refine the research objective to understate relevant aspects of phenomena (Saunders et al., 2019). The author could adjust the methodology before attempting the main study based on the pilot study. This can modify the Case or interview protocol (Bryman, 2016; Yin, 2018). It enhances the credibility of a qualitative study.

Before undertaking the pilot study, the draft protocol was reviewed by one university academic and one professional manager involved in Jordanian exporting sustainability chains in Jordan but did not participate in the study. Their experience suggested that the most critical Themes were included but modified in rewording, merging some questions for simplicity to suit the research participants' understanding (Perry, 2001; Creswell, 2013).

In addition, the author shared this work in a seminar at the University of Bedfordshire in January 2021, where academic supervisors, professional staff, and colleagues showed an excellent early understanding of the concepts and conceptual framework, resulting in no modification. Hence, one pilot Case of a Triad was conducted in November 2020. This is based on the Case protocol (Cooper and Schlinder, 2014) and the ability to access the necessary firms in Jordan (see Appendix B). The pilot Case ensured the author's clear
conceptualisation of the topic (Denzin and Lincoln, 2018). The final report reflects a clear understanding of both the design strategy and data collection from the author's side (Yin, 2018). The respondents ensure a clear understanding of the phenomena. The pilot study finding was considered the main Case of Triad A since there were no drastic changes in the main study design after this pilot study.

3.7.2.4 Secondary Data

Publications and annual reports of organisations are sources of secondary data. Governmental ministries' and associations' websites, annual reports, brochures, leaflets, newspaper and social media articles, booklets and statistical data are some examples of collected secondary data. The researcher visited the websites of organisations in Triad before conducting empirical work to understand the organisation's background and had good prior knowledge before field visits and interviews.

During field visits, the author also accessed several available written documents such as minutes of meetings, archives, archival records such as annual reports including non-written materials such as video recordings and archival records such as annual reports drawings relevant to each Case to enhance understanding of the processes being studied (Yin, 2018). Appropriate permission was sought before gathering secondary data. "Documents have words and images that have been recorded without a researcher's intervention" (Bowen, 2009, p.27). Documents used in this research: the websites and social media, available hard and soft copies from the organisation on Triad such as the management system certificates, technical manuals, suppliers and customers records, meeting minutes, annual reports, company newsletters, SUST reports, market and financial reports, and company brochures. These documents enhance understanding of the aspects that evolved during the interview. These documents provided additional evidence confidence and verified the data collected during interviews and observations (Patton, 2015; Saunders et al., 2019;). Credibility was added, and low reliability was mitigated for a holistic understanding of the phenomena (Patton, 2015; Yin, 2018).
Participants' transcripts and observation results were compared with collected secondary documents to increase confidence in the data. In Cases of divergence in the findings, participants were conducted through a telephone conversation to verify the information.

3.8 Data Analysis

In qualitative research, data analysis is interpreting an extensive data set for extracting meaning (Bryman, 2016), including coding, theming, and categorising the data (Terry et al., 2017). The author continually moves back and forth between data collection and data analysis. The research approach determines the analysis design (Ayres et al., 2003). The author's responsibility ensures the rigour and trustworthiness of data analysis (Nowell et al., 2017). There are several methods for analysing qualitative data: thematic analysis, discourse analysis, grounded theory, content analysis, and narrative analysis (Petty et al., 2012; Miles et al., 2020).

Thematic analysis was adopted in this research. It is considered the most suitable analysing technique for qualitative data to identify common Themes and key patterns repeated in data for further investigation (Pope and Mays, 2006; Braun and Clarke, 2021). Thematic analysis is a flexible approach that does not need advanced research skills and can answer various research questions (Braun and Clarke, 2021). It could deal with the highly contextualised nature of the studied phenomenon that allows an abductive approach to achieve rich interpretive data analysis and, consequently, facilitate generation theory (Saunders et al., 2016; Braun and Clarke, 2021).

Thematic analysis is defined as "Identifying, analysing, organising, describing and reporting patterns (Themes) within a data set" (Braun and Clarke, 2006, p.76). It is considered a thematisation that begins with Themes generated from existing literature and Themes that emerged from the data. Themes refer to the patterns describing various attributes of the phenomenon in existing data (Boyatzis, 1998; Nowell et al., 2017). The empirical data collected from each Case will be continuously analysed against the proposed conceptual frameworks to verify and develop Themes and Sub-Themes to develop and expand theory.
(Eisenhardt, 1989; Ritchie et al., 2014). Consequently, two steps of thematic analysis, within-case and cross-case, were applied for theory-building (Eisenhardt, 1989; Yin, 2018). Thematic Analysis is an analytical, systematic technique that follows transcription, coding, and searching for Themes and patterns. As a result of this thematic analysis, propositions are identified to explain and describe relationships between key Themes on the phenomenon of QDS in EFSCs. Consequently, a theory-building approach of a novel framework, SSCQM, is elaborated to expand the perspectives of SCN, TQM and SUST.

### 3.8.1 Four Stages of Analysis

Four stages of analysis were conducted, as seen in (Table 3.8). The analysis was performed based on the interaction between manual and electronic methods. The manual method was mainly supported with the assistance of computer qualitative data analysis software NVivo 12.

<table>
<thead>
<tr>
<th>Table 3.8: Case Analysis of this Research</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1</strong></td>
</tr>
<tr>
<td>Systematic Literature Review (SLR) Analysis</td>
</tr>
<tr>
<td>▪ Synthesis of previous research.</td>
</tr>
<tr>
<td>▪ Identification of key themes of SCN, TQM and SUST perspectives.</td>
</tr>
<tr>
<td>▪ Identification of sub-themes as codes.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>To provide an Initial Conceptual Framework as a proposed framework for data collection and analysis</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
Firstly, **Literature Review** analysis is directly related to the research questions, facilitating thematic analysis (Miles et al., 2020). The initial conceptual framework was drawn by deductive analysis of existing literature on phenomena. Consequently, the initial codes list was derived (Miles et al., 2020).

Secondly, **within-case analysis** is an exploratory stage for describing a detailed theme in each case. The researcher interplays various factors identified from the semi-structured interview, observation data and documents collected related to each theme, research question, objectives, and existing literature. After that, descriptions for Themes and Sub-Themes were presented and supported with quotations from the interviewee's original data. These analyses and findings are presented in Chapter 4. This research followed six steps by Braun and Clarke (2006): reading the collected data, coding, searching for Themes among codes, reviewing Themes, analysing the Themes and summarising the findings. **Figure 3.3** illustrates the analysis steps in the interviews, observations and secondary data.

**Figure 3.3: The Analysis Steps in Interviews, Observations and Secondary Data.**
(Source: The Researcher)
Thirdly, Cross-Case Analysis, an explanatory stage, includes identifying similarities and differences in key Themes proposed between four Cases, explaining replication logic by data sources to validate the proposed conceptual framework, and relating the findings to published literature (Eisenhardt, 1989; Yin, 2018; Miles et al., 2020). Then, a cross-case analysis is used to compare an inductive analysis that identifies essential Themes and their relationships and is further refined and reduced by clustering categories (Eisenhardt, 1989; Miles et al., 2020). The cross-analysis was conducted through matrices supported with NVivo, visualisation through network models, and pattern matching. These findings were presented in Chapters 5 and 6 of this research. The author needs more time to interpret the data to produce valid and reliable findings (Rose and Johnson, 2020). Finally, Themes were reported clearly and logically (Kiger and Varpio, 2020). Figure 3.4 illustrates the cross-four Case analysis steps.

**Figure 3.4: The Analysis Steps Across the Four Cases**  
(Source: The Researcher)
3.8.2 NVivo Analysis

Nvivo is an electronic tool that supports qualitative data management and analysis (Bazeley and Jackson, 2013). NVivo will support qualitative data analysis efficiently by organising, storing, and retrieving data, analysing the pre-discovered Themes during the manual thematic analysis in a short time (Easterby-Smith et al., 2012; Bazeley and Jackson, 2013). NVivo can increase the rigour of research (Onwuegbuzie and Leech, 2007).

The initial coding set was developed by manual thematic analysis (Braun and Clarke, 2021). NVivo 12 software assists the researcher in organising and analysing data. Coding is started based on a pre-existing coding list from manual thematic analysis. According to (Charmaz, 2006, p. 43), Coding is "Categorising segments of data with a short name that summarises and accounts for each piece of data". Then, nodes (Themes) are created through repeated analysis of transcripts to check, refine and review Themes and determine newly emerged Themes. After that, the relationship between particular nodes is identified by merging specific nodes in a more appropriate theme (node) to reach the final nodes. This results in identifying Themes (parent node) and corresponding dimensions (child nodes) and naming them.

An author's deep interpretative sense in generating Themes could not be ignored when using NVivo software to produce valid and reliable findings and combine the advantages of both methods (Lee et al., 2018; Rose and Johnson, 2020). This helped reduce the researcher's bias in analysis and addressed transparency in qualitative research (Galdas, 2017; Aguinis and Solarino, 2019). Consequently, the author reviewed the final Themes and their relationships generated from NVivo analysis and checked them with the existing theories, further developing an emergent theory (Gomm, 2008; King, 2010).

3.8.3 Analytic Hierarchy Process (AHP)

SUST is a complex problem with subjectivity in multidimensional variables that requires the involvement of many stakeholders (White, 2013; Ishizaka and Siraj, 2018). Several studies have used multi-criteria decision-making (MCDM) techniques to support decisions in sustainable development (Cinelli et al., 2014; Kumar et al., 2017; Shen and Tzeng, 2018). Among the techniques, AHP is the most often used and applied
in many fields (Saaty et al., 2017; Ho and Ma, 2018; Baidya et al., 2018), particularly the assessment and prioritization factors of sustainable SC in the food industry (Duman et al., 2017; Qorri et al. 2018; Dos Santos et al., 2019).

AHP is a highly effective decision-analysis tool used to get a deeper insight into the factors within the Decision Framework and establish priorities with respect to variables within managers' control. AHP analysis and the synthesis of the Thenmes and Sub-Themes clarify the process of selecting variables critical to the stability of EFSCs in Jordan. The process of selecting such critical variables is essential when considering the generalization of the Framework to supply chains in other industries and contexts.

The eigenvalue methods employed in AHP are standard to data reduction and prioritization methodologies. Eigenvalues point to the potential impact of decision variables, and their associated eigenvectors highlight the most critical decision variables. Hence, the author considers that her use and adaptation of AHP help construct a workable (with a manageable number of observable variables) Decision Framework. Saaty demonstrates that introducing the cardinal ordering assumption covers the objection restricting his pairwise comparison process. The author valued Saaty's clarity about the operationalization of his method, and easily available software was welcome, enabling her to obtain priorities and weights to incorporate into the Decision Framework.

The author had chosen the AHP technique to deal with SUST as a complex decision problem due to some of its advantages over other multi-criteria decision-making (MCDM):

1– Hierarchical representation allows the decomposition of a complex decision problem by focusing on its differing aspects.

2- Pairwise comparisons allow an understanding of the relative importance of interacting criteria that are strongly interrelated (Saaty, 2008; Zardari et al., 2015).

3- Enhance proposed frameworks from the Case Study by considering other criteria and verifying applicability (Kolotzek et al., 2018; Mohammed et al., 2018; Ren and Dong, 2018; Marimin et al., 2018; How and Lam, 2018).
4- Its ability to capture objective and subjective judgments to determine priority weights (Lewis et al., 2006), as AHP is mainly used for weighting the criteria.

5- Its simplicity to others (MCDM), as the AHP method requires only one evaluation compared to others, which requires more pairwise matrices as an analytic network process (ANP).

6- Flexibility to deal with inconsistency against other methods that need perfect consistency (Ishizaka and Nemery, 2013).

However, it was also found that the AHP has increasingly been used with other MCDM techniques, such as fuzzy theory, Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Interpretative Structural Modelling (ISM), and ANP. Nevertheless, AHP has the limitation of incorporating uncertainty, imprecision and subjectivity associated with the experts' judgments (Mardani et al., 2015; Raut et al., 2017); to avoid this, the researcher has acted as a facilitator in face-to-face interviews. Researchers have introduced the AHP fuzzy technique later to deal with uncertainty (Dos Santos et al., 2019).

This research used the Analytic Hierarchy Process (AHP) method to support the validation of the final Decision Framework (evaluating, weighting, and ranking the criteria) (Azimifard et al., 2018). After the key findings were confirmed and the completed Case report was applied. AHP is "A multi-criteria decision-making approach and was introduced by Saaty" (Sultana et al., 2016, p.58). AHP is a reliable tool to support decisions in complex and subjective problems that involve comparing decision elements in multiple criteria and eliminating subjective bias (Saaty, 2008; Duman et al., 2017). The AHP is most addressed for prioritising Themes and Sub-Themes of supply chain and quality management decisions and sustainability (Subramanian and Ramanathan, 2012; de Almeida et al., 2015).

AHP's three main processes are structural hierarchy building, prioritisation, and valuation (synthesis of priorities and consistency measurement) (Andersen et al., 2007). The AHP has been combined with other methodologies for quantitative decisions (Vargas, 2009). The AHP method uses a hierarchical structure to decompose complex problems into sub-problems and helps analyse the problem logically (Saaty and Vargas, 2012). AHP prioritised the importance of the factors considered in a decision-making process.
depending on a Pairwise comparison of the expert's judgements (Saaty, 2008; Krejčí and Stoklasa, 2018; Misran et al., 2020). In this research, a hierarchy of key Themes was developed based on the results of the final conceptual framework of empirical work to rank the criteria. However, this hierarchy is incomplete and divided into sub-hierarchies sharing only a common key theme (Saaty, 2008). Other methods can deal with vast amounts of paired comparisons and large numbers of alternatives (Junior et al., 2014)

Experts' engagement in decision-making processes is fundamental to increasing acceptance of the solution, reducing evaluation mistakes, and avoiding bias by one judgment (Cassidy and Kreitner, 2011; Le Pira et al., 2017). The study aims to determine the respondents' selection (Misran et al., 2020). Melillo and Pecchia (2016), Kil et al. (2016), and Ulkhaq et al. (2018) recommended three to 25 participating experts in the study. Hence, this research has identified five uninvolved (academic and policymaker) experts based on their backgrounds and experience. They have over ten years of decision-making experience and are well-experienced in related areas.

The researcher developed an AHP questionnaire (see Appendix I) based on the key findings and Case report after completing the analysis in Chapters 5 and 6. The five experts were contacted based on purposive sampling and face-to-face contact in May 2022 individually to avoid the dominance of some respondents, which helped solve any inconsistencies while filling out the questionnaire. First, the researcher explains the meaning of criteria in the hierarchical structure of the problem. Then, the participants were requested to assign the relative importance of critical factors (key Themes) based on their opinions. Their feedback is used to enhance and perhaps modify the findings of empirical work. The expert's judgements are aggregated using the arithmetic mean aggregation to form a new single individual judgment for each entry in a pairwise comparison matrix. However, to simplify, the consensus has reached an agreement on the value by using the feedback mechanism to guide participants who have disagreements and inconsistencies to modify their preferences and to check for accidental mistakes until the group reaches a consensus (Montserrat-Adell et al., 2019; Hu et al., 2021).
Consequently, the collected data were analysed using a simple AHP to validate the previously developed hierarchy. Manual AHP analysis is complicated with many decision criteria (Subramanian and Ramanathan, 2012). Therefore, AHP software (e.g. AHP Online Calculator, Priority Estimation Tool, and Make It Rational) were developed for automatic AHP analysis (Ishizaka and Labib, 2009). However, in this research, AHP Online Calculator was selected and used.

According to Andersson et al. (2015) and Saaty (2008), the main steps to conducting an AHP analysis are:

**Step 1:** Establishment of a key theme, Structural Hierarchy, based on the final conceptual framework.

**Step 2:** Establishment of Comparative Judgments using a pairwise comparisons matrix between criteria based on experts' opinions using a nine-point scale specific to AHP, as shown in Table 3.9 (Saaty, 2008), turned into a quantitative one (Ishizaka and Nemery, 2013). AHP follows a method for aggregating individual priorities using the arithmetic mean aggregation, which is suitable when an incomplete hierarchy is considered (Carmo et al., 2013).

**Table 3.9: Saaty Nine Scale**

<table>
<thead>
<tr>
<th>Importance Scale</th>
<th>Definition</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equally important</td>
<td>Two activities contribute equally to the objective</td>
</tr>
<tr>
<td>3</td>
<td>Moderately important</td>
<td>Experience and judgement slightly favour one activity over another</td>
</tr>
<tr>
<td>5</td>
<td>Strongly important</td>
<td>Experience and judgement strongly favour one activity over another</td>
</tr>
<tr>
<td>7</td>
<td>Very strong or demonstrates importance</td>
<td>An activity is favoured very strongly over another. Its dominance demonstrated in practice</td>
</tr>
<tr>
<td>9</td>
<td>Extremely important</td>
<td>The evidence favouring one activity over another is of the highest possible order of affirmation</td>
</tr>
<tr>
<td>2, 4, 6, 8</td>
<td>Intermediate values between the two adjacent judgments</td>
<td>When compromise is needed</td>
</tr>
</tbody>
</table>

The reciprocals of above are used if activity \( i \) has one of the above non-zero numbers assigned to it when compared with activity \( j \), then \( i \) has the reciprocal value when compared with \( j \). A reasonable assumption.

(Source: Saaty, 2008)

**Step 3:** Priorities Synthesis and Consistency Measurement. It starts with assessing the weight of the criteria and the maximum eigenvector based on the online AHP calculator to determine and prioritise the most
important criteria. Then, the matrices were normalised. After that, the consistency ratio (CR) was checked using maximum eigenvalue ($\lambda_{\text{max}}$), as the inconsistency (bias) of judgements and the acceptable consensus was constantly monitored and kept to a minimum for each matrix (Satty, 2008; Moreno-Jiménez et al., 2008). Consistency ratio (CR) is calculated using the formula "$CR = CI/RI$, where RI is a random index, and CI is a consistency index" (Na et al., 2011, p.3). In AHP, it accepts some minor inconsistencies in decisions of less than 10%. If the comparison matrix is inconsistent, the resulting weights cannot be used, and the pairwise comparison is redone (Misran et al., 2020).

### 3.9 Research Rigour

The quality and rigour of qualitative research are determined through validity and reliability in designing a research study, interpreting and analysing results and judging the quality of research (Golafshani, 2003; Creswell, 2009; Bryman, 2016; Yin, 2018). Hence, the researcher's skills and experience in conducting the interview and analysis help enhance validity and reliability (Golafshani, 2003). Moreover, the trustworthiness of qualitative research is needed to ensure significant findings, validity and reliability (Denzin and Lincoln, 2018). Transferability, confirmability, credibility and dependability are activities conducted for trustworthiness (Nowell et al., 2017; Denzin and Lincoln, 2018).

The following criteria (Validity, Reliability, Trustworthiness) were undertaken throughout this thesis to ensure research quality:

#### 3.9.1 Validity

Validity means that the research questions the desired outcome and evaluates the expected outcomes (Towns, 2014; Patton, 2015). Validity is the research method's appropriateness to ensure the accuracy of the research findings (Neuman, 2006; Yin, 2018). The validity of a Case is assessed through the construct, internal, and external validity (Eisenhardt, 1989; Patton, 2015; Yin, 2018).
Construct Validity refers to the validity of the conclusion it claims to investigate (Denzin and Lincoln, 2018; Yin, 2018). Construct validity is "Identifying correct operational measures for the concepts being studied" (Yin, 2018, p.42). In this research, construct validity is assured by using multiple sources of evidence (Interviews, observations and secondary data) in data collection for triangulation purposes (Amerson, 2011; Lock and Seele, 2018). Also, a chain of evidence is established through interviewing eight different participants and four participant observations at the Triad in each case, taking notes during observations and transcribing documents, then a quotation-supported explanation of data analysis and quotes from literature review support and strengthen the analysis. Question protocols were adjusted according to participants' feedback from a pilot study. Moreover, key interviewees reviewed the report's final draft to reconfirm their expression (Amerson, 2011).

Internal Validity refers to the internal consistency of the research design (Lock and Seele, 2018). This research ensures internal validity through an accurate sample selected (Winter, 2000) and data analysed with standardised steps. This is through pattern matching; data analysis triangulation was used, and patterns across Cases were identified. Explanation Building: theoretical concepts are clarified and modified in collected data, with those Themes determined from the literature.

External Validity is generalisability (Zohrabi, 2013). It means whether findings can be transferred to other fields or Case Studies (Zohrabi, 2013; Bryman, 2016; Yin, 2018). In this research, the research design influenced external validity. It was accomplished in four Cases to improve analytical generalizability and replication in multiple-case studies. A theoretical framework was used to further compare results with existing literature. The same Case protocol is used for all Cases.

3.9.2 Reliability

Reliability refers to "The consistency of the measure of a concept" (Bryman and Bell, 2015, p.169). Reliability is the degree of consistent and precise research findings, thus consistently producing detailed and meaningful descriptions of phenomena (Collingridge and Gantt, 2008). This means the data collection
and analysis process is precise and transparent (Zohrabi, 2013; Towns, 2014), so the same study results can be reproduced under a similar methodology (Yin, 2018).

In this research, reliability issues are assured with collecting data (Robson, 2002) through a standardised research protocol using the same procedure, key, and Sub- Themes used for the pilot Case Study, each Case and the same way of asking questions. The interviews were recorded with the participants' permission to reduce bias in reflecting participants' views. The academic intention of data Collection was explained to participants to avoid misjudgements (Yin, 2018). Reliability is assured by following the same procedures of analysis of semi-structured interviews. A secure database is developed for each case, containing interview and observation transcripts and documents with suitable coding instead of names.

3.9.3 Trustworthiness

Trustworthiness is maintaining reliability and the degree of trust and confidence in the outcome of qualitative research (Golafshani, 2003; Baillie, 2015; Cypress, 2017). Transferability, confirmability, credibility and dependability are methods used to ensure trustworthiness (Bryman and Bell, 2015; Nowell et al., 2017; Denzin and Lincoln, 2018). This research ensures that the final report is submitted to other participants in each Triad to express their opinions, avoiding the researcher's bias.

Credibility is similar to internal validity (Teddlie and Tashakkori, 2009). Credibility refers to confidence in truthful findings where the interpretation of participants' views and supported original data are represented (Denzin and Lincoln, 2018). In this research, credibility was demonstrated by the researcher being close to the participants. They checked the reports of the interviews, and their quotes were used in the report to inform Themes (Aspers and Corte, 2019). Also, participants willing to participate were involved and could withdraw during the interview (Shenton, 2004).

In this research, the accuracy of results through the responses of participants and interpretation of the researcher are assured through various methods such as multiple methods of data collection, data collection triangulation, prolonged engagement with participants for in-depth information and persistent observation,
peer debriefing (analytic triangulation) as my supervisors act as debriefers and presenting preliminary findings to interested groups in University of Bedfordshire seminar in 2021, member check and an external check and any ambiguity during the interview is clarified as well as author subjectivity influence is made known to the reader through reflexivity (Creswell, 2009; Nowell et al., 2017).

**Transferability** is how confidence and trust in findings can be applied to other similar contexts and settings (Robson, 2011; Denzin and Lincoln, 2018). Transferability is similar to external validity but does not advocate generalisability (Smith and McGannon, 2018). In this research, transferability is achieved by describing the characteristics of the sample (participants and context) and using purposive sampling (Korstjens and Moser, 2018). Transparency in data collection and analysis methods based on the data and what has been done (Korstjens and Moser, 2018) and applied replication logic so that the reader can evaluate the extent to make judgements regarding the transferability of the findings to other settings (Creswell, 2013; Bryman and Bell, 2015; Korstjens and Moser, 2018).

**Dependability** is the appropriateness of the research design in data collection and is well-documented and traceable (Tobin and Begley, 2004; Denzin and Lincoln, 2018). Dependability is also similar to reliability. Thus, the same results will be obtained by other researchers using the same methods of research (Yin, 2014). In this research, dependability is assured within data collection through a Case protocol, multiple perspectives, recording interviews for accuracy, triangulation and detailed reports (Bryman and Bell, 2015; Nowell et al., 2017).

**Confirmability** reflects that bias is avoided during research, and findings are derived from original data (Bryman and Bell, 2015). In this research, several techniques and procedures in data collection and analysis were conducted to exclude researcher bias (Crick, 2021). It is assumed that findings have been reached through triangulation, and member checking and data were continuously updated at every stage of data collection and analysis (Creswell, 2013; Bryman and Bell, 2015). Also, the author recognised that her experiences and subjectivity influence their interpretations through reflexivity.
3.10 Ethics and Risk Assessment

3.10.1 Ethics

Before conducting the Case studies, Bedfordshire University's research ethics committee approved the ethical considerations with the university guidelines (Saunders et al., 2016) (copy attached in Appendix F). The author attended training courses in research ethics. Before the potential respondents conducted the Case Study, they were informed that this study was purely for academic purposes. Their written informed consent was obtained (Christians, 2000; Miller et al., 2012). The consent form contains information and assurance that participants understand the implications of their participation and are freely participating without any pressure. Clearly, the participants have the right to withdraw at an agreed stage (Ritchie et al., 2014). Participants have approved audio recordings of the interviews. Participant feedback was obtained for transcribed interviews to verify the accuracy of the information (Christians, 2000).

The participants' confidentiality and safety were high priorities. Their names were anonymised for confidentiality. The anonymised transcripts were accessed by the supervisor and other representatives of the university (Miller et al., 2012). The recordings were destroyed directly after being transcribed. Scripts and related written works were encrypted and saved in a secure format. It was ensured that any bias and conflict of interest were avoided. Secondary data were collected from reliable institutions' databases. Approval was obtained from the relevant management before secondary data collection concerning the copyright regulations, with text citation and good referencing.

3.10.2 Risk Assessment

Risks may arise during fieldwork. Risk to participants was avoided by following ethical guidelines (Babbie, 2015). This research does not constitute any health and safety potential harm or acquire any costs from participants. (Bryman, 2016). One risk is that the participants may become distressed during the interviews. That was avoided by taking care of how to ask a question and arranging another suitable time. The participant may reveal other confidential information, which supervisors and the university will solve without harming participants.
Another possibility is that participants may become aggressive towards the researcher. This was mitigated by conducting the interview in a comfortable workplace and informing my supervisor of the time and place of the interview in advance. Another risk may be emerging conditions like COVID-19, which makes the data collection as planned complex. These potential risks could be mitigated; precautions are planned. The participants may withdraw, so a snowballing search for alternatives will provide the minimally acceptable number for data saturation. A new action plan (e.g., online) for collecting data was arranged to be used under the approval of supervisors and the ethics committee.

3.11 Conclusion
This research aims to understand the phenomenon of QDS in EFSC in the Jordanian food industry. The research concentrates mainly on EFSC to enhance SUST performance. The unit of analysis is the EFSC. The focus is on the manufacturer as the focal actor at the center of the Triad relationship of upstream (main suppliers), manufacturers and downstream (main customers). This Chapter has emphasised and justified the research methodology. A qualitative method was used to attain answers to the research questions and achieve the objectives and main aim. This thesis adopted interpretivism and some pragmatic philosophical views from a subjective ontology. This research was an abductive approach to theory development as a deductive approach to generating a conceptual framework before the data collection phase. The inductive approach for data collection and linking and matching new concepts emerged, resulting in the problem statement formulating a new theory.

Furthermore, purposive and snowball sampling techniques were adopted for four Case studies. Semi-structured interviews, observations and secondary data are data collection techniques. Thematic analysis was mainly used in data analysis and supported with NVivo software. Triangulation was conducted. The procedures were considered to ensure high quality, reliability, validity issues and the trustworthiness of the research. Ethical considerations were considered. Chapters 4 and 5 are dedicated to the research analysis at two levels. A within-case analysis is presented in Chapter 4. Further, in Chapter 5, the cross-case analysis and AHP are presented to validate the final conceptual framework and rank key Themes based on the five experts' judgments.
Chapter 4: Empirical Analysis of Within-Case Studies

4.1 Introduction

This Chapter is an empirical analysis of four distinct Case Studies. The author segments her studies and supportive data analysis into two primary stages: within-case analysis, discussed in this Chapter and between-case analysis, presented in Chapter 5.

The in-case analysis includes data from structured interviews, personal observations from in-company meetings and company tours, and a plethora of secondary data, detailed in Chapter 3. See Appendix B for the protocol questions.

The procedure followed for the analysis of Triads A, B, C, and D is outlined below:

1. Direct quotations by interviewees illuminating their experiences, beliefs and behaviour about the phenomena of QDS in EFSC.
2. Personal insights from the author, grounded in observations during company meetings and tours.
3. Assessment of transcriptions of structured interviews.
4. Evaluate the secondary data resources collected from the documents and sources and their role in influencing the overall interpretation.
5. Transformation of subjective interview responses into structured perspectives, Themes, and Sub-Themes associated with QDS, highlighting the significance of each from the interviewee’s viewpoint. She designed her analytic framework to show the relative importance of the Themes and Sub-Themes from their viewpoint.
6. Initial categorization of data during transcription of interviews.
7. Deeper analysis, enabling the author to streamline data into perspectives, Themes, and Sub-Themes on an individual Case basis.
8. Use Nvivo software to delve deeper into the data based on specific keywords aligned with the previously identified perspectives, Themes, and Sub-Themes.
The author is acutely aware of the inherent subjectivity throughout this methodology involved in 1-8 above. By detailing the process transparently, the intention is to provide readers with a clear lens to evaluate the findings.

This in-case analysis phase aims to encapsulate preliminary insights and clarify the Quality Driven Sustainability (QDS) phenomenon in EFSC. The pilot study, Case 1-Triad A, provided a learning experience, informing the subsequent research approach and refining the conceptual framework. Case 1-Triad A was also a rich data source for her findings, and, importantly. The timeline for subsequent studies was also derived from insights gained from this pilot. The overarching context of this analysis within Jordanian EFSC is depicted in Table 4.1. Chapter 5 will further distil these insights, spotlighting crucial findings.

Contained within this Chapter are detailed accounts of the four Case Studies, spanning demographics, Themes, Sub-Themes, participant quotations, and the author's observations. These Cases are categorized as open (Case A), transitional (Case B), and closed (Cases C and D). See the classification below. The genesis of these Themes and Sub-Themes arises from a comprehensive literature review. The interconnectedness between these perspectives will become evident, underscoring their amalgamation into QDS.

### 4.2 Case Studies: Contextual Details- Time, Place and Description

This Chapter synthesises interviewees' responses with the author's first-hand observations and tours, applying thematic analysis to categorise the data and establish their relative importance. This Chapter compares the results with secondary data sources. The fieldwork for this empirical study spanned 2020 and 2021, conducted in Jordan, as portrayed in Table 4.1, which also acts as a roadmap for this Chapter by showcasing the empirical study's sample composition.
Table 4.1: Description of Firms in the Four Case Studies - Triads

<table>
<thead>
<tr>
<th>Date</th>
<th>Case 1 Triad A</th>
<th>Case 2 Triad B</th>
<th>Case 3 Triad C</th>
<th>Case 4 Triad D</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 2020</td>
<td></td>
<td>January 2021</td>
<td>March 2021</td>
<td>April 2021</td>
</tr>
<tr>
<td>Location</td>
<td>Amman</td>
<td>Amman</td>
<td>Amman</td>
<td>Amman</td>
</tr>
</tbody>
</table>

**Interviewee**

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Case 1 Triad A</th>
<th>Case 2 Triad B</th>
<th>Case 3 Triad C</th>
<th>Case 4 Triad D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging Manufacturer</td>
<td>Vegetable Farm</td>
<td>Poultry Manufacturer</td>
<td>Machine and Technology Provider</td>
<td></td>
</tr>
<tr>
<td>Canned Meat Processor</td>
<td>Canned Vegetable Processor</td>
<td>Canned Poultry Processor</td>
<td>Canned Vegetable Processor</td>
<td></td>
</tr>
<tr>
<td>Customer</td>
<td>Distributor</td>
<td>Distributor</td>
<td>Wholesaler</td>
<td>Warehouse</td>
</tr>
</tbody>
</table>

**Observation**

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Case 1 Triad A</th>
<th>Case 2 Triad B</th>
<th>Case 3 Triad C</th>
<th>Case 4 Triad D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tour</td>
<td></td>
<td>Tour</td>
<td>Tour</td>
<td>Tour</td>
</tr>
<tr>
<td>Meeting and Tour</td>
<td></td>
<td>Meeting and Tour</td>
<td>Meeting and Tour</td>
<td>Meeting and Tour</td>
</tr>
<tr>
<td>Tour</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Secondary Data**

<table>
<thead>
<tr>
<th>Documents</th>
<th>Case 1 Triad A</th>
<th>Case 2 Triad B</th>
<th>Case 3 Triad C</th>
<th>Case 4 Triad D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality manuals, audit reports, sustainability reports, meeting minutes, stakeholders' descriptions, and yearly plans. Risk management plans</td>
<td>Project surveys, annual reports, market reports and meeting minutes, quality manuals, audit reports, social responsibility plans</td>
<td>Financial records, market reports, quality manuals, audit reports, meeting minutes, sustainability reports, strategy plan</td>
<td>Quality manuals, annual reports, internal audits reports, descriptions of stakeholders, market reports and meeting minutes</td>
<td></td>
</tr>
</tbody>
</table>

(Source: The Researcher)
4.3 Key Themes and their Contextual Factors

The discussion now outlines Themes and their corresponding Sub-Themes. The Themes and Sub-Themes presented in the subsequent tables are derived from a comprehensive literature review, with additional insights from the pilot study, Case 1-Triad A, and Cases 2, 3, and 4. The instances where these insights influence the analysis are duly indicated within the text.

The researcher delineates perspectives, Themes, and related Sub-Themes based on the interview responses. These are represented as SCN in Table 4.2, TQM in Table 4.3, and SUST in Table 4.4. Collectively, they bolster a deeper comprehension of the integrated concept of QDS in EFSC. Rich findings from each Case emanate from careful data analysis, including the interviewees' views, observational insights, and documentary evidence.

NVivo software played an instrumental role in verifying the manual subjective analysis, especially regarding the Themes and Sub-Themes of the SCN, TQM, and SUST perspectives. Augmenting the in-case analysis are illustrative diagrams, with inter-case discussions reserved for Chapter 5.
Table 4.2: Definitions of Themes, Sub-Themes for SCN Perspective.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theme 1</td>
<td>Supplier - Customer Relationship</td>
<td>Selection criteria and activities and evaluation for supplier/customer for their business plan at the dyad level to reduce their supplier/customer number to enhance their relationships later</td>
</tr>
<tr>
<td></td>
<td>Monitoring Activities</td>
<td>How they monitor and audit the supplier/customer activities and achieve results</td>
</tr>
<tr>
<td></td>
<td>Development Activities</td>
<td>Enhance their performance based on investments and continuous improvements in the process, training employees, know-how, and solving problems at the dyad levels</td>
</tr>
<tr>
<td></td>
<td>Trust</td>
<td>Reliance by one actor in the triad on another actor by close long-term relationship to a continuation of a relationship to achieve their goals</td>
</tr>
<tr>
<td>Theme 2</td>
<td>Multi-Tier Network</td>
<td>Collaboration                                                                  A long-term partnership between a triad (supplier - manufacturer - Customer) working closely together based on their supply chain to achieve common goals with activities such as planning and forecasting</td>
</tr>
<tr>
<td></td>
<td>Resilience</td>
<td>Proactive action and design of the supply chain network to anticipate an unexpected disruptive event or to recover after a disturbance happens and continuity of their business</td>
</tr>
<tr>
<td>Theme 3</td>
<td>Lean Supply Chain</td>
<td>Waste Management                                                              Reduce their losses and waste to become leaner SCM in terms of process, time, and human resources.</td>
</tr>
<tr>
<td></td>
<td>Value Creation</td>
<td>Value is created through the activities for transforming tangible resources into products that interest one stakeholder</td>
</tr>
<tr>
<td>Theme 4</td>
<td>Risk Management</td>
<td>Internal Risk                                                                  Risks associated with their supply chain affect organization activities and related uncertainty and could be controlled by SC entities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>External Risk                                                                 Supply chain risk disruptions from the uncertainties outside the environment cause negative consequences out of direct control of any actor in the SC, such as weather events, market factors, legal issues</td>
</tr>
<tr>
<td>Theme 5</td>
<td>Digitalization</td>
<td>Advanced Digital Technologies                                                   Adoption of advanced digital technologies to manage and improve traditional supply chains to integrate actors in the supply chain and their activities through those systems such as IoT, big data and blockchain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information System/Digital Platform                                            Advancement of information technology systems related to the digitalization of their supply chain, such as social media, information systems, and platforms to support and integrate the supply chain activities effectively and efficiently with Real-time information</td>
</tr>
<tr>
<td>Theme 6</td>
<td>Innovation</td>
<td>Product Innovation                                                            Introduce different products that are new or significantly developed concerning their features</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Process Innovation                                                            Implementation of new or change to a significantly improved process, production or delivery method</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organizational Innovation                                                      Changes in a company’s managerial practices, ideas, processes, and structures that have never been used before</td>
</tr>
<tr>
<td>Theme 7</td>
<td>Contracts</td>
<td>Formal Contract                                                               Written agreements between parties in order to fulfil their needs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Informal Contract                                                             An unwritten agreement between parties to set out the expectation between two parties to create and maintain a positive reputation and trust between parties</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
Table 4.3: Definitions of Themes and Sub-Themes for TQM Perspective

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theme 1</td>
<td>Soft Factors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Customer Focus</td>
<td>Actions and processes achieve customers’ requirements and quality and consider customer satisfaction essential to long-term performance.</td>
</tr>
<tr>
<td></td>
<td>Education and Training</td>
<td>Training related to technical issues, job responsibilities, quality improvement, and sustainability issues is essential for most employees to facilitate TQM success and continuous improvements.</td>
</tr>
<tr>
<td></td>
<td>Top Management Leadership</td>
<td>Top management role in supporting, monitoring problems and enhancing all quality practices resulting in improving the quality of products and processes and supply chain that meets customers’ requirements.</td>
</tr>
<tr>
<td></td>
<td>Supplier Relationship</td>
<td>Build a relationship with suppliers that contributes to product design development, engage in quality improvement efforts for sustainable development, and provide information to increase the efficiency of supply chain relationships.</td>
</tr>
<tr>
<td>Theme 2</td>
<td>Hard Factors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Continuous Improvement</td>
<td>Looking to continuous improvement and creativity in finding ways in all aspects of the product, process and supply chain, quality and sustainability to meet and satisfy changing stakeholders' needs and enhance innovation.</td>
</tr>
<tr>
<td></td>
<td>Statistical Process Control</td>
<td>Using a statistical tool to make a decision based on collecting and analysing data to control a process or production method to gain quality, reduce the variance related to the process, and solve problems.</td>
</tr>
<tr>
<td></td>
<td>Process Management</td>
<td>Manage the process from resource acquisition to the final product to improve quality performance and sustainability.</td>
</tr>
<tr>
<td></td>
<td>Quality Tools and Techniques</td>
<td>Using TQM tools and techniques for analysing data in a process such as cause and effect diagrams, relations diagrams, control charts, Pareto charts, scatter diagrams and Flow charts.</td>
</tr>
<tr>
<td></td>
<td>Product Design</td>
<td>Introducing new products, considering customers' needs and expectations in the product design and process.</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
Table 4.4: Definitions of Themes and Sub-Theme for SUST Perspective

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theme 1</td>
<td>Economic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Profit</td>
<td>Any profit in revenue to company-related process, product stable prices, and market access, upon the cost they employed and upon the quality</td>
</tr>
<tr>
<td></td>
<td>Certification</td>
<td>What kind and role of certification reduces a company's impact on the environment like ISO 14001, FSCC22000, HACCP, ISO 9001</td>
</tr>
<tr>
<td></td>
<td>Operation Cost</td>
<td>How much does it cost them in operation to produce their product. What are the cost of the operation process from machines, time, humans, research, new technology they use to produce a final product, and the cost in material and other resources for their input process</td>
</tr>
<tr>
<td></td>
<td>Market Expansion</td>
<td>How entering a new market and their performance affects their economy</td>
</tr>
<tr>
<td></td>
<td>Customer Return</td>
<td>Keeping customers maintains their stability in economic terms</td>
</tr>
<tr>
<td>Theme 2</td>
<td>Environmental</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resource Consumption</td>
<td>Resources consumed (water, energy, other materials) in the production process and other processes.</td>
</tr>
<tr>
<td></td>
<td>Recycling</td>
<td>Recycle products, including resources (water, by product and packaging)</td>
</tr>
<tr>
<td></td>
<td>Efficient Transportation</td>
<td>Transportation and delivery processes are designed to reduce carbon dioxide emissions</td>
</tr>
<tr>
<td></td>
<td>Choosing Partners Based on Environmental Practices</td>
<td>Looking for environmental practice in purchasing from a supplier</td>
</tr>
<tr>
<td>Theme 3</td>
<td>Social</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reputation</td>
<td>Image of the company, word of mouth and reputation to suppliers, customers, and other stakeholders</td>
</tr>
<tr>
<td></td>
<td>Diversity</td>
<td>Diversity in the type of products targeted to customers</td>
</tr>
<tr>
<td></td>
<td>Traceability</td>
<td>The information available to trackback from raw materials, production conditions, and supplying processes to solve problems and conveyed to consumers</td>
</tr>
<tr>
<td></td>
<td>Employee Rights</td>
<td>Wages and working hours, safe work conditions, medical insurance, training.</td>
</tr>
<tr>
<td></td>
<td>Transparency in Product Labeling</td>
<td>The information is available and accurate about nutritional facts, composition, and any essential facts for consumers’ health</td>
</tr>
<tr>
<td></td>
<td>Community Concern</td>
<td>The community and different social events provided and voluntary activities</td>
</tr>
<tr>
<td></td>
<td>Stakeholder Engagement</td>
<td>Main stakeholders as clients, suppliers, employees, government, community, and other actors in the supply chain, how they share the ideas, their needs, development and awareness of Sustainability</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
4.4 Findings of Case Studies

The fieldwork was conducted between November 2020 and April 2021 in Jordan. Recommendations of directors and managers familiar to the researcher within the respective companies enriched the selection of interviewees for each case. From these initial recommendations, a combination of purposive and snowball sampling techniques led to further referrals, introducing the researcher to other managers who could provide additional depth to the study. The resulting Case reports incorporated demographic data about the participants and insights into the perspectives, Themes, and Sub-Themes underlying QDS. In this respect, the pilot Case Study is presented and considered as Case 1 - Triad A. It was a valuable learning exercise for the insights. It provided perceptions and attitudes to perspectives, Themes and Sub-Themes and valuable guidelines for the researcher.

The researcher’s approach to the Case Studies was multifaceted: apart from relying on interview content, on-site observations and company tours were conducted. Compared with interview responses, secondary data was an essential tool for triangulating the derived insights. The pilot Case Study labelled Case 1 - Triad A proved invaluable in this context. It offered an initial dive into perceptions and attitudes related to the Themes and Sub-Themes and set the stage for refining the research approach. It also served as a temporal benchmark, allowing the researcher to anticipate the duration needed for subsequent Cases. Significantly, the pilot study influenced the framework of subsequent interviews and played a role in the evolution of specific Themes and Sub-Themes.

The Triad consists of three actors, which can be summarised below:

**Supplier**: This entity is the primary source of raw materials and other essential inputs required for production. They are the first touchpoint in the supply chain and have a critical role in ensuring the raw materials' quality, sustainability, and timely delivery.

**Manufacturer**: Acting as the central player in this Triad, the Manufacturer takes raw materials from the Supplier and processes them to produce canned food products. The Manufacturer must ensure that the products meet both quality and sustainability benchmarks.
Customer: The end-point in the supply chain, the Customer is the recipient of the finished product. In this context, it is important to note that the term 'customer' could refer to wholesalers, retailers, or even final consumers.

All the Case analysis begins with a broad overview to familiarize the reader with the companies concerned. Illustrative key quotations have been included in the narrative and tables to enrich the content, using direct quotations marked by quotation marks, with deviations only in instances where clarity was potentially compromised. At times, paraphrasing was deemed more suitable.

After a detailed exploration and analysis of each Case individually in Chapter 4, the four Triads identified in the Case Studies (the four Cases: Triad A- Case 1, Triad B- Case 2, Triad C- Case 3 and Triads D- Case 4) fall into three categories: closed, open, and transitional. Table 4.5 below summarises these types of Triads. These Triads, within EFSCs, typify various processes between the actors in each Triad and across the EFSC, interacting with other stakeholders and Triads. A comprehensive discussion follows in Chapter 5, specifically in Section 5.3.

Table 4.5: Typology of Triads A, B, C and D in EFSC

<table>
<thead>
<tr>
<th>Row number</th>
<th>Description Type</th>
<th>Triad A</th>
<th>Triad B</th>
<th>Triad C</th>
<th>Triad D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Triad Type</td>
<td>Open Triad</td>
<td>Transitional Triad</td>
<td>Closed Triad</td>
<td>Closed Triad</td>
</tr>
<tr>
<td>2</td>
<td>EFSC Status</td>
<td>Medium-established</td>
<td>Medium-established</td>
<td>Well-established</td>
<td>Well-established</td>
</tr>
<tr>
<td>3</td>
<td>Age of Triad</td>
<td>5 years</td>
<td>7 years</td>
<td>10 years</td>
<td>10 years</td>
</tr>
<tr>
<td>4</td>
<td>Exporting Experience</td>
<td>Short</td>
<td>Medium</td>
<td>Long</td>
<td>Long</td>
</tr>
<tr>
<td>5</td>
<td>Quality Practices</td>
<td>Semi-Active</td>
<td>Semi-Active</td>
<td>Active</td>
<td>Active</td>
</tr>
<tr>
<td>6</td>
<td>Sustainability Practices</td>
<td>Semi-Active</td>
<td>Semi-Active</td>
<td>Active</td>
<td>Active</td>
</tr>
<tr>
<td>7</td>
<td>QDS Applications</td>
<td>Weak-Applied</td>
<td>Medium-Applied</td>
<td>Strong-Applied</td>
<td>Strong-Applied</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
4.4.1 Case 1- Triad A

Figure 4.1 offers a visual representation of all the actors of the supply chain network in Triad A. This figure charts out their interactions, unveiling underlying processes and relationships. Triad A consisted of three actors: **Supplier - Manufacturer - Customer**, all based in Jordan. For the past five years, the three actors have collaborated to supply consumers with a diverse range of high-quality canned food products, all underpinned by a sustainable EFSC. This Triad is an open Triad with a structure indicative of indirect collaboration among the three actors.

![Figure 4.1: Depiction of an Open Triad A - Case 1](image)

(Source: The Researcher)

**Actors in Supply Chain of Case 1- Triad A:**

**The Manufacturer** is a company established in 1985 and located in Amman. They pioneered processed red and white meat products, including frozen, chilled, and canned meat. They are marketed under a primary trademark. Their products are recognized for their quality and reputation and are competitively priced to meet all consumers' needs. The company workforce includes 100 Jordanian nationals and is endorsed international certifications, including management systems such as ISO 9001, HACCP, and ISO 22000. Its product is exported globally to countries spanning the Middle East, North America, Australasia, and more, such as Lebanon, Iraq, the Gulf area, Qatar, United Arab Emirates (UAE), Tunisia, Palestine, Turkey, Australia, New Zealand, the United States of America (USA) and others.

**The Supplier** is a company established in 1990 and located in Amman. It is considered the premier entity producing metal cans for various sizes and shapes of food packaging, all manufactured under stringent standards with state-of-the-art machinery and technology.

**The Customer** is a distributor company established in 2007 and the leading player in the fast-moving consumer goods sector. It employs 200 individuals and operates with a fleet of diverse delivery vans.
and a sprawling 5,000-square-meter warehouse. For more detailed demographic information regarding the interviewees from Triad A, refer to Table 4.6 below.

**Table 4.6: Interviewees' Description of Case 1-Triad A**

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Job Title</th>
<th>Abbreviation</th>
<th>Age</th>
<th>Experience (years)</th>
<th>Gender</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supplier Supply Chain Manager</td>
<td>S1SCM</td>
<td>45-50</td>
<td>13</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
<tr>
<td>2</td>
<td>Production Manager</td>
<td>S1PrM</td>
<td>30-35</td>
<td>5</td>
<td>Male</td>
<td>Master</td>
</tr>
<tr>
<td>3</td>
<td>Purchasing Manager</td>
<td>Maf1PM</td>
<td>35-40</td>
<td>10</td>
<td>Female</td>
<td>Bachelor</td>
</tr>
<tr>
<td>4</td>
<td>Quality Manager</td>
<td>Maf1QM</td>
<td>35-40</td>
<td>15</td>
<td>Female</td>
<td>Bachelor</td>
</tr>
<tr>
<td>5</td>
<td>Business Development and Operation Manager</td>
<td>Maf1BDOM</td>
<td>40-45</td>
<td>19</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
<tr>
<td>6</td>
<td>Lean Manager</td>
<td>Maf1LM</td>
<td>40-45</td>
<td>12</td>
<td>Female</td>
<td>Bachelor</td>
</tr>
<tr>
<td>7</td>
<td>Supplier Supply Chain Manager</td>
<td>C1SCM</td>
<td>45-50</td>
<td>18</td>
<td>Male</td>
<td>Master</td>
</tr>
<tr>
<td>8</td>
<td>Marketing Manager</td>
<td>C1MM</td>
<td>35-40</td>
<td>7</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

**Empirical Analysis of Triad A**

Fieldwork for this Triad was undertaken in November 2020. A recurrent theme among the interviewees was their awareness of the networks in EFSC. For example, Maf1BDOM, “*The chain of integrated (information, product, money) where there is a coordination between production and procurement and exportation. The customer is an important actor in this supply chain.*” The manager, C1SCM, emphasized the existence of disturbance, “[…] political risk, close off borders, increased taxes, the war in Syria, The routes changed to sea transport […], increasing time and cost, taxes.”. During COVID-19, S1SCM remarked, “*Disturbance during COVID-19 is something different, the most affected are supplied material, exportation procedures, time, cost […], in all the world, really without exception, so there is no flexibility in moving Cargo […], the closed borders with regional countries during the lockdown which increase the cost and delay in delivery; the second thing, there was a decrease in capacity of employees.*”
4.4.1.1 Interviews Insights – Case 1- Triad A

The subsequent analysis delves into the perspectives of the Supplier, Manufacturer, and Customer in Triad A. It touches upon SCN, TQM, and SUST frameworks, highlighting interconnects among these perspectives in the broader QDS.

Supply Chain Network (SCN) – Case 1-Triad A

The researcher found that interviewees appeared to understand the SCN perspective. Triad A’s data underscored the pivotal role of an SCN, particularly around critical Themes like Supplier-Customer Relationships, Multi-Tier Networks, Lean Supply Chain, Risk Management, Digitalization, Innovation and Contracts. S1SCM explained to SCN, “I believe we have a relationship between the supplier, manufacturer and customer to keep a required condition for managing and transporting the goods”. Upon dissecting the eight interview transcripts from Triad A, emerging Themes encompassed Risk Management, Technology, Innovation, and Contracts and their sub-themes. The researcher includes key representative quotations linked to each sub-theme for SCN in Table 4.7.

- **Supplier-Customer Relationship:** This theme is broken down into four Sub-Themes discussed on the dyadic level in Triad A in EFSC.
  1. **Selection:** All interviewees emphasized the importance of their selection criteria for choosing partners. For them, the inception of a relationship begins with selecting the right suppliers. Key elements in their decision-making process include potential suppliers' quality, safety, and reputation.
  2. **Monitoring:** Four of eight interviewees reported engaging in independent monitoring. This often involves self-assessments based on documentation or through regular on-site visits.
  3. **Development:** One interviewee mentioned ongoing developmental activities, especially technical assistance and training when introducing new equipment or processes.
  4. **Trust:** A significant aspect that emerged is trust. Four of eight interviewees mentioned that trust, a somewhat intangible factor, is instrumental in achieving objectives and ensuring confidence throughout the supply chain operations.
• **Multi-Tier Network:** Under this theme, two Sub-Themes were highlighted:

1. **Collaboration.** Four among eight interviewees emphasised collaboration strategies to achieve and maintain their long-term objectives. These efforts typically involve detailed planning and forecasting activities, which the researcher categorizes as a crucial tangible component for orchestrating a smooth supply chain.

2. **Resilience:** One among eight interviewees shared insights into the evolving strategies towards building resilience at Triad A. This entails effective management of unforeseen disruptions and safety stock for raw materials to ensure uninterrupted product delivery.

• **Lean Supply Chain:** Two additional Sub-Themes surfaced as dominant from the pilot study:

1. **Waste Management.** Three of the respondents actively participate in waste management initiatives. These initiatives encompass recycling, optimizing energy consumption and water treatment, and minimizing time wastage.

2. **Value Creation:** Two of eight interviewees highlighted the significance of adding value to their products, which they believe fulfils Customer demands effectively. This means offering competitive pricing and prompt delivery times while sidestepping administrative hindrances like excessive paperwork.

• **Risk Management:** They split Risk Management into Internal and External Risk categories.

1. **Internal Risk:** Two respondents emphasised challenges inherent to their operations. Common internal risks include disruptions in delivery timelines and sourcing issues stemming from their sub-tier supply chain.

2. **External Risk:** Four of eight respondents expressed concerns over external risks. These typically revolve around geopolitical challenges, like unsafe transportation routes, escalating costs, different regulatory shifts on borders suddenly announced, and raw material contamination issues. For a comprehensive delineation between these internal and external risks, refer to Table 4.2 provided earlier.
• **Digitalization**: This theme revolves around the importance of technology and the role of information systems in the supply chain

  1. **Advanced Digital Technology**: Four out of eight participants cited technology's pivotal role in bolstering their daily operations. The emphasis is on technological integrations in their operations, as ERP systems improve process control and quality management.

  2. **Information Systems**: Two of eight interviewees underscored the value of various information system tools. These tools range from online platforms to mobile applications, all aimed at fostering quicker and more efficient collaboration among supply chain stakeholders.

• **Innovation**: The essence of innovation, as captured from the interviews, was broken down into three main aspects:

  1. **Organizational Innovation**: One among eight respondents identified the practice of forming "quality circles". These circles serve as a platform for gathering innovative ideas from employees, all aimed at refining products or processes. Moreover, the ultimate goal is differentiating themselves in the market and increasing the firm’s financial performance.

  2. **Product Innovation**: Four respondents refer to product innovation. They emphasise developing new products, mainly focusing on taste and shape.

  3. **Process Innovation**: Three interviewees pinpointed the significance of process innovation. They noted that introducing novel production methods invariably influences operational efficiency and quality performance.

• **Contracts**: This Theme captured how these businesses formalize their relationships.

  1. **Formal Contracts**: Two respondents mentioned that contracts were infrequent and dependent on demand, with quality, cost, and reliability being pivotal.
2. Informal Contracts: Three among eight emphasized the advantage of informal interactions to ensure adaptability, including breaking out relationships when they want and knowing the supplier’s capability to maintain consistent performance

Table 4.7: SCN Perspective: Themes, Sub-Themes and Main Quotations (Case I-Triad A)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme</th>
<th>Main Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier-Customer Relationship</td>
<td>Selection Activities</td>
<td>CISCN “Every person who works in trade should select and determine the category of the product (cheap, high price, medium price) which depend on quality and cost, and there are factories who work with low-quality low price and happy with their product, so we select our supplier based on cost and quality than the delivery time while our customer depends on their loyalty in payments.”</td>
</tr>
<tr>
<td></td>
<td>Monitoring Activities</td>
<td>Maf1PM said, “We always check our supplier’s contract to ensure their product is consistent with the contract. If the product does not meet the contract, we will not continue the relationship.”</td>
</tr>
<tr>
<td></td>
<td>Development Activities</td>
<td>Maf1PM said, “External development is difficult; development is essentially internal because internally has technical knowledge. If my customer requires unique specificities, for example, in the Iraq market, they require a taste. He will improve cooperation with us with special species requiring samples from us”</td>
</tr>
<tr>
<td></td>
<td>Trust</td>
<td>Maf1BDOM said, “Look, I have had a supplier for 25 years; it is a long relationship; we have to trust him to continue our relations.”</td>
</tr>
<tr>
<td>Multi-Tier Network</td>
<td>Collaboration</td>
<td>CISCN said, “Forecasting is another world. We are here for a company for the important availability of the item; that is how we are all at the end of 2020, coming to 2021, if I did not put my plan for quantities on the fly that I required to end of 2021, I would enter in problems, always we make an annual plan, and forecasting yearly and repeated studying it.”</td>
</tr>
<tr>
<td></td>
<td>Resilience</td>
<td>CISCN said, “COVID-19 gave us a big lesson; we know where our weaknesses, any things we ignored, we make new planning and forecasting, try to reduce its effect in future, shortage of raw material, or cost, that is part of decision increase our stock. . . . One of our conditions is to pack for two months with Covid19 before our pack up for 15-30 days; we have to think of additional stock.”</td>
</tr>
<tr>
<td>Lean Supply Chain</td>
<td>Waste Management</td>
<td>Maf1LM said, “Reducing waste is very important; we changed machines from manual to an automated process that reduces waste in production, waste of time, energy, and recycling. Also, waste of paper.”</td>
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<td></td>
<td>Value Creation</td>
<td>Maf1QM said, “Every consumer has a special taste, special requirement, labelling as the quality is today is the perceived value of a consumer, so I always keep studies and analyze data to see this product is distinguished in quality and added value with an acceptable price, so you have enough reasons to convince customer, pay more price for that product.”</td>
</tr>
<tr>
<td>Risk Management</td>
<td>Internal Risk</td>
<td>CISCN said, “Can you imagine when the product arrives at borders, we discover a problem in quality, that happens with us, so to solve this problem, this requires from producer to bring raw material from outside, we wait three months as we deal in meat, is high risk in microbial contamination, need special deal during handling, I give the transport company the requirements of keeping the quality of a product.”</td>
</tr>
<tr>
<td></td>
<td>External Risk</td>
<td>S1PM said, “We are trying risk management to be the least, not to reach the worst case. Covid19 is a world pandemic nobody can manage; there were difficulties in achieving order; the problem was a shortage of raw materials from outside, lockdown of many countries, the raw material comes from many countries, regulations on borders that affected us and submitting our orders.” Also, risk is a new trend from ten years ago; you cannot plan your goals without considering the risk.”</td>
</tr>
<tr>
<td>Digitalization</td>
<td>Advance Digital Technology</td>
<td>S1SCM honestly said, “We look at all time to new technology. Lately, We had an automation system from 2014; for 80% of the process instead of hand workers, leading to more quality management.” Now, the waste and destroyed amount is less; why? As I always improved my control process, our machines are self-control and monitoring to give you all the reading. If there is a problem during the production process, it gives an alarm; now we apply ERP, ERP is automation all processes.”</td>
</tr>
<tr>
<td></td>
<td>Information System/ Digital Platform</td>
<td>CISCN said, “We look at all time to new technology. Lately, We had an automation system from 2014; for 80% of the process instead of hand workers, leading to more quality management.” Now, the waste and destroyed amount is less; why? As I always improved my control process, our machines are self-control and monitoring to give you all the reading. If there is a problem during the production process, it gives an alarm; now we apply ERP, ERP is automation all processes.”</td>
</tr>
<tr>
<td>Innovation</td>
<td>Process Innovation</td>
<td>MF1 PM said, “We improve our product lines; For example, the boiling machine is improved by introducing a steam line for boiling meat, decreasing the time of boiling to minutes instead of one hour.”</td>
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<tr>
<td></td>
<td>Product Innovation</td>
<td>MF1BDOM said, “We always look at the leader market; there is much competition in our sector; there is always innovation of new products. We have new engineers who consider innovation; we were selling X brand for many years, now we sell a new brand, y brand, with new taste and healthy nutrition facts.”</td>
</tr>
<tr>
<td></td>
<td>Organizational Innovation</td>
<td>Mf1LM said, “We make a committee and weekly meeting for ideas of the employee for improvement and give incentives for these ideas and hear from the worker. The new ideas come from the worker on production lines, and we have a WhatsApp group of customers, suppliers, and factory for discussing ideas.”</td>
</tr>
<tr>
<td>Contracts</td>
<td>Formal Contract</td>
<td>CISCN said, “They contract us on ten shipments, as I have enough transport vehicles. These contracts determine the condition of storage, which starts from the manufacturer’s land. In some cases, we send a person to check in his eyes prior to a problem to avoid any conflict, there is always a conditional requirement, if you cause me to lose, so in some cases, we pay the penalty.”</td>
</tr>
<tr>
<td></td>
<td>Informal Contract</td>
<td>CIMM said, “We are selling this offer, and all are happy; we ordered four trucks, and we now asked for eight containers as the same price. I am concerned about its reputation and the quality design of the packaging. I want to work with its product and trademark. Each depends on the other, needs each other, we trust each other.”</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
Total Quality Management (TQM) – Case 1-Triad A

All interviewees are elucidated on their understanding and practical application of TQM and its influence on SUST. They emphasized a particular TQM implementation and awareness of TQM, encompassing both tangible (hard) and intangible (soft) factors contributing to achieving quality throughout the supply chain. S1PrM highlighted, “In my experience, the quality is become comprehensive, not as in the past, not only with its complying to specification the product, it is everywhere, in the market, supplier, it is interesting[…] will save in cost, time, reduce waste and loss”.

After analyzing the eight interview transcripts for the Triad, a set of Sub-Themes associated with TQM emerged. A more detailed breakdown, as informed by the interview data, is given below and supported by main quotations, which are provided in Table 4.8.

- **Soft Factors:** This category encapsulates the intangible aspects that directly or indirectly influence quality management. The following four Sub-Themes were highlighted:

  1. **Customer Focus:** Five among eight interviewees prioritized customer needs and continuously identified their needs and understanding of what the customer values.

  2. **Education and Training:** Four interviewees have considered the pivotal role of continuous learning. They believed that the actual value of any quality initiative lies in having well-informed and trained individuals.

  3. **Top Management Leadership:** Four interviewees highlighted the role of leadership in driving quality initiatives. Effective leadership not only quality principles but also embeds them into the organization.

  4. **Supplier Relationships:** Two out of eight interviewees highlighted the value of cooperative supplier relationships. This collaboration ensures the consistent delivery of quality across the supply chain.

- **Hard Factors:** These factors encompass tangible, measurable, and actionable aspects of quality management. The following five Sub-Themes were highlighted:

  1. **Continuous Improvement:** Four of eight interviewees believed that the pursuit of perfection through continuous improvement.
2. **Process Management**: Four of eight interviewees stressed that every process should be systematically managed and monitored to produce quality outputs consistently.

3. **Quality Tools and Techniques**: Three interviewees highlighted the effectiveness of using specific quality tools and techniques, emphasizing their role in enhancing quality management.

4. **Product Design**: Two of the eight participants highlighted the significance of designing products that meet and exceed customer expectations, emphasizing its role in ensuring sustainability across the supply chain.

5. **Statistical Process Control**: Two interviewees spotlighted using statistical methods to monitor and control processes, ensuring their reliability and consistency.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme</th>
<th>Main Quotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft Factors</td>
<td>Customer Focus</td>
<td>S1SCM said, &quot;The important one is the Customer (factory fill product) and important for me to see the quality of the product after filling; why? Why? Because the production process affects my product.&quot;</td>
</tr>
<tr>
<td></td>
<td>Education and Training</td>
<td>C1SCM said, “All of the quality factors are important, but with our experience, improving people is the most important. If you bring all the world systems considered the best and high price system, without qualified persons, you cannot benefit.”</td>
</tr>
<tr>
<td></td>
<td>Top Management Leadership</td>
<td>C1SCM said, “Top management leadership is essential to not fail, need wise leadership, and be involved through management control. So, top management cannot manage everything (need delegation) and control and monitor this person.”</td>
</tr>
<tr>
<td></td>
<td>Supplier Relationship</td>
<td>S1PrM said, “Suppliers come to us, make a trial give us improvement advice to deal with them and solve problems; we added a new test based on our customer.”</td>
</tr>
<tr>
<td>Hard Factors</td>
<td>Continuous Improvement</td>
<td>S1PrM said, “Improving is not forced; the company will not be still available for a long period.” If not improved, it will be closed.”</td>
</tr>
<tr>
<td></td>
<td>Statistical Process Control</td>
<td>C1MM said, “ERP system does not give you all the data you need. You have a data analysis person who takes data from the ERP system to an excel sheet and then uses it to give me the results required” if I go directly to software, I can’t read it, if you enter on the process from another side, with specific equations, give me the required results as tables, charts”.</td>
</tr>
<tr>
<td></td>
<td>Process Management</td>
<td>Mf1PM said, “We monitor, inspect, and control the production lines and process from raw material until it becomes a finished product; for example, we should clean the factory and sterilize it each end of the day. So the sterilization is done with expensive and food-grade material under the supervision of a quality engineer.”</td>
</tr>
<tr>
<td></td>
<td>Quality Tools and Techniques</td>
<td>Mf1PM said, “Honestly, we use software, we put in it all the related data, give us a good information investment, like charts, histogram, analysis of cause leads to more quality management”.</td>
</tr>
<tr>
<td></td>
<td>Product Design</td>
<td>S1SCM said, “If any customer asks for any development, we stand with him; he brings his product, specializing with our quality, R and D departments will help him to develop that product.”</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
Sustainability (SUST) – Case 1-Triad A

Within the context of this Triad, the concept of sustainability encompasses a comprehensive understanding of their work and interactions in the existing industry. All are engaged in environmental, economic or social SUST practices at their Triad in EFSC. Reflecting on S1SCM insights,” SUST is now in each part, not only the product, and profit in human resources, customer and supplier relationship, environment, resources, and happiness to society and employee”. An in-depth examination of the eight interview transcripts highlighted several Sub-Themes within the three primary SUST dimensions: Economic, Environmental, and Social. Table 4.9 depicts the main representative quotations for the emerging Sub-Themes for SUST.

- **Economic:** Five Sub-Themes emerged from analysing the eight transcripts for Triad A.
  1. **Profit:** Six out of eight interviewees addressed the challenges and nuances of profitability in the Jordanian context.
  2. **Market Expansion:** Fourth interviews engaged in practices that resulted in market expansion.
  3. **Customer Return:** Six of eight sought customer returns.
  4. **Operation Cost:** Six of eight interviewees explained the significance of operation costs.
  5. **Certification:** Six of eight interviewees mention their execution certification as suppliers' certification to improve the supply chain's SUST.

- **Environmental:** The environmental theme is the most prominently featured in analysing Triad A. Five Sub-Themes emerged:
  1. **Resource Consumption:** Seven of Eight interviewees demonstrated the importance of efficient resource utilization and their awareness.
  2. **Recycling:** Three interviewees identified the value of recycling practices in their operations.
  3. **Efficient Transportation:** Five of the eight interviewees Emphasized the significance of optimizing transportation to minimize environmental impact.
4. **Choosing Partners Based on Environmental Practices:** Two of the eight interviewees highlighted the importance of partnering with environmentally-conscious entities in the supply chain.

- **Social:** Seven social Sub-Themes can be identified from analysing the eight transcripts for Triad A:

  1. **Employee Rights:** Five of eight interviewees emphasized employee well-being and rights.

  2. **Community Concern:** Two interviewees discussed their initiatives addressing local community issues.

  3. **Reputation:** Maintaining good standing in the industry and with customers is crucial, as noted by Six of eight interviewees who believed that keeping a Reputation is essential.

  4. **Transparency in Product Labelling:** Three among eight interviewees highlighted the growing trend towards more transparent product labelling in line with new market trends in nutrition facts and awareness of customers.

  5. **Traceability:** A contemporary tool gaining traction, mentioned by four participants.

  6. **Stakeholder Engagement:** Two interviewees identified it as an influential factor in promoting sustainability.

  7. **Diversity:** Embracing diversity in the workplace was underscored by five of eight interviewees.
<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Themes</th>
<th>Main Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Economic</strong></td>
<td>Profit</td>
<td>SISC said, “Each is dependent on the other, needs each other, our relation is commercial.”</td>
</tr>
<tr>
<td></td>
<td>Certification</td>
<td>S1PrM said, “our customers, who visit us and monitor us. Moreover, inspect the production process and raw material and require ISO 22000.”</td>
</tr>
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<td></td>
<td>Operation Cost</td>
<td>Maf1QM said, “We establish a lean committee (lean circle) with sustainable production projects to make higher quality and safe goods. That saving cost, demonstrating and using lean management principles make for their revenue and efficiency in Profit. It is responsible for quality issues. Reduce use resources, water, electricity, and other resources, eliminate overhead processes and reduce your cost.”</td>
</tr>
<tr>
<td></td>
<td>Market Expansion</td>
<td>SISC said, “We depend on expo visits to compare packaging development to enter new markets. We also meet new customers' requirements and provide us with reference samples to improve our product and its specification (size, easy-open, laser open) To be more competitive.”</td>
</tr>
<tr>
<td></td>
<td>Customer Return</td>
<td>Maf1PM said, “We always do our best to keep our product the best, same quality at all times; the product you buy this year is the same as the other last year you bought. Also, there is sustainability in the markets; we keep our market customers to continue buying our products and finding them. There is also the sustainability of our suppliers. We keep our customer's loyalty, especially the big customer, foreign countries.”</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td>Resource Consumption</td>
<td>Maf1PM said, “Some production processes use much water as waste; we collect it in storage then use it again; there is a machine for designing meat shapes. We make a cooling by water, so we recycle it for cooling” in the past, it was a waste now used in production only in a cooling system.”</td>
</tr>
<tr>
<td></td>
<td>Recycling</td>
<td>S1PrM said, “Some customers return defective cans, it depends on the type of defect, so we Recycle by contracting a company to dispose of products (scrap sent to them)”</td>
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<tr>
<td></td>
<td>Efficient Transportation</td>
<td>C1PRM said, “We made a new loading procedure to fully loaded the transport. It was 25,000 cans, 11 layers. Instead, we make 12 layers to you 9,000 cans, that reduce the cost of transport, on my customer and me, instead of two shipping, it is once transported.”</td>
</tr>
<tr>
<td></td>
<td>Choosing Partner on environmental Practices</td>
<td>SISC said, “following the improvements in the industry market, also some countries; if the company does not consider, for example, renewable energy, it will not deal with it. (Such Europe, It becomes a conditional statement for countries.”</td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td>Reputation</td>
<td>SISC said, “In my experience, the quality becomes comprehensive, not as in the past, not only with its complying to specification the product also my image is considered necessary, what I want from my product to be excellent quality, and my image isn’t”, the most thing affected me is my image.”</td>
</tr>
<tr>
<td></td>
<td>Diversity</td>
<td>Maf1PM said, “We change the design of packaging and labelling; we continuously improve the quality of printing, colour, and design that depend on the diversity of my customers.”</td>
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<tr>
<td></td>
<td>Traceability</td>
<td>CIS said, “Once batch number they return it for any problem, it is an advantage to have ISO 9001, so I can follow any problem and solve it easily.”</td>
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<tr>
<td></td>
<td>Transparency Product Labeling</td>
<td>CIS said, “innovation in marketing with healthy nutrition facts requires me labelling with big writing with real components; some ask for more healthy take example on olive oil,” water”, “spicy or not”. we reflect that on our labelling.”</td>
</tr>
<tr>
<td></td>
<td>Employee Rights</td>
<td>Mf1LM said, “Employees are given extra paid for extra hours working; we give him medical insurance and food package.”</td>
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<tr>
<td></td>
<td>Community Concern</td>
<td>Mf1BOMD said, “There is always helping and donating food and money; we look to help low-income families around by donating food, help in medical issues, help in donating money to a municipality in the area.”</td>
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<tr>
<td></td>
<td>Stakeholder Engagement</td>
<td>C1PM said, “One of Our customers in the army, during Covid 19 lockdowns, they help us to bring for us free movement during the lockdown, so we concentrated our work to supply them.”</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
QDS in EFSC – Case 1-Triad A

Most interviewees emphasised their awareness of QDS in EFSC. For example, Maf1QM captured this sentiment by linking quality as the backbone of sustainability, stating, “Quality that should be the essence of SUST let us talk; frankly, the quality is given the stability […] reputation. There is SUST in different views in quality, time of delivery, cost, Profit., and raw material; we always do our best to keep our product the best, available for the next generation with the same quality at all times. We also protect the environment”. Also, the manager, Maf1LM, emphasised QDS “Quality has a big effect, there is a success story. I consider my product quality by working on standards decrease many problems of a returned product, we changed in product design for Halal products.. under the establishment of quality system quality ISO 9001, ISO 22000, HACCP and integrating with it environmental and social parameter is easier with quality, when we introduce lean principle, saving by reducing waste, control raw materials, by product, energy also the number of procedures and the working time as lean complement the quality, that help us in exportation where most exported countries require our environmental and social consideration “. The following Sections discuss the key Themes from the key perspectives: SCN, TQM, and SUST supporting QDS in EFSC.

All interviewees are concerned with the information and current practices related to QDS and their impact on SUST performance. They emphasised that QDS is not a mere buzzword. Instead, it is an integrative practice that synergizes product quality, process optimization, and supply chain enhancements while ensuring sustainability by their awareness of sustainable practices on product, process and supply chain to achieve SUST performance. Analysing the eight transcripts for Triad A featured a set of Sub-Themes for each key theme.

• **Quality:** The following three Sub-Themes were highlighted:

  1. **Product:** A majority, six out of eight interviewees, were concerned about the product quality, noting that adhering to stringent technical standards was paramount for customer loyalty and profitability.
2. **Process**: Four of eight interviewees considered process quality important, emphasizing continuous quality assurance to reduce non-compliance and adapt innovative quality programs that foster environmental sustainability.

3. **Supply Chain**: Three of eight interviewees pinpointed that the quality of the supply chain is essential across the EFSC. They are embracing technology platforms for information sharing and traceability, restructuring the processes and resilient supply relationships.

*•Sustainability Practices*: The following three Sub-Themes were highlighted:

1. **Sustainable Product**: Three of eight interviewees considered the development of sustainable products behind Consumers' motivation for healthy eating with nutritional aspects - ones that are low in fats and salts and ethically produced.

2. **Sustainable Process**: Two interviewees stated that export markets drive sustainable processes in driving green procurement and resource-efficient production strategies.

3. **Sustainable Supply Chain**: Three of eight interviewees emphasized the importance of sustainability in logistics, waste reduction, recycling, and donating unsold goods to charity.

*•Sustainability Performance*: co-implementation of TQM and SUST practices lays the foundation for exceptional SUST performance, with three Sub-Themes:

1. **Economic**: Five of eight interviewees considered economic performance as cost-saving and increased production efficiency to successfully combine quality and sustainability practices.

2. **Environmental**: Three of eight interviewees outlined the transformative impact of QDS on enhancing environmental performance. This ranged from clean production protocols and recycling to resource conservation and pollution reduction.

3. **Social**: Six of eight interviewees highlighted the social performance of their approach. This encompassed community initiatives, employee activities, and leveraging state-of-the-art information systems to elevate their social responsibility.
4.4.1.2 Finding of Observations Case 1- Triad A

This Section details the key insights from participant and non-participant observations for each actor within Triad A in EFSC. The generated Themes and Sub-Themes from these observations resonated with the discussions and impressions gathered during the interviews, meetings, and tours. The observational results further elucidated and reinforced specific attributes deemed crucial by the interviewees.

Participant Observation at the Manufacturer in Case 1-Triad A:

- **Duration**: 45 minutes.
- **Organizer**: Quality Manager.
- **Observation**: Within Triad A, the Manufacturer received critical forecasting support from the canned meat distributor, especially concerning product demand for the Gulf region during Ramadan. The complexities brought about by the COVID-19 pandemic underscored the importance of this predictive assistance. The Manufacturer also contemplated meeting the Supplier to discuss packaging alterations, including changes in product quantity per can and dimensions to better cater to the upcoming demand.
- **Derived Themes and Sub-Themes**:
  - **SCN**: Collaboration, Risk Management, Innovation.
  - **TQM**: Product Development, Quality Tools and Customer Focus.
  - **SUST**: Economic SUST - Market Expansion and Diversity.

Non-Participant Observation in Case 1-Triad A:

Non-Participant Observation at the Manufacturer (Case 1-Triad A):

- **Duration**: 20 minutes.
- **Organizer**: Quality Manager at the Manufacturer.
- **Observation**: The researcher's tour of the facility unveiled a structured workspace, demarcated meeting areas, and certifications showcasing their adherence to various standards, such as for management systems, including a halal certificate and the ISO 22000 certificate. Notably, the
facility also distributed food and monetary aid packages. A closer inspection of the production line revealed a seamless and organized workflow, encompassing raw material acquisition to final product storage.

- **Derived Themes and Sub-Themes:**
  - **SCN:** Lean Supply Chain, Digitalisation and Innovation, Collaboration.
  - **TQM:** Process Management, Quality Control Tools and Techniques.
  - **SUST:** Social, Employee Rights, Community Concern, Transparency in Labelling and Economical-Product Diversity, Environmental-Resource Consumption.

**Non-Participant Observation at Supplier in Case 1-Triad A:**

- **Duration:** 25 minutes.
- **Organizer:** Quality Manager at the Manufacturer.
- **Observation:** The Supplier’s facility tour showcased their investment in new automated canning lines, which augmented their production owing to technological advancements. Further, the integrated processes within a unified area streamlined operations and minimized time wastage. Additionally, the emphasis was placed on labour conditions, safety regulations, and quality management practices.

- **Derived Themes and Sub-Themes:**
  - **SCN:** Digitalisation, Innovation, Lean Supply Chain.
  - **TQM:** Process Management, Continuous Improvement.
  - **SUST:** Social SUST, Employee Rights.

**Non-Participant Observation at Customer in Case 1-Triad A:**

- **Duration:** 15 minutes.
- **Organizer:** Quality Manager at the Manufacturer.
- **Observation:** The distributor tour encompassed a range of areas, including the warehouses and the employees' offices, open areas with comfortable working conditions. There was an evident emphasis on technological infrastructure, evidenced by the researcher's examination of their
accounting, procurements and ERP systems. Recognition of their compliance and excellence, in the form of international certifications, adorned the walls of their offices. Additionally, the researcher noted meticulous store arrangements for sorting, repacking, and loading. The distributor also ensured controlled conditions in storage, ensuring the preservation of product quality. There was control of temperature and humidity, concentrating on hygienic and safety issues and cleaning. They had various transportation equipment, including trucks and electric forklifts, ensuring efficient logistics.

- **Derived Themes and Sub-Themes**:
  - SCN: Digitalisation, Innovation.
  - TQM: Top Management Leadership, Quality Tools.
  - SUST: Social; Employee Rights.

### 4.4.1.3 Secondary Data Insights – Case 1-Triad A

The review of the secondary data about the three actors in Triad A in EFSC provided the following insights described in Table 4.1 above.

- **Stakeholder Engagement**: The data emphasized the significance of engaging diverse stakeholder categories to realize the sustainability of operations. Furthermore, a concerted effort was made to diversify nutritional products to cater to a broader spectrum of consumer needs and preferences.

- **Quality and Safety**: Emphasis was placed on adhering to international quality management systems, as evidenced by possessing ISO 9001 and HACCP certificates. These certifications accentuate the commitment of the actors to maintain a consistent food supply chain that adheres to quality, safety, cost, delivery time, and effective distribution channels.

- **Environmental and Social Compliance**: Regulatory bodies, such as the Ministry of the Environment, actively monitor environmental compliance, while the Jordan Food Drug Association (JFDA) oversees health and safety through good manufacturing practices. Additionally, there is a demonstrable commitment to societal well-being. This is evident from continuous engagement in awareness initiatives, celebrations, social media campaigns, and
tangible contributions like donations to the Ministry of Health during the COVID-19 pandemic and to cancer centers.

4.4.2 Case 2 - Triad B

Figure 4.2 delineates the intricate web of relationships and interactions among the key players within the Triad B. Triad B supply chain consisted of three actors: Supplier-Manufacturer-Customer, located in Jordan. Triad B boasts a history of collaboration that stretches over seven years. This duration is a testament to the strong bonds and mutual trust the three actors have cultivated. Their shared objective has been to meet the market's demands by providing a range of high-quality, sustainable canned food products and sustainable EFSC. The interplay of relationships in Triad B is collaboration and coordination. The entities constantly interact, share feedback, and make joint decisions.

In such a Triad, the relationships between the entities are primarily transitional, focusing on exchanges like goods, services, and payments. Even though there is direct collaboration among all the members, indirect collaborations are also commonplace. This structure allows the Triad to be flexible and adaptable, quickly adjusting to market shifts and demands. This Triad B can be classified as a "Transitional Triad" and includes a structure of direct and indirect collaboration between the three actors.

![Figure 4.2: Depiction of Transitional Triad B - Case 2](Source: The Researcher)

**Actors in Supply Chain of Case 2 - Triad B:**

The Manufacturer is a leading food manufacturing company established in 1994. It is located in Amman. It has a strong reputation in Mediterranean food manufacturing. It has constantly innovated to
create high-quality nutrition and safety products at affordable prices. Their products are free from preservatives. They are pioneers in providing carton-packed and canned vegetables and bean products.

Consequently, the company has been looking for new technologies. It has a workforce of 100 skilled Jordanians. They have ISO 9001, HACCP, and ISO 22000 Certificates. The company markets their products internationally, in Lebanon, Iraq, the Gulf area, Saudi Arabia, the United States and other countries.

**The Supplier** is a leading organic fruit and vegetable farm established in 2010. It is located in Amman. It has about 30 employees. It is considered a certified organic farm with low impact and little waste. It produces over 50 varieties of vegetables and fruits. Production is seasonal; every season, it expands and improves the range of products, which changes throughout the year.

**The Customer** is a leading food distribution company and one of the largest in the Middle East. It was established in 1998 and is located in Amman-Jordan. It has more than 500 employees. It is certified with ISO 9001, HACCP, and ISO 22000 Certificates. This company focuses on delivering quality products, emphasizes customer satisfaction, and has a strong reputation in other Arab countries, Europe, the USA, and Canada. They have significant responsibility and transparency in delivering quality products and keep a strong reputation by working on suitable warehousing, transportation and distribution networks and exploring new technologies. **Table 4.10** below summarises general interviewees' descriptions of Case 2-Triad B.
Empirical Analysis of Triad B

The empirical work in Triad B was done in January 2021. Most interviewees stressed their awareness of EFSC. One notable quotation from C2SMM, “The connection of from raw material to manufacturing process till reaching the final customer, its destination outside Jordan borders it contains quality, in the land, air, sea logistics, regulations, taxes, agreements, supply-demand, data from the market, sales analysis, forecasting for the need of the market for that product and the volume of sales within in mass category”. Moreover, they emphasised the existence of disturbance in their EFSC. Another notable observation from C2MM highlighted the plethora of variables that affect their EFSC, “There are so many variables; it is not only to arrive at the products but so much between demand, problems of supply and delays in delivery at ports. Regulation, political, Say that if the importing country or our government puts in new regulation either to stop importing the product or exporting the product to price. Hence, the competitors have many restrictions. Within them, our company is affected by exportation. Hence, the prices become higher on imported countries so, affected our trade”. C2SCM pointed out the cascading problems caused by the COVID-19 pandemic: "With COVID-19, the problem was in shipping, closed the border, factories are closed; factories work with 20% or one shift only. Sure, sure, there is nothing that is not affected. Sure, if you said that some production lines are stopped is affected; second thing, if there are affected personnel with COVID-19, they closed, no production,
you stopped work so affected products, sure, they give us the minimum amount, so the ministry of trade daily follows us with our stock, third things, The countries around you also affected by coved-19 that affected us, if you bring from China”.

4.4.2.1 Interviews Insights – Case 2- Triad B

Supply Chain Network (SCN) – Case 2- Triad B

All the interviewees revealed an in-depth understanding of the SCN concept, highlighting the importance of the seven key Themes: Supplier-Customer Relationship, Multi-Tier Network, Lean Supply Chain, Risk Management, Digitalization, Innovation and Contracts. For instance, C2SCM explained SCN in EFSC, “I believe, first, you look to target countries that needed your goods, targeted people, study price and requirement of these countries of (documents, test, specification, legal documents required to enter this country) and facilitate the movement of information, product and build a strong relationship between the supplier, manufacturer and customer”. The challenges of COVID-19 further emphasized the importance of flexibility, resilience, and adaptability in these networks. Analysing the eight transcripts for Triad B featured a set of Sub-Themes for each key representative quotation linked to each sub-theme for SCN, as provided in Table 4.11.

- **Supplier-Customer Relationship:** Four Sub-Themes are discussed on the dyadic level in Triad B in EFSC.
  1. **Selection:** Five of eight interviewees stressed the importance of quality, word of mouth, and delivery time for selecting partners.
  2. **Monitoring:** Four of the eight interviewees employ third-party inspection or require documents or certificates for oversight.
  3. **Development:** Two out of eight interviewees reference the significance of development in technical knowledge, training and expertise in solving problems and improvement.
  4. **Trust:** Four of eight interviewees emphasize building a foundation of trust based on capability, prior experiences, and a solid reputation.
• **Multi-Tier Network:** Two Sub-Themes were revealed.
  1. **Collaboration:** Sixth of eight interviewees stressed that accurate forecasting is the main factor for planning supply and demand in the dynamic market change, thereby driving synchronized collaboration
  2. **Resilience:** Notably, three out of eight interviewees underscored the need for resilience within Triad B, suggesting proactive risk mitigation strategies, alternative suppliers and increasing production capacity, particularly after COVID-19.

• **Lean Supply Chain:** Two Sub-Themes emerged:
  1. **Waste Management:** Waste management is featured prominently. Five of eight participants highlighted their endeavours towards environmentally conscious initiatives such as green transportation, renewable energy adoption, water conservation through filtration for irrigation, lean manufacturing techniques, and time optimization.
  2. **Value Creation:** Value creation was highlighted by three out of eight respondents, who identified it through practices such as triple bottom line sustainability (TBL SUST), ensuring adherence to regulatory and quality compliance, and rigorous implementation of value streams and workflows. This was perceived as an ongoing initiative aimed at fostering consistent improvements.

• **Risk Management:** Risk Management was split into two main categories:
  1. **Internal Risk:** Three of eight interviewees believe in existing internal risk and manage it to avoid loss in their EFSC, pinpointing challenges like sudden demand, inventory shortage, storage constraints, and employee strikes.
  2. **External Risk:** A higher proportion, five out of eight, spotlighted external risks, singling out geopolitical dynamics like wars, export restrictions due to new governmental regulations, late notification, and global crises, exemplified by the COVID-19 pandemic.
• **Digitalization**: Participants acknowledged that the Sub-Themes:

1. **Advanced Digital Technology**: A portion of the respondents, three out of eight interviewees, encouraged technological adoptions, detailing the leverage of advanced technological tools in refining and supervising their operations.

2. **Information Systems**: A significant four out of eight highlighted the role of information systems in facilitating their daily operations, fostering new ideas, and, after COVID-19, pivoting towards digital communication platforms like Zoom for consistent collaboration.

• **Innovation**: Participants acknowledged that the Sub-Themes:

1. **Organizational Innovation**: Four out of eight interviewees recognized a culture of innovation within their organizations, accentuating the company's focus on quality and sustainability and giving incentives for new ideas.

2. **Product Innovation**: A slightly larger group, five out of eight respondents, drew attention to their continuous product innovation endeavours from market trends and digital platforms.

3. **Process Innovation**: Four of eight interviewees depend on technological innovation and continuous improvement in their processes.

• **Contracts**: Two Sub-Themes emerged:

1. **Formal Contracts**: Two of eight respondents pointed out that signing a **formal contract** can create a stable buyer-customer relationship and the reliability of quality and delivery of the product and coordination problems arising from sub-tier such as operational, reputational risks

2. **Informal Contracts**: Four out of eight, a more significant segment preferred more informal contracts that rely on a reputation and frequent interaction to foster long-lasting and mutually beneficial relationships. They conveyed a belief that in a personalized relationship, actors are more likely to be forthcoming about potential risks.
Table 4.11: SCN Perspective, Themes, Sub-Themes and Main Quotations (Case 2 - Triad B)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme</th>
<th>Main Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selection Activities</td>
<td></td>
<td>Maf2SCM said, “Our selection for suppliers is very selective; the reason we search for quality, not the supplier. We have criteria for a supplier as documents procedure in the quality department. Before being accredited, we should pass these procedures to make filtration for an approved supplier.”</td>
</tr>
<tr>
<td>Monitoring Activities</td>
<td></td>
<td>Maf2BDM said, “We evaluate our supplier according to quality procedures and inspect him and require documents and certificates. We have a BRC certificate that requires us to manage our suppliers, evaluates according to their mistakes, complaints, and quality of products; complies with requirements and delivery time, and health requirements in we make the first inspection and visit him before agree with, then visit him regularly to evaluate him every 3-6 months by inspection.”</td>
</tr>
<tr>
<td>Development Activities</td>
<td></td>
<td>C2MM said, “Give them a hint, we give them a signature taste from the importing country; the essential R&amp;D is in the factory itself responsible to development, it is their job, it is part his sustainable business, ”development is part of their job, not our job” if he has not an R&amp;D, it is a problem, they know where they are, what they want to develop where to reach, have indirect development with supplier, you proposed to supplier and he should invest for you, to work with you, there is a lot of suppliers who invest for you. Because we have a vision as a known company, that how much return, payback for than, and us when investing for.”</td>
</tr>
<tr>
<td>Trust</td>
<td></td>
<td>Maf2BDM said, “ We depend on a partnership with our distributors; we trust them. Otherwise, we do not work with them, they are interested, and we are interested in this relation.”</td>
</tr>
<tr>
<td>Collaboration</td>
<td></td>
<td>C2SCM said, “You plan to sell 100,000 cartons in the year for x item, okay forecasting is dynamic, increase and decrease; it depends on the market that happens and the seasonality, so in the forecast the will be an increase due to marketing that reflects on forecasting change, sometimes changeable the plan is put as steady yearly that will sell x in this year, but forecasting is changeable depend on the market. We are responsible for demand planning, what they want from goods, forecasting, until the clearance point of goods, to stores to the fleet of trucks, that all the points of SC.”</td>
</tr>
<tr>
<td>Resilience</td>
<td></td>
<td>C2SCM said, “People did not know, what covid19 is; each one told you are a hospital, each one country give a different solution, how to deal with it differ from other countries; Jordan closed on 2 cases of covid10 no one knew what to do …, I will tell you what you benefit from covid19, its benefit among others things, you depend on online to continuous of your work, each one has an online business, another thing has happened that ordering was depended online, each customer order by online applications, All these online applications is now available, your order and send, only B2B.”</td>
</tr>
<tr>
<td>Waste Management</td>
<td></td>
<td>Maf2BDM said, “I reduce the waste using 5S, it a lean tool, in production use it also, they make the area of packing near the production area, so decrease in waste of time to deliver it, or need a container, I decrease the number of employees.”</td>
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<tr>
<td>Value Creation</td>
<td></td>
<td>Maf2QC said, “Our employees have equal importance as our customers, creating learning opportunities for our employees related to lean approach besides their main job responsibilities, this added value to them and job satisfaction.”</td>
</tr>
<tr>
<td>Internal Risk</td>
<td></td>
<td>C2SCM said, “I am here for the distribution. I take all kinds of risks, such as financial risk; I pay directly to the factory. So I bear the risk of money if others do not pay money. Also, risks of damaged products through handling and risk of Sudden demand we introduce new plans to increase the stock, building more storage areas.”</td>
</tr>
<tr>
<td>External Risk</td>
<td></td>
<td>C2MM said, “The supply chain should look at the worst situation, not too pessimistic. In some countries, there will be a jump in prices since there is a disruption in their product due to the crisis. Like the war in Syria, Syria is considered an intermediate country; The routes increased from Jordan – Turkey, which took around five days; after the war, it changed through sea transport to Agaba port, so it took about one month, that increased time and cost.”</td>
</tr>
<tr>
<td>Advance Digital Technology</td>
<td></td>
<td>Maf2QM said, “there is much waste in Packaging machines, in grams, 4 – 10 grams, when you collect it at the end of the year, it becomes a lot, its money, so you buy new technology machines, it gives you high accuracy, every time we have new technology, and we introduce ERP system the directly connected with other departments even the stores.”</td>
</tr>
<tr>
<td>Information System/ Digital</td>
<td></td>
<td>Maf2QC said, “We now toward automation; it an integrated system; you see all processes on – line with on button it will be linked to your mobile, anything is done wrong it will give the alarm, monitoring by online. Inspection by online, release in one tab, see the procedure of the test, purchased are on the system; also we make a platform for integration all business administration as all worker can be online.”</td>
</tr>
<tr>
<td>Process Innovation</td>
<td></td>
<td>Maf2QM said, “we have already done all types of innovation. In the process, today, we, for some years, searched for a zero cost. We improve our process by working on other processes but using the same raw material; we improve it; we produce a new product, and we make sustainable production by recycling, reducing waste. We innovate to bring the sample by air duct, so I did not need an extra employee, decrease time.”</td>
</tr>
<tr>
<td>Product Innovation</td>
<td></td>
<td>Maf2SCM said, “we have time to think about new ideas, we always think of new products depending on trends from market, internet, it is like funnel we put ideas here, then you reach big idea, our top management want to ….. in front of other industry. We now aim to produce products friendly to the environment in packaging design, developing a healthier product (e.g., reducing preservatives).”</td>
</tr>
<tr>
<td>Organizational Innovation</td>
<td></td>
<td>Maf2SCM said, “I am a new employee in the company; I realized this company is concerned with quality and sustainability; it is a culture in a company. We promote a healthy lifestyle for sustainability; this is the global trend as our top management forms innovation committees from all departments for a new idea “.</td>
</tr>
<tr>
<td>Contracts</td>
<td></td>
<td>Maf2QM said, “The product from the local market is continuous purchasing order; I want to work with it, The first time we go to him, from here the relationship starts, we have built the trust, need the transparency of work, for example, the plastic factory internally we deal with it ok. It recorders. I have a person who follow the stock and makes an order regarding quantities you will benefit, and I will benefit, we are all happy, we have a season for raw material, I order more quantities where low price”.</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
Total Quality Management (TQM) – Case 2- Triad B

All participants expressed a deep interest in TQM's principles and current practices, particularly its impact on SUST. The emphasis was notably on the holistic implementation and profound understanding of TQM, encompassing its soft and hard elements. As Maf2SCM elucidated, “In my experience, quality is important. Your first look at the quality, then at other things; it tries to reduce variations and deviation to achieve customer need and satisfaction. The manufacturer is interested in his brand; he is interested in the quality of the product; the quality is followed from supplying to manufacturing to distribution to the end consumer; our work is the same internally or externally; quality helps you to take a certificate.”

Analyzing the TQM perspective in the eight transcripts for the Triad featured a set of Sub-Themes for each key theme, as the main representative quotations linked to each sub-theme are provided in Table 4.12.

- **Soft Factors**: The following four Sub-Themes were highlighted:
  1. **Customer Focus**: A significant number, five of eight interviewees, put customer focus at the top and continually strive to meet their evolving needs.
  2. **Education and Training**: Four of the eight interviewees deemed education and consistent training indispensable, advocating that the benefits of TQM would remain intangible without a qualified workforce.
  3. **Top Management Leadership**: Five out of eight interviewees highlighted the pivotal role of enlightened leadership at the top echelons in driving quality initiatives.
  4. **Supplier Relationships**: Three out of eight participants spotlighted the significance of fostering collaborative supplier partnerships, asserting their role in upholding quality throughout the EFSC.

- **Hard Factors**: The following five Sub-Themes were highlighted:
  1. **Continuous Improvement**: A majority, five of eight interviewees considered an organization's survival on continuous improvement.
  2. **Process Management**: Process management emerged as a focal point for four out of eight respondents, emphasizing its centrality in the TQM framework.
3. **Quality Tools and Techniques**: Three out of eight interviewees highlighted the effectiveness of quality tools and methodologies, underscoring their efficacy in spearheading quality management initiatives.

4. **Product Design**: Three of eight interviewees' results show that product design is a critical function across the EFSC, especially when sustainability is at the forefront.

5. **Statistical Process Control**: A smaller group, two out of eight, highlighted their implementation of SPC, emphasizing its role in their operational processes.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme</th>
<th>Main Quotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft Factors</td>
<td>Customer Focus</td>
<td>Maf2BDM said, “sure; sure, it is an integrated relationship, continuous exchangeable knowledge, we have a strategy of open doors to all customers, no hidden data, we do not have fear, of course, it is a needed relation, our goals are clear, we focus on all customers inside and foreign countries.”</td>
</tr>
<tr>
<td></td>
<td>Education and Training</td>
<td>Maf2SCM said, “Training will be in software, the employee will receive an invitation for training, then take training, and complete database, all our team communicate and transfer to have educated employee, It is a continuous exchangeable knowledge.”</td>
</tr>
<tr>
<td></td>
<td>Top Management Leadership</td>
<td>Maf2BDM said, &quot;Top management supports us; he is very supportive and gives us the freedom to improve. We deal as work with each other as a family, not as a company; that is an effect of our leadership.”</td>
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<tr>
<td></td>
<td>Supplier Relationship</td>
<td>S2MM said, “We go back and meet with suppliers always to meet our requirements. We determine seed from agents or go to the country and visit and choose which kind we want and direct us in site, diseases, and irrigation.”</td>
</tr>
<tr>
<td>Hard Factors</td>
<td>Continuous Improvement</td>
<td>S2BDM said, &quot;we are considered the biggest in organic agriculture, so continuous improvement is important; we also still learn and improve that because to keep our progress, it was taken us four years to increase the productivity in 2010, it starts, it starts as private farm them become a commercial farm.”</td>
</tr>
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<td></td>
<td>Statistical Process Control</td>
<td>C2MM said, &quot;We inform our supplier logistic team of all those related to the matter until deciding where the error is. Takes data from the ERP system to an excel sheet, then use it to give me the results required.”</td>
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<tr>
<td></td>
<td>Process Management</td>
<td>C2SCM said, “Instead of the factory having a department for distribution, it now like this: instead of concentrating on distributing, I want to focus on the manufacturing process. Its efforts to reduce variations and deviation.”</td>
</tr>
<tr>
<td></td>
<td>Quality Tools and Techniques</td>
<td>C2SCM said, &quot;Our meeting on rooms on site with numbers data growth, all the charts on the front, what produce and compare it monthly with real production compare with our plan.”</td>
</tr>
<tr>
<td></td>
<td>Product Design</td>
<td>Maf2BDM said, “Our company, we have met, and sometimes suggest new ideas on new products, we study his idea and work on it, for example, suggested a product we make the first trial, it is with meeting with customer, supplier, our customer from Japan, come here.”</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
Sustainability (SUST) – Case 2 - Triad B

The interviewees, guided by their understanding of the Triple Bottom Line (TBL) sustainability framework, shared insights regarding its application within their work and interactions in the existing Triad. Maf2SCM defined SUST as” SUST is seen as a continuity of organization in the process, operation and sustain the environment, for example, change from plastic to paper cups, all that to environmental sustainability and healthy to consume and also take consideration of social. We always try to find and hear all our stakeholder's requirements”. Analysing the SUST perspective in eight transcripts for Triad B featured a set of Sub-Themes for each key theme. The main representative quotations for SUST are depicted in Table 4.13.

- **Economic:** Five Sub-Themes emerged for the economic theme:
  1. **Profit:** The sixth of eight interviewees demonstrated profit issues in Jordan.
  2. **Market Expansion:** Five out of eight interviews engaged in practices that resulted in market performance and expansion.
  3. **Customer Return:** Five out of eight sought customer returns.
  4. **Operation Cost:** Seven of eight interviewees explained the significance of operational costs.
  5. **Certification:** Six of eight interviewees acknowledged the importance of obtaining certifications.

- **Environmental:** The environmental theme is the most prominently featured in analyzing Triad B. Five Sub-Themes emerged:
  1. **Resource Consumption:** A significant seven out of eight emphasized the need for resource utilization.
  2. **Recycling:** Three of eight interviewees reported incorporating recycling practices.
  3. **Efficient Transportation:** Five of them identified efficient transportation and its value.
  4. **Choosing Partners based on Environmental Practices:** Five of eight interviewees prioritize suppliers who maintain environmental standards.
• **Social**: Eight Sub-Themes of the social theme were identified for Triad B.

1. **Employee Rights**: Six of eight interviewees emphasized that employee rights and benefits contribute to social SUST at Triad B.

2. **Community Concern**: Five of eight interviewees highlighted their engagement with local community concerns.

3. **Reputation**: Seven of the eight interviewees believed in the importance of maintaining a reputation.

4. **Transparency in Product Labelling**: Four among eight interviewees indicated the importance of transparency in product labelling with the new market trends and awareness of customers.

5. **Traceability**: The six interviewees pointed out its emerging importance.

6. **Stakeholder Engagement**: Two of the eight interviewees emphasized stakeholder involvement in promoting sustainability.

7. **Diversity**: Six of eight respondents identified its relevance in Triad B.
Table 4.13: SUST Perspective: Themes, Sub-Themes and Main Quotations (Case 2-Triad B)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme</th>
<th>Main Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>Profit</td>
<td>Maf2QM said, &quot;From my experience of 30 years, I tell you that my profit is quality, quality, that the customer takes the product from shelf upon I put it&quot; all the industry looking to the cost, always reducing the cost is by the quality, our price on the market is little more than others, that is because we give them a quality product.&quot;</td>
</tr>
<tr>
<td></td>
<td>Certification</td>
<td>Maf2QM said, &quot;We have BRC. It opens us to export about 51 countries, Australia, Canada, Germany, Japan, ISO, Halal certificate, FSC 22000 that related to food, these having like this international certificate.&quot;</td>
</tr>
<tr>
<td></td>
<td>Operation Cost</td>
<td>Maf2QM said, &quot;We have already done all types of innovation. Today, we searched for a zero cost with some years in the process. How? We put solar panels. We put on grid in past two years you give back electricity to company. Also, we included on-grid, use what you produce on thermal oil, the heating of oil heaters instead of working on fuel that works on electricity, anything inside the factory on electricity.&quot;</td>
</tr>
<tr>
<td></td>
<td>Market Expansion</td>
<td>Maf2BDM said, &quot;Today, we see an increase in demand, not the main reason is the high demand only, maybe its indicator that you export to new markets. “</td>
</tr>
<tr>
<td></td>
<td>Customer Return</td>
<td>Maf2SCM said, &quot;Today in your design, in export, in the product itself, you bring from the best supplier to make a product with high quality, that product of high quality, lastly, will find his customer, that customer has a repeating purchase due to quality, taste, that will make sustainability for you to be in market ..... (if a poor quality product we will die).&quot;</td>
</tr>
<tr>
<td></td>
<td>Resource Consumption</td>
<td>Maf2SCM said, &quot;We work on solar heating on PV for electricity, and We make energy audit as second party ad consulting ISO 50001; we take a report and work on their recommendation on saving in energy, water, raw material. It is a specialized company that make gaps and recommendation in energy, and electricity; every year, make our practical recommendation not only to be theoretical.&quot;</td>
</tr>
<tr>
<td></td>
<td>Recycling</td>
<td>Maf2QM said, &quot;A machine compresses waste of packing we installed and then sends it back to Recycling companies.&quot;</td>
</tr>
<tr>
<td></td>
<td>Efficient Transportation</td>
<td>C2SCM said, &quot;Some people try to change the way of transporting, and the cheapest one is the marine. Land transport also is effective such Saudia.&quot;</td>
</tr>
<tr>
<td></td>
<td>Choosing Partners on Environmental Practices</td>
<td>S2BDM said, &quot;Our customers select us because we are the only organic farm that can produce in large amounts; it has become our requirement to be sustainable.&quot;</td>
</tr>
<tr>
<td>Social</td>
<td>Reputation</td>
<td>S2MM said, &quot;It depends on reputation; they come and select us and our products; it depends on the type of product we produce.&quot;</td>
</tr>
<tr>
<td></td>
<td>Diversity</td>
<td>S2BDM said, &quot;There are always new products not found in the market that were not found before.&quot;</td>
</tr>
<tr>
<td></td>
<td>Traceability</td>
<td>Maf2QM said, &quot;We have traceability for the product batch. Each quantity knows where it is going, electronic data system through ERP, and a logistic system tracking the location of our cars.&quot;</td>
</tr>
<tr>
<td></td>
<td>Transparency in Product Labeling</td>
<td>Maf2BDM said, &quot;Each country has special label requirements that increase our complexity to comply with different requirements and standards. You should be sure within this; I reflect that on my labelling.&quot;</td>
</tr>
<tr>
<td></td>
<td>Employee Rights</td>
<td>C2MM said, &quot;Our customers require social responsibility such as the type of labour force, safe workplace, personal safety regulation like boots and high head discrimination must be avoided; women ration 20% - 30%. That we comply with ..&quot;</td>
</tr>
<tr>
<td></td>
<td>Community Concern</td>
<td>S2 MM said, &quot;We employees from the region, people when need work, help in support students at university to pay their fees, there is always helping and donation in food and money.&quot;</td>
</tr>
<tr>
<td></td>
<td>Stakeholders Engagement</td>
<td>C2SCM said, &quot;now we make the tasting meeting with our stakeholders take their point of view of a product, to feel they are part of that product. We give them free product samples. They feel they are the owner of that product&quot;.</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
QDS in EFSC- Case 2- Triad B

The interviewees expressed an understanding of QDS in EFSC. S2BPDM explained that Quality and SUST go hand in hand with QDS: "Quality and SUST, they are going parallel. Quality will reduce cost; raw material costs indirectly affect SUST. You cannot sustain without quality {… } more quality, the more sustainable with export; it is not the quality of the product only. It is the quality of service, relationships, and lead time [...]. The most important thing I look to is quality; the first thing is quality, no, not the price. By quality, you continue selling. We look to quality is our SUST {…}. you should consider the environment and social issue”.

This is explained by S2BPDM, who stated, “The more quality your more SUST with export, it is important for green our company image; our vegetables from a certified organic farm with pesticides residue, water quality and our packing are environmentally friendly. Also, you do not destroy a lot of returned final goods; there is some why you do not reproduce reused products collected from end-users in the centralized center; they consider logistic tracking systems in the location, our cars, loading of trucks, introduce GPS, sensor and become an automated system, these stores transit to electrical not using diesel, solar panel to reduce using electricity we make energy audit as second party ad consulting ISO 50001 we take a report and work on their recommendation on saving in energy, water, raw material”. The following Sections discuss the key Themes from the key perspectives: SCN, TQM, and SUST supporting QDS in EFSC.

All interviewees are concerned with the information and current practices related to QDS and their impact on SUST performance. They emphasised a particular quality implementation on the product, process, and supply chain levels. They deployed a change to sustainable practices on product, process and supply chain to achieve SUST performance.

Upon evaluating the eight transcripts, several Sub-Themes emerged:

- **Quality:** The following three Sub-Themes were highlighted:
  1. **Product:** Seven of eight stressed product quality, adhering to specific specifications.
2. **Process**: A majority, six out of eight, emphasized process quality, mainly through integrated quality systems and third-party audits. Such measures have become prerequisites for entering specific markets and have led to the adoption new management systems, such as organic certification and improvement process control.

3. **Supply Chain**: Three of eight interviewees highlighted supply chain quality, emphasizing service and an automated tracking logistic system, which ensures timely, efficient deliveries and flexible and online purchasing.

- **Sustainability Practices**: The following three Sub-Themes were highlighted:
  
  1. **Sustainable Product**: All eight interviewees considered the importance of developing improved sustainable products. Examples included organic products free from adding synthetic fertilizers and chemicals, fortified with higher nutrient content, and incorporating eco-friendly packaging such as paper cups.

  2. **Sustainable Process**: Four out of eight emphasized sustainable processes. This approach prioritizes energy and resource conservation while minimizing waste and mitigating adverse environmental impacts.

  3. **Sustainable Supply Chain**: Three of eight interviewees highlighted the effectiveness of implementing a sustainable supply chain, which involves centralized return product collection points and the optimization of transport routes to cut emissions. This method is also seen as a way to minimize food wastage.

- **Sustainability Performance**: The following three Sub-Themes were highlighted due to the co-implementation of TQM and SUST practices.

  1. **Economic**: Five of eight interviewees observed economic growth resulting from quality and sustainability implementation across processes, products, and supply chains, leading to increased profits and employee earnings.

  2. **Environmental**: Four of eight interviewees considered implementing QDS to improve environmental performance, including recycling, waste management, and an efficient transport system with minimal environmental effects.
3. **Social**: Sixth of the eight interviewees emphasized social performance, pointing towards community engagement, employment, and heightened concern for employee well-being and environmental sustainability.

4.4.2.2 *Observations Finding – Case 2 - Triad B*

Observations were conducted at each actor in Triad B in January 2021: the manufacturer (vegetable and beans canned food factory in Amman), supplier (farm) and customer (distributor in Amman). The meeting and tours emphasised the Themes and Sub-Themes identified from the interview responses.

**Participant Observations of Case 2 - Triad B**

*Participant Observation at the Manufacturer in Case 1- Triad A:*

- **Duration**: 45 minutes.
- **Organizer**: Manufacturer.
- **Observation**: Interestingly, a key customer visited the production line — from raw material sourcing to the final product. This also included reviewing various QM and sustainability documents, procedures, and records. Discussions revolved around new organic product specifications, design, collaboration, and the pooling of expertise, especially environmental packages. They provide their knowledge regarding the supplier of raw materials.
- **Derived Themes and Sub-Themes:**
  - **SCN**: Supplier-Customer Relationship: Monitoring and Development; Multitier Network: Collaboration, Innovation
  - **TQM**: Product Development and Process Management
  - **SUST**: Economic SUST - Diversity Product, Social: Transparency of Labelling, Environmental: Resource Consumption and Choosing a Partner on Environmental Practices.

*Non-Participant Observation at the Manufacturer in Case 2 - Triad B*

- **Duration**: 15 minutes.
- **Organizer**: Quality Manager at the Manufacturer.
• **Observation:** The author made a tour of the raw material stores, passed through the production line, and reached the final stores. She provided insights into production processes, quality control measures (batch records, quality control records, and standard operating procedures) and certifications, such as the halal and BRC certifications. The author also noted that employees adhered to safety measures, with some having disabilities. The author saw different recyclable and environmental packaging with different materials and clear labelling.

• **Derived Themes and Sub-Themes:**
  - **SCN:** Lean Supply Chain, Digitalisation and Innovation.
  - **TQM:** Process Management, Quality Control Tools and Techniques.
  - **SUST:** Social, Employee Rights, Transparency in Labelling and Economical-Product Diversity, Environmental-Resource Consumption.

**Non-Participant Observation at Supplier in Triad B,**

• **Duration:** 20 minutes.

• **Organizer:** Quality Manager at the Manufacturer.

• **Observation:** The researcher's visit to the farm highlighted organic farming methods, labour conditions, safety measures, and integrated farm management systems. Moreover, the researcher visited the management offices and saw an information system integrated with the farm.

• **Derived Themes and Sub-Themes:**
  - **SCN:** Lean Supply Chain and Innovation.
  - **TQM:** Process Management, Continuous Improvement.
  - **SUST:** Social, Employee Rights, Community Concern, and Economical-Product Diversity, Environmental-Resource Consumption.

**Non-Participant Observation at Customer in Triad B,**

• **Duration:** 15 minutes.

• **Organizer:** Quality Manager at the Manufacturer.
• **Observation**: The tour revealed modern office spaces, warehousing facilities, and an advanced truck fleet equipped with modern maintenance facilities, emphasizing temperature, humidity, hygiene, and safety, including a comfortable working environment.

• **Derived Themes and Sub-Themes**
  - **SCN**: Digitalisation.
  - **TQM**: Top Management Leadership, Quality Control Tools and Techniques.
  - **SUST**: Social, Employee Rights, Transparency in Labelling and Economical-Product Diversity, Environmental-Resource Consumption.

4.4.2.3 Secondary Data Insights - Case 2 - Triad B

Upon analyzing secondary data about the participants of Triad B in the EFSC (outlined in Table 4.1), several findings emerged:

1. **Responsibility and Sustainability**: Each actor demonstrated greater responsibility, emphasising sustainability (SUST) and maintaining product quality.

2. **Certification and Standards**: The actors adhere to various international quality standards. The presence of ISO 9001, HACCP, organic, and clean production certificates underscore their commitment to best practices and quality assurance of quality, safety, cost, and delivery time.

3. **Technology Adoption**: To guarantee a consistent food supply characterized by quality, safety, cost-effectiveness, and efficient distribution, these actors are leveraging modern technologies. This involves using platforms and mobile apps pertinent to their industry.

4. **Organic Practices and Inspection**: The emphasis on organic certification reinforces a proactive approach to sustainability. Moreover, rigorous health and safety inspections are conducted, adhering to the best manufacturing practices outlined by the Jordan Food Drug Association (JFDA).

5. **Social Responsibility**: These actors are committed to social responsibility. This is evident in their ongoing community outreach programs like awareness days, participation in food festivals and exhibitions, and contributions during crises, such as donations to the Ministry of Health amid the COVID-19 pandemic and support to the cancer center.
6. **Financial Sustainability**: The annual reports and data from the Amman stock exchange indicate that these companies have maintained financial stability in the market.

4.4.3 Case 3 - Triad C

*Figure 4.3* delineates the supply chain network in Triad C, elucidating the intricate web of interactions, processes, and relationships among the actors. Triad C comprises three actors: **Supplier-Manufacturer-Customer**, located in Jordan. For the last ten years, the three actors have collaborated to provide customers with various high-quality, sustainably produced canned food items within the EFSC framework. The structure of Triad C can be classified as a "Closed Triad," marked by direct contractual dyads between the three actors.

![Figure 4.3: Depiction of Closed Triad C – Case 3](Source: The Researcher)

**Actors in Supply Chain of Case 3 - Triad C:**

**The Manufacturer** is a meat factory established in 1992 with a long-standing brand for processed meat products (canned meats, cold cuts, and frozen food) in the Sahab area, Jordan. It always adopted the latest technologies to create new products with the highest quality and safety standards in food production. It is a market leader in exporting to markets beyond Jordan, for example, Kuwait, Qatar, Oman, Yemen, Bahrain, Syria, Lebanon, KSA, UAE, Turkey, Sweden, China, Australia, USA and European countries and upholding consumer trust through its high-quality products. It had the most capable and experienced employees, consisting of 528 Jordanian employees. It maintains an integrated management system of these certifications, such as ISO 9001, ISO 22000, ISO 14001, HACCP, Jordanian Halal Certificate and ISO 45001. So, it is responsible for contributing to the community and environmental focus.
**The Supplier** is a leading Jordanian Poultry Company that was established in 1997. It is located in Qatarneh - in the south of Jordan. Being a leader in Jordan and having a continuous commitment to quality, reliability, and stability has allowed for its expansion to neighbouring Arab countries, such as Iraq, KSA, UAE, Oman, Qatar, Egypt, and Bahrain. It meets customers' needs and changes in the marketplace by providing a wide range of quality products produced with international quality and safety standards ISO 9001, HACCP and Good Manufacturing Practices (GMP), providing more than 1,500 jobs for local males and females. Product Development and Innovation in their production are by using high technology, quick responses to product development to meet the continuous changes in consumer behaviour and an attitude and commitment to environmental and community development, the local community, water and wastewater management, and energy management. They also make sure they maintain a safe workplace environment.

**The Customer** is a wholesaler that was founded in 2016. It is located in Amman with 20 employees. The adoption of technology in the sense of electronic commerce and starting a digital transformation has disrupted the traditional buying experience and improved the wholesale business. It has steadily been growing and earning great trust, increasing its customer base internally and externally and penetrating new markets with a well-established, secure, reliable and experienced e-commerce platform and e-commerce mobile applications. Its platform is a unique tool to connect distributors and points of sales in one place for efficiency. There is a complete process from processing customer orders to fulfilling and transporting. Transportation costs are reduced to increase sales, expand distribution, and avoid human interaction. **Table 4.14** provides general information about the eight interviewees for Case 3. This table comprehensively summarises the eight Case 3 - Triad C interviewees, detailing their backgrounds, roles, and insights. (The actual table contents are not provided here, but it is understood that they pertain to the interviewees' descriptions).
Table 4.14: Interviewees' Description of Case 3 - Triad C

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Trial</th>
<th>Job Title</th>
<th>Abbreviation</th>
<th>Age</th>
<th>Experience (years)</th>
<th>Gender</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supplier</td>
<td>Supply Chain Manager</td>
<td>S3SCM</td>
<td>40-45</td>
<td>17</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
<tr>
<td>2</td>
<td>Supplier</td>
<td>Quality Assurance and Health, Safety, Environment Manager</td>
<td>S3QAHSEM</td>
<td>40-45</td>
<td>15</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
<tr>
<td>3</td>
<td>Manufacturer</td>
<td>Quality Manager</td>
<td>Maf3QM</td>
<td>40-45</td>
<td>14</td>
<td>Female</td>
<td>Master</td>
</tr>
<tr>
<td>4</td>
<td>Manufacturer</td>
<td>Marketing Manager</td>
<td>Maf3MM</td>
<td>45-50</td>
<td>20</td>
<td>Male</td>
<td>Master</td>
</tr>
<tr>
<td>5</td>
<td>Manufacturer</td>
<td>Planning Manager</td>
<td>Maf3PM</td>
<td>35-40</td>
<td>9</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
<tr>
<td>6</td>
<td>Manufacturer</td>
<td>Production Manager</td>
<td>Maf3PrM</td>
<td>45-50</td>
<td>18</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
<tr>
<td>7</td>
<td>Customer</td>
<td>Supply Chain Manager</td>
<td>C3SCM</td>
<td>40-45</td>
<td>10</td>
<td>Male</td>
<td>PhD</td>
</tr>
<tr>
<td>8</td>
<td>Customer</td>
<td>Business Development Manager</td>
<td>C3BDM</td>
<td>30-35</td>
<td>6</td>
<td>Female</td>
<td>Master</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

Empirical Analysis of Triad C:

In March 2021, eight interviews were conducted in Jordan. Most interviewees focused on their understanding and experiences with EFSC, especially under the lens of Maf3PM, “A chain related to an export opportunity that requires extra costs (shipping fees, customs fees) when there are agreements and facilities in cooperation, it becomes an easier process in export, it is strategic thinking to compete in the export market start from enquiry order, until finalizing the agreements and receiving, determine the country requirements, managing all related process information and money”. However, the participants also underscored the challenges and disruptions in the export food supply chain. As C3BDM articulated,” Disturbance could be political such internal wars in Iraq, Syria; the relation between counties, Regulation is changeable, and sometimes suddenly, we were not notified new regulation Such KSA want a particular certification company also is standards related to each country like Europe, USA, each require different quality you need to change the formula of production. Moreover, in logistics, time of orders and the delivery date of the consignee, fluctuation in prices, especially the shipping, raw material and packaging, blocked suppliers like Belgium with the disease with meat".
C3SCM brought attention to the unique disturbances induced by the COVID-19 pandemic, saying “Is something different, there is a sudden high demand from all the countries with different requirement so cannot achieve the targeted, you deal with external suppliers, in this also has a sudden demand, that not have enough time to supply you with raw material, also, exportation procedures is restricted, delay and shortage in export shipments, that led to increase in prices to 50%, Also the closed boarders, search for the costly decrease in manpower so decrease the production capacity, so this decrease our profit because the high cost of operation”.

4.4.3.1 Interviews Insights - Case 3 - Triad C

Supply Chain Network (SCN)- Case 3- Triad C

All the interviewees revealed an excellent knowledge of the SCN concept. They highlighted its critical components as Supplier-Customer Relationships, Multi-Tier Networks, Lean Supply Chain, Risk Management, Digitalization, Innovation and Contracts. As described by S3SCM regarding SCN, “It is a connected and integrated chain, needs to control and facilities cooperation in all the process, information between all related actors’ supplier, manufacturer and customer, and there is always a challenge there is a delay in shipping congestion in high seasons, regulations”. Table 4.15 below depicts the Illustrative quotations of interviewees’ own words, which capture their experiences, beliefs and behaviour about the SCN perspective.

- **Supplier-Customer Relationship:** Analyzing the eight transcripts for Triad C featured four Sub-Themes, which are discussed on the dyadic level in Triad B in EFSC.
  1. **Selection:** Seven of eight interviewees discussed their selection's importance based on quality and delivery, certification, cost, and environmental concerns.
  2. **Monitoring:** Seven out of eight interviewees highlighted self-monitoring by questionnaire and yearly on-site visits or third-party auditing requirements.
  3. **Development:** Five among eight interviewees reference development according to new trends in the market in the form of training on technology and solving technical problems.
  4. **Trust:** Seven out of eight interviewees comment on trust due to familiarity and the history of previous interactions with higher frequency and duration.
• **Multi-Tier Network**: Two Sub-Themes appeared from analyzing eight transcripts for Triad C.

1. **Collaboration**: All eight interviewees stressed the importance of accurate forecasting and planning, emphasizing a collaborative spirit in the supply chain based on the expectation of the financial year.

2. **Resilience**: All eight interviewees are ready to recover from any disaster, crisis or disruption and emphasise timely information sharing and alternative suppliers to mitigate supply chain disruptions.

• **Lean Supply Chain**: Two Sub-Themes generated from synthesising interview responses for Triad C.

1. **Waste Management**: Waste management is featured prominently among the eight as they work to reduce waste through technology, reducing time, recycling, and being paperless.

2. **Value Creation**: Six of eight interviewees mentioned the need to add value across various aspects of their operations, creating value in terms of the triple bottom line of their products through employees constantly learning how to apply value stream mapping of processes and collaborating to devise new concepts and innovation as managers go to the workplace to see where value is being created.

• **Risk Management**: Risk management was split into two main categories:

1. **Internal Risk**: All eight interviewees shared their concerns about potential disruptions arising from internal operational dynamics, delivery dates, and changes in demand that could disrupt the upstream supply chain due to poor planning capability in sub-tiers SC.

2. **External Risk**: All eight respondents stressed that external geopolitical situations, such as wars in Iraq and Syria, suddenly notified new regulations related to export markets, which caused a scarcity of critical raw materials.

• **Digitalization**: Participants acknowledged that the Sub-Themes are

1. **Advanced Digital Technology**: All eight participants indicated the inevitable integration of technology into operations, with the majority showcasing a proactive approach.
Including online platforms, digitalization of business administration systems, and customer platforms.

2. **Information Systems:** Seven of eight interviewees encouraged new information systems, such as ERP systems, sensors and logistic tracking systems, for supply chain connection.

- **Innovation:** Participants acknowledged that the Sub-Themes. All of the interviewees seek innovation in their SC.
  
  1. **Organizational Innovation:** Seven among eight participants believe that organizational innovations produce a change in culture, self-learning and education from the internet, as top management requires a new idea yearly.
  
  2. **Product Innovation:** Seven among eight of the interviewees focused on improving product characteristics, as there is new product innovation every year.
  
  3. **Process Innovation:** Seven among eight interviewees have introduced automation machines and expanded on new lines production, the speed of process and production capacity to improve quality and reduce cost.

- **Contracts:** Contracts were split into two main categories:

  1. **Formal Contracts:** Seven among eight respondents favoured contracts for their precision and security, including quantity and quality, delivery, innovation, environmental and social conditions, and avoiding rising prices from uncertainties. They help each other in Case of a product recall.

  2. **Informal Contracts:** Six among eight respondents prefer verbal contracts due to their flexibility, avoiding penalties and handling problems quickly.
## Table 4.15: SCN Perspective - Themes, Sub-Themes and Main Quotations (Case 3 - Triad C)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme</th>
<th>Main Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lean Supply Chain</strong></td>
<td><strong>Selection Activities</strong></td>
<td>Maf3QM said, “I make for them qualification by our management system for any new supplier that provides us with pre-shipment sample according to my specification then I tested it according to my specification, if pass, these I require trial shipment (100Kg) if passed I go to more quantity of shipment (3 trials) so quality – cost – delivery time.”</td>
</tr>
<tr>
<td><strong>Monitoring Activities</strong></td>
<td>Maf3QM said, “monitoring my supplier regarding certification, but if not have a certification, I evaluated by HACCP system, an internal system, so it depends on the type of raw material regarding a customer.”</td>
<td></td>
</tr>
<tr>
<td><strong>Development Activities</strong></td>
<td>Maf3QM said, “There is always development in solving problems by brainstorming that happens when air enters, and the meat is destroyed so we make development with the supplier to solve the problem such Easy open rectangular, that is laser cut for easy open) to a patent company external (Holland supplier.)”</td>
<td></td>
</tr>
<tr>
<td><strong>Trust</strong></td>
<td>Maf3MM said, “we trust them, that thing distinguished our company, the distributors are known for us, we know the past performance we deal with them since ten years, we trust them they have a good infrastructure, to deal with our products, We do not deal with any customer, we have success stories; the information we get from them we are using it for any personal thing, but we use it to help us.”</td>
<td></td>
</tr>
<tr>
<td><strong>Collaboration</strong></td>
<td>C3SCM said, “We are a pioneer in the world, not only Jordan. Our goal is to increase companies’ sales and make a sustainable supply chain through (planning, forecasting, replenishment, time management, reducing cost, and risk management). Because there are seasons such as Al-Futar, Asha, and Ramadan, these are high seasons where demand is increased up …..up. The salary week, so the demand is increased by salary week. Pre-salary week, there is a drop.”</td>
<td></td>
</tr>
<tr>
<td><strong>Collaboration</strong></td>
<td>C3SCM said, “In each region, you should have a distribution centre. If there are disconnection and disruption, you can supply each region (like Jordan, we have five regions) you can deliver through in the disruptions.”</td>
<td></td>
</tr>
<tr>
<td><strong>Supplier-Customer Relationship</strong></td>
<td><strong>Waste Management</strong></td>
<td>Maf3QM said, “We targeted in 2020 is lean, and waste management since the waste of meat is high if we work there is a significant effect waste – raw material – energy-water by working with a non-governmental organization in the lean project, kaizen principle took and machine.”</td>
</tr>
<tr>
<td><strong>Creation Value</strong></td>
<td>Maf3MM said, “Today, always monitor all relevant stakeholders and make the market analysis as there are changing value perceptions for our products to be environmental and social sustainability that will add sufficient value to the product and distinguished from competitors.”</td>
<td></td>
</tr>
<tr>
<td><strong>Internal Risk</strong></td>
<td><strong>Random Risk Management</strong></td>
<td>Maf3QM said, “we have a clear risk management plan from 4 years ago with responsible persons; we have HACCP, ISO 22000 certificates. So all these certificates help you to avoid any risk. HACCP certificate is built on critical quality control points and risks in the production process and, at the same time, how to avoid or find a solution for risk in process and quality.”</td>
</tr>
<tr>
<td><strong>External Risk</strong></td>
<td>Maf3PM said, “Your company will stop and be back if it does not accompany the new improvement in technology … The vans and stores have sensors; these sensors are connected with a system with alarms for checking the temperature and humidity”. GPS in vans. Frankly, there is an investment in technology. We have ERP systems, all orders and work, no person talks with each other, that make facilitation in work and decrees waste of time. SAP system in our stores, other software analyze data chart, Logistic tracking systems, warehouse management to make tracking and traceability by next year.”</td>
<td></td>
</tr>
<tr>
<td><strong>Digitalization</strong></td>
<td><strong>Advance Digital Technology</strong></td>
<td>Maf3PM said, “I give an example that knife, either you believe or not believe, it will cut. At the same, technology comes; whether you believe in technology or not, we merge innovation and technology. So we improve our online distribution platform (which does not exist before, not depend on human resources which, customers, suppliers and manufacturers online.”</td>
</tr>
<tr>
<td><strong>Product Innovation</strong></td>
<td>Maf3MM said, “I have been here since 2013, and there is much innovation; we are a leader in some products; for example, the new product, you do not find in Arab region like its I told you Arab region, not Jordan, through it the innovative, I fill the gap in the market Our name brand is known in the market you know. Hence, there is a continuous improvement in the product through R&amp;D, Innovation products in halal food as people more aware of ingredient food.”</td>
<td></td>
</tr>
<tr>
<td><strong>Process Innovation</strong></td>
<td>Maf3PRM said, “Innovation in washing system of cans replaced by air suction. Also, also, Innovation in the speed of process we transfer the speed of lines so production capacity.”</td>
<td></td>
</tr>
<tr>
<td><strong>Organizational Innovation</strong></td>
<td>Maf3QM said, “my success today is a result of my work, my teamwork, and supporting my employees; we target our customer requirements. We read, have a culture, have educated, build relationships with local experts, and work with the university and government to identify new opportunities for learning and growth. We encourage Innovation through prizes for any innovative idea.”</td>
<td></td>
</tr>
<tr>
<td><strong>Contracts</strong></td>
<td><strong>Formal Contract</strong></td>
<td>Maf3MM said, “It is known that we have not changed our suppliers much. We contract only to the companies we have verified or use approved supply chain actors willing to commit. However, I believe that it is one of the best ways to eliminate any possible risks from the beginning; after Covid 19, I make a yearly contract with shipping companies instead of shipping directly from the supplier, which may help me increase the efficiency of shipping and reduce the risk of delay in shipment and financial risk.”</td>
</tr>
<tr>
<td><strong>Informal Contract</strong></td>
<td>Maf3PRM said, “I move... more closely to them, the only way through which you are getting more from them, because you have taken the relationship to a personal level and trust and communication in the early stages, the other party would not see any reason to hold back anything. We need transparency; I will not pay in blinding; let us talk in South Africa, it far away from you, so how do you know about him it took one year to study; I am concerned about its reputation and quality also, we agree on the margin of profit in the long term and then Reducing the risk of future non-conformances and make an effective decision on a true capability before a contract is agreed.”</td>
<td></td>
</tr>
</tbody>
</table>

(Source: The Researcher)
Total Quality Management (TQM) - Case 3 - Triad C

All interviewees are concerned with understanding TQM and its associated practices, underscoring its influence on SUST. The overwhelming consensus was on the interdependent nature of soft and hard TQM factors, as elaborated by Maf3PRM, “We sometimes think quality related to finished product only that arrived the customer. No. It is related to quality, from thinking of producing that product to reaching the final consumer. It should concern specification, transport, storage, test, and production processes. It would be best to have a solid quality system that guarantees all the processes for Doing what is right and compliance with the regulations and requirements of markets, so customers focus”.

Table 5.16 provides the main representative quotations for each sub-theme of the Themes for the TQM perspective.

- **Soft Factors:** The following four Sub-Themes were highlighted from the eight transcripts for Triad C.
  1. **Customer Focus:** Seven among eight interviewees put **customer focus** at the top of the pyramid.
  2. **Education and Training:** Seven among eight interviewees accentuated the indispensable nature of education and training, labelling them as pivotal for retaining top-tier talent.
  3. **Top Management Leadership:** Seven among eight interviewees stressed that proactive leadership at the top is vital for ingraining quality across the board.
  4. **Supplier Relationships:** Sixth among eight interviewees suggested cooperative supplier relationships.

- **Hard Factors:** The following five Sub-Themes were highlighted from analyzing the eight transcripts for Triad C.
  1. **Continuous Improvement:** All eight interviewees considered continuous improvement for an extended sustainability period.
  2. **Process Management:** All eight interviewees stressed the role of efficient process management in TQM.
3. **Quality Tools and Techniques**: Six among eight interviewees highlighted the effectiveness of using quality tools and techniques for quality management.

1. **Product Design**: Five of eight interviewees recognized product design as pivotal across the food supply chain for ensuring sustainability.

4. **Statistical Process Control**: Five out of eight interviewees' results show that SPC is necessary.

| Table 4.16: TQM Perspective -Themes, Sub -Themes and Main Quotations (Case 3-Triad C) |
|---------------------------------|---------------------------------|---------------------------------|
| Theme                          | Sub-Theme                       | Main Quotations                 |
| Soft Factors                   | Customer Focus                  | Mať3MM said, “Quality is compliance with regulation and requirements of markets so customer focus we started recently to send to Kuwait, not was included, they have a formula different from other countries, so we focus on customer requirements. There are special orders, we deal with it, we work all together based on special orders, seek for customer return.” |
|                                | Education and Training          | S3SCM said, "We have continuous training for our employees; our qualified employees give internally training to other contracted other training centres. It is essential for all we work with universities, consulting, and having a budget for training." |
|                                | Top Management Leadership       | S3SCM said, “Any management, you should propose a new project in good time, the right way, with convincing reasons to convince the top management. For example, when I proposed solar panels, give a number on long runs, so the top management supported new ideas on it although it cost a million, there is a prize for innovation from top management.” |
|                                | Supplier Relationship           | Mať3PM said, “General, each relationship is good; we have the authorization to know my supplier in his process, with his inputs, so he is honest with me 100%.” |
| Hard Factors                   | Continuous Improvement          | Mať3PM said, “Our top management requires me yearly a new thing; we invest in a new production line as we need the second line in 2025, really there is high growth in new products.” |
|                                | Statistical Process Control     | Mať3MM said, “For marketing analysis, there is an employee daily using for statistical process, and software gives me a report of results.” |
|                                | Process Management              | S3SCM said, “The first step that I control our main process from raw material, packaging material, then slaughtering is considered as a complicated process, there is supervision through our process, so we assured of the quality of our main product.” |
|                                | Quality Tools Techniques        | Mať3QM said, “I use quality tools and techniques such as certification, scorecards system, root cause analysis, and software.” |
|                                | Product Design                  | Mať3QM said, “We target the export market that affects the product design, research and development department improve the product design based internally or based on the trend of markets. It is a customer base. It depends on market requirements feedback.” |

(Source: The Researcher)

**Sustainability (SUST) – Case 3 - Triad C**

Reflecting on the SUST perspective, interviewees articulated their grasp of sustainability and its inherent role in their current industry. The overwhelming emphasis was on embracing practices
encapsulating the sustainability Triad: economic, environmental, and social. Maf3MM elaborated,”

*What you work on it, to be sustainable on a long run through all the long chain, that not affect adverse effect to the environment, we work now on the thinking of people regarding the environment, healthy oriented, more sustainable to health and environment of people that without development you will not be, you should be developed according to new trend not only regarding a product, quality and profit but to take consideration of new requirements like environment, to keep you an employee and take care of around you people, society, customers*. Table 4.17 depicts the main representative quotations that emerged from the SUST perspective for the Sub-Themes.

- **Economic**: Five Sub-Themes for Economic Themes emerged for Triad C.
  1. **Profit**: All eight interviewees underscored profit as a pivotal concern in Jordan's context.
  2. **Market Expansion**: All eight interviews acknowledged endeavours that yielded market expansion and performance.
  3. **Customer Return**: All interviewees seek customer retention and repeat business.
  4. **Operation Cost**: Seven among eight interviewees highlighted the significance of managing operational costs.
  5. **Certification**: All eight interviewees mention their adherence to the necessary certification.

- **Environmental**: The results of analyzing eight transcripts for the Environmental Theme in analyzing Triad C emerged five Sub-Themes:
  1. **Resource Consumption**: All eight interviewees expressed the importance of efficient resource usage.
  2. **Recycling**: Seven among eight interviewees practised recycling.
  3. **Efficient Transportation**: Eight of them accentuated the role of efficient logistics and transportation.
  4. **Choosing Partners Based on Environmental Practices**: Partnering based on eco-friendly practices was a trend among seven of eight respondents.
Social: Social SUST identified eight Sub-Themes from analyzing Triad C.

1. **Employee Rights**: Seven out of eight interviewees emphasized that employee rights, welfare and benefits contribute to social SUST at Triad C.

2. **Community Concern**: Six out of eight interviewees showed their engagement in society and local community concerns.

3. **Reputation**: All eight interviewees were universally recognized as essential in keeping their reputation.

4. **Transparency in Product Labelling**: Six out of eight interviewees recognized the importance of transparency, especially given the current trends and heightened customer awareness.

5. **Traceability**: All eight interviewees recognized it as a crucial modern tool.

6. **Stakeholder Engagement**: Four out of eight interviewees identified the influence of stakeholders' engagement in SUST.

7. **Diversity**: Diversity was emphasised in Triad C among seven of eight of the interviewees.
<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Themes</th>
<th>Main Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>Profit</td>
<td>Maf3PrM said, “We have a trend of building a brand not only short-term profit. The main thing we can work on is the operation to reduce costs and achieve profit.”</td>
</tr>
<tr>
<td></td>
<td>Certification</td>
<td>S3SCM said, “I have different sources for improvement, one of them as ISO certificates, which is essential in the improvement.”</td>
</tr>
<tr>
<td></td>
<td>Operation Cost</td>
<td>Maf3MM said, “It started from covid19, and its increased shipping price becomes (10X) its original price; we are looking for a solution to this problem, such as changing the shipping routes.”</td>
</tr>
<tr>
<td></td>
<td>Market Expansion</td>
<td>S3SCM said, “Already, the demand increases, that indicator for a new market or open new channels. We are ready for any new requirement, year by year is increased.”</td>
</tr>
<tr>
<td></td>
<td>Customer Return</td>
<td>Maf3PRM said, “We are working on a tasting promotion of free samples that make the customer know the product, taste it, like it so they will come back and buy it, our product is good, customer if like it, they buy it”.</td>
</tr>
<tr>
<td>Environmental</td>
<td>Resource Consumption</td>
<td>S3QAHSEM said, “Our governmental regulation is restricted that I should use wastewater treatment unit, we shift to Solar cells, to reduce depending on fuel.”</td>
</tr>
<tr>
<td></td>
<td>Recycling</td>
<td>Maf3MM said, “We make treatment of water, recycle it and use it in cooling; solid waste is recycled by contracted companies that support environmental and financial.”</td>
</tr>
<tr>
<td></td>
<td>Efficient Transportation</td>
<td>S3SCM said, “We make a plan that merges the employee from the same point in the first shift while the next shift from another point so I reduce the transport cost.”</td>
</tr>
<tr>
<td></td>
<td>Choosing Partners on Environmental Practices</td>
<td>S3QAHSEM said, “In some countries if the company does not consider renewable energy, it will not deal with it. (such as Europe. It becomes a conditional statement for countries.”</td>
</tr>
<tr>
<td>Social</td>
<td>Reputation</td>
<td>S3SCM said, “We work on digitals; when we achieve the requirement of our customer, we achieve the trust, reputation, requirement of our customer. when they see that we achieved that requirement, it good for our reputation., word of mouth is important.”</td>
</tr>
<tr>
<td></td>
<td>Diversity</td>
<td>Maf3PM said, “I believe, when calculated finically, our market share is increased yearly, it achieved your profit”. It depends on a different category of product.”</td>
</tr>
<tr>
<td></td>
<td>Traceability</td>
<td>S3SCM said, “For example, if we complain about a product being destroyed, I immediately trace back all the conditions”. We go back to the internal system of oracle for traceability; we have our records,”</td>
</tr>
<tr>
<td></td>
<td>Transparency in Product Labeling</td>
<td>Maf3PRM said,“We promote a healthy lifestyle for sustainability. This global trend is sustainability, not adding many preservatives as you know, all the world is afraid of preservatives, that is reflected on our labels.”</td>
</tr>
<tr>
<td></td>
<td>Employee Rights</td>
<td>Maf3PRM said, “Today in the factory, we work on the quality environment. We have ISO to take care of the safety and health of the employee, the minimum right they require.”</td>
</tr>
<tr>
<td></td>
<td>Community Concern</td>
<td>Maf3QM said,” One of the things we have a relationship with society. That we employ from the same countries” we contribute to the government Hussein cancer centre with financial support yearly, With Covid19 support ministry of health.”</td>
</tr>
<tr>
<td></td>
<td>Stakeholder Engagement</td>
<td>S3QAHSEM said,” We have yearly at least an event from all our stakeholders, society, non-governmental organization, government, suppliers, and customers, who engage in meetings and present our plans and achievements and get feedback from them.”</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
The interviewees reported a sufficient understanding of the QDS of EFSC. Maf3QM stated, “Your SUST starts from the quality of product to achieve sustainable product in taste and texture, the sustainable process in process control, raw material, how I am qualified in quality, The continuity of company to supply its products in the same quality, This needs an integrated system a, so take compliance in other stakeholders requirement of environment, people for customer satisfaction to achieve SUST”. C3SCM stated, “We seek new thing, our platform, which links distributors or supplier and manufacturers easily and have a shared fleet for collective orders and Transportation through short route of shipping, make SUST of the supply chain through (planning, forecasting, time management, in cutting cost, efficiency shorter process relationship management, reduce the waste, through technology, to track his order step by step, your start SUST from the quality of product new thing new product, factory we work on quality, the environment we have ISO”.

All interviewees are concerned with current practices related to QDS and their impact on SUST performance. They emphasised a particular quality implementation on the levels of product, process and supply chain by their awareness of SUST and deploying a change to sustainable practices on a product, process and chain to achieve performance. Analysing the eight transcripts for Triad featured a set of Sub-Themes for each key Theme.

- **Quality:** The following three Sub-Themes were highlighted:
  1. **Product:** All eight interviewees are concerned about product certification complying with the specification of a product regarding both the intrinsic and extrinsic attributes.
  2. **Process:** All eight interviewees considered the importance of process quality through integrating certifications ISO 45001, ISO 14001, and ISO 22000 for efficient process control, contractual arrangements, minimizing safety incidents and forming innovation circles to improve new ideas.
  3. **Supply Chain:** All eight interviewees suggested that the supply chain quality improves relationships and information through digital e-commerce platforms, enabling monitoring activities and quality control along the supply chain with greening processes.
• **Sustainability Practices**: The following three Sub-Themes were highlighted:

1. **Sustainable Product**: Seven among eight interviewees considered sustainable products to be of higher quality and safety, with higher social, economic and environmental SUST linked with reducing energy, respecting animal welfare and considering certification and specific labels and logos on packaging as halal meat products.

2. **Sustainable Process**: All eight interviewees put sustainable process as central through the clean production process, working on the efficient flow and evaluation and the monitoring of information at all stages of SC and implementing reduction, recycling, and reusing to address environmental, social and economic SUST.

3. **Sustainable Supply Chain**: Seven out of eight interviewees highlighted the effectiveness of implementing a sustainable supply chain through a collaborative network of collection centers for returnable products. Recovery processes are re-manufacturing, reusing, and recycling, allowing the companies to be more sustainable by closing process loops and engaging a circular economy. Also, some products are collected by organizations that distribute them to food banks and families in need to reduce waste.

• **Sustainability Performance**: The following three Sub-Themes were highlighted due to the co-implementation of TQM and SUST practices to impact SUST performance positively:

1. **Economic**: All eight interviewees considered economic performance as a result of implementing quality and SUST in the process, product, and supply chain, resulting in financial and non-financial economic value to increase efficiency and profitability.

2. **Environmental**: All eight interviewees implemented QDS to improve environmental performance by collaborating with supply chain partners on efficiently using resources and improving processes concerning recycling, waste management, pollution reduction, wastewater treatment, energy efficiency, and feedstuff from waste. The circular economy seeks to reduce the need for new raw materials as it continually circulates resources and energy.
3. **Social**: Seven out of eight interviewees highlighted social performance as achieving an acceptable quality of life for all internal and external people through contributing to societal development programs, such as donations and health and social awareness programs.

**4.4.3.2 Observational Findings for Case 3 - Triad C**

In March 2021, observations were conducted at Triad C, the manufacturer (meat canned food factory in Amman), supplier (poultry company) and customer (wholesaler). The Themes and Sub-Themes discussed in observation, and tours emphasised the results of interviewee responses. The following presents the participant and non-participant observation findings for each actor of Triad C.

**Participant Observation at the Manufacturer in Case 3 - Triad C:**

- **Duration**: 45 minutes.
- **Organizer**: Quality Manager.
- **Observation**: The subject of discussion was innovation and continuous improvements. Triad C supports his employees through an innovation circle committee, which holds weekly meetings to discuss innovative ideas with the involvement of top management and discusses the reports about lean management, the monitoring and analysis of water consumption, and implements corrective actions on water, material, energy management and charts of analysis and statistical results and how to continue with continuous improvements, as during meeting they contacted the supplier for the applicability of new ideas.

- **Derived Themes and Sub-Themes**:
  - **SCN**: Lean, Innovation, Risk Management.
  - **TQM**: Continuous Improvement, Quality Tools and Charts, Top Management.
  - **SUST**: Resource Consumption.

**Non-Participant Observation in Case 3 - Triad C**

**Non-Participant Observation at the Manufacturer (Case 3 - Triad C):**

- **Duration**: 20 minutes.
- **Organizer**: Quality Manager at the Manufacturer.
• **Observation:** The researcher visited the raw material stores, passed along the production line, and reached the final stores. The researcher witnessed sterilisation machines in each area, the production process, batch records, packaging machines, refrigerators for meats, standard operation procedures and ISO certificates. Quality control was taking samples during the production process. The researcher was taken to waste separation and shown the meat and packaging waste areas. The employees were wearing gloves, masks and safety shoes.

• **Derived Themes and Sub-Themes:**
  - **SCN:** Lean Supply Chain, Digitalisation and Innovation.
  - **TQM:** Process Management, Quality Control Tools and Techniques.
  - **SUST:** Social, Employee Rights, Transparency in Labelling and Economical-Product Diversity, Environmental-Resource Consumption, Recycling.

**Non-Participant Observation at the Supplier (Case 3 - Triad C):**

• **Duration:** 25 minutes.

• **Organizer:** Quality Manager at the Manufacturer.

• **Observation:** The researcher visited a slaughtering area, and all production stages were implemented under the supervision of experienced staff, hygienic and safety areas, and advanced technology equipment consistent with the manual Islamic slaughter method (Halal). It is quick, precise and has a high level of efficiency. It is fully controlled and maintained to ensure no contamination and that the final product is safe and of the highest quality. Also, the researcher noticed the water and energy management, waste management, labour conditions, work and safety requirements, quality management procedures and certification in work, and refrigeration vehicles that are equipped according to the international standard of keeping the final product's regular cooling and freezing cycle.

• **Derived Themes and Sub-Themes:**
  - **SCN:** Lean Supply Chain, Digitalisation.
  - **TQM:** Process Management, Continuous Improvement.
• **SUST**: Social, Transparency in Labelling- Employee Rights, Environmental-Resource Consumption and Efficient Transportation, Economic -Certification, Operation.

**Non-Participant Observation at the Customer (Case 3 - Triad C):**

- **Duration**: 15 minutes.
- **Organizer**: Quality Manager at the Manufacturer.
- **Observation**: The discussion was around technology. A tour of the employees' offices was an open area with comfortable working conditions. The author looked at the platform, and the mobile application was used in selling and order collection.

- **Derived Themes and Sub-Themes**:
  - **SCN**: Digitalisation, Lean Supply Chain, Innovation, Resilience.
  - **TQM**: Top Management Leadership, Quality Control Tools and Techniques.
  - **SUST**: Social- Diversity of Product, Economic, Market Expansion.

**4.4.3.3 Secondary Data Insights – Case 3 - Triad C**

The researcher has reviewed secondary data about the three actors in Triad C in EFSC.

- Economic benefits were evident in financial and annual reports, especially on the Amman Stock Exchange.

- The company demonstrated strong community ties, sponsoring the King Hussein Cancer Foundation and donating during the COVID-19 pandemic.

- Emphasis on employee health and safety, with regular medical exams, recognition for promoting occupational safety standards, awarded excellence from Social Security Corporation.

- Environmental stewardship through solid waste management, energy and water consumption monitoring, and partnering with the United Nations Development Programme (UNDP) for clean production and compliance with regulations and environmental legislation in Jordan.

- Several certifications, such as ISO 9001, ISO 14001, and HACCP, are in place to ensure product quality and safety.
• Continuous health and safety awareness through collaborations with the Jordan Food Drug Association (JFDA), regular inspections for health and safety through Good Manufacturing Practices (GMP) practices and active communication on social media.

• Social responsibility is demonstrated not just through employee care but also by reducing pollution and ensuring the provision of safe and nutritious food.

4.4.4 Case 4 - Triad D

Figure 4.4 captures all the actors of the SCN in Triad D and provides a road map of how they interact with each other, revealing their processes and relationships. Triad D consisted of three actors: Supplier-Manufacturer-Customer, located in Jordan. The three actors have been working together for the last ten years to provide customers with various canned food products of high quality and sustainable EFSC. The ten years of collaboration between the three actors indicate a well-established, symbiotic relationship, where each actor contributes to enhancing the entire supply chain's quality and sustainability. The exploration of Case 4 - Triad D highlights the importance of integrating advanced technology like blockchain into the food supply chain. It further emphasizes the need to maintain high-quality standards, efficient logistics operations, and foster collaborative relationships for a sustainable and efficient food supply chain. This Triad is a type of Closed Triad that includes a structure of direct collaboration between the three actors.

![Figure 4.4: Depiction of Closed Triad D-Case 4](Source: The Researcher)
**Actors in Supply Chain of Case 4 - Triad D:**

**The Supplier** is a technology and machine company established in 2015 in Amman. It has about 20 employees. It provides a platform for traceability of the quality and safety of food assurance to food producers worldwide. The end-to-end supply chain complies with strict quality control standards. They provide food safety and quality assurance traceability solutions using blockchain technology and compliance with food import regulations of foreign countries. The USA, China, the European Union, and Japan require food traceability information. Quality is guaranteed by utilizing an unbroken chain of tamper-proof records of quality assessment at each stage of the production and delivery processes. They are decentralized applications that work on the blockchain and are powered by Smart Contracts. It is fully autonomous and tamper-proof and does not require an intermediary.

**The Manufacturer** is a company established in 1980. It is located in Marka, Amman. It is currently specialized in producing canned beans and vegetables. It offers the best quality and price to meet all categories of consumers with different needs and tastes. It consists of 100 Jordanian employees. It complies with the highest international quality standards, ISO 9001, HACCP, and ISO 22000 certificates. The company exports products worldwide to Lebanon, Kuwait, Iraq, KSA, Qatar, Europe, USA, Canada, Turkey, Japan, India, Oman, UAE, Australia, New Zealand and other countries.

**The Customer** is a warehouse and distribution company that was established in 2003. It is located in al Yadoudeh - Amman, Jordan. It offers modern and advanced warehousing and storage facilities, logistical facilities for transportation, and supply chain solutions operations, including Pallet rack systems, pre-packing and delivery. It has a warehousing capacity of 150000 sq.m², with a 50000 pallet rack and hundreds of distribution trucks. Investments in new technology, operations and opportunities secure continuous success. It has 300 highly trained staff to deal appropriately with the product while storing goods with advanced systems. ISO 9001, ISO 22000, ISO 14001, and ISO 45001 certificates added quality value to key customers. They have an ERP system, an automated sale system, GPS tracking, a warehouse management system, and an advanced fire alarm system for the highest levels of security for all goods stored in their facilities. Table 4.18 provides a general description of participants for Triad D.
Table 4.18: Interviewees' Description of Triad D - Case 4

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Job Title</th>
<th>Abbreviation</th>
<th>Age (Years)</th>
<th>Experience (Years)</th>
<th>Gender</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supplier Supply Chain Manager</td>
<td>S4SCM</td>
<td>35-40</td>
<td>13</td>
<td>Male</td>
<td>Master</td>
</tr>
<tr>
<td>2</td>
<td>Business Development Manager</td>
<td>S4BPDM</td>
<td>30-35</td>
<td>7</td>
<td>Female</td>
<td>Bachelor</td>
</tr>
<tr>
<td>3</td>
<td>Marketing Manager</td>
<td>Maf4MM</td>
<td>40-45</td>
<td>16</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
<tr>
<td>4</td>
<td>Business Development and Quality Manager</td>
<td>Maf4BDQMM</td>
<td>30-35</td>
<td>7</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
<tr>
<td>5</td>
<td>Production Manager</td>
<td>Maf4PrM</td>
<td>35-40</td>
<td>11</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
<tr>
<td>6</td>
<td>Sustainability operation Manager</td>
<td>Maf4SOM</td>
<td>35-40</td>
<td>7</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
<tr>
<td>7</td>
<td>Customer Supply Chain Manager</td>
<td>C4SCM</td>
<td>45-50</td>
<td>20</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
<tr>
<td>8</td>
<td>Marketing Manager</td>
<td>C4MM</td>
<td>30-35</td>
<td>9</td>
<td>Male</td>
<td>Bachelor</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

**Empirical Analysis of Case 4 - Triad D**

In April 2021, the Triad D was visited. The manager (S4BPDM) explained that “EFSC has a lot of input and output. It is already a network, people to connect in one place, […] the supplier, customer, and manufacturers are like a ring, a network; final customers outside Jordan design the supply chain”.

Moreover, they emphasized the existence of disturbance, which affected their EFSC. From the point of view of C4MM, the disturbances, “Give you an example, when there is a political problem, prices of fuel, transport, regulations, governmental agreements, barrier in applying these agreements”. Also, S4SCM mentioned disturbance during COVID-19, “COVID-19 affects the SC, it is like air, from our perspective, the simplest way of answer that its effect the productivity […] the lockdown restriction on capacity of working employees that cancel the orders and especially the exportation, most countries included Jordan work in the policy of internally food security that affected shortage of supplying raw material, increase the prices, lead time becomes triple, not double, roots of loading become longer”.
4.4.4.1 Interviews Insights - Case 4

Supply Chain Network (SCN) - Case 4

All the interviewees revealed a good knowledge of the SCM concept. They emphasized the significance of implementing SCN issues, such as Supplier-Customer Relationships, Multi-Tier Networks, Lean Supply Chain, Risk Management, Digitalization, Innovation and Contracts. As S4BPDM explained SCN, “I believe we, the supplier, manufacturer and customer, work together, in general, it is a chain of supplying from raw material, all the production factors until providing a final product that arrives at final customer, or consumer it depends on your position on the chain”. Table 4.19 provides the main representative quotations on each sub-theme of the SCN Themes.

- **Supplier-Customer Relationship**: Analyzing the eight transcripts for Triad D featured four Sub-Themes, which are discussed on the dyadic level in Triad D in EFSC.
  1. **Selection**: Seven among eight interviewees discussed the importance of their supplier selection criteria: reputation, quality, delivery time, and cost.
  2. **Monitoring**: Seven among eight interviewees discussed that constant monitoring ensures adherence to standards by questionnaire, site visit, or third-party auditing.
  3. **Development**: Five of eight interviewees mentioned adaptability's importance in catering to new customer requirements.
  4. **Trust**: Sixth, among eight interviewees, the trust built over the years is critical for successful and healthy long-term relationships.

- **Multi-Tier Network**: Two Sub-Themes appeared from analyzing the eight transcripts for Triad D.
  1. **Collaboration**: All eight interviewees stressed that Collaboration is the key to ensuring forecasts align with production schedules.
  2. **Resilience**: Seven of eight interviewees ensure they can handle unexpected disruptions or challenges, such as risk mitigation strategy through supplier switching and rerouting transportation.
• **Lean Supply Chain:** Two Sub-Themes emerged from analyzing Triad D.

1. **Waste Management:** Seven among eight respondents are constantly engaged in lowering waste to save energy, resources, and water and reduce overproduction.

2. **Value Creation:** Sixth, among eight interviewees, engage in value-adding activities to emphasise efficiency and ensure maximum value is provided at every chain step.

• **Risk Management:** Risk management was split into two main categories:

1. **Internal Risk:** Seven among eight interviewees believe in existing internal risk, so they utilize their experience to assess the probability of a machine breakdown, fire, or product contamination with the help of management systems such as HACCP and ISO 22000 to help prevent that risk.

2. **External Risk:** All eight interviewees continuously evaluated and addressed, ensuring that unforeseen events have minimal impact on the operations, such as financial risk and fluctuation in the price of a product, fuel, transport or weather risk, and governmental agreements between countries.

• **Digitalization:** Participants acknowledged that the Sub-Themes.

1. **Advanced Digital Technology:** All eight interviewees adopted digitalization, such as traceability systems, tracking systems, GPS, and sensors, as a good investment in the automation of the process, leading to quality management and traceability.

2. **Information Systems:** Sixth among eight interviewees emphasising appropriate information technology systems. They have access to mobile applications and online platforms anytime and show foresight in keeping up with global trends.

• **Innovation:** Respondents identified in their SC.

1. **Organizational Innovation:** Six among eight interviewees argue that willingness to adapt and change organizational norms, especially in accommodating online work, fosters creativity.
2. **Product Innovation**: Seven among eight respondents stressed that regular introduction of new products helps cater to changing market demands, sustains growth, and increases market sales.

3. **Process Innovation**: All eight respondents mention leveraging the latest technology and scientific methods to improve processes further, consistently emphasising Triad D's commitment to efficiency and evolution.

- **Contracts**: Contracts were split into two main categories:
  
  1. **Formal Contracts**: Seven among eight respondents highlighted that ethical and transparent contracts ensure clarity and trust, fostering a sense of commitment between parties and underlining the significance of shared risk management.
  
  2. **Informal Contracts**: Five out of eight responses indicated that starting with informal engagements gives parties the time to assess each other's operational credibility and lays the foundation for future formalized agreements.
<table>
<thead>
<tr>
<th>Themes</th>
<th>Sub-themes</th>
<th>Main Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier-Customer Relationship</td>
<td>Selection Activities</td>
<td>MaF4MM said, “Selection depends on the quality and safety of products. They require the first simple certificates for one simple reason: we have these certificates, so our chain will work more easily than other suppliers.”</td>
</tr>
<tr>
<td></td>
<td>Monitoring Activities</td>
<td>MaF4MM said, “For local suppliers, we monitor by visiting external suppliers, we monitor and evaluate by depending on third party certification, accredited for us, especially the supply chain either local or external we concrete more on developing our customer (distributaries, if the supplier replies to my needs, then I open new work with them).”</td>
</tr>
<tr>
<td></td>
<td>Development Activities</td>
<td>MaF4MM said, “Our customer development is important since customers and clients drive our development. Some of our customers, Canada and Germany, send a team to our factory or development as teamwork together.”</td>
</tr>
<tr>
<td></td>
<td>Trust</td>
<td>S4BPDMM said, “Our system is to make factories work in standards requirements, follow all the steps will give trust to external and internal customers. Blockchain gives you trust in the platform – you use.”</td>
</tr>
<tr>
<td>Multi-Tier Network</td>
<td>Collaboration</td>
<td>MaF4MM said, “We collaborate to reach the best quality results, so we work under conditional requirements. We have forecasting from my client for one year at the end of the year; send me his plans for next year – so I can determine my planning with my supplier based on my clients (planning for all items monthly).”</td>
</tr>
<tr>
<td></td>
<td>Resilience</td>
<td>MaF4SOM said, “It is sure, what happens like covid19, we learn for future, always as food production, we have storage that enough for six months at least plus there is orders in a way to us, but its need time to arrive, we learn to concentrate on e-commerce also to concentrate on technology more and have more stores to be one of available on for them. “What makes me a risk, that makes for me to find the opportunity.”</td>
</tr>
<tr>
<td>Lean Supply Chain</td>
<td>Waste Management</td>
<td>MaF4BDQMM said, “It is new knowledge, lean come from japan culture, producing what I want with right way and without wasting quality, minimum time, We are looking to improve on (waste) all the time, I know we are a good position my savings […] we introduce clean production philosophy that reduces about 45% in waste from that I can see where the air leaks and water leaks, energy waste are and stop that.”</td>
</tr>
<tr>
<td></td>
<td>Value Creation</td>
<td>MaF4PM said, “Finally, the customer determines the needs of markets that he is in it. He gave me feedback on what quality, and then I made many elimination, improvement and development before getting to the final point; this lean aspect contributed meaning to reduce waste but also not having an overhead process that doesn’t result in productivity and efficiency, that producing what I want, with right way with the required quality, with minimum time.”</td>
</tr>
<tr>
<td></td>
<td>Internal Risk</td>
<td>CASCM said, “We all work on not entering the loss; the risk exists, but we try to avoid it; the biggest problem we face is mainly in K.S.A market, as their requirements are changeable and updated each time without early notification, and sometimes we know it on the border. These requirements affect your flexibility and cause a disturbance in your operation and planning. For example, last time, there was a new regulation in K.S.A that affect not only us all the (companies in Jordan).”</td>
</tr>
<tr>
<td></td>
<td>External Risk</td>
<td>S4SOM said, “We are all about digitalization (blockchain platform) we store on computers and help our customers access that technology and update it is the integrated system responsible for quality control, quality improvement, tractability system, tracking system,”</td>
</tr>
<tr>
<td>Digitalization</td>
<td>Advance Digital Technology</td>
<td>MaF4MM said, “I will tell you what we benefit from covid19; we learn for the future; the new thing is e-commerce and customer order online, that reflected in the logistic distribution, the behaviour of buying things is changed not only in Jordan, in all the world, ok. There is an improvement in technology information increase communication through the internet. They require from us that the product and its information be online. this requires an integrated system and application on mobile.”</td>
</tr>
<tr>
<td></td>
<td>Digital Platform/ Information System</td>
<td>MaF4MM said, “We work mostly on innovation; new products are introduced yearly. We have one or two new products we cannot work on the same products. For 40 years ago, we worked in canned food. We have more than 25 types of canned foods.”</td>
</tr>
<tr>
<td></td>
<td>Product Innovation</td>
<td>MaF4MM said, ”when we enter a new innovative design for cans used for external exported markets,, we make a technological innovation to change in process improvement.”</td>
</tr>
<tr>
<td></td>
<td>Process Innovation</td>
<td>MaF4MM said, “We are mainly concerned with improving a comfortable workplace by introducing flexible working hours, as with labour law, it should work 7 hours so the employee so there is no fixed hour to arrive, that depend on working area and arrangement and cooperation between employees.”</td>
</tr>
<tr>
<td></td>
<td>Organizational Innovation</td>
<td>MaF4SOM said, “We are mainly concerned with improving a comfortable workplace by introducing flexible working hours, as with labour law, it should work 7 hours so the employee so there is no fixed hour to arrive, that depend on working area and arrangement and cooperation between employees.”</td>
</tr>
<tr>
<td>Contracts</td>
<td>Formal Contract</td>
<td>MaF4PM said, “Sometimes, I personally feel a well-specified contract to enable the whole supply chain actors to understand responsibilities clearly better could help the development of cooperative, long-term and trusting relationships, and reduce the uncertain and risks for the actors. Take responsibility for disruptions. When we renew the contract within Europe, countries, make a conditional on contract also to take social consideration, not to make word teenager worker and 16 years old, workers from prisoners, especially women. They require from us the environmental sustainability.”</td>
</tr>
<tr>
<td></td>
<td>Informal Contract</td>
<td>MaF4PM said, “There is a different relationship with our customer, so we work under informal cooperation, orders upon request that can be changed depending on the case. If my supplier does not have a certificate, I will monitor his reports of exporting and selling and get feedback from him and his customer. Because not everyone can give everything perfect, he can't order all quantity required, their products will sell in any area then under our supervision we will help him in solving quickly, or if he hasn’t a capability to supply me and support me if he doesn’t have the ability, he will suggest for me another supplier.”</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
Total Quality Management (TQM) – Case 4

All interviewees are concerned with TQM's information and current practices and their impact on SUST. They emphasized a particular level of TQM implementation and awareness of TQM, including soft and hard factors. Furthermore, the all-encompassing perspective on quality shared by interviewees, as described by Maf4PRM, “In my experience, the quality is become comprehensive, not as in the past, not only with its complying to specification the product, it is everywhere, from different point views in the market, supplier, delivery time it is interesting if applied in any company, will save in cost, money, time, effect reduce waste and loss. It is a beneficial approach with quality there is a standard procedure, anyone can read the protocol, Keep the product quality, that by keeping my efficiency, I concern with the thing that my customer not considered, I concern the efficiency”. Table 4.20 provides the main quotations for each sub-theme of the Themes for the TQM perspective.

- **Soft Factors:** The following four Sub-Themes were highlighted from eight transcripts for Triad D.
  1. **Customer Focus:** Seven among eight interviewees put customer focus at the top of the pyramid.
  2. **Education and Training:** Seven out of eight interviewees considered training and education the most important due to the growing awareness that employees are the organisation's main asset. If you bring all the best world systems, you cannot benefit.
  3. **Top Management Leadership:** Seven of eight interviewees argued that the wise leadership of top management is essential to quality management.
  4. **Supplier Relationships:** Five among eight interviewees suggested that the supplier. The relationship is cooperative.

- **Hard Factors:** The following five Sub-Themes were highlighted from synthesizing the eight responses for Triad D.
  1. **Continuous Improvement:** All eight interviewees considered continuous improvement and process management significant that the company be available for a long time.
  2. **Process Management:** All eight interviewees stressed the role of efficient process management in TQM.
3. **Quality Tools and Techniques**: Sixth among eight interviewees, highlighted the effectiveness of using quality tools and techniques that lead to quality management.

4. **Product Design**: Five out of eight interviewees' results show that product design is an essential function across the food SC for SUST.

5. **Statistical Process Control**: Five out of eight interviewees' results show that statistical process control is applied within the company.

Table 4.20: TQM Perspective - Themes, Sub-Themes and Main Quotations (Case 4-Triad D)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme</th>
<th>Main Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soft Factors</strong></td>
<td>Customer Focus</td>
<td><em>Maf4MM said, “The customer determines the needs of markets that he is in. He gives me feedback on what quality he wants and concentrates on his requirements.”</em></td>
</tr>
<tr>
<td></td>
<td>Education and Training</td>
<td><em>C4MM said,” We attract people with experience of continuity of training employee, training of employee become a loyally strong relationship with an employee.”</em></td>
</tr>
<tr>
<td></td>
<td>Top Management leadership</td>
<td><em>Maf4BDQMM said, “Our ideas come from each employee; the employee can see the problems in an area, not me; I am looking to paper, and the assumption comes from employees; anyone with good ideas can come in and discuss them and share them and drive change in business.”</em></td>
</tr>
<tr>
<td></td>
<td>Supplier Relationship</td>
<td><em>Maf4BDQMM said, &quot;If you are strong relationships with suppliers, give me a quality that reflects me in my quality to decrease the defects and problems, and reflect on sustainability and how to be competent in the market.&quot;</em></td>
</tr>
<tr>
<td><strong>Hard Factors</strong></td>
<td>Continuous Improvement</td>
<td><em>Maf4MM said, “Continues improvement we imply kaizen. I make a quick change that improves my work in the long run; if you are not improved, another one will be improved and take your chain from the cake, so you should be improved every time; it is not correct to be there is not an improvement. Also, the total employee commitment such as fraying loyalty, awareness, and be improved.”</em></td>
</tr>
<tr>
<td></td>
<td>Statistical Process Control</td>
<td><em>C4MM said, “We believe that “Speak with data, not opinions “always. You must use all the information and deal with statistical and quantitative control. We have an engineer for the analysis of all data.”</em></td>
</tr>
<tr>
<td></td>
<td>Process Management</td>
<td><em>S4SCM said, “We help our customers to do process management, fall under TQM, we have all procedures in many areas, so reduce problems in manufacturing it should work best.”</em></td>
</tr>
<tr>
<td></td>
<td>Quality Tools and Techniques</td>
<td><em>Maf4BDQMM said, “We use new ways of thinking such as root causes analysis, fishbone diagram, for solving problems, we use control charts, it is an attractive tool, a histogram for a good visual representation of the finding, 7s is wise thinking for human resources.”</em></td>
</tr>
<tr>
<td></td>
<td>Product Design</td>
<td><em>Maf4MM said,” If there is a new requirement from my customer, then a three triad (supplier, factory, customer, Meet to collaborate and design a new product, for example, are required a new product that requires a special and defined supply of raw material we meet to understand it and determine the requirement and sources of it.”</em></td>
</tr>
</tbody>
</table>

(Source: The Researcher)
Sustainability (SUST) – Case 4 - Triad D

The interviewees' feedback provides a comprehensive insight into the SUST practices within Triad D. With a balanced emphasis on economic, environmental, and social perspectives, Triad D demonstrates an integrated approach to sustainable practices. MaH1SOM said, "SUST is now in each element in a company, not only the product, it is in human resources, improvement, a relationship of customer suppliers, system, market, planet quality. SUST should be in all the things, improving all of them altogether. There is SUST in different views. Following the improvements in the industry's market, in the environment, finding resources, and bringing happiness to society and employees, It becomes a conditional statement for countries for continuity of work and profit’.

The key representative quotations which emerged for the Sub-Themes for SUST are depicted in Table 4.21.

- **Economic:** The economic aspect is essential in analyzing the eight transcripts for Triad D. Five Sub-Themes emerged:
  1. **Profit:** All eight of the interviewees demonstrate profit issues in Jordan.
  2. **Market Expansion:** All eight interviews engaged in practices that resulted in market performance and expansion.
  3. **Customer Return:** Seven among eight of the interviewees are seeking customer returns.
  4. **Operation Cost:** All eight interviewees explained the significance of operation costs
  5. **Certification:** Seven among eight of the interviewees mentioned their execution certification.

- **Environmental:** Analyzing eight transcripts for Triad D, six Sub-Themes emerged:
  1. **Resource Consumption:** Resource Consumption is dominant in all eight interviewees, who demonstrated their awareness of its importance.
  2. **Recycling:** Seven among eight of the interviewees practised recycling.
  3. **Efficient Transportation:** Seven among eight of the respondents identified efficient transportation as necessary.
  4. **Choosing Partners based on Environmental Practices:** Six of eight interviewees show that sourcing is based on choosing partners in the supply chain based on environmental practice.
• **Social**: Eight Sub-Themes of the social Theme were identified for Triad D.

1. **Employee Rights**: All eight interviewees emphasized that employee Rights and benefits contribute to social SUST at Triad D.

2. **Community Concern**: Four of the eight interviewees show their engagement in Society, and local community concerns further solidify their commitment to fostering positive and long-lasting relationships.

3. **Reputation**: All eight interviewees believed that keeping their reputation is important.

4. **Transparency in Product Labelling**: Seven of eight interviewees indicated the importance of transparency in product labelling with the new market trends in nutrition facts and the awareness of customers.

5. **Traceability**: All interviewees indicated traceability as a new tool required.

6. **Stakeholder Engagement**: Four among eight interviewees emphasized partnering with entities that prioritize ecological practices in influencing SUST.

7. **Diversity**: Diversity was prioritized among all eight interviewees.
### Table 4.21: SUST Perspective -Themes, Sub-Themes and Main Quotations (Case 4 - Triad D)

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme</th>
<th>Main Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>Profit</td>
<td>S4SCM said, &quot;Quality in economic sustainability, quality improve the profit, revenues, when you show that save in high quality, impacts the prices.&quot;</td>
</tr>
<tr>
<td></td>
<td>Certification</td>
<td>Maf4MM said, “Certification is Positive and has a high impact. We took a quality certificate because we are the first company in 1990 that took ISO 9001 certificate. After that, we took ISO 22000 and higher certificate requirements FSCC. We are the pioneer who took FSCC for food safety.”</td>
</tr>
<tr>
<td></td>
<td>Operation Cost</td>
<td>Maf4SOM said, “The highest operating cost, this will decrease your competitiveness; in other countries, they have support and incentives from their countries as turkey support export products 13%; also other examples, in Egypt, operating cost is low also on Jordan.”</td>
</tr>
<tr>
<td></td>
<td>Market Expansion</td>
<td>S4BPDM said, “Jordan has a problem in exportation; by our platform, you will have a logo on your product indicating quality and safety of your product and continuity on the quality that helps in entering new market be a leader in the market, so give trust in production, and so enter easily foreign markets.”</td>
</tr>
<tr>
<td></td>
<td>Customer Return</td>
<td>S4BPDM said, “Initially, when I deal with a customer, I seek the loyalty of my customer to give him the required.”</td>
</tr>
<tr>
<td>Environmental</td>
<td>Resource Consumption</td>
<td>Maf4SOM said, “We tend to use our resources by having a long-term plan efficiently. For example, we reduce water use and recycle it for cleaning purposes; in energy, we switch to solar cells and panels. Moreover, we tend to make everything as paperless as possible.”</td>
</tr>
<tr>
<td></td>
<td>Recycling</td>
<td>C4SCM said, “We established consumer take-back programs and contracted recyclable companies, even the cartoon and shrinks. We can improve where we can, and the wooden pallets are recycled.”</td>
</tr>
<tr>
<td></td>
<td>Efficient Transportation</td>
<td>Maf4MM said, “The most important factors affected transport in humidity that affected cans and packing requirements, small size and improvement.”</td>
</tr>
<tr>
<td></td>
<td>Choosing Partners on Environmental</td>
<td>Maf4PrM said, “our customers outside start looking for environmental practice, we consider purchasing from factories that are environmentally concern, even the supplier of raw material, yes, from an ethical point.”</td>
</tr>
<tr>
<td></td>
<td>Reputation</td>
<td>S4BPDM said, &quot;you will increase amounts for exporting markets; your name and brand will be known and trusted outside.&quot;</td>
</tr>
<tr>
<td>Social</td>
<td>Diversity</td>
<td>Maf4BDQMM said, &quot;If a Jordanian manufacturer is like to do like his competitor; he fails, fails due to a selection of wrong category or selectors of quality is wrong &quot;in the market, what plays the role? It is not quality only, who support a variety of your products, price, places of dispersing your product in market and countries as you eat from other persons before others you.&quot;</td>
</tr>
<tr>
<td></td>
<td>Traceability</td>
<td>S4BPDM said, “Traceability means transparency, trust, safety, quality, and it is important for the consumer; if you enter the data on our system, you cannot change, the customer through it scan the required information related to production, storing, sourcing, approval, actually fact improving their economic performance by being more efficient by using traceability.”</td>
</tr>
<tr>
<td></td>
<td>Transparency Product Labelling</td>
<td>S4BPDM said, “Consumers look to their health, cancer is increased, our customer requires us to mention nutritional values of our products so by QR on the product, that can scan then you will have all the information required.”</td>
</tr>
<tr>
<td></td>
<td>Employee Rights</td>
<td>C4MM said, “We keep our employees; we deal with them in a good way and relationship, and we deal as one group that is more important than their salary; they have high salary we deal as a team, we keep them if there is a high turnover that affects me to train from the start.”</td>
</tr>
<tr>
<td></td>
<td>Community Concern</td>
<td>Maf4PrM said, “We donate to charities, help low-income families around, help in medical issues, help in donating money to a municipality in the area.”</td>
</tr>
<tr>
<td></td>
<td>Stakeholders Engagement</td>
<td>Maf4PrM said, “Our stakeholders can add his requirements. It is not wrong, why not bring all related, to hear and concern, to know from where the problem is, everything is clear, to know where is the problem at a supplier, manufacture of transport. The problem is related to all.”</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
QDS in EFSC - Case 4 - Triad D

The interviewees stressed a sufficient understanding of QDS in EFSC; as Maf4BDQMM stated, “We often consider that SUST is through the continuity of quality, we reposition our capabilities for surviving in a sustainable environment, we should have quality in all process of production, and supply chain, it is the quality not only for the same product but also the quality of planning, forecasting and delivery time, so on [...] that will affect my exportation for better benefits. Quality is seen in economic profitability is the easier, through profit and improved revenue, in social SUST through the sustainable prices and fair labour usage, from environmental perspective awareness about the environmental impact in a way they produce product across our chain members”.

S4BPDM stated QDS, “If you have the right management, its first Goal is quality; then you reach other goals such as SUST. You needed to follow standards and traceability. Our platform is an integrated system through its traceability, quality and safety of the food in all the processes. If an error is happening, that will be a warning. You cannot proceed in the next step unless you make the required correction, know the source and reduce waste, and the customer can access it “.

All interviewees are concerned with current practices related to QDS and their impact on SUST performance. They emphasised a particular quality implementation on the levels of product, process, and supply chain and their awareness of sustainable practices on the product, process and supply chain to achieve SUST performance. Analysing the eight transcripts for Triad featured a set of Sub-Themes for each key theme.

- **Quality**: The following three Sub-Themes were highlighted:
  1. **Product**: All eight interviewees acknowledged the significance of intrinsic and extrinsic attributes of products, emphasizing functional features, pricing, branding, and sustainability claims. The inclusion of health and sustainability claims signifies an industry trend towards responsible production and marketing.
  2. **Process**: The majority, Seven among eight interviewees, prioritized process quality, underlining systems for evaluation, root cause analysis, and quality improvement. Adopting certifications
like HACCP, ISO 22000, and ISO 14000 underlines their commitment to stringent quality standards and establishing quality circles for quality improvement.

3. **Supply Chain**: Seven among eight interviewees' Emphasis on blockchain technology to enhance traceability demonstrates a proactive approach to ensuring safety and quality throughout the EFSC.

**Sustainability Practices**: The following three Sub-Themes were highlighted:

1. **Sustainable Product**: All eight interviewees acknowledged the rising demand for sustainable products, particularly in the fruit and vegetable sector. The emphasis on certifications and packaging logos shows the value of transparent communication to consumers about sustainability attributes.

2. **Sustainable Process**: Seven of eight respondents stressed the importance of evaluating production stages, green sourcing, using renewable resources, and leveraging new technologies such as blockchain for addressing environmental and ethical issues.

3. **Sustainable Supply Chain**: Seven of eight interviewees emphasised reverse chain distribution, recycling, and material recovery, suggesting a comprehensive strategy to optimize the supply chain's sustainability.

**Sustainability Performance**: The following three Sub-Themes were highlighted due to the co-implementation of TQM and SUST practices to impact SUST performance positively:

1. **Economic**: All eight respondents recognized the financial benefits stemming from the co-implementation of TQM and SUST practices. Quality improves profitability across the supply chain, ensuring sustainable operations.

2. **Environmental**: Seven among eight interviewees highlighted the efficient use of resources, vertical and horizontal supply chain cooperation, and a focus on reducing environmental impacts as crucial elements.

3. **Social**: Social responsibility emerged as a key Theme, with Six out of eight respondents pointing towards practices beneficial to labour and local communities and the growing global emphasis on Sustainability.
In conclusion, the feedback from Triad D's interviewees offers valuable insights into the intertwined nature of quality and Sustainability in EFSC. Their holistic approach to quality assurance and sustainable practices benchmarks industry standards and practices.

4.4.1.2 Observational Findings for Case 4 - Triad D

In April 2021, observation was conducted at Triad D, the manufacturer (vegetable canned food factory in Amman), supplier (technology and machine company) and customer (warehouse and distributor in Amman). The meeting and tours emphasised the Themes and Sub-Themes generated from the interview responses in Triad D.

Participant Observation at the Manufacturer in Case 4-Triad D:

- **Duration**: 45 minutes.
- **Organizer**: Marketing Manager.
- **Observation**: The subject of discussion was product design in the presence of the supplier and customer. It was concluded that Triad D supports his customer in providing a diversity of products and applying his requirements, such as a customer from the USA meeting at the manufacturer site with a supplier to make a contractual agreement regarding new organic vegetable canned food. The manufacturer encourages its employees to be innovative. His customer helped him provide the supplier, who provides this raw material to produce the product and guidance on environmental packaging with small size and labelling of the organic product following the USA regulations.

- **Derived Themes and Sub-Themes**:
  - **SCN**: Innovation, Collaboration, Contracts, Development and Supplier Relationships.
  - **TQM**: Product Design and Customer Focus.
  - **SUST**: Economic - Market Expansion and Diversity; Social - Transparency in Labelling; Environmental - Resource Consumption, Choosing a Partner on Environmental Concern.
Non-Participant Observation in Triad D

Non-Participant Observation at the Manufacturer (Case 4-Triad D):

- **Duration**: 15 minutes.
- **Organizer**: Marketing Manager at the Manufacturer.
- **Observation**: The author visited the raw material stores, passed along the production line, and reached the final stores. The author saw the production machines, sterilization machines and process, packaging machines, standard operation procedures and ISO certificates. The author was taken to the showroom for different packaging designs. The author was introduced to the solar system and wastewater treatment unit.

- **Derived Themes and Sub-Themes**:
  - **SCN**: Lean Supply Chain, Digitalisation and Innovation, Collaboration.
  - **TQM**: Process Management, Continuous Improvement.
  - **SUST**: Social, Employee Rights, Transparency in Labelling and Economic -Product Diversity, Environmental- Resource Consumption.

Non-Participant Observation at Supplier (Case 4-Triad D):

- **Duration**: 25 minutes.
- **Organizer**: Marketing Manager at the Manufacturer.
- **Observation**: The author quickly reviewed the small, modern open area and employees' offices, focusing on labour conditions, work, and gender. The employees were working in a paperless office with their laptops. There was training for customers. In addition, the platform and dashboards were presented to the author and how they work.

- **Derived Themes and Sub-Themes**:
  - **SCN**: Lean Supply Chain, Digitalisation and Innovation, Collaboration, Resilience.
  - **TQM**: Process Management, Continuous Improvement, Education and Training.
Non-Participant Observation at the Customer (Case 4-Triad D):

- **Duration**: 15 minutes.
- **Organizer**: Marketing Manager at the Manufacturer.
- **Observation**: The stores were separated into dry containers, refrigerators and freezers with temperature and humidity-controlled facilities and fire alarm systems, including security cameras, barcoding systems, hygiene and safety signs and sensors. The author introduced the solar system, forklifts, and a fleet of modern trucks. Also, the author visited the offices of employees, which were information systems used as ERP to manage the operation process, the condition of work and gender balance.
- **Derived Themes and Sub-Themes**:
  - SCN: Digitalisation and Innovation.
  - TQM: Process Management, Quality Control Tools and Techniques, Continuous Improvement.

4.4.4.3 Finding of Secondary Data - Case 4

An examination of secondary data reinforced the findings from primary observations. The researcher reviewed secondary data about the three actors in Triad D in EFSC, as described in Table 4.1 above.

1. They showcased their SUST initiatives on their websites, focusing on transparency, stakeholder engagement, and diversification of nutritional products to meet different needs and satisfaction.
2. All actors in the Triad D emphasized obtaining certifications from recognized bodies, including ISO 9001 and HACCP, which underscores their commitment to ensuring food supply quality, safety, and efficient delivery.
3. Governmental regulation is a driver of SUST, such as environmental monitoring by law enforcement of the Ministry of Environment. Quality and safety of products and Good Manufacturing Practices (GMP) inspected by the Jordan Food Drug Association (JFDA).
4. The company’s SUST reports indicate social activities through continuous awareness of nutritional days, food shows, festivals and social media, a donation to the Ministry of Health during the COVID-19 pandemic and a cancer center.

5. Continuous training by stakeholder engagement from the Jordan Food Drug Association (JFDA) and the Ministry of Industry and Trade on HACCP is essential.

6. Environmental reports on their website indicate information transparency for environmental protection, energy saving, and reduction in resource consumption.

4.5 Conclusion

This Chapter has provided an in-depth exploration of the results from analysing the transcribed data from the 32 semi-structured interviews based on the thematic analysis method, documents, and observations across four Case studies. Illustrative quotations from the interviewee support the findings. As established, the preliminary Themes and Sub-Themes associated with the three principal perspectives were revised and refined through these findings, leading to the emergence of new theoretical constructs within each main Theme.

The findings of this Chapter offer a foundation for cross-analysis, drawing out more holistic insights and understanding. Hence, the next Chapter, Chapter 5, becomes imperative as it is poised to delve into a deeper, cross-case analysis of the phenomena, amalgamating insights from individual Cases to identify patterns. This would further allow for a comprehensive understanding of the nexus between quality, supply chain, and sustainability, paving the way for the following layers of this research journey.
Chapter 5: Further Analysis and Discussion

5.1 Introduction

This Chapter presents further analysis of findings across all four Cases. After exploring each Case individually in Chapter 4, this cross-case analysis and discussion explain the phenomenon of QDS in EFSC, this research topic.

Chapter 5 begins by refining the classification of the four Triads discussed in the Case studies, grouping them into closed, open, and transitional categories. Section 5.2.1 continues with a broad Case-by-Case overview and deeper analysis of the three perspectives. The SCN perspective is the medium through which TQM and SUST are communicated in the Triads. Then, the broad summary continues with further analysis of the TQM and SUST perspectives in Section 5.2.

Section 5.3 presents a more systematic approach to the Case Studies that attempt to elicit the interviewees' Themes and priorities with respect to the interviews and observations described in Chapter 4. The researcher recognized the inevitability of responder and interviewer bias. Therefore, triangulation is important. It moves into a holistic interpretation of the three perspectives from the researcher's point of view. A systematic process is followed, mapping the general categories of the perspectives into general Themes and Sub-Themes. The three perspectives are treated separately and merged into the integrated approach summarised under QDS, then into the integrated category QDS and combined to study their effect on SUST performance.

First, a detailed account of the responses of actors in the Triad to the Themes and Sub-Themes is presented in a strength matrix that maps the strengths and weaknesses of subjective impressions of the responses; then, there is further validation of the strengths of the responses in the matrix using NVivo. The network models map the perspectives into hubs, and then the hubs are mapped into QDS. The researcher uses the Initial Conceptual Framework of the three key perspectives of the phenomenon of QDS in EFSC, as stated in Chapter 2 (Figure 2.19). This is to conduct the analysis and answer the research questions and objectives.
of the current research to build up and expand a theory, including differences and similarities across the four Cases: Triad A - Case 1, Triad B - Case 2, Triad C - Case 3 and Triads D - Case 4. The outcome of the cross-case analysis is analysed using thematic analysis and supported by NVivo 12 software.

5.2 Demographic Characteristics of the Interviewees

The purpose of this Section is to provide an analysis of the respondents' characteristics in this study to generate a first impression of the main characteristics of the sample. The demographic profiles are presented in Table 5.1.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Category</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>30-34</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>35-40</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>41-45</td>
<td>11</td>
<td>34.37</td>
</tr>
<tr>
<td></td>
<td>46-50</td>
<td>5</td>
<td>15.62</td>
</tr>
<tr>
<td>Experience</td>
<td>5-10</td>
<td>13</td>
<td>40.06</td>
</tr>
<tr>
<td></td>
<td>11-15</td>
<td>11</td>
<td>34.37</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>21</td>
<td>65.62</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>11</td>
<td>34.37</td>
</tr>
<tr>
<td>Education</td>
<td>Bachelor</td>
<td>22</td>
<td>68.75</td>
</tr>
<tr>
<td></td>
<td>Master</td>
<td>9</td>
<td>28.13</td>
</tr>
<tr>
<td></td>
<td>PhD</td>
<td>1</td>
<td>3.13</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

To conclude, most employees are young people with approximately ten years of experience. Most respondents had bachelor's degrees, showing a high maturity level and academic formation. Male participants are more prevalent than females.

5.3 Key Differences and Similarities

This Section briefly summarises the differences and similarities between the four Cases, Triad A - Case 1, Triad B - Case 2, Triad C - Case 3 and Triad D - Case 4 in EFSC in Jordan. First, the typology of Triads is discussed in more detail. Second, a key comparison of the impact of the three perspectives, namely SCN, TQM and SUST, on QDS in EFSC is presented. Then, the author elicits priorities that, from her point of view, emerged from the Case Studies individually and collectively. The author's impressionistic viewpoint
is checked against NVivo analysis. Hence, a summary of the analytical generalisation has been followed in this Chapter to provide a final conceptual framework for the SSCQM-Decision Framework.

Further, triangulation follows in Chapter 6. The author attempts to be transparent in presenting her interpretation and results. Chapter 6 contains a cross-analysis and comparison with the literature.

**5.3.1. Typology of Cases Triads**

The rows of Table 5.2 below indicate the perspectives contained in the intersection of QDS (see Venn diagram Chapter 2, Figure 2.1), and the columns represent the 4 Cases in the study. So, rows 1 – 4 represent properties of the Triad supply chain network. Row 1 is a typology of Triad networks. Rows 2 - 4 describe other properties of the SCN network. Rows 5 and 6 refer to the other two perspectives, quality and SUST. Row 7 refers to the intersection of the three perspectives represented in the Venn diagram.

**Table 5.2: Typology of Triads A, B, C and D in EFSC (same Table 4.5)**

<table>
<thead>
<tr>
<th>Row number</th>
<th>Description Type</th>
<th>Triad A</th>
<th>Triad B</th>
<th>Triad C</th>
<th>Triad D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Triad Type</td>
<td>Open Triad</td>
<td>Transitional Triad</td>
<td>Closed Triad</td>
<td>Closed Triad</td>
</tr>
<tr>
<td>2</td>
<td>EFSC Status</td>
<td>Medium-established</td>
<td>Medium-established</td>
<td>Well-established</td>
<td>Well-established</td>
</tr>
<tr>
<td>3</td>
<td>Age of Triad</td>
<td>5 years</td>
<td>7 years</td>
<td>10 years</td>
<td>10 years</td>
</tr>
<tr>
<td>4</td>
<td>Exporting Experience</td>
<td>Short</td>
<td>Medium</td>
<td>Long</td>
<td>Long</td>
</tr>
<tr>
<td>5</td>
<td>Quality Practices</td>
<td>Semi-Active</td>
<td>Semi-Active</td>
<td>Active</td>
<td>Active</td>
</tr>
<tr>
<td>6</td>
<td>Sustainability Practices</td>
<td>Semi-Active</td>
<td>Semi-Active</td>
<td>Active</td>
<td>Active</td>
</tr>
<tr>
<td>7</td>
<td>QDS Applications</td>
<td>Weak-Applied</td>
<td>Medium-Applied</td>
<td>Strong-Applied</td>
<td>Strong-Applied</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

Row 1 of Table 5.2 further describes the Case Studies according to type. The Cases of Triads A, B, C and D have shown that the focal actors could affect the structure between actors, resulting in different types of Triads: open, closed or transitional Triads. These Triads are the dynamic components of EFSCs to manage
and operate different processes between the actors in each Triad and across the EFSC, including other actors and Triads. The three types of Triads could be part of a supply network in EFSCs in Jordan.

The author's classification is consistent with that of Wilhelm et al. (2016) and Jraisat et al. (2021). A detailed picture of the broadly defined types in (a), (b) and (c) (described in (Mena et al., 2013; Jraisat et al., 2021) is given in Figures 5.1, 5.2 and 5.3 below and the corresponding tables

(a) **Open**: An open Triad that presents a traditional structure of indirect dyads between the three actors in the Triad.

(b) **Closed**: A closed Triad with a contractual direct dyad structure between the three actors in the Triad

(c) **Transitional**: A transitional Triad reflects a structure of potential direct dyads between the three actors in the Triad.

5.3.2 Further Description of Case Study Typologies

Referring to rows 2-7 in Table 5.2 above, it is useful to comment on Case-by-Case perspectives that generally emerged in the empirical work.

**Case 1**

Case 1 demonstrated an open Triad that includes a structure of indirect dyads in the Triad between the three actors, where the three actors have been working together and with other actors for five years. This Triad provided weak-established EFSC that showed medium experience in exporting canned food to markets in the Gulf, Iraq, Lebanon, Turkey, Australia, New Zealand and others. However, their practices of quality and SUST have been shown as semi-active because they did not apply all practices due to a shortage of funds and experiences that affected their applications of QDS in EFSC.

**Case 2**

Case 2 demonstrated a transactional Triad that includes a structure of potential direct dyads in this Triad between the three actors, where the three actors have been working together and with other actors for seven years to be able to provide a medium-established EFSC that shows medium experience in exporting canned
food to markets located in EU, USA, Gulf markets and others. In this Triad, their practices of quality and SUST have been shown as semi-active because they applied several practices by ensuring some funds and international experiences that affected their applications of QDS in EFSC.

**Case 3 and Case 4**

Cases 3 and 4 demonstrate a closed Triad that includes a structure of contractual dyads in these Triads between the three actors where the three actors have been working together and with other actors for ten years to provide a well-established EFSC that shows long experience in exporting canned food to markets located in Lebanon, Iraq, KSA, USA, European countries, Gulf markets and others. The managers in this Triad have good education levels and demonstrated experience of between 10 and 20 years in exporting activities. Many of these years were spent in quality and SUST, showing active practices in providing strong applications towards QDS in their EFSC.

Hence, an EFSC of a multi-tier structure could have different types of Triads at the same time across the different actors. The key findings are also consistent with the works of Choi and Wu (2009) and Huo et al. (2019), who have argued that Triadic structures of business dyads can be at horizontal and vertical levels, which are key drivers in order to make Adaptable Sustainable Supply Chain Amanemgt Performance (ASSCMP) linked to quality practices. This level of analysis shows that QDS in EFSCs can have a sustainable performance of social, economic and environmental performance.

**5.4 An Analysis of the Perspectives, Themes and Sub-Themes within QDS**

In this Section, the author conducts a deeper analysis of the three perspectives contained in QDS, taking an integrated point of view as promised in Chapter 1. The Section begins with the network perspective in QDS and continues with an exposition of the quality and SUST perspectives in QDS.
5.4.1 Tabulation Of Themes and Sub-Themes associated with Supply Chain Network (SCN) Perspective within QDS

This Section will compare the four Cases from the key perspective of SCN in contributing to QDS in EFSC. Table 5.3 presents the SCN perspective, which has seven key Themes, which are then categorized into related Sub-Themes.

Table 5.3: SCN Perspective, Themes and Sub-Themes

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Key Themes</th>
<th>Sub-Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer-Supplier Relationship</td>
<td>Selection</td>
<td>Monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trust</td>
</tr>
<tr>
<td>Multi-Tier Network</td>
<td>Collaboration</td>
<td>Resilience</td>
</tr>
<tr>
<td>Risk Management</td>
<td>External Risk</td>
<td>Internal Risk</td>
</tr>
<tr>
<td>Lean Supply Chain</td>
<td>Waste Management</td>
<td>Value Creation</td>
</tr>
<tr>
<td>Innovation</td>
<td>Process Innovation</td>
<td>Product Innovation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Organisational Innovation</td>
</tr>
<tr>
<td>Digitalisation</td>
<td>Information System</td>
<td>Advanced Digital Technology</td>
</tr>
<tr>
<td>Contracts</td>
<td>Informal Contract</td>
<td>Formal Contract</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

5.4.1.1 Relationships between Themes and Sub-Themes within SCN Perspective of QDS

Figure 5.1 shows the network model for the perspective of SCN and its key Themes and Sub-Themes (coding) and their relationships, which impact QDS in EFSC. This results from the NVivo analysis, which visually organises related Themes and Sub-Themes. This network model represents the hub SCN (Parent). The next circles (called child) are key Themes related to the SCN perspective. Responses are Supplier-Customer Relationship, Multi-Tier Networks, Lean Supply Chain, Risk Management, Digitalization, Innovation and Contracts. The next outer circles (child) are related to Sub-Themes for each key theme as these Responses are further categorised in this Sub-Theme related to indicate practice related to the main
These Themes and Sub-Themes, which refer to the model by a child, are the results of synthesising the primary data.

![Network Model for SCN Perspective, Key Themes and Sub-Themes](image)

**Figure 5.1: Network Model for SCN Perspective, Key Themes and Sub-Themes**

### 5.4.1.2 Relative Strength of Application of Themes and Sub-Themes of QDS relating to SCN

Table 5.4 briefly presents the strength matrix of synthesising findings for the four Cases. This matrix maps the subjective impression, reflecting the strengths and weaknesses of the Theme and Sub-Theme related to the SCN perspective based on manual thematic analysis of the transcribed interviews for developing ideas and understanding for all Cases. The relative strengths and weaknesses were indicated from strongly increased familiarity by interviewees to weakly observed. The synthesis of the strengths among Cases is discussed in detail below. Further, NVivo validates the strengths and priorities in **Table 5.4** below. NVivo screenshots of respondents' responses indicating SCN and its Themes and Sub-Themes are presented in **Appendix G, Figure G.1**.
<table>
<thead>
<tr>
<th>Perspective</th>
<th>Key Themes</th>
<th>Coding (Sub-Themes)</th>
<th>Case 3 (Triad C)</th>
<th>Case 4 (Triad D)</th>
<th>Case 2 (Triad B)</th>
<th>Case 1 (Triad A)</th>
<th>Total Aggregate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Supplier</td>
<td>Manufacturer</td>
<td>Customer</td>
<td>Aggregate</td>
<td>Supplier</td>
</tr>
<tr>
<td>Customer-Supplier Relationship</td>
<td>Selection</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Monitoring</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Development</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Trust</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Aggregate</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Multi-Tier Network</td>
<td>Collaboration</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Resilience</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Aggregate</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Lean Supply Chain</td>
<td>Waste Management</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Value Creation</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Aggregate</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Risk Management</td>
<td>Internal Risk</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>External Risk</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Aggregate</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Supply Chain Network (SCN)</td>
<td>Digitalization</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Information System</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Advanced digital Technology</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Aggregate</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Innovation</td>
<td>Product Innovation</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Process Innovation</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Organizational Innovation</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Aggregate</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Contracts</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Informal Contract</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Aggregate</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Total: SCN Support QDS</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
5.4.1.3 Further Discussion of SCN Perspective Cross Cases Analysis: Comparison

Supplier-Customer Relationship: It was found in dyadic relationships between each of the two actors that Selection across all actors in all Cases positively affects QDS in EFSC. That confirmed that actors at the dyadic level used criteria to select suppliers based on quality, cost and delivery time, differentiated according to the material supplied. Interestingly, new selection criteria emerged, such as the engagement of environmental issues and social concerns. The actors follow a trial purchase, and most follow ISO 9000 quality procedures as most are certified, but there was no structured process among Cases. In Monitoring, it was found that monitoring positively affects the developing QDS across all Cases at the focal actors (manufacturers). This revealed that they are concerned with assessing other actors differently at the manufacturer level, such as on-site visits or requiring third-party certification. However, there is a weak driver at the customer level in Cases 1 and 2, while in Cases 1, 2, 3 and 4, they positively impact the supplier level. Suppliers were monitored and evaluated on delivery time, pricing and costs. However, customers were able to improve a regular monitoring process and not wait till the appearance of problems to do the monitoring process. It was found that development across all Cases at the manufacturers positively impacted QDS. The customer actors show little impact in Case 1, but in Cases 3 and 4, they had a positive, driven impact, while at the supplier level, in Cases 1 and 2, they had little impact. Most confirmed that the manufacturers seek continuous development activities and use them efficiently in their dyadic relationships. It could be human resources, training, problem-solving, guiding suppliers to set up environmental programs, or new technology, but there was no financial support. This revealed that the suppliers and customers needed more effort to increase their development to impact QDS positively. It was revealed through the interviews that trust positively impacted their dyadic relationship for all actors in all Cases, which confirmed that trust is essential in their long-term dyadic relationship for better SUST and business continuity.

Multi-Tier Network: Collaboration: Triads revealed a prominent Collaboration among all actors in all Cases, which strongly or moderately support QDS at the Triadic level. This was confirmed by meeting their
objectives and helping direct SUST throughout the quality of the SC. SUST requires joint planning and solution finding, investment in cooperative activities and resources, and forecasting and planning activities to achieve their goals successfully. **Resilience:** It was revealed through the interviews with all manufacturers that resilience shows strong or moderate support for QDS. This confirmed that they put their effort into planning to avoid risk and disruption. However, customers in Cases 1 and 2 and suppliers in Cases 1 and 2 show they are unaware of resilience plans and how to recover after disturbance.

**Lean Supply Chain:** It was found that **Waste Management** has strong or moderate support to QDS in all actors except the customer in Case 1, which has a weak implementation. This revealed that they put the lean approach into practice through different tools and practices such as reuse, recycling, and reducing energy or, water or material consumption to reduce costs, decrease waste and improve the quality and efficiency of the process and supply chain. It was revealed that **Value Creation** has strong or moderate support to QDS on all manufacturers, suppliers in Cases 3 and 2 and customers in Cases 3 and 4 as they determine value in advance, such as TBL SUST and quality compliance for customer requirements. Some actors are implementing the value stream and workflow for a process to know every step for continuous improvements.

**Risk Management:** Interviews revealed that **Internal Risk** positively supports QDS in all Cases on manufacturer except the supplier in Cases 1 and 2 and the customer in Case 1. This confirmed that they put effort into managing uncertainty in their activities and cooperating to avoid internal risk. However, It was found that the **External Risk** strongly or moderately supports QDS in all Cases. This confirmed their awareness of external risks such as wars, restrictions on exportation due to new governmental regulations and late notification, and crises, especially COVID–19.

**Digitalization:** It was revealed that **advanced digital technology** was similarly categorized as strong or moderate for all actors in all Cases except the supplier in Case 2 and the customer in Cases 1 and 2, showing that technology weakly impacts QDS. ERP systems, GPS, bar codes, new automated machines and blockchain technology are examples of technology. Suppliers in Cases 1 and 2 and the customers in Case
1 revealed that **Information Systems and Platforms** are weakly supported QDS as they consider technological advancement challenging, creating new risks and needing a costly infrastructure which will reduce their economic performance. In contrast, all other actors in all Cases have categorised **Information systems and platforms** as strong or moderate support to QDS as they believe digital platforms and information systems help them to perform tasks efficiently among supply chain members.

**Innovation:** It was found that **product and process innovation** was similarly categorized as strong or moderate support for QDS at all actors in all Cases as they believe process innovation and product innovation help them to meet new demand and achieve sustainable development, except for the customer at Case 1 revealed that **product and process innovation** has weak support for QDS. It was revealed that **Organizational Innovation** was similarly categorised as strong or moderate support to QDS at all actors in all Cases. Those actors are concerned with quality and SUST culture in their company in order to differentiate themselves, except the supplier in Case 1 and the customer in Case 1 and Case 2 show that organisational innovation has a low impact on QDS as they believe organizational innovation needs more financial investment, time and skills.

**Contracts:** It was found that **formal contracts** were categorised as strong or moderate support to QDS at all actors in all Cases except customers in Cases 1 and 2. That confirmed that actors at the Triadic level know that signing a contract can create a stable buyer-customer relationship and efficiently solve problems arising from the sub-tier. It was found that **informal contracts** across all Cases at all actors positively impacted QDS, except the supplier and customer in Case 1. This means they rely on the reputation for repeated interaction to retain flexibility, including breaking out relationships when they want and knowing the supplier's capability to engage in long-term relationships in the future.
5.4.2 Analysis of Perspectives Themes and Sub-Themes within QDS: Referring to Total Quality Management (TQM)

5.4.2.1 Tabulation of Themes and Sub-Themes associated with TQM Perspective in QDS

This Section compares the hard and soft aspects of the key perspective, TQM, engaged by the four Cases, Triads A, B, C and D, in contributing to QDS in EFSC. The TQM perspective has two key Themes and is then categorised into related Sub-Themes, as depicted in Table 5.5 below.

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Key Theme</th>
<th>Sub-Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Quality Management (TQM)</td>
<td>Soft Factors</td>
<td>Top Management Leadership</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Customer Focus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education and Training</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supplier Relationship</td>
</tr>
<tr>
<td></td>
<td>Hard Factors</td>
<td>Continuous Improvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Process Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quality Tools Techniques</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Product Design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Statistical Process Control</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

In the four studied Triads, Customer Focus, Education and Training, Process Management, Top Management Leadership and Continuous Improvement are considered the most dominant factors for TQM implementation in all Cases. All Triads balanced using hard or soft practices for their QDS in EFSC. This indicates the diverse experiences each company has.

5.4.2.2 Relationships between Themes and Sub-Themes within TQM Perspective of QDS

Figure 5.2 shows the network model from the perspective of TQM and its key Themes and Sub-Themes (coding) and their relationships that impact QDS in EFSC. This model resulted from the NVivo analysis, which visually organises a network of connected Themes and related Sub-Themes (Codes and Nodes). This network model represents the hub TQM (parent); the next circles (called child) are key Themes related to the TQM perspective: **Soft Factors and Hard Factors** to the Sub-Themes are outer circles. The next outer
circles (child) are related to Sub-Themes for each key theme as these responses are further categorised in this Sub-Theme to indicate practice related to the main Theme. These Themes and Sub-Themes, which refer to the model by a child, are the results of synthesising the primary data.

Figure 5.2: Network Model for TQM Perspective, Key Themes and Sub-Themes
(Source: The Researcher)

5.4.2.3 Relative Strength of Application Of Themes and Sub-Themes of QDS relating to SCN

Table 5.6 briefly presents the strength matrix of findings in the four Cases. This matrix maps the subjective impression indicating the strengths and weakness of the Themes and Sub-Themes related to the TQM perspective based on thematic analysis of the transcribed interviews based on manual coding data for developing ideas and understanding the TQM critical factors. The relative strengths and weaknesses were indicated from strongly increased familiarity by interviewees to weakly observed. The synthesis of the strengths among Cases is discussed in detail below. Further, NVivo validates the strengths and priorities in Table 5.6 below. Figure G.2 in Appendix G represents a screenshot of NVivo coding results for TQM and its Themes and Sub-Themes.
<table>
<thead>
<tr>
<th>Perspective</th>
<th>Key Theme</th>
<th>Coding (Sub-Themes)</th>
<th>Case 3 (Triad C)</th>
<th>Case 4 (Triad D)</th>
<th>Case 2 (Triad B)</th>
<th>Case 1 (Triad A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Supplier</td>
<td>Manufacturer</td>
<td>Customer</td>
<td>Aggregate</td>
</tr>
<tr>
<td>Total Quality Management (TQM)</td>
<td>Customer Focus</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Soft Factors</td>
<td>Top Management Leadership</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Supplier Relationship</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Education and Training</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Aggregate</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Hard Factors</td>
<td>Continuous Improvement</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Quality Tools Techniques</td>
<td>++</td>
<td>+++</td>
<td>-</td>
<td>++</td>
<td>+++</td>
<td>-</td>
</tr>
<tr>
<td>Process Management</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Product Design</td>
<td>-</td>
<td>+++</td>
<td>-</td>
<td>++</td>
<td>+++</td>
<td>-</td>
</tr>
<tr>
<td>Statistical Process Control</td>
<td>-</td>
<td>++</td>
<td>-</td>
<td>++</td>
<td>+++</td>
<td>-</td>
</tr>
<tr>
<td>Aggregate</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Total: TQM Support QDS</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
</tbody>
</table>

+++ strongly observed  ++ Often observed  +- Moderately observed  - Weakly observed  N.A not applicable

(Source: The Researcher)
5.4.2.4 Further Discussion of TQM Perspective across Cases: Comparison

**Soft Factors:** In the four Triads, at the manufacturer level, it was revealed that there is a strong or moderate influence on QDS in EFSC. All respondents in all Cases expressed that **customer focus** has strong and positive support for QDS in EFSC. They agreed that listening to customers and learning from their feedback is important to maintain their satisfaction. Respondents in all Cases discussed that the **training and education** positively support QDS, except the customers in Cases 1 and 2, who show that training and education are weak support for QDS. In Cases 1 and 2, customers need to put more effort into their personnel to ensure a consistent level of QDS and enhance productivity and organisational relationships. In contrast, other actors considered that employees need to be more involved and motivated through continuous training internally or externally regarding technical issues and quality awareness. This helps organisations to implement and operate TQM successfully and ensure a consistent level of quality.

Regarding **top management leadership**, all Cases support QDS positively at all actors' levels, indicating that they have a participative management style and are aware of their role in formulating, implementing the quality, and assisting them with their experience. It can be observed that the **supplier relationship** in Cases 3 and 4 at all levels positively supports QDS. This confirmed that most suppliers maintain good communication and are committed to supplying quality products. In contrast, suppliers in Cases 1 and 2 and customers in Case 2 revealed that supplier relationships weakly support QDS. Hence, they should pay attention to supplier cooperation and building stronger relationships with others.

**Hard Factors:** **Process management** and **continuous improvement** have strong or moderate support for QDS at all actors in all Cases. They are more advanced in identifying their main processes, which help improve product quality and efficient operations control. Regarding **continuous improvement, they ensure** flexibility, respond quickly to market changes, and improve work practices. **Statistical Process Control** yielded a variety of opinions among the Cases. All manufacturers, in all Cases, show positive support for QDS. They used statistical methods to control the variation in the food process, reduce rejects, and find the root causes of problems. However, SPC negatively supports QDS on the supplier level in Case
1. Those suppliers considered it more related to production processes; they did not fully understand it due to the lack of training.

It was revealed that **quality tools and techniques** positively support QDS at all manufacturers, in all Cases, and the customer and supplier in Cases 3 and 4. Different tools and techniques are identified, such as cause and effect diagrams and control charts for controlling process variation and data analysis. However, the customer and supplier in Cases 1 and 2 show **quality tools and techniques** have weak support to QDS, so those actors need more attention for using these tools. Regarding **product design**, all actors in Cases 3 and 4 show that product design has positive support for QDS, as the respondents highlighted the importance of product innovation and the expansion of the market and profit. In contrast, product design was weak support for QDS at the supplier and at the customer in Cases 1 and 2. Those actors need more financial investment.

### 5.4.3 Analysis of Perspectives, Themes and Sub-Themes within QDS: Referring to Sustainability (SUST) Perspective

#### 5.4.3.1 Tabulation of Themes and Sub-Themes associated with SUST Perspective in QDS

This Section compares the three key Themes of SUST, environmental, economic, and social, for the key perspective of SUST in contributing to QDS in EFSC across the four Triads (Triad A- Case 1, Triad B- Case 2, Triad C- Case 3 and Triads D- Case 4). This indicates the diverse experiences that each company has. Most of the Triads balanced between three dimensions for their QDS in EFSC. The SUST perspective has three key Themes and is then categorised into related Sub-Themes, as depicted in **Table 5.7** below.
Table 5.7: SUST Perspective, Themes and Sub–Themes

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Key Themes</th>
<th>Sub-Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability (SUST)</td>
<td>Economic</td>
<td>Profit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Market Expansion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operations Cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Customer Return</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Certification</td>
</tr>
<tr>
<td></td>
<td>Social</td>
<td>Traceability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reputation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Employee Rights</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diversity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Community Concern</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transparency Labelling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stakeholder Engagement</td>
</tr>
<tr>
<td></td>
<td>Environmental</td>
<td>Resource Consumption</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Choosing partner on the basis of Environmental Impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Efficient Transportation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycling</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

5.4.3.2 Relationships between Themes and Sub-Themes within SUST Perspective in QDS

Figure 5.3 shows the network model for the SUST perspective, its key Themes and Sub-Themes (coding), and their relationships that impact QDS in EFSC. This results from NVivo analysis and visually organises related Themes and Sub-Themes. This network model represents the hub SUST (Parent). The next circles (called child) are key Themes: **Environmental, Economic and Social**, and the Sub-Themes are outer circles (child) related to Sub-Themes for each key theme to indicate practice related to the main Theme.
5.4.3.3 Relative Strength of Application of Themes and Sub-Themes of QDS relating to SUST

Table 5.8 briefly presents the strength matrix of synthesising findings for the four Cases. This matrix maps the subjective impression indicating the level of strength and weakness of the Theme and Sub-Theme related to the SUST perspective based on thematic analysis of the transcribed interviews. Manual coding data assists in developing ideas and understanding. The relative strengths and weaknesses were indicated from strongly increased familiarity by interviewees to weakly observed. The synthesis of the strengths among Cases is discussed in detail below. NVivo is used to validate the strengths and priorities in Table 5.8 below. Figure G.3 in Appendix G presents an NVivo screenshot for the respondents indicating SUST and its Themes and Sub-Themes.
Table 5.8: A Case-Ordered Predictor - Outcome Matrix: SUST Driven Support QDS in EFSC.

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Key Themes</th>
<th>Case 3 (Triad C)</th>
<th>Case 4 (Triad D)</th>
<th>Case 2 (Triad B)</th>
<th>Case 1 (Triad A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coding (Sub-Themes)</td>
<td>supplier</td>
<td>manufacturer</td>
<td>customer</td>
<td>Aggregate</td>
</tr>
<tr>
<td>Environmental</td>
<td>Resource Consumption</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Recycling</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Efficient Transportation</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Choosing a Partner on</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Environmental Impact</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Aggregate</td>
<td>+++</td>
<td>++</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Social</td>
<td>Reputation</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Diversity</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Traceability</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Transparency Labelling</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Employee Rights</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Community Concern</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Stakeholder engagement</td>
<td>+-</td>
<td>+</td>
<td>-</td>
<td>N.A.</td>
</tr>
<tr>
<td></td>
<td>Aggregate</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Economic</td>
<td>Profit</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Certification</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Operations Cost</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Market Expansion</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Customer Return</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td></td>
<td>Aggregate</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Total: Sustainability Support to QDS

+++ Strongly Observed    ++ Often Observed    +- Moderately Observed    - Weakly Observed    N.A Not Applicable

(Source: The Researcher)
5.4.3.4 Further Discussion of SUST Perspective across Cases: Comparison

**Economic**: All Cases at all levels stated that the **profit, certification, and operating cost** positively supported QDS in EFSC. For certification, this affects their profit, final prices and competition. As regards the **operating cost**, they seek alternative plans and continuous improvement in performing their operation at minimum cost. As for **Market Expansion**, all actors in all Cases showed positive support for QDS except the suppliers in Cases 1 and 2, who had revealed weak support for QDS. The supplier should focus more on planning for market expansion and confirming different requirements, such as social and environmental requirements, to penetrate new markets. As far as **Customer Return** is concerned, all actors in all Cases revealed positive support for QDS, except the supplier in Case 2, who revealed weak support for QDS, so they should consider customer loyalty and have a long relationship with them.

**Environmental**: All the Cases were similarly categorised as strong or moderate, while they differed at the supplier or customer levels. Some were categorised as having weak support QDS in EFSC. **Resource consumption** has positive support to QDS in all Cases at the manufacturer. However, the customer in Cases 1,2 and 4 show resource consumption had weak support towards QDS. In all Cases, manufacturers use **recycling** strongly or moderately to support QDS. In Case 1 and 2, the customer and supplier had less implementation to support QDS. It was found that all Cases at all levels for **efficient transportation** had positive support for QDS. Regarding **choosing a partner based on environmental practices**, the manufacturer level had positive support for QDS and followed this process. However, the customer and supplier in Case 1 negatively influence QDS as this new perspective needs to be considered in their process and given more attention.

**Social**: All Cases stated that the **Reputation** of all the actors on a supplier, customer, or manufacturer had strong or moderate support to QDS. Diversity for all actors revealed positive support for QDS in all Cases, so they should consider customer requirements. For **Traceability**, all actors in all Cases revealed positive support for QDS, so they use a simple procedure or advanced technology for a traceability system to trace back their product. **Transparency in Labelling**: all the actors had strong or moderate support for QDS
except the supplier in Case 2, who showed negative support for QDS, as they consider it is the responsibility of the customer referring to the type of product they produce, vegetables and fruits from farm to factory. **Employee Rights** positively support QDS, in all Cases, at manufacturers, suppliers, and customers, as they maintain a comfortable work environment for their employees. All actors in all Cases revealed **Community Concern** has positive support for QDS except for the suppliers and customers in Case 1, who identified community support as having weak support for QDS because their priorities are employee support. For **Stakeholder Engagement** in all Cases, all the manufacturers highly support QDS. However, the customers in Cases 3 and 4 and the suppliers in Cases 1 and 2 revealed weak support for QDS, so awareness is needed for them to engage more different stakeholders in their activities.

### 5.4.4 Analysis of Perspectives Themes and Sub-Themes within QDS: Referring to QDS and SUST Performance

#### 5.4.4.1 Tabulation of Themes and Sub-Themes associated with QDS and SUST Performance

All actors, especially focal actors, have argued that integrating QDS in EFSC is essential by integrating the three perspectives of SCN, TQM and SUST. Focal actors and manufacturers should be the main hub to lead this integration and help their Triadic actors understand it. A Triad is the main unit at a network of EFSC. This research focuses on Triads as Case Studies to bring knowledge and understanding of the phenomenon of QDS in EFSC as the unit of analysis. In most Cases, the focal actors in their Triads of three actors, supplier-manufacturer-customer, have demonstrated that the phases of QDS play a vital role in ensuring that quality is driven by SUST for the three actors and is led by the focal actors in their Triads and along the EFSC.

This Section will compare the four Cases from the key perspective of SCN in contributing to QDS in EFSC. The SCN perspective has seven key Themes and is then categorised into related Sub-Themes, as depicted in Table 5.9 below.
Table 5.9: QDS Support SUST Performance Perspective, Themes and Sub-Themes

<table>
<thead>
<tr>
<th>Perspective to Sustainability Performance</th>
<th>Key Themes</th>
<th>Sub-Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Product</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Process</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supply Chain</td>
<td></td>
</tr>
<tr>
<td>Sustainability Practices</td>
<td>Sustainable Supply Chain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sustainable Product</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sustainable Process</td>
<td></td>
</tr>
<tr>
<td>Sustainability Performance</td>
<td>Economic Performance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social Performance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental Performance</td>
<td></td>
</tr>
</tbody>
</table>

(Source: The Researcher)

Most Cases have understood that QDS is a concept and practice which should be applied in each Triad, where each actor can attach quality at three levels: product, process and supply chain. Then, each Triad (led by the focal actor) should ensure sustainability management at the same three levels to achieve SUST performance of the three domains, environmental, social and economic, for each factor in the Triad and hence for their EFSC.

5.4.4.2 Relationships between Themes and Sub-Themes within QDS and SUST Performance

Figure 5.4 shows the network model for the concept of QDS and its key Themes and Sub-Themes (coding). This network model represents the hub QDS, then the next circles of Themes are Quality and SUST practices, and the Sub-Themes are outer circles. Figure 5.5 shows the network model for the concept of SUST performance and its key Themes. This network model represents the hub SUST(Parent), and the next circles of Themes (Child) are Environmental, Economic and Social Performance. Those models result from NVivo analysis and visually organise related Themes and Sub-Themes.
Figure 5.4: Network Model for QDS Perspective, Key Themes and Sub-Theme
(Source: The Researcher)

Figure 5.5: Network Model for SUST Performance Perspective and Key Themes
(Source: The Researcher)
5.4.4.3 Relative Strength of Application of Themes and Sub-Themes of QDS relating to SUST Performance

Table 5.10 briefly presents the strength matrix of findings for the four Cases. This matrix maps the subjective impression indicating the strengths and weaknesses of the Themes and Sub-Theme related to QDS and ASSCMP based on thematic analysis of the transcribed interviews, as manual coding data assists in developing ideas and understanding. The relative strengths and weaknesses were indicated from strongly increased familiarity by interviewees to weakly observed. The synthesis of the strengths among Cases is discussed in detail below. Further, NVivo is used to validate the strengths and priorities in Table 5.10. Figure G.4 and Figure G.5 in Appendix G present NVivo screenshots for respondents, indicating QDS and its Themes and Sub-Themes and SUST performance, respectively.
Table 5.10: A Case-Ordered Predictor - Outcome Matrix: QDS Support SUST Performance in EFSC.

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Coding (Sub-Themes)</th>
<th>Case 3 (Triad C)</th>
<th>Case 4 (Triad D)</th>
<th>Case 2 (Triad B)</th>
<th>Case 1 (Triad A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>supplier</td>
<td>manufacturer</td>
<td>customer</td>
<td>aggregate</td>
</tr>
<tr>
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<td>Total: QDS Support sustainability</td>
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</table>

(Source: The Researcher)
5.4.4.4 Further Discussion of QDS across Cases: Comparison

Quality: It was found that the quality of the product has strong or moderate support QDS at all actors. Those actors highlighted that the quality of the product is important for the expanding market and profit. Those actors are concerned with the certification of their products to ensure compliance with the specification of a product regarding the intrinsic and extrinsic attributes.

Regarding process quality, it supports QDS at all actors' levels in the manufacturer and supplier in all Cases as they identify the process requirements for continuous improvement and solving operational problems. They maintain product quality through certification ISO 45001, ISO 14001, ISO 22000, HACCP, halal and organic certification, and they establish quality/Lean circles for improvements and motivation of new ideas. However, Case 1 revealed that process quality has weak support to QDS at the customer level as they need more control of the variation in the food process to reduce rejects through quality assurance and certification.

Regarding the quality of the supply chain, it yielded a variety of opinions in the Cases. In all Cases, all manufacturers show that the supply chain's quality has positive support for QDS at the supplier level in Cases 3 and 4 and the customer level in Cases 2, 3 and 4. Those actors use traceability systems and blockchain technology. They believe that digital platform helps them distribute and collect information on time; thus, these digital platforms enable monitoring activities and quality control improvement along the supply chain with the greening of processes. However, the supplier in Cases 1 and 2 and the customer in Case 1 show that the quality of the supply chain has negative support for QDS. They need more training and financial investment in those information systems and digital platforms.

Sustainability Practices: it was revealed that sustainable products were similarly categorised as strong or moderate support for QDS in all Cases except supplier and customer levels; Case 1 shows sustainable products have weak support for QDS. Those actors mentioned that sustainable products such as organic and halal products are high quality. Those products consider social, economic and environmental SUST during production, such as reducing energy and respecting animal welfare.
All Cases at the manufacturer expressed that a **sustainable process** positively supports QDS through the clean production process, working on the efficient flow, and actors practice green procurement to concern the environment, social, and economic SUST. However, the customer in Case 2 and the supplier in Case 1 revealed that the sustainable process had weak support towards QDS.

In all Cases, manufacturers use a **sustainable supply chain** strongly or moderately to support QDS, such as a collaborative network of collection centers for returnable products. Recovery processes are remanufacturing, reusing and recycling, allowing the companies to be more sustainable by closing process loops and engaging in a circular economy. Reverse logistics is fundamental to promoting a collaborative circular economy. However, at the customer level in Cases 2 and the suppliers in Cases 1 and 2, they expressed that a **sustainable supply chain** had less implementation to support QDS as companies need knowledge and financial ability.

**Sustainability Performance**: It can be seen that Triads can meet the sustainable development requirements of TBL (social, economic, and environmental performance). All the Cases in all actors have similarly categorised **economic performance** as a strong or moderate level to support QDS as a result of implementing quality and SUST in the process, product, and supply chain, resulting in financial and non-financial economic value to increase efficiency and profitability.

All the Cases at the manufacturer have similarly categorised **environmental performance** as a strong or moderate level to support QDS in addition to the supplier in Cases 2, 3 and 4 and the customer in Cases 3 and 4 by collaborating with actors in SC on the efficient use of resources and the improvement of processes concerning recycling, waste management, pollution reduction, wastewater treatment, and energy efficiency. At the same time, they differed at the supplier or customer levels in Cases 1 and 2 as environmental performance weakens QDS in EFSC.

In all Cases, manufacturers revealed that **social performance** strongly or moderately supports QDS at the supplier and customer to achieve an acceptable quality of life for all internal and external people through a contribution to societal development programs, such as donations and health and social awareness programs.
5.5 Further Discussion of QDS and Sustainability Performance across Cases: Comparision

Earlier in the thesis, the supply chain network was said to be the vehicle or medium for transmitting TQM and SUST Themes and Sub-Themes accessing the supply chain; this research treated it as a Triad. The SCN is also a medium for integrating the three perspectives into QDS. Figure 5.6 below illustrates QDS by embedding two perspectives, TQM and SUST, in the SCN.

The combined three perspectives treated separately resulted in the integrated category QDS affecting SUST performance. It can be seen in economic, environmental and social performance. A variety of sustainable activities have been developed through the relations in the Triad between a company, supplier, and customer in SC and its environment, including the society, to achieve better sustainable development and SUST performance. It is necessary to consider the efficiency (internal activities) and effectiveness (external activities) of practices along the whole supply chain to achieve sustainable development.

The following explains the quality and SUST practices needed to achieve sustainable performance on the Triad (Supplier-Customer, Manufacturer). Figure 5.6 shows the network model for the concept of QDS, which has been formed due to the integration of Quality and SUST practices and its link to SUST performance in EFSC. This results from the NVivo analysis, which visually organises related Themes and Sub-Themes. This network model represents the hub QDS and SUST; the next circles are related to key Themes.
Quality Practices

**Product Quality**: Product Quality is perceived based on intrinsic and extrinsic attributes. Intrinsic quality is objective functionality characteristics of a product that cannot be changed without modifying the product itself, such as sensory properties (e.g. taste, texture, flavours, appearance) or ingredients of product composition. Extrinsic attributes are aspects that are not a part of the physical composition of a product, such as brand name, country of origin, nutritional information, packaging, SUST claims and quality labels. Moreover, food safety has become an important food quality attribute. Product quality significantly affects the brand image, profitability, customer satisfaction and loyalty. Product certification ensures product compliance with requirements and international food quality and safety standards.

**Process Quality**: The quality of the process could be seen in quality assurance and quality circles practices. Quality assurance is identifying and eliminating the causes of quality and safety issues at every stage in the process to provide confidence in the product quality and for the product to comply with defined requirements and standards. Q.A. even increased with certification. Certification improves SUST performance, increases efficiency, and reduces non-compliance regarding food quality and safety. Certification systems enhance the production process's transparency, product quality, and

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**Figure 5.6: Network Model for QDS and SUST Performance, Key Themes**
(Source: The Researcher)
traceability and support sustainable production, reducing negative environmental and social impacts. Certification helps the food actors in the supply chain in commercial and contractual arrangements and eliminates multiple audits. Quality assurance includes quality and food safety management systems. ISO 14001 certification focuses on resources and energy, material efficiency, waste, and pollution reduction, which helps to enhance environmental performance. Adopting Good Manufacturing Practices (GMP), HACCP, and ISO 22000 ensures that food is safe and hygienic along the EFSC. Also, ISO 45001 controls workplace occupational health and safety risks, leading to fewer accidents. Thus, it enhances social performance.

**Quality/Lean Circles** are a systematic approach to identifying, analysing and solving problems for continuous improvement. These practices are adopted to improve the quality of products and decrease scrap, waste, reworking or material usage in the production process, shorten the lead time in purchasing, and improve the response to the market. At the economic level, it improves the quality and reliability of products. It reduces costs by establishing a cost control and reward system to reduce unnecessary expenditure and waste in process management and simplify the process to achieve customer satisfaction and enhance performance. In social performance, the quality team helps in collaborative decision-making. Moreover, developing employees' skills, proper training on problem-solving tools, motivating employees, and providing recognition for creative ideas are activities that improve social performance.

**Supply Chain Quality: Traceability** systems can improve integration and monitoring, thus helping in more accurate planning, quality management assurance and efficient distribution activities at all levels in the EFSC, which can significantly improve the upstream-to-downstream SUST of the supply chain. It ultimately makes resource planning more efficient, shortens the operation process, manages inventory appropriately, and results in environmental performance. Traceability helps resource management by monitoring raw materials and their associated process (location, amounts, inventory, transportation, delivery time, consumption rate of natural resources and energy). Moreover, traceability helps in waste management at each step, tracking waste for recycling, reuse, and emissions, reducing costs and protecting the environment. Traceability results in transparency in information related to the product in upward and downward FSC; this helps in providing a high-quality product and helps in efficiently
managing the process of recalling products and avoiding risks. It offers record integration from different sources or tracking sensors using radio frequency identification (RFID) technology.

**A Digital Platform** is an efficient, accessible system platform with flexibility and efficiency of supply chains that help e-commerce and online purchasing products with on-time delivery to fulfil the customer requirements. Digital platforms optimize the supply chain's operations while reducing energy and material consumption. Automating the process for monitoring activities and improving quality control for food inventory management can reduce lead times and uncertainty in demand and increase order fulfilment. That influences transportation, such as reducing costs, increasing customer service and decreasing environmental influence.

**Sustainable Practices**

**Sustainable Product:** Sustainable products concern higher quality and healthy products and integrate environmental SUST without compromising the product’s function. The most relevant attributes of food healthiness are ingredients, nutrition facts, and additives. Considering the packaging and production type during sustainable product production is essential. There are eco-friendly ingredients and eco-friendly packaging; friendly products and related packaging are manufactured effectively using resources such as materials, water and energy, eliminating hazardous materials, minimizing wastes, and increasing resource recovery by recycling. Moreover, sustainable green packaging is manufactured with green technical design in intrinsic attributes of packaging. Thus, this helps save costs, reducing the environmental impact and waste generated, consequently reducing procurement and waste costs. Sustainable packaging is products with less packaging, such as bulk products) Alternatively, it could be simple, recyclable, biodegradable, or packaging made of recycled or other environmentally friendly materials.

Sustainable products are organic products that are more environmentally friendly, processed without adding synthetic fertilizers and chemicals and healthier with higher nutrient content; this environmentally friendly agricultural technology reduces the use of chemicals, protecting health. Healthy food is concerned with nutrition (less fat, sugar, salt, no additives and artificial ingredients).
Halal products respect animal welfare and cover health, hygiene, food safety, and environmental friendliness. Certification and specific labels and logos on packaging give information about the product SUST. Sustainable products increase the market segment, profit, and sales, encouraging economic performance. Sustainable products reduce environmental impact without harmful chemicals, artificial additives, organic ingredients, green manufacturing technology, and minimizing pollution. In addition, sustainable products require suppliers to commit to their workers' conditions that contribute to social SUST improvement. Higher vitamin and nutritional capacity and no pesticide residue or additives concern the health and safety of people.

**Sustainable Process: Green Procurement:** The focal company will force its upstream suppliers to adopt technology and environmentally friendly materials, such as using non-toxic chemicals, recycled paper, renewable resources, and energy with a low environmental impact, which reflects more sustainable performance on the supplier's side rather than on that of the manufacturer. Regarding economic performance, environmental procurement reduces costs with a good purchase strategy through waste treatment, consumption of energy and conservation of resources, which improves the public image. Social performance could help achieve market differentiation, increase labour productivity, improve the supplier's public image and social conditions, and engage in ethical labour practices. The environmental performance involves purchasing procedures such as selecting suppliers with SUST targets to ensure resource conservation, animal welfare in the upstream stage, and waste minimisation.

**Clean Production** focuses on efficient flow and evaluation at all stages of the production process, with friendly, sustainable environmental activities. Organic, Halal, and environmentally friendly products are examples of the transformation to sustainable production. Clean production minimizes consumption resources (material, water, toxic substances) and waste management for greening production. It also reduces energy consumption (alternative fuels, energy conservation and renewable energy) as the food industry is energy intensive. Energy audits force manufacturers to focus on redesigning processes, using environmentally friendly technologies and minimising waste. Clean production and green procurement enhance environmental performance. Also, Social performance is achieved through minimizing bad
conditions such as accidents, considering the safety and health of the employees and public health. Economic performance is enhanced through cost reduction and product quality.

**Sustainable Supply Chain:** The reverse logistics practice means that distribution and collection centers are established at the same locations or multiple sub-assemblies. This helps the firms focus more on their core activities, enhancing economic performance. The returned products are either in acceptable condition (before the expiry date) that they are resold to retail collection centers or donated to charities. On the other hand, these products are unusable for remanufacturing, reuse, and recycling. Reverse logistics optimize logistics through better-developed transport design and management, proper stores, and logistic asset sharing, which could be concerned with returnable products and focus on transport efficiency to choose the best route and reduce travel distances. Combining many shipments in one and using alternative fuel vehicles (electric, hybrid) so there is lower fuel consumption and emission and proper infrastructure to reduce the damage. This will enhance their environmental impact, greatly influence costs, and improve customer retention. Product quality is ensured during distribution through tracking and tracing systems, temperature control, and good-quality packaging. Thus, this would protect products from damage during travelling and storage, keep the quality of food products, and reduce waste to enhance environmental and economic performance.

**Circular Economy:** The circular economy increases the efficiency of processes and reduces the consumption of natural resources, reducing food wastage. Circular economy emphasises the recycling, reuse, reduction of materials, and turning materials into valuable resources for other actors. Proteins in animal waste streams are often used as animal feed. Organic waste has great potential for organic recovery fertilizer, wastewater treatment for cleaning water, and by-products are considered useful for energy recovery.

**Sustainability Performance**
Increasing awareness of the need for SUST practices and quality management simultaneously aims to achieve social, environmental and economic performance. Sustainability performance is conceptualised as an outcome of monitoring and improving SUST and QM. Adaptive Sustainable Supply Chain
Management performance (ASSCMP) is balanced in a combination of its economic, social and environmental performance, indicating its contribution (positive or negative) to sustainable development. These results show that the manufacturing organisation, the focal actor, is at the center of SC to pay attention to sustainable practices along SC with the engagement of suppliers and buyers to enhance economic, social and environmental performance. Social performance results in achieving the well-being of the employees, providing a suitable and safe working environment, preserving employee health and safety, freeing child labour and reducing accidents through transparent procedures and monitoring the supplier and customer activities in their supply chain. Employees are the organization's main asset; they protect their human rights, ensure basic treatment, offer training programmes aligned with the organisation's objectives, and establish a system to retain them. In society, organisations establish a positive corporate image; this could be through social health and safety, employment from surrounding societies and social projects and reports. In addition, environmental performance could be environmental protection, the reduction of energy consumption, resource conservation, and pollution reduction. The enhancement of economic performance leads to profit.

Consequently, Employee income and their living conditions will improve. COVID-19 has illustrated the need for sustainable production and localized input production. Government incentives and legislation in developing countries help adopt clean production to reduce taxes and increase the image of companies to open exports to foreign customers. Responsiveness within a timeframe to customer requests and fluctuations in demand and supply or changed requirements in the marketplace has become an opportunity for developing countries to access export markets. Moreover, enhanced ASSCMP in SC supports exporters in gaining a reputation in the market.

**5.6 Further Analysis: NVivo**

The researcher continued with the in-depth data analysis process to validate and refine the manual cross-analysis with the aid of NVivo 12 software to validate the results at each coding stage and, finally, organize and keep track of records, retrieve reports, and graphical models and data queries. Prolonged
involvement with the Case material is advocated in qualitative research. Thus, adopting Nvivo analysis and other triangulation techniques increases the transparency and validity of the research.

Thirty-two records of transcribed data were imported to NVivo 12 for analysis. This starts with reading and rereading interview transcripts and the documents several times for more familiarization, using predetermined codes and Themes from analysing each Case (each Triad). The thematic analysis helps refine the initial coding Themes and categories in nodes of Sub-Themes through reviewing and linking or deleting similar nodes involved in merging similar Themes or separating individual Themes to develop the final set of Themes and Sub-Themes.

The NVivo 12 outcomes of this research were similar and strengthened the manual research results. A visualization using NVivo 12 is presented in the Figures above of the Theme (codes) and Sub-Themes (nodes) generated during the coding process for each theoretical perspective. These show the percentage coverage of codes and nodes for all Case studies. Figure 5.7 below displays a word cloud through NVivo 12 highlighting the important words. Participants mentioned QDS in EFSC and quickly understood the most important word. Table H-1, Appendix H is a codebook depicting prominent codes and further categorizations into the nodes generated from the responses to the respondents' analysis in Cases, their frequency for each Theoretical Perspective, and the percentages of respondents contributing to each theme.

![Figure 5.7: Word-Cloud of Word Frequency of Actors' Interviews](Source: Nvivo 12 for interview analysis)
5.7 Conclusion

Chapter 5 presents the detailed findings of the second stage of the in-depth analysis. 32 semi-structured interviews were analyzed by a manual thematic analysis method to conduct a cross-case analysis of the transcribed generating Themes and Sub-Themes. Then, the transcribed data was processed in NVivo 12 software to verify the results and draw a conclusion. Theoretical saturation was reached after four Case studies. Further, the final Decision Framework was validated with the AHP method and supported by a literature review in the next Chapter, Chapter 6.
Chapter 6: Final Conceptual Framework and Validation

6.1 Introduction

This is a transition Chapter moving from analysing the state of the export food supply chain (EFSC) in Jordan using the concept of QDS to developing a Decision Framework for managers based on the analysis. The author uses the conceptual framework of the three key perspectives of the phenomenon QDS in EFSC, as stated in Chapter 2 (Figure 2.19), as a basis for analysis that addresses the research questions in Chapter 1.

The within-case analysis in Chapter 4 and the cross-case analysis in Chapter 5 enabled the author to identify the critical Themes and Sub-Themes incorporated into QDS. After exploring each Case individually in Chapter 4 and after the cross-case analysis in Chapter 5, five research propositions are set out in this Chapter, and the final Decision Framework is developed, as illustrated in Figure 6.2.

In Section 6.2, the author refines the preliminary conceptual model set out in Figure 2.19 in Chapter 2 to show the relationship between Quality Driven Sustainability (QDS) and Adaptable Sustainable Supply Chain Management Performance (ASSCMP). The Final Decision Framework is constructed related to earlier findings from Chapters 4 and 5 empirical studies and described in detail.

Section 6.4 offers a triangulation with the Literature Review as the author compares results with the literature Review. In Section 6.5, with the help of an expert panel, the author validates a Decision Framework based on her modified analytical hierarchy process AHP originally developed by Saaty and followers in a series of papers from the conceptual framework. The expert’s role is to assess them and use their assessment to validate or otherwise contradict or modify the propositions and refine key perspectives' transformation into Themes.

In brief, this Chapter presents the findings of the final Decision Framework as a result of further analysis within and across all Cases. The Decision Framework is intended to perform an important function: to create adaptive management of supply chains (ASSCMP). ASSCMP describes the situation in which a supply chain is robust in the face of frequent disruptions, endogenous and exogenous. ASSCMP
describes a situation in which SCs are flexible and able to adapt to and manage disruptions over the medium to long term.

The study's findings were triangulated with the literature and the AHP multi-decision criteria method to deal with the differences. Use an AHP methodology modified by the researcher to validate a Decision Framework in consultation with an expert panel and to refine the transformation of key perspectives into Themes.

6.2 Research Propositions

This research has provided vital findings on the phenomenon of QDS in EFSC. The findings revealed that integrating the three perspectives, SCN, TQM and SUST, is the theoretical foundation for QDS across Triads in their EFSC in the empirical context, the food industry in Jordan. A great deal of interdependence between the findings about attributes within the three perspectives and QDS in EFSC leads to key propositions.

These propositions are related to research questions and objectives. The responses to the research questions were gathered from interpreting participants' responses in the Case Studies to generate propositions. Table 6.1 clarifies the research questions and the related propositions.

The first row of Table 6.1 shows how the literature review enabled the author to combine the three perspectives into her concept QDS, which is the cause of a law-independent variable set out in a conceptual model, revealing not only that the three perspectives can be integrated, but that the process of in the integration, carried out by the author in her empirical fills the gap in the literature (Section 6.4). The next three rows relate to the empirical work and show how the three perspectives are mapped into the Case Studies.
<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Purpose of Research Question</th>
<th>Propositions</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ1 How are the three perspectives (SCN, TQM and SUST) interrelated in the existing literature of supply chain management?</td>
<td>A critical review of the literature concerned with the 3 perspectives. RQ1 enables the researcher to synthesise the relevant literature and formulate the concept of QDS. The concept of QDS enables the researcher to develop an initial conceptual framework. The QDS concept is studied in the thesis from the perspective of focal actors (Manufacturers in triads of Supplier-Manufacturer-Customer).</td>
<td>P1: The literature demonstrates the close relationship between the three perspectives and provides the basis for an initial conceptual framework of QDS in EFSC.</td>
</tr>
<tr>
<td>RQ2 What are the SCN practices applied by triads to build QDS in EFSCs?</td>
<td>Analyse case studies and related data to identify: The actual SCN practices associated by managers with QDS in EFSC’s in Jordan. Enables themes, subthemes and empirically derived attributes associated with supply chain networks SCN to be identified and interpreted by the researcher</td>
<td>P2: EFSC in triads analysed in the research reflects themes and sub-themes associated with supply chain networks (SCN) in the category QDS.</td>
</tr>
<tr>
<td>RQ3 What TQM practices are applied by triads to build QDS into EFSCs in Jordan?</td>
<td>Analyse case studies related data to identify: The actual TQM practices associated by managers with QDS in EFSCs in Jordan. Enables themes, subthemes and empirically derived attributes associated with total quality management TQM to be identified and interpreted by the researcher</td>
<td>P3: EFSC in triads analysed in the research reflects themes and sub-themes associated with total quality management (TQM) in the category QDS.</td>
</tr>
<tr>
<td>RQ4 What are TBL SUST practices applied by triads to build QDS into EFSCs in Jordan?</td>
<td>Analyse case studies and related data to identify: Sustainability practices associated by managers with QDS in EFSCs in Jordan. Enables themes and sub-themes associated with Sustainability to be interpreted and classified into themes and sub-themes by the researcher.</td>
<td>P4: EFSC in triads analysed in the research reflects themes and sub-themes associated with Sustainability in the category QDS.</td>
</tr>
<tr>
<td>RQ5 What are the implications of QDS (Integrating the three perspectives into QDS) in the context of EFSCs in Jordan?</td>
<td>How is the integration of the 3 perspectives into QDS perceived by managers in triads in EFSCs? Enables relative strengths and priorities associated with QDS demonstrated in the case studies and related data to be interpreted and synthesized as themes and sub-themes and empirically derived attributes by the researcher.</td>
<td>P5: A. Managers in EFSC in Jordan integrate the three perspectives (themes and sub-themes) into QDS. B. Analysis of evidence related to QDS enables the researcher to identify the relative importance to QDS of themes and sub-themes according to the perceptions of supply chain managers.</td>
</tr>
<tr>
<td>RQ6 How do QDS practices impact the TBL sustainability performance of triads in EFSCs in Jordan?</td>
<td>With special reference to triads in EFSC’s in Jordan. Enables the researcher to identify the relationship between QDS and Adaptable supply chain management performance (ASSCMP). Taking account of: a. Evidence relating to RQ1 – RQ6, case study analysis of triads in EFSCs in Jordan. b. Triangulating evidence from four case studies and further data (cross-analysis of four case studies, comparison with related supply chain research, discussion with experts and observation in company tours). Enables the researcher to design a decision framework for SCM managers.</td>
<td>P6: When faced with internal and external disruptions, QDS positively impacts Adaptable Sustainable SCM performance (ASSCMP) in triads in EFSC. Performance in supply chains management relates to the following dimensions of sustainability or robustness in the face of internal and external disruptions: Economic, Environmental and Social Sustainability.</td>
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(Source: The Researcher)


Research Questions and Related Chapters

The author discusses RQ 1 in the literature review. The author discusses this in RQ 2 – RQ 4, the empirical work. The author mainly discusses RQ 5a and RQ 5b in Chapters 6 and 7. This enabled the author to undertake cross-analysis by comparing evidence in the four Case Study - Triads and comparing evidence in the four Case studies- Triads and other original research with RQ 1, which occurs partly in Chapter 5. Chapter 6 also enables the author to lay the foundations of a framework for managers whose goal is to achieve SSCM in the face of disruptions.

The author discusses RQ 6 a and RQ 6 b in Chapters 4, 6, and 7. This enabled her to discover the impact of QDS on the future Adaptable Sustainable Supply Chain Management Performance (ASSCMP) and explain the SSCM in the past. It also validates the relationship between SSCM in the face of disruptions and the dimensions of SSCM, which are economic, social and environmental SUST.

RQ 1 – RQ 6 enabled the author to design

1) A conceptual model that relates QDS to ASSCMP.

2) A Decision Framework for supply chain managers.

Propositions

The following Sections look at the relationship between the research questions and the related proposition:

RQ1 - P1
P1: “The literature demonstrates the close relationship between the three perspectives and provides the basis for an initial conceptual framework of QDS in EFSC.”

Concerning RQ1 and P1, the literature review supports the view that the three perspectives (SCN, TQM and SUST) can usefully be integrated to understand QDS in EFSC in a conceptual model. The review also supported an additional proposition that the author addresses a gap in the literature. It also demonstrates in an extensive literature review that the three perspectives are predominantly concerned with the perspectives separately or in pairs. As a result, the author constructed a conceptual model based on QDS. An initial conceptual framework of QDS in EFSC was formed (see Chapter 2, Figure 2.18).
RQ2 - P2

P2: “EFSC in Triads analysed in the research reflect Themes, Sub- Themes associated with Supply Chain Networks (SCN) in the category QDS.”

This research revealed that all actors in their Triad must integrate the seven key Themes of the SCN (customer-supplier relationship, multi-tier network, lean supply chain, risk management, digitalization, innovation, and contracts) for practical and enhanced QDS in EFSC. All the Cases indicated that all Triad actors focusing on the focal actor (manufacturer) and other actors must create a dyadic relationship for application quality and SUST to enhance the three dimensions of SUST performance. This starts with the selection, then monitoring is required, and development may be seen as a further step for improvement (Luthra et al., 2016; Petljak et al., 2018). This is supported by building trust resulting from long-term relationships (Dobrzykowski et al., 2015). The focal actor is responsible for extending these dyadic relationships to the Triadic relationship in its network. They are building a collaborative relationship, and establishing a network requires a focal company's resources, managerial skills, and capabilities, which cannot be completed individually (Sharma et al., 2019; Potter and Wilhelm, 2020). The relationship between dyads can be at a different Triadic level and monitored by the focal actor. Focal actors make the decisions that impact performance at the dyadic and Triadic levels. A multi-tier network between manufacturers, suppliers, and customers in collaboration, risk management, and resilience can effectively address risks and uncertainties and build resilient, sustainable supply chain practices.

Moreover, collaborative stakeholders in new technology and information systems are essential to accelerate and manage these relationships effectively. In some Cases, the focal actor could practise product, organization and process innovation, working with network actors across the EFSC. Moreover, lean management helps to eliminate waste across EFSCs using the latest digital technologies to make the SC more responsive to changes. A lean approach encourages incremental improvement and value-added activities at every step (Willumsen et al., 2017; Madhani, 2018). Hence, value is created to reform the SC structure, enhance quality, and reduce lead times and costs that meet customers' needs (Welo and Ringen, 2015; Soliman and Saurin, 2017). The existence of an informal contract maintains a
positive reputation and trust between parties to facilitate formal cooperation (Stevenson and Pirog, 2008; Pilbeam et al., 2012). The formal contract exists to mitigate risks and mutual understanding and manage the business processes (Wolf et al., 2001). The focal actors could build awareness and develop with other actors for long-term SUST.

**RQ3 - P3**

**P3: “EFSC in Triads analysed in the research reflects Themes and Sub-Themes associated with Total Quality Management (TQM) in the category QDS.”**

This is about how the focal actor uses the established quality management system to integrate the SUST dimensions to achieve SUST performance among all actors in the EFSC. It was noticed in all Cases that all actors should create interest in change by understanding the TQM approach and implementing a combination of soft and hard practices to achieve the required sustainable quality performance in the product, process, and supply chain relationships (Beske and Seuring, 2014). SUST is when the products, processes and the whole chain reflect effectiveness and efficiency in TQM implementation (Idris and Zairi, 2006).

The critical TQM practices identified in the studied Cases are (top management leadership, continuous improvement, training and education, customer focus, and process management) to enhance the TBL of SUST performance (Nguyen, 2018). Critical success factors can help analyze the dynamic interactions of TQM factors and the successful implementation of TQM. The effective implementation of soft practices is related to hard practices (Nallusamy, 2016). This can help managers succeed in overall SUST performance by integrating the focus of QDS. TQM seeks to enhance process efficiency and product quality to ensure greater customer satisfaction through continuous improvement. Customers focus on their needs and evolving requirements to improve activities and opportunities for continuous improvement in value co-creation and innovation for economic SUST (Tari et al., 2007; Nguyen, 2018). Quality of the processes to design new markets and products is followed by committed leadership, successful training, and the empowerment of employees to enhance social responsibility.

This research has demonstrated positive contributions of the effective TQM approach to fostering QDS in Triads along the SC, as integrating TQM and SUST enhances QDS in EFSC.
RQ4 - P4

P4: “EFSC in Triads analysed in the research reflects Themes, Sub-Themes associated with Sustainability (SUST) in the category QDS.”

There are positive relationships between SUST to enhance quality and SUST among the three actors in a Triad in the EFSC. Quality extends from the quality of products and processes to the quality of the SC. SUST motivates actors to integrate SUST through established management approaches (Siva et al., 2016; Rajeev et al., 2017). The focal actors should optimize the quality management strategy for quality achievement towards more added value. They establish and integrate environmental, social and economic SUST dimensions within their quality strategy. SUST with three dimensions reflects the complexity. It causes difficulties in integration improvement along SC (Seuring and Müller, 2008). The SCN and TQM concepts were adopted to integrate TBL SUST into SC processes and practices for sustainable development (Reefke and Sundaram, 2016; Rajeev et al., 2017). However, this research revealed that the Triad actors expand sustainable performance across EFSC through SSCM strategies.

The actors in the Triad consider activities such as certification, operating cost, market expansion, and customer return to achieve economic performance. Also, those actors considered environmental practices in their products, process, and supply chain, such as resource consumption, recycling, efficient transportation, and choosing a partner based on environmental practices, to lean their supply chain and reduce waste. Moreover, all the actors (supplier, customer, and manufacturer) should consider reputation, diversity, traceability, and transparency in labelling to achieve different requirements and solve problems. Employee rights, community concern and stakeholder engagement are considered to maintain their activities and target their social performance and TBL SUST.

RQ5 - P5

P5-A: “Managers in EFSC in Jordan integrate the three perspectives (Themes and Sub-Themes) into QDS.”

P5-B: “Analysis of evidence related to QDS enables the researcher to identify relative importance to QDS of Themes, Sub-Themes according to the perceptions of supply chain managers.”
This research revealed that QDS is the key strategy for actors in Triads in their EFSC. All Cases, especially the focal actors, have confirmed that QDS should be established and developed by all three actors in the supply chain, the supplier, manufacturer and customer, to effectively and successfully implement QDS practices across the EFSC, which enhances the quality of products, processes and the overall supply chain. Good relations and committed focal actors, suppliers and customers can be a real asset to a Triad, where knowledge and experience are drivers for the continuous improvement of processes, products and the whole supply chain.

Product quality cannot be observed directly (Sun and Anwar, 2022). Food quality is intrinsic in terms of nutritional value, sensory value and extrinsic criteria. Process quality is a systematic or reliable approach through process management improvement and managing quality variation in production at each step in the food production chain, continuous improvement, solving operational problems, and maintaining product quality through certification (Asefa et al., 2011). They form quality, lean and innovation circles for continuous improvements of processes and the motivation of new ideas.

Moreover, traceability systems and digital platforms contribute to the quality of the supply chain. These digitalization activities enable actors along the supply chain to have real-time data, monitor activities and make quality control along the SC with green processes. This motivates the company to become sustainable products of higher quality and safety with nutritional aspects and eco-friendly packaging.

Moreover, actors in the Triad consider social, economic and environmental SUST dimensions during product design (Aquilani et al., 2016). Halal and organic certification is evidence of sustainable products. They adopted the clean production process and green procurement, working on the efficient flow for reducing the consumption of resources and implementing reduction, recycling, and reusing to enhance SUST performance, which minimizes negative environmental impacts. However, a **sustainable supply chain** is a collaborative network of collection centres for returnable products. Recovery processes such as re-manufacturing, reusing and recycling allowed the companies to recycle materials into valuable resources to be more sustainable. Reverse distribution centers help reduce
storage area and transportation costs. This enhances economic, environmental and social SUST (Kang et al., 2015).

RQ6-P6
P6-A: “When faced with internal and external disruptions, QDS positively impacts Adaptable Sustainable SCM Performance (ASSCMP) in EFSC in Triads.”
P6-B: “Performance in supply chain management relates to the following dimensions of sustainability or robustness in the face of internal and external disruptions: Economic, Environmental and Social Sustainability.”

QDS in EFSC is an essential step in the Triad to manage the increasing SC vulnerability. It helps face growing internal disruptions to the Triad, such as food offences and product recalls, and external disruptions, such as inflation, collapse, food contamination across boundaries and economic crises. The COVID-19 pandemic caused further challenges, such as maintaining food quality and safety and security of food supplies that released the need for collaboration on transparent global sharing of information about food safety and quality to create SSCM.

The concept of SUST has advanced from moral and ethical means for protecting humans and non-humans (Jørgensen, 2008). SUST is balanced social, environmental, and economic performance (Chardine-Baumann and Botta-Genoulaz, 2014). This research revealed that sustainability TBL performance is an outcome of incorporating QM and SUST practices. Focal actors should establish practices to generate SUST of SCM in their Triad. Quality and SUST are implemented in the process, product, and supply chain. Product quality is concerned with product design (Song and Su, 2015). It considers sustainable processes through the clean production process and collaboration with SC partners on the efficient use of resources and concerning recycling, waste management, pollution reduction, and energy efficiency to be more sustainable by closing process loops and engaging circular economy and, in turn, these activities contribute to environmental and economic SUST performance (Scipioni et al., 2021). The focal actors should be aware of acceptable customer relationship satisfaction and quality of life for all internal and external people by contributing to social awareness and social and environmental development programs related to social performance (Shahzad et al., 2019).
6.3 A Conceptual Framework of SSCQM for QDS in EFSC - Decision Framework
6.3.1 Foundations of Decision Framework for Sustainable Supply Chain Quality Management

Transforming the analysis of the export food supply chain (EFSC) in Jordan into a Decision Framework requires simplifying the Themes and Sub-Themes so that managers can focus on a limited number of variables that have the most impact on creating Sustainable Supply Chain Quality Management (SSCQM).

The Chapter is moving towards constructing a Decision Framework using the insights from the Case Studies and the conceptual model. The empirical evidence drawn from the Case Studies and the synthesis of the Case Studies enables the development of a Decision Framework (Figure 6.2).

In conclusion, the present research attempts to provide a full picture of QDS in EFSC. The findings have demonstrated the integration between the three key perspectives: SCN, TQM and SUST. Thus, the perspective's key Themes are also integrated to support understanding each Theme individually and their intersecting on QDS in EFSC. This research has indicated that the concept of QDS is built based on three steps: the integration of QDS, the phases of QDS and the upgrading of QDS in EFSC. Hence, this research highlights a better conceptualisation for QDS in EFSC based on Triads, focusing on the focal actor. Figure 6.1 below shows a network model (roadmap) to illustrate better the QDS phenomenon and its holistic border in the EFSC.
6.3.2 Developing and Examining a Framework of SSCQM - Decision Framework

The conceptual framework of SSCQM and supported propositions pointed toward positive theoretical associations between SCN, TQM and SUST. These findings were reflected in the TQM and SUST integration literature (Isaksson, 2006; Kuei and Lu, 2013; Allur et al., 2018; Nguyen et al., 2018; Bastas and Liyanage, 2019; Kumar et al., 2020b; Akanmu et al., 2021; Soltanmohammadi et al., 2021). The SCN and SUST integration literature (Beske and Seuring, 2014; Haghighi et al., 2016; Gunasekaran et al., 2016; Stindt, 2017; Rezaee., 2018; Baliga et al., 2019; Mosteanu et al., 2020; Qorri et al., 2021) reinforcing the role of QDS in EFSC for better SUST performance.
An initial conceptual framework of SSCQM (Figure 2.19) was proposed from a comprehensive discussion of the literature on SCN, TQM, and SUST in Chapter 2. Then, this initial framework was a basis for a pilot Case and data collection from four Triads and analysis in Chapter 4. This was to individually examine the initial framework in each Case to explore the key Themes and identify new Themes and Sub-Themes to enrich our understanding of the theoretical associations of SCN, TQM and SUST perspectives, QDS and ASSCMP in Triads in EFSCs.

In Chapter 5, a cross-case analysis of the four Cases has been applied to explain the identified theoretical associations with rigorous validity and reliability research to provide a final Decision Framework of SSCQM, as seen in Figure 6.2. These associations, as seen in the propositions, complement one another. The author has considered it beneficial to blend these and understand the phenomenon of QDS in EFSCs. Amongst the undertaken perspectives, SCN is considered the theoretical foundation for the new framework, where the totality of Triads is the component of a food supply chain network linked to support understanding EFSC. The author considered all the information generated from the Case Studies and their analyses, considering the current situation of the export food industry and its EFSC in Jordan.

Furthermore, interviewees' feelings, opinions and behaviours were appropriate in identifying quality and SUST issues for the implementation of SSCQM. Observations and secondary data have enriched the analyses and key findings from the interviews. AHP analysis has also been triangulated to support the key findings and research rigour. Several triangulation methods have also been applied in the data collection and analysis to bring research validity and reliability. The process transformed responses to the research questions into propositions generated from interpreting the responses and testing them on experts to generate a final Decision Framework. Expert opinions' role was in modifying or otherwise responding to questions in the Case Studies and interpreting those responses.

Successful implementation is based on a systematic approach to developing a logical and comprehensive Decision Framework generated from the SSCQM framework for QDS in EFSC. This is the first thing that should be done to set the direction for the implementation of SSCQM. This Decision
Framework (Figure 6.2) illustrates the areas of these three SCN, TQM and SUST and the impacts on ASSCMP. This research thus presents this Decision Framework with key Themes of three perspectives, which have been explored and explained across multiple Cases. Several Sub-Themes, mainly newly emerged, have clustered these key Themes. More importantly, several new key Themes have emerged across the four Cases and are supported by triangulated views. There was evidence from the empirical study that factors are applied effectively within the EFSC to implement SSCQM.

In conclusion, this framework positively impacts the results of SUST performance. In summary, SCN (supplier-customer relationships with activities of selection monitoring, development, and trust; multi-tier network in activities of collaboration, and resilience; lean supply chain in activities related to waste management and value creation; risk management in activities related to internal and external risk; digitalization in activities related to advanced digital technology and information systems; innovation in activities related to the organizational, product, process innovation; contracts in activities related to formal and informal contracts and TQM (Soft factors with activities of education and training, supplier relationships, top management leadership, customer focus; hard factors in activities, product design, quality tools and techniques, process management, continuous improvement and statistical process control) and SUST (economic SUST in activities of profit, certification, operational cost, market expansion, customer return; environmental SUST in activities of resource consumption, recycling, efficient transportation, choosing partners based on environmental practices; social SUST in activities of diversity, reputation, traceability, transparency in product labeling, employee rights, community concern, stakeholders engagement) have a positive impact on the SSCQM implementation for TBL SUST performance (economic, environmental and social) to achieve Adaptable Sustainable Supply Chain Management performance (ASSCMP).
The successful implementation of SSCQM will profoundly affect countries' production systems and supply chains, such as EFSC of Jordan. Following developing countries' guidelines, an SSCQM implementation framework has been elaborated. Finally, from the proposed framework, it can be said that SSCQM could be implemented in the EFSC in Jordan.

However, a shift in thinking about the implementation of environmental, economic, and social SUST requires actors in the SC to be responsible for resource use and waste minimization for environmental consideration as well as take care of the social issues related to internal and external people, in addition, to achieve economic SUST to increase their profitability. Managers could integrate quality practices with SUST practices. They need to incorporate quality practices such as product quality to consider intrinsic and extrinsic characteristics for product and process quality through quality assurance, certification, quality circles and supply chain quality through digital platforms and traceability.
technology. The SUST practices could be sustainable products and packages, sustainable processes through green procurement and clean production, and sustainable supply chains through reverse logistics and circular economy in their SC. These quality practices and SUST practices help achieve sustainable performance. However, implementing the new approach in the EFSC will take years to achieve significant results. This was related to various reasons but rested heavily on how organizational learning occurred.

6.3.3 SSCQM Framework: Stages of QDS in EFSC and Adaptable Sustainable Supply Chain Management Performance (ASSCMP) in the Face of Disruptions

This Section concerns empirical findings on QDS (a concept that integrates the three perspectives) and SSCM in the face of disruptions. It also suggests what focal actors should do to generate SSCM in their Triad.

In EFSCs, customer demand and global competition require product quality and process quality improvement along the SC (Omta et al., 2002). According to Foley (2005) and Abbas and Sagsan (2019), quality remains an important part of improving export performance and competitive advantage and is driven by markets (Lamuka, 2014). Focal actors seek sustainable development through improved quality and SUST (Isaksson, 2019).

The success of implementing SUST depends on taking advantage of its current strengths (Kuei and Lu, 2013). There is a possible synergism advantage in combining TQM and SUST, so the concepts of quality and SUST can be understood collectively to achieve the required chain performance (Isaksson, 2006) in EFSCs. Hence, the present research consists of three key stages to support the QDS concept in EFSC: integrating QDS, phases of QDS, and upgrading QDS in EFSC. All Cases have argued that these three stages are the road map to drive support for Triads in their EFSC. The three stages are discussed in detail below:

1) **Stage 1 - Integrating QDS** is mainly concerned with the issue of integrating QDS.

2) **Stage 2 - Phases of QDS** are concerned with the strategies that focal actors need to pursue to achieve SSCM.
3) **Stage 3- Upgrading of QDS** is concerned with how the focal actors need to achieve the goal of SSCM.

**Stage 1-Integrating QDS**

All actors, especially the focal actors, have argued that integrating the three perspectives (SCN, TQM and SUST) into QDS in EFSC is an essential step in SCM. The integration is essential because EFSC are facing a growing number of internal disruptions to the Triad, for example, food offences, product recalls, and external disruptions such as inflation, collapse and economic crises (Grzybowska and Stachowiak., 2022). Other issues include the global food trade, outsourcing, and climate change, contributing to food contamination across boundaries that release the need for collaboration on transparent global sharing of food safety and quality (Aggarwal and Srivastava, 2016; Barman et al., 2021).

The urgent disruption at the time of research was the COVID-19 pandemic. The pandemic caused special challenges to food supply chains: maintaining food quality and safety and security of food supplies (Barman et al., 2021). Firms in the Case Study Triads appear to have managed and adapted to increasing supply chain vulnerability. The researcher noted that their responses indicated that dimensions of Quality Driven Sustainability (QDS) were important in adaptability in SCM to create SSCM. The researcher noted their reference to the balance or trade-off between economic, environmental and social criteria. They argued that SSCM had important economic, environmental and social dimensions.

Some authors, including Jonker (2000) and Konstantas et al. (2019), attach similar importance to integration in ASSCMP. However, compared to this research, they have a limited view of integration.

The Case Study research found that focal actors had an important role in creating QDS, especially by introducing innovative logistics systems to reduce food waste and information systems to improve communication in the Triads and anticipate future food crises. Xiaorong et al. (2015), Sharma and Joshi (2020) and Galanakis (2020) make similar observations and point to the trend of localising global networks. Other aspects of ASSCMP are important, as evidenced in this research (refer to the items in
Other researchers cited that EFSCs may be viewed from various perspectives, including but not limited. For example, lean practices (Tortorella et al., 2017; Phan et al., 2019), TQM philosophy, achieving ISO 9000 standards and certification (Vandenbrande, 2021) in order to reduce at least the frequency of food and health disturbances leading to crises in the future.

Quality improvement in the food industry is directly related to the TQM system and food safety, aligned with national and international standards. It may vary from country to country (Pozo et al., 2018). The food safety system HACCP (Hazard Analysis of Critical Control Point) is applied to control EFSCs (Vanichchinch, 2019). The HACCP is currently considered a prerequisite for exporting food, and other commonly applied quality frameworks in the food industry include Good Manufacturing Practices (GMP), HALAL, and ISO 22000.

Focal actors need to identify the vital aspects of SUST, quality practices, and support tools that the author refers to as hard factors (information computer technology, logistics packages referred to in the previous paragraph) and items in Table 4.3 in Chapter 4. Soft factors include Identifying, communicating and relating to the Triads' main stakeholders, other actors, and decision-makers. Understanding and planning their needs is also important to better support SUST practices.

**Stage 2-Phases of QDS**

This research focuses on Triads (the main unit at a network of EFSC) as Case Studies to bring knowledge and understanding of the phenomenon of QDS in EFSC. In most Cases, the focal actors in their Triads of three actors, Supplier-Manufacturer-Customer, have demonstrated that the phases of QDS at the product, process and supply chain levels play a vital role in ensuring that quality-driven support to SUST for the three actors and the focal actors in their Triads and along the EFSC who lead this change. Hence, the focal actors facilitate learning, managing, and monitoring of a common SUST standard along the EFSC to their customers or the next-tier supplier (Tachizawa and Wong, 2014; Wilhelm, 2016). However, those focal actors should understand the complexity of EFSCs and that the sub-suppliers or sub-customers of direct suppliers and customers are responsible for most social and environmental problems (Abidin et al., 2018), which implies that lead firms need to disseminate SUST
standards to the next suppliers to implement SUST practices in their operations (Grimm et al., 2014). However, managing non-compliance environmental issues in the SC reduces costs and improves quality (Ashby et al., 2012; Kenneth et al., 2019). Many scholars have called for in-depth conceptual and empirical studies linking quality and SUST in SC (e.g., Kuei and Lu, 2013; Siva et al., 2016).

Stage 3- Upgrading of QDS: Most Cases have understood that QDS is a concept and practice which should be applied in each Triad, where each actor can attach quality for better SUST in EFSCs. Then, each Triad led by the focal actor should ensure the chain performance of the three domains, environmental, social and economic, at the Triadic level. That implementation is often the most difficult part. Focal actors at the Triad level have recognised that TQM leads through quality and customer focus, leading to a better reputation with suppliers and customers in SCN. This indicates that there should be a synergy in combining TQM with SD in SCN as the foundation perspective. TQM as a management system, its principles, methodologies, and tools could seemingly be used and expanded to include components of SUST to create a balanced TQM-SD system. (Bergman and Klefsjö, 2003). The SUST issue is complex (Voss et al., 2006; Isaksson, 2013) and cannot be reached without the interaction of many actors along the supply chain as one entity, defining their goals and following strategies to achieve them (Galli et al., 2016). SUST could contribute to TQM by broadening the focus to all the dimensions of TBL, which needs to be understood, integrated and balanced effectively as one process to avoid unintended consequences along other dimensions. TBL SUST enlarges the focus from customers to all stakeholders. (Nguyen, 2018). All Cases have highlighted that this process of QDS could be improved by SCN, integrating quality into actors in their Triads along their EFSC with the help of top management. Its integration with SUST enhances some of the characteristics of TQM. QDS is a management system; the SUST dimensions could easily emerge in the SSCQM framework. QDS contributes to improving economic performance to enable social and environmental performance at each Triad along the EFSC. So, QM could support SUST performance (Siva et al., 2016). Moreover, customer focus should be a core principle in this framework (Bergman and Klefsjö, 2010).

In conclusion, the present research attempts to provide a full picture of QDS in EFSC. The findings have demonstrated the integration between the three key perspectives: SCN, TQM and SUST. Thus,
the perspective's key Themes are also integrated to support understanding individually each theme and their intersecting on QDS in EFSC. This research has indicated that the concept of QDS is built based on three steps: the integration of QDS, the phases of QDS and the upgrading of QDS in EFSC. Hence, this research highlights a better conceptualisation for QDS in EFSC based on Triads, focusing on the focal actor.

6.3.4 Practical Roadmap Final Decision Framework

Following the discussion in the previous Chapter, the author addresses the action set out in Figure 6.3. Figure 6.3 illustrates the final practical process map for the Decision Framework (Figure 6.2) for integrating the key perspectives and Themes associated with the phenomenon of QDS in EFSC in Jordan. The current research contributes to establishing a framework for implementing SSCQM in the EFSC, in line with the research objective. The SCN, TQM, and SUST complement one another, and the author has considered it beneficial to blend these. In this situation, the focal actor in the Triad can control the evolution of relationships and long-term stability, allowing three actors to participate in the Triad in a closed contractual structure. The focal firm can help in the interactions of SCN members and the transition to a Triadic structure and demonstrate the effectiveness of the SCN model to facilitate a space for quality and sustainability practices for the implementation of SSCQM. The successful implementation is based on a systematic approach to developing a simple and logical direction for implementing the SSCQM Decision Framework.
The researcher developed a process to integrate the TQM and TBL SUST to form SSCQM. It is designed to help managers and policymakers in EFSC move step by step towards an SSCQM and pay attention to related practices and sharing of relevant information. It is a continuous learning process based on a cycle of Plan-Do-Check-Act (PDCA), which is recommended for implementing SSCQM in the EFSC that is complemented with the three key stages: integrating QDS, phases of QDS, and upgrading QDS in EFSC (see Section 6.3.3 above) to drive support QDS for Triads in their EFSC. The planning stage is in parallel with integrating QDS, the ACT stage is in parallel with phases of QDS, and the DO and Monitor stages are in parallel with upgrading QDS. The process of leading change
starts with a decision and commitment to change. Continuous improvement of processes could be seen as a support process providing resources in methodologies and tools.

6.4 Comparisons of this Research with Relevant Literature
6.4.1 SCN Literature

This research revealed that the Seven key Themes of the SCN (Customer-Supplier Relationship, Multi-Tier Network, Lean Supply Chain, Risk Management, Digitalization, Innovation, Contracts) need to be integrated by all actors in their Triad for effective and enhanced QDS in EFSC, with most focus on:

- Supplier-Customer Relationship,
- Multi-Tier Network
- Risk Management

The manufacturer, a focal actor, needs to establish and monitor a dyadic relationship with other actors to apply quality and SUST to enhance SUST performance within all three dimensions and achieve ASSCMP. The focal actor needs to extend these dyadic relationships to the Triadic relationship in its network. Closed Triads, among other transitional and open Triads, are the most effective in building SUST performance, building a collaborative relationship and establishing a network that requires resources, managerial skills, and the capabilities of a focal company, such as information systems and management systems like HACCP, ISO 22000, which cannot be completed individually.

A multi-tier network between manufacturers and their suppliers and customers regarding collaboration and resilience can effectively address risks and uncertainties and build resilience for sustainable supply chain practices. Thus, actors must collaborate to mitigate SCN disruptions and risks effectively and return to a normal situation or overcome the disruption promptly.

A complex network approach has evolved in the SCM concept. In this situation, the focal actor in the Triad can control the evolution of relationships and long-term stability, allowing three organisations to participate in the Triad. The focal firm can help in the interactions of SCN members and the transition to a Triadic structure and demonstrate the effectiveness of the SCN model to facilitate a space for innovation, risk management, digitalization and contracts. Several interactions and relationships
changed where actors changed their roles and were transformed from an open Triad to a transitional Triad, where the dyadic relationship began to change to the closed Triad; this closed Triad is the strongest relationship, creating value for the three actors to build SUST.

The interaction of the SCN Themes and the interaction of all Sub-Themes in each theme is important to enhance QDS in EFSC. The actors need to extend their dyadic relationships to Triadic relationships and manage their related activities. Hence, the manufacturer should manage these relationships as the focal actor to develop QDS in Triads across EFSC. To conclude, the SCN perspective positively contributes to QDS in the EFSC. The interaction of seven key Themes of the SCN (Customer-Supplier Relationship, Multi-Tier Network, Lean Supply Chain, Risk Management, Digitalization, Innovation, and Contracts) in the four Triads across the EFSC is required to enhance quality and SUST among all actors at the dyad and Triad levels. Moreover, previous research is consistent with these findings (Govindan et al., 2015b; Bastas and Liyanage, 2018a; Rajeev et al., 2017). Previous research suggested further studies on Triads across the chain actors (Mena et al., 2013; Vedel et al., 2016). Focal actors (manufacturers) are responsible for building relationships with their upstream and downstream for better quality and SUST (Sauer and Seuring, 2019; Alinaghian et al., 2020), which are enhanced by digitalisation (Bag et al., 2018; Raji and Rossi, 2019).

The **Supplier-Customer Management** activities in dyadic relationships are supplier selection (Awasthi et al., 2018). Supplier selection has many criteria, of which the highest priority criteria are quality, followed by on-time delivery (Ghadimi et al., 2018). Moreover, product variety and innovation have influenced supplier selection (Vanichchinchai, 2014). Recently, environmental consideration has been adopted into the supplier selection process (Azadnia et al., 2015; Banaeian et al., 2016; Faisal et al., 2017). Delivery performance depends on selecting delivery and distribution channels, warehouse location, and vehicle scheduling (Wang et al., 2019b). **Monitoring** practices are auditing or self-assessment by the actors based on assessment criteria, which incorporate recent environmental and social dimensions to generate positive impacts in EFSC (Lee et al., 2016; Luthra et al., 2016). **Supplier development** shares know-how and cooperation with a few suppliers about environmental issues (Ralston et al., 2015; Busse et al., 2016). This effectively motivates SC partners to help each other with
product quality and enhances SUST ( Ağan et al., 2016; Petljak et al., 2018). Some findings show that the focal actor could depend on mutual trust and information sharing due to a close long-term partnership for loyalty and best economic performance (Dobrzykowski et al., 2015; Hajli et al., 2017). Research findings strongly support the suggestion that the collaboration between the focal actor and other SC actors is essential for sustainable performance (Ashby et al., 2012; Campos et al., 2017). Hence, a collaboration system is a joint platform of multiple firms along the SCN to work together to achieve a successful long-term partnership (Vanichchinchai., 2014). Moreover, Triadic collaboration requires a high level of integration and needs an alignment of incentives that influence economic performance (Schuh et al., 2014). The focal actor has the main responsibility for establishing the dyadic relationship for a particular functional demand and sharing information and coordination activities for effective planning and the forecasting of demand fluctuations, delivery methods, products, and problem-solving to reduce overall costs and avoid the cost of switching suppliers and reduce pollution (De Almeida et al., 2017; Ding et al., 2018). Downstream, the logistic cost is high due to the need to invest in building infrastructure, vehicles and drivers, training staff, and subsequently enhancing delivery performance for customer satisfaction (Rahman and Korn, 2010). Thus, more flexibility is given to the focal actors to arrange their work and collaboration, focusing on core processes and enhancing innovation and production capability (Ateş et al., 2015; Ermes et al., 2022). There is a need to focus more proactively on managing risk and disruption (Blackhurst et al., 2018). The focal actor is responsible with other actors for responding to and recovering from unexpected disruptions and mitigating risks to enable resilience as a solution to fulfil SUST (Pettit et al., 2019; Zavala-Alcivar et al., 2020). A common practice for developing supply chain network resilience and mitigating risk is a multi-sourcing approach for valuable products with limited resources (Heese, 2015; Hu et al., 2017) and collaborations among vertical and horizontal stakeholders (Azadegan and Dooley, 2021).

**Risk Management** is related to contingency planning and supply disruptions, thus influencing SUST (Chaudhuri et al., 2020). Even though a disruption may not originate from a focal firm's immediate neighbours, it can spread to the focal firm (Kim et al., 2015). Collaborative relationships in Triads reduce disruptions (Leat and Revoredo-Giha, 2013) and the sources of risks due to the SC complexity
and uncertainty (Bode and Wagner, 2015; Kamalahmadi and Parast, 2016). Disruption risks involve potential disturbances, either natural risks (earthquake, fire) or artificial risks (equipment breakdowns and labour strikes) (Kaufmann et al., 2016). The sources of supply chain risk are internal to the organisation, and the SC might be predictable. However, external risks outside the focal company extending to the network are more challenging to predict (Busse et al., 2017). External network risks are usually environmental, social, political, weather or natural disasters (Christopher and Peck, 2004). Internal supply chain risks could be machine breakdown, supply and demand, production, manufacturing, and organisational risks (Canzaniello et al., 2017; Fan and Stevenson, 2018).

As a result of market competition, focal actors are responsible for transferring innovation in terms of product, process, and organization along SCN to enhance SUST performance (Adams et al., 2016; Hong et al., 2019). Collaboration with developed countries for innovation is needed due to a lack of knowledge and infrastructure (Campos et al., 2017; Silva et al., 2019). Innovations can be obtained from upstream suppliers as sources of innovative ideas, critical technologies, and downstream processes to create products that create value and meet consumers' needs on time (Hong et al., 2019; Haus-Reve et al., 2019). SUST in the SC is enhanced by incorporating lean management approaches such as waste identification and elimination (Tasdemir and Gazo, 2018; Sony, 2018). Lean management practices contribute to environmental and financial performance (Göbel et al., 2015; Mårtensson et al., 2019). Lean tools significantly contribute to bringing quality to the process and products by reducing process waste (Modgil, 2017a; Gandhi et al., 2018). One of the practices is to standardize the process for the continuous flow of products and process improvement; as a result, innovation is found due to more free time for the employees to improve quality and reduce costs (Theagarajan and Manohar, 2015). The lean approach focuses on value-added activities at every step for incremental improvement (Willumsen et al., 2017; Madhani, 2018). Hence, value is created by actors in order to reform the supply chain structure, organisational functions, understanding of a sequence of activities and processes, and improve product flow to increase productivity, enhance quality, reduce lead times and costs that meet the needs of customers so increase satisfaction and loyalty (Welo and Ringen, 2015; Soliman and Saurin, 2017; Sarkar and Banerjee, 2019).
Digital technologies help to integrate actors and manage their activities in SC (Büyüközkan and Göçer, 2018; Haddud and Khare, 2020). Every focal actor has channels for sharing information and facilitating efficient decision-making by reducing data collection time and real-time data communication among all other actors along the EFSC. Advanced digital technology management effectively uses technical knowledge and skills to improve quality, safe products and processes and existing technology, which requires investment, managerial focus and employee training to create and use efficient technology. Using appropriate technologies such as blockchains and information systems that can support and control their SC processes, including product traceability, reducing food waste, monitoring energy, and increasing efficiencies in transport (Xiaorong et al., 2015; Rana et al., 2021), can increase their customer loyalty, achieve economic, environmental and social performance and innovations (Sharma et al., 2021; Pirmanta et al., 2021). Exogenous shocks and turbulent environments force organisations to align information systems in their key activities for survival (Sabherwal et al., 2019; Lamzon et al., 2022).

Information systems applications such as enterprise resource planning (ERP) and electronic data interchange (EDI) have recently gained popularity in enhancing processing, communication and relationships. Tracking systems such as bar codes and warehouse management systems enable daily data collection and efficient communication. Sensors monitor the quality to prevent poor-quality products from reaching customers (Foidl and Felderer, 2015). Moreover, they are responsible for inventory and safety stock to measure the expiry date position of a product, which helps in scheduling production and distribution activities. Blockchain is a potential technology for EFSCs, but it is not used much in practice to ensure customer satisfaction with the timely delivery of quality products at minimum cost (Vanichchinchai and Igel, 2011).

Contracts facilitate trust by encouraging initial cooperation and mutual understanding, decreasing uncertainty and risk (Mesquita and Brush, 2008; Gulat and Nickerson, 2008). Contracts can be formal and informal (Mesquita and Brush, 2008). A formal contract exists to mitigate risks, share information, and manage business processes (Wolf et al., 2001; Lu et al., 2022). An informal contract maintains a positive reputation and promises repeated transactions and trust between parties to facilitate formal cooperation (Stevenson and Pirog, 2008; Susanty et al., 2018).
6.4.2 TQM Literature

This research revealed that the most dominant factors and the factors considered critical are:

- Customer Focus
- Top Management Leadership
- Education and Training
- Continuous Improvement
- Process Management

This research revealed that soft factors are more important than hard ones; the most important factor is customer focus. The focal actor uses the established QM system to implement a combination of soft and hard practices to integrate the environmental, social and economic SUST dimensions, to expand QDS orientation such as quality in Product, process, and supply chain relationship, and focus on sustainable practices to achieve Adaptable Sustainable Supply Chain Quality Management Performance (ASSCMP) among all actors in the EFSC. Top management should create interest in change and appropriate planning by understanding the TQM approach. TQM is a long-term commitment, and the implementation process with the involvement of all staff and cultural acceptance with regular feedback and providing resources is essential.

TQM positively impacts the performance of TBL SUST (Kuei and Lu, 2013; Al-Qahtani et al., 2015; EmamiSaleh et al., 2018; Bastas and Liyanage, 2019; Abbas, 2020; Magd and Karyamsetty, 2021; Akanmu et al., 2021). This research is consistent with previous research suggesting that Top Management Leadership, Continuous Improvement, Training and Education, Customer Focus and Process Management are the most critical Themes for SUST performance (Nguyen et al., 2018; Bastas and Liyanage, 2018b; Abbas, 2020). One practice for reducing process variation is statistical process control (SPC), with less attention to actors in a Triad (Isaksson, 2016). SPC positively relates to continuous improvement (Lim and Antony, 2016). The focus on process management is important for realising TQM and SUST synergies (Isaksson, 2006; Nguyen et al., 2018). Efficient process management considers identifying the customer and stakeholders' needs, mapping the workflow, and measurements of inputs and output, leading to reducing material consumption and cost, consequently
improving TBL SUST performance (Bergman and Klefsjö, 2003; Isaksson, 2006; Nguyen et al., 2018; Xie et al., 2019). Errors in the processes can be figured out, and a maintenance plan and innovative products or processes are introduced frequently, increasing social responsibility and financial performance (Un and Asakawa, 2015).

Continuous Improvement is critical in providing the superior value of products, processes, and supply chains to reduce rejections and save costs (Abbas, 2019; Sutrisno and Ardyan., 2020). TQM shares similar implementation factors with the environmental management system (Nadae and Carvalho, 2019; Goyal et al., 2019). Integrating quality practices into the environmental management system is a continuous improvement to support environmental and economic performance (Machado et al., 2016; Gold and Schleper, 2107; Nadae and Carvalho, 2019; Abbas, 2020).

**Top Management Leadership** influences other practices of TQM (Kaynak, 2003; Han et al., 2016; Modgil and Sharma, 2017). It is responsible for successful planning and implementing the strategies for quality and SUST goals through acceptance, involvement and providing necessary resources for implementing TQM practices (Somsuk and Laosirihongthong, 2017; Yusr et al., 2017; Zhang and Cao, 2018). A participative management style is essential in problem-solving, decision-making, promoting quality and continuous improvement, which could be in the form of regular meetings with customers, employees and suppliers, formal and informal recognition, and training (Drewniak and Posadzińska, 2020; van Assen, 2021). Moreover, enhancing the skills and **knowledge of employees** on quality, such as advanced statistical techniques and technical information, would reduce defects and reduce the cost of poor quality and environmental SUST (Luburić, 2015; Stachová et al., 2019). Employees have specific training to enhance their skills in quality-related contributions to social SUST (Sadikoglu and Olcay, 2014; Srivastava and Shree, 2019; van Assen, 2021). Management commitment is shown when the training starts with the top team and cascades down to ensure managers train their people through organised periodical meetings to discuss quality issues and corrective measures (Sadikoglu and Olcay, 2014; Stachová et al., 2019).
The ultimate focus is on stakeholders for whom value is created (Busch et al., 2018; Dembek et al., 2018). Current and future customers' needs are essential for product or process improvement. Various transparent and effective mechanisms for customer feedback impact customer satisfaction and the appraisal system for employee satisfaction (Elrehail et al., 2019; Kurdi et al., 2020). Integrating environmental and quality requirements in product development reduces waste and material consumption, thus contributing to economic and environmental SUST. Quality tools control and monitor products and processes for quality and SUST improvement (Phan et al., 2019; Aquilani et al., 2016). The first step is managing the customer-supplier relationship, which is critical to a quality transformation to support the management of processes (Akrout and La Rocca, 2019). Supplier management is a critical practice of TQM (Han et al., 2016; Sriyakul et al., 2019). As a result, process control, collaboration on green activities and improvement reduce the variance in price and processes and enhance SUST performance (Lo et al., 2018).

TQM's soft and hard factors were clearer (Sun et al., 2004; Ali et al., 2022). The soft factors related to the behavioural side include customer focus, top management support and training (Yan et al., 2019; Saragih et al., 2020). The hard factors related to the system side of facts and numerical quality control techniques include quality data tools, process management and product design (Ali. and Johl, 2021). Soft practices facilitate the hard practices and motivate the employees to implement TQM practices (Sciarelli et al., 2020). The hard TQM practices that are operational are the vehicle for quality results, which are quantifiable and can be easily monitored, such as defects reduction and continuous improvement and SPC (Modgil and Sharma, 2016; Zhou and Li, 2020). CSFs are linked and managed for successful TQM implementation and financial and non-financial performance (Hietschold et al., 2014; Aquilani et al., 2016). SC performance is enhanced by synergizing TQM's soft and hard practices with SC (Saragih et al., 2020). TQM and SC performance requires the involvement of all departments and coordination in supplier selection and procurement with other partners like suppliers and wholesalers for responsiveness to customer needs and requirements (Modgil and Sharma, 2017b; Vanichchinachai., 2019; Kaur et al., 2019). The successful implementation of TQM will reduce the cost
by reducing scrap and defects rework without comprising quality, increasing customer satisfaction and loyalty that will enhance economic performance (Tyagi et al., 2019)

6.4.3 Sustainability Literature

It revealed economic SUST, social SUST, and environmental SUST. The focal actors should motivate the integration of the environmental, social and economic SUST dimensions through established management approaches in terms of the quality of products and processes to the quality of supply chain relationships towards more added value.

Economic, social and environmental SUST positively contributes to QDS in EFSC. It enhances the overall SUST performance by incorporating all TBL SUST into SCM, consistent with previous research (e.g. Ansari and Qureshi, 2015; Gold and Schleper, 2017; Qorri et al., 2021). On the other hand, managing the TBL of SUST separately is prominent in previous research (Albertini, 2013; Wang and Sarkis, 2017; Liao et al., 2018). This is a shift from focusing on Profit to the Planet and People (Seuring and Müller, 2008).

In order to increase support for QDS, the manufacturer (focal actor), as well as the supplier and customer actors along the SC, should consider environmental, social and economic SUST together because SUST performance heavily relies on all actors of the SC (Gopal and Thakkar, 2016; Wang et al., 2018) and multi-tier supply chains (Esfahbodi et al., 2016; Wilhelm et al., 2016). It also provided a rich understanding that the focal actor, the manufacturer, facilitates the adoption of SSCM practices (Kashmanian, 2016), controlling activities (Lambert and Cooper, 2000), promoting innovations, and developing processes in developing countries for promoting sustainable development (Silvestre, 2015).
Economic SUST focuses on short-term profit through increasing revenue and market share (Björklund et al., 2012). Social SUST concerns human rights, including free child labour and workers' health and safety, supported by implementing the health and safety management system ISO 45001 (Ağan et al., 2016; Winter and Lasch, 2016; Faisal et al., 2017). Labelling of the product increased transparency and SUST (Banterle et al., 2013). Social investment supports the community in development projects. Diversity in supply includes local suppliers and workforce and protects the community's environmental and social impacts. Companies understand customer demand, employees, and external stakeholders; they influence public opinion, publish environmental and social SUST reports, and enhance reputation (Barić, 2017; Aguilera-Caracuel and Guerrero-Villegas, 2018).

It has been revealed that organisations reduce the consumption of resources through recycling, reuse and use of renewable energy sources, which minimises the running cost and resources and creates environmentally friendly products, resulting in better environmental and economic SUST performance (Ortas et al., 2014; Famiyeh et al., 2018).

Environmental performance is enhanced through long-term collaborative relationships with suppliers to help tackle environmental challenges (Ahmed et al., 2020) and waste management in the SC (Gimenez et al., 2012; Ocicka and Raźniewska, 2018). ISO certification, such as international management system standards (ISO 14001, ISO 45001 and ISO 9001), successfully fulfils environmental, health, safety and quality requirements to attain the goals of the three pillars of SUST performance.

6.4.4 QDS and Adaptive Sustainable Supply Chain Management Performance (ASSCMP) Literature

All actors, especially the focal actors, have confirmed that QDS should be established and developed effectively by all three actors in the SC: Supplier, Manufacturer and Customer. Good relations and committed focal actors, suppliers and customers can be a real asset to a Triad, where knowledge and experience are drivers of continuous improvement in operations, processes, products and the whole SC. The quality practices could be
• Quality of the product itself (intrinsic and extrinsic properties).
• Quality of process in terms of quality assurance, certification and quality circles.
• Quality of supply chain in terms of traceability and digital platform.

The sustainability practices are:

• Sustainable Products (sustainable products and sustainable packaging).
• Sustainable Process in terms of green procurement and clean production.
• Sustainable Supply Chain in terms of reverse logistics and circular economy.

QDS is a major contributor to ASSCMP. This TBL SUST performance is an outcome of sustainability management incorporated by quality management by implementing quality and SUST in the process, product, and supply chain, resulting in a balanced performance among three aspects of social, environmental, and economic SUST to create adaptive management of supply chains, in other words. ASSCMP describes a situation in which supply chains are flexible and able to adapt to and manage endogenous and exogenous disruptions over the medium to long term.

Quality management focuses on effective quality improvement but was later extended to improve Sustainable Development (SD). All actors in SC altogether should explore the synergies of TQM and SD. This ensures that the core values of TQM support the success of effective co-implementation of QDS, leading to enhanced SD (Broman and Robèrt, 2017; Abbas, 2019; Vandenbrande, 2021). The TQM concept is about standardisation, quality, and transformation with its customers as it continuously evolves according to changes and demand. However, integrating the SCN, TQM, and SUST perspectives helps all Triad actors improve quickly with long-term SUST but does not promise to improve everything or solve every problem. Hence, Triads along the EFSC are working toward successful transformation to QDS and SUST performance. The transformation requires a view from the outside to define the boundaries and knowledge about variation based on identifying and analysing stakeholder needs. Each SC actor should effectively manage all QDS practices because each practice improves different aspects of SUST performance (Bourlakis et al., 2014). The top management supports setting goals and encouraging behaviours toward SUST (Maletic, 2013). Chain actors strive to provide
quality products at the lowest possible cost, as economic performance is considered a strong driver for change (Basheer et al., 2019). As a result, there are still no universal practical SSCQM frameworks for implementing QDS among SCN actors (Vanichchinchai, 2019). QDS is a holistic concept that continuously improves products, processes, and the supply chain to improve overall performance and SUST (Sadikoglu and Olcay, 2014).

**Product quality** included food safety (hazard-free). Hence, food safety law regulates food risks and public health issues. Products' sensory properties would affect customers' choices (Carrillo et al., 2011). Sensory qualities include shape, colour, taste, smell and homogeneity (Yu et al., 2018). However, other extrinsic characteristics, including health-related claims and production methods, have also influenced food acceptability (Morris et al., 2018). In addition, extrinsic information, product certification, and packaging affect consumer product preference (Choi and Lee, 2019).

**Process quality** is important to control process variance, prevent defective products and reduce resource consumption, time, waste, and operating costs, leading to enhanced customer satisfaction and economic and environmental SUST (Yuan and Xiang, 2018; Abbas, 2020). Organisations are encouraged to co-implement quality management practices with environmental management systems for similarity in waste management. These also result in the minimum utilisation of resources, minimising waste, eliminating defects, reducing pollution, and the satisfaction of customers. In turn, improving the environment enhances the focus on continuous improvement. There is a strong trend towards assurance systems and third-party certification at the international level (García-Sánchez et al., 2019). Third-party certification helps engage in collaborative relationships with suppliers to avoid poor quality in the production and distribution processes for better SUST performance (Grimm et al., 2014; Wilson and Campbell, 2020). **Quality Circles (QC)** is a systematic approach to solving problems, quality improvement, and motivating employees, innovation and customer satisfaction (Kulkarni et al., 2018; Kumar et al., 2020b).

**The quality of the supply chain** could be achieved through digital platforms that optimise the existing operations with the accessible system, flexible delivery, collaboration and the greening of processes by reducing energy and material consumption to fulfil the customer requirements and SUST performance across the supply chain (Reim et al., 2022). E-collaboration and e-transportation increase trust and on-
time transaction frequency (Thöni and Tjoa, 2017). Food traceability systems are important for the transparency of safety and the quality of the whole process, resulting in more quality management activities in EFSC (Accorsi et al., 2018). Traceability could use RFID and Blockchain technology (Feng et al., 2020; Alfian et al., 2020). Hence, safety and quality management systems, such as GMP, HACCP and ISO 14001, contribute to the management of operations efficiently and environmental protection, society and economic performance (Ikram et al., 2019). Sustainable supply chain enhances SUST (Allaoui et al., 2019), and sustainable production enhances SUST (Azapagic et al., 2016).

SUST is required to satisfy customers with high-quality products and high process performance. QDS should support more effective and efficient change for SUST, directing future efforts to the transition to sustainable development and contributing to economic SUST. These are the approaches of QDS to achieve higher profits and the economic aspect of SUST.

The three pillars of Sustainability are well connected with sustainable development goals (SDGs) (Singh et al., 2021). Jordan is committed to the United Nations SDGs by 2030. SDGs are comprehensive and have 17 goals: water, energy, food, health, poverty, women, climate, economy, infrastructure, and sustainable development. Embedding SDGs into key processes and stakeholder collaboration allows new growth opportunities to enhance economic, social, and environmental SUST (Pedersen, 2018).

6.5 Validation of the Conceptual Framework of SSCQM for QDS in EFSC – Decision Framework

Based on the AHP triangulated approach, the final decision framework and its propositions were validated by five uninvolved experts (three academic staff and two policymakers) familiar with QDS in EFSC (See Table 6.2). AHP is a highly effective decision-analysis tool used to take a deeper insight into the factors and their interrelationships within the decision framework, prioritize each key theme of the three perspectives, and emphasise the most crucial ones for QDS (TQM, SCN, and SUST).
6.5.1 Main Steps of AHP Data Analysis – Prioritizing Key Themes of QDS

Step 1: AHP Hierarchy

The hierarchical structure of AHP was built on three perspectives and the main Themes of QDS in EFSC (Figure 6.2), which resulted from the empirical work analysis in Chapters 4 and 5. Layer one is the goal QDS, layer 2 is the main three perspectives, and layer three is the key Themes (top-level attributes) related to the perspectives to validate the Decision Framework. This stage indicates the most important indicators for the perspective, not going further than the alternative AHP hierarchy level.

---

Table 6.2: Profile of Experts

<table>
<thead>
<tr>
<th>No.</th>
<th>Expert Title</th>
<th>Years of Experience</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Academic Staff</td>
<td>10</td>
<td>PhD in Supply Chain Management, UK</td>
</tr>
<tr>
<td>2</td>
<td>Academic Staff</td>
<td>12</td>
<td>PhD in Manufacturing and Design, USA</td>
</tr>
<tr>
<td>3</td>
<td>Academic Staff</td>
<td>15</td>
<td>PhD in Sustainable Operations, UK</td>
</tr>
<tr>
<td>4</td>
<td>Policy Maker</td>
<td>20</td>
<td>PhD in Agriculture Economics, Jordan</td>
</tr>
<tr>
<td>5</td>
<td>Policy Maker</td>
<td>15</td>
<td>MSc in Agricultural Engineering, Jordan</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
Step 2: Establishment of Pair-Wise Comparison Matrix

The researcher asked the experts to review the final conceptual framework and answer a short questionnaire (Appendix I) related to the three main perspectives and key Themes in the hierarchy in Figure 6.4 above. Each expert stated their subjective opinion of the criteria for each key Theme based on the Saaty scoring system (nine-point scale) given in Table 6.3.

Table 6.3: Saaty Nine Scale

<table>
<thead>
<tr>
<th>Importance Scale</th>
<th>Definition</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equally important</td>
<td>Two activities contribute equally to the objective.</td>
</tr>
<tr>
<td>3</td>
<td>Moderately important</td>
<td>Experience and judgement slightly favour one activity over another.</td>
</tr>
<tr>
<td>5</td>
<td>Strongly important</td>
<td>Experience and judgement strongly favour one activity over another.</td>
</tr>
<tr>
<td>7</td>
<td>Very strong or demonstrates importance</td>
<td>An activity is favoured very strongly over another. Its dominance demonstrated in practice.</td>
</tr>
<tr>
<td>9</td>
<td>Extremely important</td>
<td>The evidence favouring one activity over another is of the highest possible order of affirmation.</td>
</tr>
<tr>
<td>2, 4, 6, 8</td>
<td>Intermediate values between the two adjacent judgments</td>
<td>When compromise is needed.</td>
</tr>
<tr>
<td>Reciprocals of above</td>
<td>If activity $i$ has one of the above non-zero numbers assigned to it when compared with activity $j$, then $j$ has the reciprocal value when compared with $i$.</td>
<td>A reasonable assumption.</td>
</tr>
</tbody>
</table>

(Source: Saaty, 2008)

The experts' judgments recombined to form a single new individual judgment of each entry in a pair-wise comparisons matrix using an arithmetic mean aggregation with rounding the decimals to approximate value. Data inserted into the online AHP calculator are presented in Appendix K (Figure K.1 for SCN, Figure K.2 for TQM and Figure K.3 for SUST) perspectives, respectively. This method in a pair-wise comparison matrix determines each criterion's subjective weights or relative importance (key theme). Holistic pair-wise comparison matrices were obtained for each perspective (SCN perspective – Table 6.4; TQM perspective - Table 6.5; SUST perspective - Table 6.6) below. Then, the researcher conducted the mathematical analysis using a freely accessible software tool called AHP online Calculator.
Table 6.4: Decision Comparison Matrix of Main Themes of SCN Perspective

<table>
<thead>
<tr>
<th>SCN Perspective</th>
<th>Supplier-Customer Relationships</th>
<th>Multi-Tier Network</th>
<th>Lean Supply Chain</th>
<th>Risk Management</th>
<th>Innovation</th>
<th>Digitalization</th>
<th>Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier-Customer</td>
<td>1</td>
<td>2.00</td>
<td>3.00</td>
<td>2.00</td>
<td>3.00</td>
<td>9.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Relationships</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-Tier Network</td>
<td>0.50</td>
<td>1</td>
<td>2.00</td>
<td>1.00</td>
<td>2.00</td>
<td>4.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Lean Supply Chain</td>
<td>0.33</td>
<td>0.50</td>
<td>1</td>
<td>1.00</td>
<td>1.00</td>
<td>3.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Risk Management</td>
<td>0.50</td>
<td>1.00</td>
<td>1.00</td>
<td>1</td>
<td>2.00</td>
<td>5.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Innovation</td>
<td>0.33</td>
<td>0.50</td>
<td>1.00</td>
<td>0.50</td>
<td>1</td>
<td>3.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Digitalisation</td>
<td>0.11</td>
<td>0.25</td>
<td>0.33</td>
<td>0.20</td>
<td>0.33</td>
<td>1</td>
<td>2.00</td>
</tr>
<tr>
<td>Contracts</td>
<td>0.11</td>
<td>0.11</td>
<td>0.11</td>
<td>0.11</td>
<td>0.11</td>
<td>0.50</td>
<td>1</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

Table 6.5: Decision Comparison Matrix of Main Themes of TQM Perspective

<table>
<thead>
<tr>
<th>TQM Perspective</th>
<th>Soft Factors</th>
<th>Hard Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft Factors</td>
<td>1</td>
<td>2.00</td>
</tr>
<tr>
<td>Hard Factors</td>
<td>0.50</td>
<td>1</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

Table 6.6: Decision Comparison Matrix of Main Themes of SUST Perspective

<table>
<thead>
<tr>
<th>Sustainability Perspective</th>
<th>Economic Sustainability</th>
<th>Social Sustainability</th>
<th>Environmental Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Sustainability</td>
<td>1</td>
<td>2.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Social Sustainability</td>
<td>0.50</td>
<td>1</td>
<td>1.00</td>
</tr>
<tr>
<td>Environmental Sustainability</td>
<td>0.33</td>
<td>1.00</td>
<td>1</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

Step 3: Measurement of Consistency

First, an online AHP calculator calculated the weight of the criteria (theme) in the prioritising criteria. Then, the matrices were normalized to prioritize the most important criteria. After that, each main comparison matrix's consistency ratio (CR) is checked to ensure validity. Consistency ratio (CR) equals CI/RI, where CI is the consistency index and RI is a random index (See Table 6.7). More details of manual AHP calculation are given in Appendix J.
Table 6.7: Random Index (RI)

<table>
<thead>
<tr>
<th>N</th>
<th>RI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>0.58</td>
</tr>
<tr>
<td>4</td>
<td>0.90</td>
</tr>
<tr>
<td>5</td>
<td>1.12</td>
</tr>
<tr>
<td>6</td>
<td>1.24</td>
</tr>
<tr>
<td>7</td>
<td>1.32</td>
</tr>
<tr>
<td>8</td>
<td>1.41</td>
</tr>
<tr>
<td>9</td>
<td>1.45</td>
</tr>
<tr>
<td>10</td>
<td>1.49</td>
</tr>
<tr>
<td>11</td>
<td>1.51</td>
</tr>
<tr>
<td>12</td>
<td>1.48</td>
</tr>
</tbody>
</table>

(Source: Saaty, 2008)

All consistency ratios for the pair-wise matrix for each theme calculated are less than 10%. The Consistency Ratio CR=2.0% for SCN, Consistency Ratio CR=0.0% for TQM, and Consistency Ratio CR=1.9 % for SUST. These Consistency Ratios are acceptable for each matrix.

**Step 4: Synthesis of Priorities and AHP Overall Results**

Based on the feedback from the experts, the researcher has ranked the key Themes of SCN, TQM and SUST. Their values are presented on priority percentage (100%) and ranked based on their impact on QDS in EFSCs. AHP combines qualitative and quantitative decisions by establishing a hierarchical structure and quantifying (weights evaluation) the decision-making process of the different key Themes in the framework (See Table 6.8). The approach was used for explanation building to validate the Decision Framework of QDS in EFSC from the five experts with experience with QDS in the food industry. The AHP's final ranking confirmed and strengthened the empirical results of the thematic analysis in Chapter 5. The graphical visualization results revealed from the AHP online calculator presented more explanation of ranks for the results and prioritizing key Themes presented below for each perspective (SCN perspective - Figure 6.5; TQM perspective - Figure 6.6; SUST perspective - Figure 6.7).
Table 6.8: AHP Priority for Three Key Themes (SCN, TQM, SUST)

<table>
<thead>
<tr>
<th>Supply Chain Network (SCN)</th>
<th>Priority</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Supplier-Customer Relationships</td>
<td>32.6%</td>
<td>1</td>
</tr>
<tr>
<td>2  Multi-Tier Network</td>
<td>19.0%</td>
<td>2</td>
</tr>
<tr>
<td>3  Risk Management</td>
<td>17.8%</td>
<td>3</td>
</tr>
<tr>
<td>4  Lean Supply Chain</td>
<td>12.9%</td>
<td>4</td>
</tr>
<tr>
<td>5  Innovation</td>
<td>11.7%</td>
<td>5</td>
</tr>
<tr>
<td>6  Digitalisation</td>
<td>3.9%</td>
<td>6</td>
</tr>
<tr>
<td>7  Contracts</td>
<td>2.0%</td>
<td>7</td>
</tr>
</tbody>
</table>

The five experts have confirmed that SCN has a significant impact on QDS for better sustainability performance. The key themes are ranked as followed: Supplier-Customer Relationship is followed by Multi-Tier Network, Risk Management, Lean Supply Chain, Innovation, Digitalization, and finally Contract has less impact. The weights for these key themes are 32.6%, 19.0%, 17.8%, 12.9%, 11.7%, 3.9%, 2.0% respectively. The total weight of priorities is 100%, which shows that the results are satisfactory. The key themes of SCN have helped the focal actor and its supplier and customer in their triad to work on the practices of quality and sustainability in order to have better sustainability performance for each actor.

<table>
<thead>
<tr>
<th>Total Quality Management (TQM)</th>
<th>Priority</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Soft Factors</td>
<td>66.7%</td>
<td>1</td>
</tr>
<tr>
<td>2  Hard Factors</td>
<td>33.3%</td>
<td>2</td>
</tr>
</tbody>
</table>

The five experts have confirmed that TQM has a significant impact on QDS for better sustainability performance. The soft factors have high impacts and hard factors have less impact. The weights for these key themes are 66.7% for Soft Factors and 33.3% for Hard Factors, respectively. The total weight of priorities is 100%, which shows that the results are satisfactory. The key themes of TQM have helped the focal actor and its supplier and customer in their triad to work on the practices of quality and sustainability in order to have better sustainability performance for each actor.

<table>
<thead>
<tr>
<th>Sustainability</th>
<th>Priority</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Economic Sustainability</td>
<td>55.0%</td>
<td>1</td>
</tr>
<tr>
<td>2  Social Sustainability</td>
<td>24.0%</td>
<td>2</td>
</tr>
<tr>
<td>3  Environmental Sustainability</td>
<td>21.0%</td>
<td>3</td>
</tr>
</tbody>
</table>

The five experts have confirmed that sustainability has a significant impact on QDS for better sustainability performance. The economic dimension is followed by the social dimension and finally the environmental dimension has less impact. The weights for these key themes are 55.0%, 24.0%, 21.0% respectively. The total weight of priorities is 100%, which shows that the results are satisfactory. The key themes of Sustainability have helped the focal actor and its supplier and customer in their triad to work on the practices of quality and sustainability in order to have better sustainability performance for each actor.

(Source: The Researcher)
Priority Ranking Charts:

Figure 6.5: AHP Ranking Key Themes of SCN Perspective

Figure 6.6: AHP Ranking Key Themes of TQM Perspective

Figure 6.7: AHP Ranking Key Themes of SUST Perspective
6.7 Conclusion

Chapter 6 has illustrated the Decision Framework (Figure 6.2) of the relationship between three theoretical perspectives (SUST, TQM, SCN), QDS and SUST performance in EFSC in Jordan. This Chapter has elaborated on the detailed findings of this research. This Chapter revealed the validation of a Decision Framework based on the modified AHP methodology based on expert opinions for the key Themes of the three perspectives and was prioritised using the AHP method. These results validated the final Decision Framework and related the findings to the current literature. Accordingly, the six research questions are answered, and propositions are proposed (Table 6.1).

Finally, the following Chapter 7 draws a summary and conclusions and adds something new in terms of the contribution, including theoretical, practical, and managerial contributions. Moreover, limitations are identified, and future research recommendations are suggested.
Chapter 7: Summary, Contribution and Conclusion

7.1 Introduction

A doctoral thesis should demonstrate mastery of the paradigms associated with the subject or issue under discussion. It should contain something novel or original and address gaps in current research. In summarizing and reflecting on the research, this Chapter attempts to show that it successfully fulfils expectations. In other words, the author attempts to convince the reader that she extends the boundaries of knowledge by building on the foundations of other scholars who have worked on Supply Chain Management.

Two fundamental propositions underlie the thesis. The first is that the state of the Export Food Supply Chain (EFSC) in Jordan can be understood through three related perspectives, which are integrated (SCN, TQM and SUST) into the concept Quality Driven Sustainability (QDS). The second is that by specifying the state of the Export Food Supply Chain in Jordan, the author can develop a practically valuable Decision Framework for supply chain managers.

To address the propositions, the author chose four case studies representing relationships that have endured for up to 12 years and not less than five years. In other words, the author selected Case Studies and Triads that have demonstrated stability and robustness over the medium to long term. Thus, stability and robustness in the face of disruptions and changes of all kinds are marked by the durability of relationships in supply chains of relationships. Stability and robustness as critical features include agility of response to the emergent properties that are features of complex systems. In complex systems such as supply chains, emergence is motivated by competitive pressures to foster and adopt innovations such as digital technologies that have transformed the dissemination of information via telephone, the Internet of Things, sensors, AI, and barcoding. Stability and robustness complement each other in suggesting that stability involves the element of robustness, the sense of agility or going with the flow of change. The issues in this paragraph, mainly the reasons for focussing on Triads, are set out in the Sections below.

This final Chapter aims to reflect on the thesis, the fundamentals of the theory, and the process of generating a conceptual model leading to a Decision Framework. Section 7.2 looks at the thesis from
the point of view of theoretical, empirical and practical contributions, as they complement each other, seeing the thesis from different points of view. Section 7.3 shows how the thesis develops Chapter by Chapter. Section 7.4 relates the thesis to the stated aims, objectives and research questions. Section 7.5 outlines the limitations of her research and suggests possible directions for future research. Section 7.6 reflects on the author's experience that has evolved over three years of thesis preparation. Section 7.7 concludes the Chapter.

7.2 Contribution

This Section is divided into three parts: theoretical, methodological, and practical contribution. The distinction is somewhat artificial because the three parts are closely linked. However, it helps to clarify the author's thoughts and, hopefully, helps the reader to critically examine her claim that the research is significant and addresses a gap in existing research.

7.2.1 Theoretical Contribution

Complexity

Supply chains are complex systems. They contain many variables or Sub-Themes which interact with one another. Local interactions between many variables are characteristics of complexity. Another critical feature of complexity is emergence. Discussion of this feature is discussed later in the Chapter. The author has simplified the complexity of supply chain analysis by focusing on 4 Case Studies that exhibit stability and robustness against disturbances. This is achieved by focusing on Triadic relationships between Suppliers, Manufacturers and Customers in Cases that have shown stability and robustness in their relationships stretching over five years and 12 years.

In other words, a critical definition is that the duration of relationships between Triad members marks stability and robustness. Suppose relationships in the Triad have endured for a significant time despite changes that may have occurred in the supply chain. Critical variables (the thesis also refers to them as Sub-Themes) can be elicited from examining the four carefully selected Case Studies. Understanding the Sub-Themes that underlie stability and robustness enables the design of a Decision Framework for managers.
Quality Driven Sustainability (QDS)

Triads can be understood through the novel concept of QDS that integrates three perspectives (SCN, TQM and SUST). The features of Quality and Sustainability are transmitted through supply chain networks. Given the importance of networks in conveying Themes and Sub-Themes associated with Quality and SUST in supply chains, it is surprising that the advantages of analyzing the three perspectives appear to have been neglected. The authors' extensive literature review appears to support the contention that a gap in the literature can be opened up via the concept of QDS.

Supply Chain Networks

The description of supply chains through networks captures their complexity. Confining the analysis to Triadic relationships which have endured despite disturbances enables nodes in the network to be identified with QDS and its associated Themes and Sub-Themes. Linkages between the nodes represent Quality and SUST management communication between supply chain members.

Networks appear in many forms in this thesis. Chapter 2, Section 2.3.1, and Section 2.4.1 highlight networks of relationships relating to aspects of quality and SUST. Chapter 2, Section 2.4.3.5, also highlights the vast variety of communications media associated with SCN.

AHP and the Decision Framework

Applying QDS to understanding Triads enables the author to elicit significant factors for supply chain managers. To design a valuable framework for managers, it is essential to identify critical decision variables and decide how to prioritize them. Identification and prioritization are achieved via 32 structured interviews with managers and related research discussed in Section 7.2.3 below. In other words, data reduction is necessary.

Synthesis of the research findings and data sources relating to the Case Study Triads enables the data reduction necessary to construct a Decision Framework. Triangulation is discussed in Section 7.2.3.

AHP provides another layer of data reduction. AHP and related methods use the eigenvalue technique, enabling the strength of decision variables to be detected via eigenvalues and the relative importance of decision variables to be detected through eigenvectors. The author used AHP Online Calculator software to conduct calculations. A criticism might be made that recent techniques are alternatives to
AHP, but eigenvalue methods employed in AHP are common to most data reduction and prioritization methodologies, recent or otherwise.

7.2.2 Methodological Contribution

Understanding the paradigms associated with the relevant literature on supply chains implies understanding and adherence to research methods used by scholars, especially concerning reliability and validity.

Interpretation

Understanding the state of supply chains in the Case Study - Triads is based on the perceptions of the 32 managers interviewed. As stated in earlier Chapters (Chapter 3, Section 3.4.1). The author adopts an interpretive approach based on layers of perceptions of how people observe and interpret reality. Thus, her ontological approach is that reality is what observers subjectively perceive it to be. Her approach follows the pragmatist stance concerning practical outcomes, such as designing a Decision Framework. The author attempts to establish reliability for critical readers in two ways. First, she details the research process so other researchers can replicate it in principle. Thus, she makes every attempt to make her research process transparent. The author argues that the essence of interpretivism is subjectivity, and her qualitative approach enables the details and nuances of crucial decision variables or Sub-Themes to be identified. Replication can only be achieved 'in principle' because conditions change as time passes, and preconceptions differ from author to author. Secondly, data sources are triangulated.

Triangulation

The author uses her triangulation method to establish validity in a way that might be persuasive to critical readers. The research method amounts to synthesizing layers of perceptions within Case Studies and between Case Studies, comparing with methods and findings in the literature, trying to make explicit the role and possible biases of the researcher in transcribing and interpreting data herself, using her experience, her tours of companies which are part of the Triads, structured interviews with managers, and attendance at company meetings.
Finally, she presented her results to a panel of experts in Chapter 3, Section 3.8.2 and Chapter 6, Section 6.5. She adopted the AHP methodology to identify key variables and their importance in successful management. The AHP methodology, as noted above, led to the Decision Framework.

**New Data**

The author can claim novelty in that she generated data from 32 structured interviews described in full in the thesis. Hopefully, they will be valuable sources of information and knowledge for future researchers. Analyzing 32 interviews during COVID-19 lockdowns presented challenges, and a careful description of how the interviews were arranged and carried out by the researcher may be helpful to future researchers facing different but equally challenging circumstances.

**7.2.3 Practical Contribution**

This research reveals several practical guides for managers and policymakers that can assist actors in EFSC in practice to implement sustainability management through the framework, as empirically investigated in the study.

**Jordanian Economy**

As described in earlier Chapters, the EFSC is critical to the Jordanian economy and society. There is no need to repeat the description, but a *careful scholarly analysis* contributes to knowledge. The author hopes that the reader agrees that her thesis fits the description of a *careful scholarly analysis*.

**Decision Framework for Managers**

This research reveals several practical guides for supply chain managers and policymakers in Jordan generally. This thesis can help practitioners expand their perspectives, opening up to factors they might have ignored—need to tailor priorities for the key Themes and variables in QDS within the Decision Framework derived from this study to the particular circumstances or future problem-solving to implement sustainability management.

The Decision Framework SSCQM serves as a practical assessment tool and roadmap. It guides managers in assessing sustainability (SUST) using a balanced approach derived from the Triple Bottom Line (TBL) dimensions. Organizations can implement or enhance management systems by leveraging
the QDS concept, particularly its Themes and Sub-Themes. The ultimate goal is to transform supply chains towards sustainable development (SD), managing relationships with various partners and establishing a robust supply chain. This transformation addresses challenges and improves the quality of products, processes, and supply chains linked to SUST.

The modified AHP multi-criteria decision techniques function as an assessment tool and equip managers and decision-makers with a framework to prioritize factors in practical techniques for ongoing SUST enhancement.

This research aims to broaden practitioners' perspectives, especially managers of focal firms in EFSCs. It enlightens them on creating, mapping, managing, and amplifying collaborative ties, particularly in close-contractual Triadic relationships. Additionally, it emphasizes the importance of interactions within extended supply chain networks and the potential benefits of incorporating links with firms in extended network positions that might have been overlooked. The insights gained are crucial for establishing resilient and sustainable supply chains and responding to stakeholder demands, particularly in similar developing country contexts.

7.3 Brief Chapter-by-Chapter Review

Following the introductory overview of the thesis's contributions, a Chapter breakdown will help readers grasp the development of the thesis's argument. Sections 7.2 and 7.3 should be viewed as complementary, and the researcher acknowledges and apologizes for any unavoidable repetitions.

Chapter 2. The critical literature review was conducted on 164 relevant papers focusing on three integrated perspectives into a collective concept of QDS. Themes and Sub-Themes related to QDS were identified, leading to the development of an initial conceptual model, depicted in Figure 2.19. This Chapter highlights the original contribution of addressing the literature's identified gap.

Chapter 3 This Chapter describes the chosen qualitative methodology. Multiple Case Studies centered on a fundamental Triad relationship (Supplier-Manufacturer-Customer). Various secondary data and triangulation techniques were used to enhance the study's reliability and validity. The philosophical underpinnings of this thesis include interpretivism and elements of pragmatism.
Chapter 4 This exploratory phase employs within-case analysis for individual Cases. The aim is to capture preliminary insights and investigate the quality-driven sustainability (QDS) phenomenon in the Export Food Supply Chain (EFSC).

Chapter 5 The Cross-Case analysis is presented, discussing the QDS phenomenon in the context of the EFSC. The Chapter further refines the classification of the Triads detailed in the Case studies, categorizing them into open (Case A), transitional (Case B), and closed (Cases C and D). To validate observations, keywords from interviews were inputted into NVivo software, confirming the impressions regarding the relative importance of Themes and Sub-Themes.

Chapter 6 constructed and explained the final Decision Framework for supply chain managers in the Jordanian EFSC. Figure 6.2 illustrates how sustainable performance, driven by QDS, is a tangible outcome of this study. Further model validation was executed using the AHP method and expert consultations. Finally, the findings are examined with the existing literature.

Chapter 7 reflects on the thesis's contributions, segmenting them into theoretical, methodological, and practical applications. Limitations of the study are outlined, leading to potential avenues for future research. The Chapter ends with a reflective piece of the researcher's PhD journey.

7.4 Research Questions and Objectives

The only purpose of this Section, which is important, is to show how the research questions and the propositions relate to the aims of the thesis. For convenience, Table 6.1 in Chapter 6 is reproduced below.
Table 7.9: Research Questions and Propositions (same as Table 6.1)

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Purpose of Research Question</th>
<th>Propositions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RQ1</strong> How are the three perspectives (SCN, TQM and SUST) interrelated in the existing literature of supply chain management?</td>
<td>A critical review of the literature concerned with the 3 perspectives.</td>
<td>P1: The literature demonstrates the close relationship between the three perspectives and provides the basis for an initial conceptual framework of QDS in EFSC.</td>
</tr>
<tr>
<td></td>
<td>RQ1 enables the researcher to synthesise the relevant literature and formulate the concept of QDS. The concept of QDS enables the researcher to develop an initial conceptual framework.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The QDS concept is studied in the thesis from the perspective of focal actors (Manufacturers) in triads of Supplier-Manufacturer-Customer.</td>
<td></td>
</tr>
<tr>
<td><strong>RQ2</strong> What are the SCN practices applied by triads to build QDS in EFSCs?</td>
<td>Analyse case studies and related data to identify:</td>
<td>P2: EFSC in triads analysed in the research reflects themes and sub-themes associated with supply chain networks (SCN) in the category QDS.</td>
</tr>
<tr>
<td></td>
<td>The actual SCN practices associated by managers with QDS in EFSCs in Jordan.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enables themes, subthemes and empirically derived attributes associated with supply chain networks SCN to be identified and interpreted by the researcher.</td>
<td></td>
</tr>
<tr>
<td><strong>RQ3</strong> What TQM practices are applied by triads to build QDS into EFSCs in Jordan?</td>
<td>Analyse case studies related data to identify:</td>
<td>P3: EFSC in triads analysed in the research reflects themes and sub-themes associated with total quality management (TQM) in the category QDS.</td>
</tr>
<tr>
<td></td>
<td>The actual TQM practices associated by managers with QDS in EFSCs in Jordan.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enables themes, subthemes and empirically derived attributes associated with total quality management TQM to be identified and interpreted by the researcher.</td>
<td></td>
</tr>
<tr>
<td><strong>RQ4</strong> What are TBL SUST practices applied by triads to build QDS into EFSCs in Jordan?</td>
<td>Analyse case studies and related data to identify:</td>
<td>P4: EFSC in triads analysed in the research reflects themes and sub-themes associated with Sustainability in the category QDS.</td>
</tr>
<tr>
<td></td>
<td>Sustainability practices associated by managers with QDS in EFSCs in Jordan.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enables themes and subthemes associated with Sustainability to be interpreted and classified into themes and subthemes by the researcher.</td>
<td></td>
</tr>
<tr>
<td><strong>RQ5</strong> What are the implications of QDS (Integrating the three perspectives into QDS) in the context of EFSCs in Jordan?</td>
<td>How is the integration of the 3 perspectives into QDS perceived by managers in triads in EFSCs?</td>
<td>P5: A. Managers in EFSC in Jordan integrate the three perspectives (themes and sub-themes) into QDS.</td>
</tr>
<tr>
<td></td>
<td>Enables relative strengths and priorities associated with QDS demonstrated in the case studies and related data to be interpreted and synthesized as themes and sub-themes and empirically derived attributes by the researcher.</td>
<td>B. Analysis of evidence related to QDS enables the researcher to identify the relative importance to QDS of themes and sub-themes according to the perceptions of supply chain managers.</td>
</tr>
<tr>
<td><strong>RQ6</strong> How do QDS practices impact the TBL sustainability performance of triads in EFSCs in Jordan?</td>
<td>With special reference to triads in EFSC’s in Jordan.</td>
<td>P6: When faced with internal and external disruptions, QDS positively impacts Adaptable Sustainable SCM performance (ASSCMP) in triads in EFSC.</td>
</tr>
<tr>
<td></td>
<td>Enables the researcher to identify the relationship between QDS and Adaptable supply chain management performance (ASSCMP).</td>
<td>Performance in supply chains management relates to the following dimensions of sustainability or robustness in the face of internal and external disruptions: Economic, Environmental and Social Sustainability</td>
</tr>
<tr>
<td></td>
<td>Taking account of:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Evidence relating to RQ1 – RQ6, case study analysis of triads in EFSCs in Jordan.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Triangulating evidence from four case studies and further data (cross-analysis of four case studies, comparison with related supply chain research, discussion with experts and observation in company tours).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enables the researcher to design a decision framework for SCM managers.</td>
<td></td>
</tr>
</tbody>
</table>

(Source: The Researcher)
The previous Chapter 6 describes in detail the research questions and related propositions. The research questions are the foundation of the structured interviews. The research propositions enable the author to analyze within and between her four Case Studies and compare her results with scholarly literature.

7.5 Limitations and Future Research

7.5.1 Limitations

This Section presents limitations that need to be addressed and provides avenues for future research opportunities. The author acknowledges the limitations of the thesis. She apologizes for the avoidable limitations that remain. It is convenient to treat limitations and suggestions together. The concept limitation implies opportunities for further research. This Section also suggests opportunities that arise from the nature of the research reported in the thesis.

Returning to the Triads

The author emphasizes that the thesis is concerned with eliciting the conditions for creating robust supply chains in the face of disturbances. The author chose four Case Studies representing relationships that have endured for up to 12 years and not less than five years.

The Triad is the smallest unit in the supply chain network that enables the researcher to understand the network as a whole from the perspective of the focal actor, the manufacturer. The manufacturer is the link actor in the relationship: Supplier - Manufacturer - Customer. Triadic relations in the EFSCs enabled her to reduce the complexities of supply chain analysis without losing their essential features.

The reasoning is as follows. Suppose relationships in the Triad have endured significantly despite changes that may have occurred elsewhere in the supply chain. Critical variables (the thesis also refers to them as Sub-Themes) can be elicited by focusing on Triadic relations in four selected Case studies. If what happens elsewhere in the supply chain does not overturn relationships in the Triads, then an examination of the state of the Triad can be used to generate a decision framework for managers generally seeking stability.
Alternative Avenues to the Triads

The author contends that her focus on Triads opens avenues for future research. As the thesis demonstrates, she prepared to defend the argument robustly on grounds explained in the previous few paragraphs.

She accepts that the argument that supply chains can only be understood in their entirety is supportable. However, considering supply chains entirely demands different research to address different problems. Such research might be concerned with the macro aspects of supply chains rather than the nuanced Case Study approach she adopts. For example, network centrality is a macro concern of great interest.

Further, the manufacturer is the leading actor at the centre of the Triad within a supply chain. The supply chain may, therefore, be vulnerable to disruptions explicitly targeted at the manufacturing firms rather than, for example, primary producers or final customers. In the Case Studies selected by the author to understand critical variables underlying stability, such considerations are irrelevant. The author can claim that her logic in concentrating on the Triad can be treated as a set up of null propositions that can be tested in a quantitatively orientated macro study.

Addressing Issues of Generalizability

This study was conducted via multiple Cases in the Jordan food industry and with a sub-sector centred on canned food, a sector not representative of the entire Jordanian industry. The results may not be generalizable to other industries and other contexts. Although this method facilitated high internal validity and triangulation, it may have low external validity. However, the primary purpose of this research was not to generalize across other settings but rather to explore QDS in EFSC. Thus, findings may apply to similar contexts and settings.

However, the author does not emphasize specific findings relating to a specific sector. An underlying proposition, stated earlier, ‘is that by specifying the state of the Export Food Supply Chain in Jordan, the author can develop a practically valuable Decision Framework for supply chain managers.’ In this respect, the thesis emphasizes the processes for eliciting the kinds of decisions that ensure stability and robustness in supply chains. The process begins with eliciting manager perceptions and related data and leads to a Decision Framework based on a modified AHP technique.
Focus on Jordan

The selected Triad of Cases is located in Jordan. Although they have international suppliers and customers, this cannot be generalized to global SC since cultural diversity, the maturity levels of TQM and economic maturity among countries can impact the results.

7.5.2 Further Opportunities for Future Research

Further Research and the Decision Framework

Developing a Decision Framework reflects the objectives achieved, leading to several paths for suggestions for future research. Future research could be extended with different data collection instruments, for instance, a quantitative method, mixed methods study, or soft system methodology, which is expected to contribute to the generalizability of the research results.

Further investigation of the Decision Framework in different settings, i.e., neighbouring developing countries, developed countries, or other industries, or can be extended to broader different sub-sectors, sub-product groups, such as products that have a short shelf life (frozen foods or fresh vegetables),

The analytical hierarchy process (AHP) could be further extended to set priorities, rank Sub-Themes, and make more validation for results.

Future researchers should extend the framework to the supply chains for suppliers and customers drawn from other countries, which play critical roles in most supply chains.

External factors such as political and cultural issues can be assessed for their impact on the proposed decision framework.

Furthermore, emerging concepts like circular economy, reverse logistics, digitalization and blockchain can be investigated in depth regarding SUST.
7.6 Reflection

Reflexivity is imperative in ensuring the rigour and transparency of qualitative research. It is a concept that should be integrated at all stages of the research process: pre-research, during, and post-research (Saunders et al., 2016; Bryman, 2016). Reflexivity facilitates critical thinking for the researcher, the central instrument in qualitative studies, to mitigate potential biases that stem from prior experiences or backgrounds.

The researcher in this study is a Jordanian national who completed her undergraduate studies in chemical engineering and pursued a master's in quality management from the University of Jordan. With a professional background in a governmental organization pertinent to quality infrastructure and established ties with the industrial sector, there exists the potentiality that her prior experiences influenced certain decisions and interpretations throughout the study. The four-year duration of this doctoral research journey proved to be both professionally enriching and personally demanding. With consistent guidance from the supervisory team, the researcher honed her skills, particularly in academic writing, and now feels poised to contribute to the academic community. Organizational skills played a pivotal role in navigating the inherent challenges of the research process. Reflecting upon the journey, the researcher perceives the challenges as invaluable learning opportunities that broadened her academic horizons. However, I did not have any regrets during the accomplishment of this research as it gave me a fruitful experience and new knowledge, and I explored new things.

The challenging ups and downs during this research process can be encountered during the following process: research idea initiation, methodology design, data collection, and data analysis and writing up. First, establishing the research gap is the most difficult. The critical review and analysis of existing literature, accompanied by an exhaustive exploration of current articles, digital media platforms, books, conferences, and dialogues with peers, formed the foundation of the research. Continuous interactions with the supervisory team and colleagues were instrumental in refining the research design from its inception, optimizing efficiency. The researcher focused on the appropriately developed research design from the beginning, which helped in saving time.
The unwavering support from the supervisory team was pivotal. Regular meetings, daily interactions in the concluding months, and varied communication mediums – emails, WhatsApp, and Zoom meetings – bolstered the researcher's confidence. Drafts of the questionnaire and interview guide were presented to the supervisory team. They kept in touch during on-site visits, which helped the researcher become more confident. The researcher's background as an auditor provided a unique perspective on people engagement, fostering richer interactions over time.

For the data collection phase, adaptability was key. A flexible timeline was conceived, anticipating potential hurdles. Data was collected from 32 participants across varied locations during the COVID-19 pandemic. The researcher designed a flexible time frame and substituted plans to accommodate potential difficulties at this stage. However, participants were cooperative and friendly. Ethical considerations, aligned with the standards of the University of Bedfordshire, were strictly adhered to throughout the research, especially during data collection. This involved utilizing letters of invitation and ensuring informed consent.

The analysis phase presented challenges, notably mastering NVivo software and AHP analysis. This necessitated self-driven learning through articles, books, and instructional videos. This phase, while demanding, further enriched the researcher's understanding and skill set with fruitful experience and new knowledge.

7.7 Concluding Remarks

I hope to publish various aspects of the research in academic conferences and journals and develop theoretical and empirical contributions in cooperation with my supervisory team, who have become friends and colleagues over the study period. The doctoral journey has transformed not only my professional practice but also my worldview. High-level research demands motivation, passion and inspiration. The learning process does not end with this Chapter.
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Terry, G., Hayfield, N., Clarke, V. and Braun, V. (2017), Thematic analysis, The Sage Handbook of qualitative research in psychology, pp.17-37


# Appendix A: Sample of Articles Analysis for Literature Review

<table>
<thead>
<tr>
<th>Author</th>
<th>Type of Study</th>
<th>Factors</th>
<th>Key Findings</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbas (2020)</td>
<td>Empirical (Survey)</td>
<td>•</td>
<td>TQM practices of the American MBNQA model (leadership, strategic planning, customer focus, process management, human resource management, and information and analysis) play a positive role in enhancing SBIL Sustainability with mediating knowledge management.</td>
<td>Pakistan, Manufacturing and Service</td>
</tr>
<tr>
<td>Feng et al. (2020)</td>
<td>Literature Review and Pilot Analysis</td>
<td>•</td>
<td>Use of blockchain-based food traceability. Management has a positive effect on the improvement of food sustainability and a need for further research.</td>
<td>China (Food Plant and Poultry)</td>
</tr>
<tr>
<td>Andriansyah et al. (2019)</td>
<td>Survey</td>
<td>•</td>
<td>The positive effect of Quality assurance, continuous process improvement and environmental regulation and policies on supply chain performance.</td>
<td>Indonesian Supply Chain Companies</td>
</tr>
<tr>
<td>Bastas and Liyanage (2019)</td>
<td>Literature Review</td>
<td>•</td>
<td>Critical evaluation of the extent integrated models in the literature incorporate synergies offered by the QM Principles of ISO9001, supply chain integration for SBIL sustainable development, facilitating SWOT analysis and policy deployment for continual organizational sustainable development SSCQM principles of &quot;relationship management, customer focus and supply chain integration.&quot;</td>
<td>Manufacturing and Other Business Sectors</td>
</tr>
<tr>
<td>Do et al. (2019)</td>
<td>Case Study</td>
<td>•</td>
<td>Key parameters to increase competitive advantage and sustainability (marketing and brand innovation, product quality, strategic planning) while new technology, SCM, and alliance-joint venture are the lowest three-parameter</td>
<td>Vietnam (Coffee Industry)</td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Study Type</td>
<td>Impact/Findings</td>
<td>Location/Industry</td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
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<td>---------------------------</td>
<td></td>
</tr>
<tr>
<td>Nadae and Carvalho (2019)</td>
<td>Systematic Literature Review</td>
<td>Integrated management systems (ISO 14001, OHSAS 18001, SA 8000, and ISO 26000) as a driver for sustainability, companies need to focus on social action.</td>
<td>Literature Review</td>
<td></td>
</tr>
<tr>
<td>Goyal et al. (2019)</td>
<td>Case Study</td>
<td>Impact of defects with Six Sigma on economic, environmental and social Sustainability that enables existing quality management systems and tools to be more responsive towards Sustainability</td>
<td>Manufactures for Electric Power Plants (India)</td>
<td></td>
</tr>
<tr>
<td>Taseem et al. (2019)</td>
<td>Empirical Survey</td>
<td>TQM (six elements of MBQNA: Leadership, Strategic Planning, Customer Focus, Workforce Focus, Process Management, Knowledge Management) and technology management in integrated effect positively on 3BL sustainability.</td>
<td>Pakistan (Multi-Industry)</td>
<td></td>
</tr>
<tr>
<td>Nimeh et al. (2018)</td>
<td>Survey</td>
<td>Effects of lean supply chain management (LSCM) practices (just-in-time, system, the flow of information, supplier relationship, customer relationship, waste reduction) positively on supply chain performance and market performance</td>
<td>Manufacturing (Jordan)</td>
<td></td>
</tr>
<tr>
<td>Bastas and Liyanage (2018a)</td>
<td>Literature Review</td>
<td>An initial theoretical framework for future theory building on the integration of QM, SCM, and 3BL Sustainability Further research integration with other QM practices such as ISO9001, Baldridge, EFQM and Six Sigma</td>
<td>Literature Review</td>
<td></td>
</tr>
<tr>
<td>Fritz and Silva (2018)</td>
<td>Literature Review</td>
<td>The major triggers for sustainable supply chain management in economies (green supply chain management practices, local development, stakeholder engagement, innovation, risk management, trust, power among SC members, supplier selection, environmental legislation, social capital, corporate social responsibility, working conditions, traditions, culture, SC integration,</td>
<td>Latin American</td>
<td></td>
</tr>
<tr>
<td>Al-Ghwayeen and Abdallah (2018)</td>
<td>Survey</td>
<td>The positive impact of green supply chain management (GSCM) (Eco-design, Cooperation with customers, Green purchasing, Internal environmental management) on environmental performance (EP) and export performance</td>
<td>Jordan (Different Industries)</td>
<td></td>
</tr>
<tr>
<td>Author(s) and Year</td>
<td>Methodology</td>
<td>Quality Management Principles</td>
<td>Location and Industry</td>
<td>Country</td>
</tr>
<tr>
<td>--------------------</td>
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<td>---------</td>
</tr>
<tr>
<td>Bastas and Liyanage (2018b)</td>
<td>Conceptual Framework (Delphi Study) Experts from industry and academia</td>
<td>Quality management principles of ISO 9001 (leadership, engagement of people and improvement) and supply chain integration are most affected by the lens of triple-bottom-line Sustainability</td>
<td>Turkey, UK, Cyprus, Morocco, Mexico, USA</td>
<td>Automotive</td>
</tr>
<tr>
<td>Gong et al. (2018)</td>
<td>Case Study</td>
<td>Focal company knowledge, resources and governance mechanisms, collaboration, and third-party providers help their multi-tier supply chains achieve Sustainability</td>
<td></td>
<td>China (Food, Packaging, Furniture)</td>
</tr>
<tr>
<td>Nguyen et al. (2018)</td>
<td>Empirical Survey</td>
<td>Quality management practices (Top management support, Design for quality, Quality data and reporting, and Continuous improvement) have a positive effect on 3BL Sustainability</td>
<td></td>
<td>Vietnam</td>
</tr>
<tr>
<td>Ocieka and Raźniewska (2018)</td>
<td>Literature Review</td>
<td>The food waste problem at a supply chain level requires the collaboration of all parties and enhanced Sustainability</td>
<td></td>
<td>Literature Review</td>
</tr>
<tr>
<td>Oelze et al. (2018)</td>
<td>Empirical Case Study</td>
<td>Identify implementation of SSCM practices (supplier evaluation, supplier management through risk management, transparency and policies, strategy, culture to achieve social and, environmental and economic performance</td>
<td>Germany (Transportation, Automotive Industry)</td>
<td></td>
</tr>
<tr>
<td>Pozo et al. (2018)</td>
<td>Qualitative, Quantitative Literature Review</td>
<td>Critical success factors that affect quality management systems and food safety management systems, and performance management can vary depending on the type, size, location and sector of the company</td>
<td></td>
<td>Literature Review</td>
</tr>
<tr>
<td>Thomas et al. (2018)</td>
<td>Survey and Interviews</td>
<td>Smart Systems (SS) is an approach to achieving significant economic and environmental sustainability improvements.</td>
<td></td>
<td>UK (Food)</td>
</tr>
<tr>
<td>Cho et al. (2017)</td>
<td>Survey</td>
<td>Behavioural QM practices moderate the relationship between professional QM practices and firm performance. In the USA that professional QM practices have indirect effects on firm performance through behavioural QM practices; whereas, in China is the contrary situation.</td>
<td></td>
<td>USA, China</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Article Type</td>
<td>Methodology</td>
<td>Keywords</td>
<td>Country</td>
</tr>
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<td>---------</td>
</tr>
<tr>
<td>Ghadge et al. (2017)</td>
<td>Descriptive Research (Survey)</td>
<td>*</td>
<td>Supply chain drivers (Organizational performance, investors, suppliers, government, competitor, consumer and barriers (market structure and logistics network; government; competitors and customer) for the implementation of environmental sustainability)</td>
<td>Greece (Dairy)</td>
</tr>
<tr>
<td>Kim and Chai (2017)</td>
<td>Survey</td>
<td>*</td>
<td>Environmental practices and integration with suppliers are positively associated with performance, while supply disruption risk is negatively associated with performance</td>
<td>Korea Manufacturing Companies</td>
</tr>
<tr>
<td>Siddh et al. (2017)</td>
<td>Conceptual Model</td>
<td>*</td>
<td>Quality of the supply chain has a significant impact on the sustainable performance throughout the practices: supplier quality, customer focus, process and logistics quality and support practices (top management leadership and commitment to quality, quality of the human resource, quality of information and SC integration)</td>
<td>Literature Review (Perishable Food)</td>
</tr>
<tr>
<td>Tortorella et al. (2017)</td>
<td>Survey</td>
<td>*</td>
<td>The positive association between LSCM and supply chain performance through 4 industry technology</td>
<td>Brazilian</td>
</tr>
<tr>
<td>Agi and Nishant (2016)</td>
<td>Interpretive Structural Modelling (ISM) Method.</td>
<td>*</td>
<td>A positive relationship between QM principles of ISO9001 (top management commitment, the implementation of quality management, employees training and education on Organizational environmental performance and GSCM through, (dependence, trust, and durability of the relationship with SC partners)</td>
<td>Gulf Countries</td>
</tr>
<tr>
<td>Azizi et al. (2016)</td>
<td>Survey</td>
<td>*</td>
<td>Knowledge management practices show a positive impact on supply chain quality management and competitive advantage</td>
<td>Iran</td>
</tr>
<tr>
<td>Lee et al. (2016)</td>
<td>Survey</td>
<td>*</td>
<td>Supply chain (SC) capabilities and their effects on SC performance, including economic, environmental, and social sustainability</td>
<td>Korea, Manufacturing</td>
</tr>
<tr>
<td>Machado et al. (2016)</td>
<td>Conceptual Study</td>
<td>*</td>
<td>QM practices (Leadership, continuous improvement, innovation, Sustainability, involvement and commitment of stakeholders, information, management and strategic planning within a (SC) environment from an integrated perspective for performance)</td>
<td>Literature Review</td>
</tr>
<tr>
<td>Dubey et al. (2016)</td>
<td>TISM Methodology (Professional and Experts)</td>
<td>*</td>
<td>Extrapolates SSCM drivers (institutional pressures, internal pressures, top management commitment, strategic collaboration with suppliers) with appropriate information technologies, Logistics and warehousing on economic and environmental concerns</td>
<td>India, automotive, chemicals</td>
</tr>
<tr>
<td>Zhong et al. (2016)</td>
<td>Literature Review</td>
<td>*</td>
<td>Advanced technologies (Big Data Analytics, Cloud Computing, and IoT would be adopted to achieve a more sustainable green supply chain)</td>
<td>Manufacturing and business sectors</td>
</tr>
</tbody>
</table>
Appendix B: Case Interview Protocol / Pilot Case Protocol - Questions (Example)

General Information
Name:
Position:
Years of Experience:
Company Type:
Number of employees:
Size of company (large-medium -small):
Year of establishment company:
Products of canned food:

Information on EFSC
1. Define EFSC?
2. What are the most important disturbances (internal and external) affecting EFSCs currently and the future scenarios with a focus on COVID-19?

Information on SCM Factors in EFSC:
Customer -Supplier Relationship (Dyad Relationship)
3. How do you build your supplier-customer relationship (criteria for selecting, evaluating, monitoring and developing for QDS)?

Multitier Network:
4. How do you manage (establish, build and improve) Triad (supplier-manufacturer-customer) in a multi-tier network in EFSC to achieve QDS (collaboration, resilience)?
5. How do you define lean management, and what are your practices to achieve QDS in your Triad in EFSC?
6. What other practices does your company improve Triad for better QDS in EFSC?

Information on TQM Factors in EFSC
7. How do you define TQM?
8. What are the critical success factors (Soft and hard) for TQM implementation to deliver QDS in EFSC?

Information on Sustainability Factors in EFSC
9. Define sustainability?
10. What are the factors of TBL (environmental, social, economic) applied in EFSC?

Information on the whole Themes
11. How does the implementation of SCM and TQM integration practices impact the environmental, social, and economic dimensions of EFSCs?
12. How do you understand the quality that affects sustainability (QDS) in your EFSC?
13. Do you have any comment on the proposed Framework?
Appendix C: Invitation Letter

Dear Participant,

I am a second-year doctoral student at Bedfordshire University UK. I invite you to participate in a research project, “The Role of Quality Driven Sustainability (QDS) in Export Food Supply Chains: The Case of Food Industry in Jordan”. The data will be collected via semi-structured face-to-face interviews under your permission and lasting at least one hour. A convenient time will be determined for both the researcher and the participants.

I would like you to read the information sheet before starting the interview. Also, please do not hesitate to ask me any questions. Finally, I will appreciate your time and support for my research, and if you agree to be part of it, please fill out and sign the consent form and return it to me.

Thank you in advance.

Note:

Please be informed that the interviews could be changed to remote (online) if the pandemic (COVID-19) situation and government regulations have forced us to do that.

The information Sheet and Consent Form are attached.

Best Regards,

Researcher: Lana Jreisat
Mobile: 
Email: Lana_jreisat@ study. beds.ac.Uk
The Business and Management Research Institute (BMRI)
The University of Bedfordshire, UK.
Appendix D: Additional Participant Information Regarding the Research

Study Title

The Role of Quality Driven Sustainability (QDS) in Export Food Supply Chains: The Case of Food Industry in Jordan.

Research Project Scope:

This research is part of the researcher’s PhD requirements of Bedfordshire University UK (in partnership with the Middle East University, Amman). It aims to analyse QDS in Jordan's Export Food Supply Chains (EFSCs). It will attempt to identify a possible association between Supply Chain Management (SCM), Total Quality Management (TQM) and Sustainability from the perspective of the supplier-manufacturer-customer Triads. Manufacturers are focal actors in these Triads in EFSCs. The approach of this research is holistic to develop a framework integrating three perspectives in order to build a new perspective called Sustainable Supply Chain Quality Management (SSCQM)

Research Project Procedures:

This qualitative research includes a case-study strategy that will be applied using techniques of primary data, interviews and observations, and secondary data. It will conduct one pilot Case Study of a Triad at the beginning of the fieldwork for multiple Cases of four Case Studies in the canned exporting food industry from Jordan. Eight semi-structured interviews will be conducted in each case, giving 32 interviews. One observation at the Triad level will be conducted for each case, giving a total of four observations. First, the manufacturer manager in the focal actor will be contacted in order to gain confirmation about conducting the research and to suggest the other two tiers in their Triad (one supplier (upstream tier) and one buyer (downstream tier) to be contacted for participation, and also to suggest interviewees at the manufacturer. The target population is managers, such as procurement managers, quality managers, sustainability managers., etc. Each interview will be approximately one hour via semi-structured face-to-face interview. The interview consists of open-ended questions to guide the researcher. In Case any risk appeared during collecting data that prevented collecting data with face-to-
face interviews, like lockdown in COVID-19, an online tool (e.g. Skype, phone call, etc.) will be used as a plan B and recorded and transcribed.

**Participating in Research Projects, Confidentiality and Data Storage:**
Participants will receive an invitation letter, this information sheet, and a consent form in advance by email before conducting the interview. If the email is unavailable, a hard copy will be handed over to the participant. All questions will be on the topic of this research project from the perspectives of the participating company and employees. All final transcribed interviews by the researcher will be emailed back to the participant for any feedback. The confidentiality and anonymity of the companies, participants, and product trademarks will ensure that their names will not be written but instead, number coded. Their collected data will not be shared. The audio recordings, scripts, and written work will be saved on a separate password-protected file to ensure anonymity and safety and kept on external encrypted data sticks or hard drives. The documents and analyzed materials will be locked in a safe place. At the end of the research project, the details of the companies and participants will be destroyed and removed. Any bias and conflict of interest will be avoided.

**Questions for Participants:**
Participants will answer open-ended questions related to their company profile and products, EFSCs, SCM factors in EFSC, TQM factors in EFSC, Sustainability factors in EFSC and other general information, and the whole Themes (Please see the attached interview protocol).

**Risks and Other Uncertain Factors:**
The research project has no risks, humiliation or any harm or damage. The researcher will conduct the interviews in an agreed comfortable and secure environment.

**Participating and Withdrawal:**
Participation is entirely voluntary in this research project, and confirmation is with a signed consent form. Any participant is free to withdraw from this research or withdraw any part of the given data within the agreed time of two weeks after the participation date.
**Participant Selection Criteria:**

This is based on research criteria and a sampling strategy, including working experiences in the field of exporting in sustainable chain networks, work position at your company, and knowledge of TQM, SCM and sustainability.

**Participant Contribution and Research Findings:**

The data collected will be used to develop a new conceptual framework focusing on the phenomenon of QDS. This is, in turn, to examine how supply chain actors adopt sustainable supply chain practices and quality methods and can move towards better sustainability implementations in their EFSCs. This framework focuses on QDS as a new theory in the integrated research field of SSCQM: SCM as a foundation perspective, TQM as a methodological perspective and the sustainability perspective of 3BL. This will also be used as a key recommendation for the food industry in Jordan.

**Results of the Research Project:**

The results will be used in the following ways. The completed PhD thesis and an abbreviated and appropriately anonymized version may be submitted to selected Journals with permission. If you want to receive a summary of the findings, please indicate this on the consent form or contact the researcher.

**Approval of Research Project:**

This project has been approved by the Research Ethics Committee at the UoB, UK.

**Contact for Further Information**

If you have any enquiry or concern about any aspect of this research, then please contact me using the contact details below or my supervisors:

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Thank you for considering taking part in this research project.

Researcher: Lana Jreisat  
Email: lana.jreisat@study.beds.ac.uk  
Faculty of Business and Management Research Institute  
The University of Bedfordshire, UK
Appendix E: Consent Form

Date: - - 202

Statement of Informed Consent:

Please return the signed portion of this page prior to the interview meeting (e-mailed to Lana.jreisat@study.beds.ac.uk)

This is to confirm that our company/employee agrees to participate in the research project that the researcher, Lana Jreisat, will conduct at our company. This project is titled “The Role of Quality Driven Sustainability (QDS) in Export Food Supply Chains: The Case of Food Industry in Jordan”. This will adhere to our company regulations and the University of Bedfordshire's principles of ethical practices.

<table>
<thead>
<tr>
<th>Yes/No</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Our company/Employee has agreed on the content of the invitation letter, information sheet and consent form.</td>
</tr>
<tr>
<td></td>
<td>Our company/Employee accepts the researcher to conduct the study at our company by applying interviews not more than one hour and observation and also collecting secondary data.</td>
</tr>
<tr>
<td></td>
<td>Our company/Employee accepts the researcher audio recording the interviews</td>
</tr>
<tr>
<td></td>
<td>Our company/Employee is voluntary participation and free to withdraw anytime within two weeks after data collection without giving reasons.</td>
</tr>
<tr>
<td></td>
<td>Our company/Employee is looking to receive feedback from the researcher for both the transcript and the findings.</td>
</tr>
<tr>
<td></td>
<td>Our company/Employee is aware that this research findings will be used for academic publications purposes.</td>
</tr>
<tr>
<td></td>
<td>Our company/Employee is aware that the company/employees’ names and products’ names and trademarks are preserved their all anonymity and confidential</td>
</tr>
<tr>
<td></td>
<td>Our company/Employee is accepting the researcher to use quotation from the interview and get our permission before using them in research.</td>
</tr>
<tr>
<td></td>
<td>Our company/Employee has agreed to let the researcher to conduct the project.</td>
</tr>
</tbody>
</table>

Researcher: Lana Jreisat
Company/Employee Name: 
Email: lana.jreisat@study.beds.ac.uk

The Business and Management Research Institute (BMRI)
The University of Bedfordshire, UK

Company/Employee Signature: 
Researcher Signature: 
Date: 

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Appendix F: Ethical Approval

UNIVERSITY OF BEDFORDSHIRE

Research Ethics Scrutiny (Postgraduate Research Students)

When completing this form please ensure that you read and comply with the following:

Researchers must demonstrate clear understanding of an engagement with the following:

1. *Integrity* - The research has been carried out in a rigorous and professional manner and due credit has been attributed to all parties involved.
2. *Plagiarism* - Proper acknowledgement has been given to the authorship of data and ideas.
3. *Conflicts of Interest* - All financial and professional conflicts of interest have been properly identified and declared.
4. *Data Handling* - The research draws upon effective record keeping, proper storage of date in line with confidentiality, statute and University policy.
5. *Ethical Procedures* - Proper consideration has been given to all ethical issues and appropriate approval sought and received from all relevant stakeholders. In addition the research should conform to professional codes of conduct where appropriate.
6. *Supervision* - Effective management and supervision of staff and student for whom the researcher(s) is/are responsible
7. *Health and Safety* - Proper training on health and safety issues has been received and completed by all involved parties. Health and safety issues have been identified and appropriate assessment and action have been undertaken.

The **Research Institutes** are responsible for ensuring that all researchers abide by the above. It is anticipated that ethical approval will be granted by each Research Institute. Each Research Institute will give guidance and approval on ethical procedures and ensure they conform to the requirements of relevant professional bodies. As such Research Institutes are required to provide the University Research Ethics Committee with details of their procedures for ensuring adherence to relevant ethical requirements. This applies to any research whether it be, or not, likely to raise ethical issues. Research proposals involving vulnerable groups; sensitive topics; groups requiring gatekeeper permission; deception or without full informed consent; use of personal/confidential information; subjects in stress, anxiety, humiliation or intrusive interventions must be referred to the University Research Ethics Committee.

Research projects involving participants in the NHS will be submitted through the NHS National Research Ethics Service (NRES). The University Research Ethics Committee will normally accept the judgement of NRES (it will never approve a proposal that has been rejected by NRES), however NRES approval will need to be verified before research can commence and the nature of the research will need to be verified.

Where work is conducted in collaboration with other institutions ethical approval by the University and the collaborating partner(s) will be required.

The **University Research Ethics Committee** is a sub-committee of the Academic Board and is chaired by a member of the Vice Chancellor’s Executive Group, appointed by the Vice-Chancellor and includes members external to the University

**Research Misconduct**: Allegations of Research Misconduct against staff or post graduate (non-taught) research students should be made to the Director of Research Development.

*October 2014*
UNIVERSITY OF BEDFORDSHIRE

Research Ethics Scrutiny (Annex to RS1 form)

SECTION A To be completed by the candidate

Registration No: 1827201
Candidate: Lana Eed Freisat
Degree of: PhD Business Administration
Research Institute: BMRI
Research Topic: The Role of Quality Driven Sustainability (QDS) in Export Food Supply Chains: The Case of Food Industry in Jordan

External Funding: No

The candidate is required to summarise in the box below the ethical issues involved in the research proposal and how they will be addressed. In any proposal involving human participants the following should be provided:

- clear explanation of how informed consent will be obtained,
- how will confidentiality and anonymity be observed,
- how will the nature of the research, its purpose and the means of dissemination of the outcomes be communicated to participants,
- how personal data will be stored and secured
- if participants are being placed under any form of stress (physical or mental) identify what steps are being taken to minimise risk

If protocols are being used that have already received University Research Ethics Committee (UREC) ethical approval then please specify. Roles of any collaborating institutions should be clearly identified. Reference should be made to the appropriate professional body code of practice.

Approval is sought for the primary data analysis and secondary data for this project. I will run pilot study and four case studies. The case study and pilot study will consist of triad (supplier-manufacturer-buyer) in the canned food industry in Jordan. In each case, first, the manufacturer manager in the focal actor will be contacted in order to gain confirmation about conducting the research and to suggest the other two tiers in their triad (one supplier (upstream tier) and one buyer (downstream tier) to be contacted for participation, and also to suggest interviewees at the manufacturer.

Currently, four cases studies are being planned, where each case study will have six mangers at manufacture, two managers at supplier, and two managers at buyer. Those targeted mangers will be asked about how TQM are applied on their supply chain in order to drive sustainability and the challenges they face. The transcripts collected will be analysed using the thematic analysis.

Observations will be at the manufactures as focal actors and other actors in a triad in EFSC, one in each triad of the company. The researcher is a participant-observer, who would attend a meeting and observe body behaviour and the operational processes of each manufacturer by touring relevant site and be active during this meeting with their two triadic partners; at other times, the researcher plan to join the participants from the manufacturers in their tours at a triadic actor, also public availability secondary data will be websites, newspaper articles, and general

October 2014
documentary information, statistics, reports, other confidential secondary data will be obtained if premised from the company.

Prior conducting the pilot and case studies, informed consent from the participants regarding my research project is received as required by Bedfordshire University. Also the information sheet will be e-mailed with the purpose of the research, and what will be done with the content of the discussions, recordings and transcripts. The participants’ anonymity will be ensured where the names of the organisations and participants, product trademarks instead, coding them in numbers. The participants will be given an option to withdraw from the study by a set deadline (a two weeks after the end of the data collection period).

The participants will be sent back the transcribed interview and debriefed of summary of the findings of the project which will be sent to them at the end of the project. There will be no financial incentive given to the participants.

The audio recording under their permission will be transcribed. If not allowed, a detailed notes will be taken. The audio files, transcripts will be securely anonymised and securely stored on two different encrypted USB data stick; or external hard driver.

I can identify at this moment no risks of humiliation and any harm or damage. Any arise, I will inform the university and consult with supervisory team. The researcher will insure carry out the interviews in an agreed comfortable and secure environment. One risk is that the participants may become distressed during the interviews. That will be avoided by arranging another suitable time. Other, confidential information may be revealed by the participant and will be solved by the support of supervisors and the university.

Answer the following question by deleting as appropriate:

1. Does the study involve vulnerable participants or those unable to give informed consent (e.g. children, people with learning disabilities, your own students)?
   - Yes
   - No

   If YES: Have/will Researchers be DBS checked?
   - Yes
   - No

2. Will the study require permission of a gatekeeper for access to participants (e.g. schools, self-help groups, residential homes)?
   - Yes
   - No

3. Will it be necessary for participants to be involved without consent (e.g. covert observation in non-public places)?
   - Yes
   - No

4. Will the study involve sensitive topics (e.g. sexual activity, substance abuse)?
   - Yes
   - No

5. Will blood or tissue samples be taken from participants?
   - Yes
   - No

6. Will the research involve intrusive interventions (e.g. drugs, hypnosis, physical exercise)?
   - Yes
   - No

7. Will financial or other inducements be offered to participants (except reasonable expenses)?
   - Yes
   - No

8. Will the research investigate any aspect of illegal activity?
   - Yes
   - No

9. Will participants be stressed beyond what is normal for them?
   - Yes
   - No

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10. Will the study involve participants from the NHS (e.g. patients) or participants who fall under the requirements of the Mental Capacity Act 2005?

Yes*  No

If you have answered yes to any of the above questions or if you consider that there are other significant ethical issues then details should be included in your summary above. If you have answered yes to Question 1 then a clear justification for the importance of the research must be provided.

*Please note if the answer to Question 10 is yes then the proposal should be submitted through NHS research ethics approval procedures to the appropriate NRES. The UREC should be informed of the outcome.

Checklist of documents which should be included:

<table>
<thead>
<tr>
<th>Document Description</th>
<th>✔</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project proposal (with details of methodology) &amp; source of funding</td>
<td></td>
</tr>
<tr>
<td>Documentation seeking informed consent (if appropriate)</td>
<td></td>
</tr>
<tr>
<td>Information sheet for participants (if appropriate)</td>
<td></td>
</tr>
<tr>
<td>Questionnaire (if appropriate)</td>
<td></td>
</tr>
</tbody>
</table>

(Tick as appropriate)
Applicant declaration

I understand that I cannot collect any data until the application referred to in this form has been approved by all relevant parties. I agree to carry out the research in the manner specified and comply with the statement of ethical requirements on page 1 of this form. If I make any changes to the approved method I will seek further ethical approval for any changes.

Signature of Applicant: Lana Jreisat…… Date: …09/ 10/2020..............................

Prof Robin Matthews 9/Oct/20

This form together with a copy of the research proposal should be submitted to the Research Institute Director for consideration by the Research Institute Ethics Committee/Panel.

Note you cannot commence collection of research data until this form has been approved

SECTION B To be completed by the Research Institute Ethics Committee:

Comments:

Approved

Signature Chair of Research Institute Ethics Committee: 

Date: 14-10-2020

This form should then be filed on the student’s record

If in the judgement of the committee there are significant ethical issues for which there is not agreed practice then further ethical consideration is required before approval can be given and the proposal with the committees comments should be forwarded to the secretary of the UREC for consideration.

There are significant ethical issues which require further guidance

Signature Chair of Research Institute Ethics Committee:

Date:

This form together with the recommendation and a copy of the research proposal should then be submitted to the University Research Ethics Committee

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Appendix G: NVivo Results

Further, NVivo is used to validate the strengths and priorities of perspectives and related Themes and Sub-Themes in Chapter 5. **Figure G.1** represents an NVivo screenshot of respondents' responses indicating SCN and its Themes and Sub-Themes. **Figure G.2** represents a screenshot of an NVivo coding for TQM and its Themes and Sub-Themes. **Figure G.3** presents an NVivo screenshot of respondents indicating SUST and its Themes and Sub-Themes. **Figure G.4** and **Figure G.5** present NVivo screenshots for respondents, indicating QDS and its Themes and Sub-Themes and sustainability performance, respectively.

![Figure G.1: NVivo Screenshot for SCN and Codes of Themes and Nodes of Sub-Themes](image1)

![Figure G.2: NVivo Screenshot for TQM and Codes of Themes and Nodes of Sub-Themes](image2)
Figure G.3: NVivo Screenshot for SUST Perspective and Codes of Themes and Nodes of Sub-Themes

Figure G.4: NVivo Screenshot for QDS and Codes of Themes and Nodes of Sub-Themes

Figure G.5: NVivo Screenshot for SUST Performance and Codes of Themes and Nodes of Sub-Themes
## Appendix H: NVivo Codebook for Research Analysis

**Table H.1: NVivo Codebook for Research Analysis**

<table>
<thead>
<tr>
<th>Key Perspectives and Themes and Sub-Themes</th>
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<tr>
<td>Environmental Performance</td>
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<td>470</td>
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</table>
Appendix I: AHP Pairwise Comparison Questionnaire

Dear Sir/Madam,

I am a doctoral student at Bedfordshire University UK, conducting research (Quality-Driven Sustainability in the Export Food Supply Chain: The Case of The Food Industry in Jordan.”

This questionnaire aims to perform a pair-wise comparison of the Analytical Hierarchical Process (AHP). Your response will help us determine the relative importance of identified factors (main criteria, sub-criteria) related to Supply Chain Management (SCM), Total Quality Management (TQM), and Sustainability. This research will help develop the best model For Sustainable Supply Chain Quality Management (SSCQM).

All the responses will remain confidential and used for academic purposes to fulfil the Business administration doctorate thesis, and your names will be anonymous. The survey will take approximately 10 minutes, and your responses are completely anonymous. We appreciate your time.

Thanks in advance for your contribution to the enhancement of the scientific research process

Researcher: Lana Jreisat
Mobile :
Email: Lana.Jreisat@study.beds.ac.uk
The Business and Management Research Institute (BMRI)
The University of Bedfordshire, UK.
General Information
Name...........................................

Put the sign (X) in the suitable selection:

<table>
<thead>
<tr>
<th>Place of work</th>
<th></th>
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<tbody>
<tr>
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<tr>
<td>Private sector</td>
<td></td>
</tr>
<tr>
<td>Universities</td>
<td></td>
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<tr>
<td>Other (specify):</td>
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<td>Less than 10 years</td>
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<td>10-20 years</td>
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<td>More than 20 years</td>
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<table>
<thead>
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<td>Master (M Sc.)</td>
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<td>Doctorate (Ph.D.)</td>
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<td>30-40 year</td>
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<td>More than 40 years</td>
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<table>
<thead>
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</tr>
<tr>
<td>Female</td>
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AHP Pairwise Comparison Questions
The following questionnaire forms will be used to determine the relative importance weights of criteria related to actor - using the following scale (Adapted from that in the AHP method) with the values 1, 3, 5, 7 and 9 as a basis for discriminating levels of preference

Table 1: Saaty Nine Scale

<table>
<thead>
<tr>
<th>Importance Scale</th>
<th>Definition</th>
<th>Explanation</th>
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<tbody>
<tr>
<td>1</td>
<td>Equally important</td>
<td>Two activities contribute equally to the objective</td>
</tr>
<tr>
<td>3</td>
<td>Moderately important</td>
<td>Experience and judgement slightly favour one activity over another</td>
</tr>
<tr>
<td>5</td>
<td>Strongly important</td>
<td>Experience and judgement strongly favour one activity over another</td>
</tr>
<tr>
<td>7</td>
<td>Very strong or demonstrates importance</td>
<td>An activity is favoured very strongly over another. Its dominance demonstrated in practice.</td>
</tr>
<tr>
<td>9</td>
<td>Extremely important</td>
<td>The evidence favouring one activity over another is of the highest possible order of affirmation.</td>
</tr>
<tr>
<td>2, 4, 6, 8</td>
<td>Intermediate values between the two adjacent judgments</td>
<td>When compromise is needed.</td>
</tr>
<tr>
<td>Reciprocals of above</td>
<td>If activity / has one of the above non-zero numbers assigned to it when compared with activity j, then / has the reciprocal value when compared with i.</td>
<td>A reasonable assumption.</td>
</tr>
</tbody>
</table>
Main - Criteria Pairwise Comparison

| Total Quality Management | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Soft Factors             | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Hard Factors             | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 2 |

| Sustainability          | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Economic Sustainability | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Social Sustainability   | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 2 |
| Environmental Sustainability | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 2 |

| Supply Chain Network    | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Supplier-Customer Network | Multilateral Network | Risk Management | Lean Supply Chain | Digitalization | Contracts | Innovation |
| Customer Relationship | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Supplier-Customer Relationship | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Supplier-Customer Relationship | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Supplier-Customer Relationship | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Multi-Tier Network | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Multi-tier Network | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Risk Management | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Risk Management | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Lean Supply Chain | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Lean Supply Chain | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Lean Supply Chain | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Lean Supply Chain | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Innovation | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Innovation | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Digitalization | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Digitalization | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

If there is a need to modify, add or delete other criteria or sub-criteria, please identify_____________________________________________________________________

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Appendix J: Manual AHP Calculation (Example)

Mathematical Calculation of AHP Decision of Sustainability Perspective:

1. Pairwise Comparison Matrix

The combined judgments of experts' pairwise comparisons of the relative importance of different attributes concerning the SUST perspective provided by experts are presented in a 3x3 matrix as follows: orange cells (above the diameter of 1 cell) values are provided by the experts, The rest are inversing these values. That is reflected in the pairwise comparison matrix in Table 1. Then, a pair-wise comparison matrix is created with the help of a scale of relation importance, as expressed in Table 2 below.

Table J.1: Combined Judgments of Experts Pairwise Comparisons SUST (AHP)

<table>
<thead>
<tr>
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<th>Economic Sustainability</th>
<th>Social Sustainability</th>
<th>Environmental Sustainability</th>
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<tbody>
<tr>
<td>Economic Sustainability</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Social Sustainability</td>
<td>1/2</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Environmental Sustainability</td>
<td>1/3</td>
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(Source: The Researcher)

Table J.2: The Results of SUST Perspective Pairwise Comparison Matrix

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<td>Environmental Sustainability</td>
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<td>1</td>
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<tr>
<td>Sum of Attribute</td>
<td>1.83</td>
<td>4</td>
<td>5</td>
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</table>

(Source: The Researcher)

2. Synethization Priority Criteria

Calculate the priority of each attribute in terms of its contribution to the Sustainability perspective for ranking economic, environmental and social sustainability using the pairwise comparisons matrix. The following procedure
AHP determines that Economic SUST, with a priority of 54.91%, is the most important attribute. Social SUST is ranked second with a priority of 24.1%. While Environmental SUST, with a priority of 21.1%, is ranked third.

3. Consistency

Consistency of the pairwise judgments provided by the experts through calculation of the consistency ratio for the criteria matrix

3-1 Multiply each value in the column of the pairwise comparison matrix by the related Priority value criteria in order to obtain weighted sums are as follows

Table J.3: Normalize Pairwise Comparison

<table>
<thead>
<tr>
<th>Priority Criteria</th>
<th>Economic Sustainability</th>
<th>Social Sustainability</th>
<th>Environmental Sustainability</th>
<th>Priority Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Sustainability</td>
<td>0.545</td>
<td>0.499</td>
<td>0.6</td>
<td>0.5485</td>
</tr>
<tr>
<td>Social Sustainability</td>
<td>0.272</td>
<td>0.249</td>
<td>0.2</td>
<td>0.2409</td>
</tr>
<tr>
<td>Environmental Sustainability</td>
<td>0.181</td>
<td>0.249</td>
<td>0.2</td>
<td>0.2106</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

Table J.4: Calculation for the Weighted Sum

<table>
<thead>
<tr>
<th>Priority Criteria</th>
<th>0.5485</th>
<th>0.2409</th>
<th>0.2106</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Economic Sustainability</td>
<td>Social Sustainability</td>
<td>Environmental Sustainability</td>
</tr>
<tr>
<td>Economic Sustainability</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Social Sustainability</td>
<td>0.5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Environmental Sustainability</td>
<td>0.33</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

(Source: The Researcher)

3-2 Add the values across the rows to obtain a “weighted sum”. The calculated weighted sums are as in the table.

3-3 Divide the elements of the weighted sum by the equivalent priority for each criterion.

Table J.5: Calculation of the Maximal Eigenvalue (λ max)

<table>
<thead>
<tr>
<th>Priority Criteria</th>
<th>Economic Sustainability</th>
<th>Social Sustainability</th>
<th>Environmental Sustainability</th>
<th>Weighted Sum Value</th>
<th>Priority Criteria Weight</th>
<th>Weighted Sum Criteria Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Sustainability</td>
<td>0.55</td>
<td>0.48</td>
<td>0.63</td>
<td>1.65</td>
<td>0.55</td>
<td>3</td>
</tr>
<tr>
<td>Social Sustainability</td>
<td>0.28</td>
<td>0.24</td>
<td>0.21</td>
<td>0.72</td>
<td>0.24</td>
<td>3</td>
</tr>
<tr>
<td>Environmental Sustainability</td>
<td>0.18</td>
<td>0.24</td>
<td>0.21</td>
<td>0.62</td>
<td>0.21</td>
<td>3</td>
</tr>
</tbody>
</table>

(Source: The Researcher)
3-4 Calculating the average of the values called maximal eigenvalue and denoted by $\lambda_{\text{max}}$

$$\lambda_{\text{max}} = \frac{3 + 3 + 3}{3} = 3$$

3-5 Calculate the Consistency Index ($CI$):

$$CI = \frac{\lambda_{\text{max}} - N}{N - 1}$$

(N= number of compared elements.)

$$\frac{3 - 3}{3 - 1} = 0.0$$

$CI=0$, then the evaluation for the pair-wise comparison matrix is implied to be entirely consistent

3-6 Calculate Consistency Ratio ($CR$):

$$CR = \frac{CI}{RI}$$

The Value of the random index RI depends on the number of items being compared and is shown in the table for N=3, equal to 0.58

Consistency Ratio = 0/0.58 = 0

**Table J.6: Average Random Index (RI) for Corresponding Matrix Size**

<table>
<thead>
<tr>
<th>$N$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>RI</td>
<td>0.00</td>
<td>0.00</td>
<td>0.58</td>
<td>0.90</td>
<td>1.12</td>
<td>1.24</td>
<td>1.32</td>
<td>1.41</td>
<td>1.45</td>
<td>1.49</td>
<td>1.51</td>
<td>1.48</td>
</tr>
</tbody>
</table>

(Source: Saaty, 2008)
Appendix K: AHP Calculator

Figure K.1: Two Pairwise Comparisons of Experts for SCN Themes in the AHP Calculator

Figure K.2: Two Pairwise Comparisons of Experts for SUST Themes in the AHP Calculator

Figure K.3: Two Pairwise Comparisons of Experts for TQM Themes in the AHP Calculator