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**SUPPLY CHAIN QUALITY RISK MANAGEMENT:
IMPACT ON ORGANISATION PERFORMANCE**

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Master's Thesis

Supervisor

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I hereby declare that all information/data presented in this graduation project has been obtained in full accordance with academic rules and ethical conduct. I also declare all unoriginal materials and conclusions have been cited in the text and all references mentioned in the Reference List have been cited in the text, and vice versa as required by the abovementioned rules and conduct.

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XXXXXXXXXX

DEDICATION

First and foremost, I would like to thank Professor MEHMET TEKELIOĞLU GÜREL for supervising my thesis. I dedicate this thesis with deep thanks and respect to my family, whose everlasting love, support, and encouragement have served as the cornerstone of my academic endeavors. Their confidence in my abilities has strengthened my resolve.

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ABSTRACT

SUPPLY CHAIN QUALITY RISK MANAGEMENT: IMPACT ON ORGANISATION PERFORMANCE

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Supply chain is a cohesive network of connections between various businesses, it may be argued that international supply networks face a significantly greater degree of risk compared to domestic supply networks. Many companies have tried to improve their overall financial performance by using a range of various strategies. The existing body of research on managing quality risks in complicated international supply chains is insufficient, and there is a lack of understanding of the nature of risks within the framework of a global supply chain. Despite the considerable advancements in understanding the underlying principles of risk management, this problem persists. This research aims to investigate how SCQRM could be used to mitigate the risks associated with product quality. This study focuses on developing supply chain risk management strategies for specific types of risks within supply networks. A quantitative research design is used in the study. A survey collects data from an oil company in Basra, Iraq. The respondents will be carefully selected—only the company's middle- and upper-level executives will be invited to respond. The results indicate that risk sharing and risk remedy have a statistically significant relationship with organization performance. However, risk shifting was found to be insignificant in organizational performance.

Keywords: Risk Management, Supply Chain Quality, Risk Sharing, Risk Remedy, Organization Performance.

ÖZET

TEDARİK ZİNCİRİ KALİTE RİSK YÖNETİMİ: KURULUŞ PERFORMANSI ÜZERİNDEKİ ETKİSİ

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Tedarik zinciri, çeşitli işletmeler arasındaki bağlantılardan oluşan uyumlu bir ağıdır, uluslararası tedarik ağlarının yerel tedarik ağlarına kıyasla önemli ölçüde daha fazla riskle karşı karşıya olduğu söylenebilir. Birçok şirket, çeşitli stratejiler kullanarak genel finansal performanslarını iyileştirmeye çalışmıştır. Karmaşık uluslararası tedarik zincirlerinde kalite risklerinin yönetilmesine ilişkin mevcut araştırmalar yetersizdir ve küresel tedarik zinciri çerçevesinde risklerin doğasına ilişkin bir anlayış eksikliği söz konusudur. Risk yönetiminin altında yatan ilkelerin anlaşılmasında kaydedilen önemli ilerlemelere rağmen bu sorun devam etmektedir. Bu araştırmanın amacı, SCQRM'nin ürün kalitesiyle ilişkili riskleri azaltmak için nasıl kullanılabileceğini araştırmaktır. Bu çalışma, tedarik ağlarındaki belirli risk türleri için tedarik zinciri risk yönetimi stratejileri geliştirmeye odaklanmaktadır. Çalışmada nicel bir araştırma tasarımı kullanılmıştır. Basra, Irak'taki bir petrol şirketinden anket yoluyla veri toplanmaktadır. Katılımcılar dikkatle seçilecek ve yalnızca şirketin orta ve üst düzey yöneticileri yanıt vermeye davet edilecektir. Sonuçlar, risk paylaşımı ve risk telafisinin organizasyon performansı ile istatistiksel olarak anlamlı bir ilişkisi olduğunu göstermektedir. Bununla birlikte, risk kaydırmanın örgütsel performans üzerinde önemsiz bir etkisi olduğu bulunmuştur.

Anahtar Kelimeler: Risk Yönetimi, Tedarik Zinciri Kalitesi, Risk Paylaşımı, Risk Çözümü, Organizasyon Performansı.

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1. INTRODUCTION

The effective administration of a global supply chain poses challenges for organizations. This can be attributed to the presence of several challenges in global logistics operations, encompassing economic, political, competitive, cultural, practical, and infrastructural issues. Global logistics operations encompass a multitude of obstacles, hence giving rise to the explanation above. Kwak (2014) assert that globalization presents enterprises with the potential to exploit expansive product markets, cost-effective labor and raw materials, and various incentives offered by host governments to promote foreign capital investment. Furthermore, globalization facilitates firms in capitalizing on many additional benefits that may be offered by a host government. Global supply networks exhibit significant complexity and unpredictability due to the extensive volume of flows, nodes, entities, and transits involved, along with the potential for extended lead times (Craighead et al., 2011).

The material, informational, and financial flows inside a corporation's supply chain are subject to ongoing disruptions. The increased complexity and interconnectedness of inter-organizational networks can be attributed to the phenomenon of globalization (Bode et al., 2011). This implies that a disturbance occurring at any individual link within the chain possesses the capacity to impact the entirety of the chain. the intricacy of worldwide supply chains can significantly influence the approach to managing logistical risk and the implementation of operational management approaches by multinational organizations. Furthermore, the intricate nature of worldwide supply chains can significantly influence the approach to mitigating logistical risk.

Supply chain is a cohesive network of connections between various businesses, it may be argued that international supply networks face a significantly greater degree of risk compared to domestic supply networks. The presence of linkages among many enterprises located in different regions of the world has been identified as a contributing factor (Kwak, 2014). These organizations are geographically dispersed throughout several regions worldwide. The presence of globalized corporate environments has resulted in an increased probability of encountering supply chain risk (Blackhurst et al., 2011). The primary factor contributing to this phenomenon can be mostly attributed to the extended duration required for lead times and the escalating intricacy of supply chain operations. Many businesses have tried to improve their overall financial performance by using a range of various strategies.

These include to name a few of the more well-known ones, just-in-time production, single-sourcing, vendor-managed inventory, lean operations, supply base reduction, and outsourcing.

Nevertheless, several scholars have expressed concerns regarding the potential vulnerability of powerful and successful initiatives that have been implemented to enhance global supply chains. These initiatives, originally designed during a period of business stability, may unexpectedly become weak points in the system due to their contribution to the lengthening and increased complexity of supply chains (Tang, 2011). The academics mentioned above have highlighted that these measures were implemented during a period of commercial stability. The implementation of these efforts during a period of favorable corporate performance gives rise to some issues. identified several risk factors that have influenced the configuration of supply networks, resulting in increased interconnectedness and complexity (Juttner et al., 2003). These factors include (1) effectiveness; (2) supply chain globalization; (3) the consolidation of manufacturing and distribution activities; (4) the utilization of third-party providers; and (5) the reduction in the overall number of suppliers. The aforementioned alterations can be attributed to five distinct trends, as expounded upon in the subsequent paragraph: (1) a heightened emphasis on efficacy; (2) the globalization of supply chains; (3) the amalgamation of production and distribution processes; and (4) the employment of the contracted workforce. The unforeseen events, including acts of terrorism, labor disputes, fires, and natural calamities, can significantly impact the worldwide supply chain (Kwak, 2014).

Numerous instances have been documented when malfunctions have impeded the optimal functioning of the global supply chain. Due to a fire incident, Ericsson was compelled to endure a delay exceeding one month in the reception of their consignment of microchips. The insolvency of UPF-Thompson, a prominent UK service provider, resulted in the retrenchment of 1,400 personnel by Land Rover, thereby leading to their unemployment (Tang, 2011). An earthquake resulted in the full destruction of the facilities belonging to one of Toyota's car components suppliers (Pettit et al., 2010). Consequently, the shutdown of all Toyota production lines resulted directly from this event.

The World Economic Forum (2013) reported that Hurricane Sandy resulted in losses above \$70 billion in the United States in 2012. Additionally, the floods in Thailand during the same

year led to the closure of over 1,000 businesses and incurred a total cost of \$20 billion for the country. Both of these catastrophic calamities transpired in the year 2012. Due to this phenomenon, firms must conduct risk assessments of their global supply chains in order to ensure the efficiency and ethicality of their supply chain operations. The concept of risk management emerges as individuals perceive an escalation in the severity of risks and recognize the necessity of implementing appropriate measures to mitigate them (Monroe & Teets & Martin, 2014). Risk management is a concept that emerges when individuals recognize their personal accountability for determining their own destinies. This is the underlying cause behind the current state of affairs. Effective risk management plays a crucial role in determining a company's success in the current competitive business landscape.

The interest in supply chain risk management has been heightened due to the increasing occurrence of unforeseen occurrences that negatively affect the operations and performance of companies (Blackhurst et al., 2011). This is because unforeseen circumstances can adversely affect the functioning and productivity of businesses. The academic community has dedicated significant attention to the study of SCRM in the past decade. Although significant modifications have been implemented, the fundamental elements of the SCRM approach. These components encompass the identification of risks, assessment of their severity, and the execution of measures to alleviate these risks. Supply chain risk management (SCRM) studies often encompass one or more of these activities to investigate supply chain hazards and the diverse approaches employed to mitigate them within various supply chain environments. SCRM encompasses examining the complete supply chain, commencing at the moment of purchase and concluding with the delivery of goods; each research study is characterized by its unique research focus. In addition to the authors above, it is worth noting that a significant portion of existing research primarily focuses on risk management from the manufacturers' standpoint.

A limited number of research projects have been conducted on logistics and the global supply chain (Chiappetta et al., 2019). This phenomenon can be mostly attributed to the prevailing consensus among scholars that logistics is an integral part of a supply chain, alongside the notion that a broader supply network is also a constituent element. Both of these notions are associated with the notion that a supply chain comprises multiple components. However, the potential hazards and challenges associated with global logistics networks have not received

sufficient attention thus far. This phenomenon can be attributed, to some extent, to the perspective known as the "unionist view," which argues that supply chain management is merely a component of logistics. This perspective has played a significant role in shaping the current state of affairs through several mechanisms. This perspective has played a significant role in shaping the current state of affairs. There is a potential disparity in the allocation of attention among various aspects of business management, such as production management, inventory management, and demand forecasting, with logistics potentially receiving comparatively less emphasis. However, it is important to note that this assertion is speculative.

Another consideration is that the sector expends significant resources to mitigate new hazards (Chopra et al., 2021). This factor contributes to the high level of safety within the industry. This represents one of the numerous factors contributing to the sector's notable performance. The study on Supply Chain Risk Management (SCRM) may have been susceptible to the influence of this phenomenon, wherein corporations frequently underestimate the infrequent yet significant international logistics hazards (Aljabhan, 2023). The preceding study on SCRM has proven advantageous in this context; nonetheless, its applicability to the domain of global logistics is, at most, restricted. The presence of this knowledge gap holds significant importance due to the imperative for businesses to prioritize the management of global logistics risks, which has arisen as a consequence of the processes of globalization, extended lead times, a surge in the practice of outsourcing logistics by enterprises, and a rise in the occurrence of unforeseen natural and man-made disasters on a global scale. The closure of this knowledge gap is imperative as firms are compelled to address and mitigate global logistics risks in order to sustain their operations.

Business leaders and policymakers worldwide have been aware of instances of product damage occurring during global transportation. Furthermore, they have facilitated the exploration of novel research domains, specifically within the realm of logistics. SCQR has provided several opportunities for scholars to investigate and enhance existing theories and models pertaining to risk management and quality management (Ganesh & Kalpana, 2022). This scenario is characterized by mutual benefits for all parties involved. Nevertheless, the methods employed to effectively handle supply chain risk pertaining to quality and safety concerns are not widely acknowledged or evaluated.

The exacerbation of SCQR can be attributed to two key factors: the substantial proliferation of global material sources and the increasing production of brand-name goods through contract manufacturing (Roth et al., 2016). Consequently, the field of SCRM has developed into a crucial element within efficient supply chain management. In recent years, the academic literature on SCRM has highlighted the significance of efficiently managing operational risks in supply chains with extensive linkages. Researchers have developed a range of risk management decision models to aid in mitigating SCQR occurrences (Wicaksana et al., 2022). Research has demonstrated that service quality declines when customers seek compensation for damage, delayed delivery, or other problems. The handling of product recalls entails meticulous planning regarding the procedures and duration for which a product may be returned. This measure is undertaken to alleviate the adverse consequences associated with SCQR.

The increasing complexity of collaborating with overseas suppliers has exacerbated the issue of product quality, leading to a growing and increasingly troublesome problem over time. In contemporary business practices, a significant number of companies integrate the practice of global sourcing as a fundamental component of their comprehensive procurement strategies. Consequently, the production chain can exhibit considerable length and sometimes necessitates involvement from multiple geographical locations. It is not unexpected that the sale of plants accounts for almost 50% of all identified commodities produced. It was observed that the introduction of extra vendor plants to assist in the completion of a task negatively impacted the quality of the final product (Lindberg et al., 2021). At every level of the manufacturing process, the quality of the product undergoes a progressive and cumulative reduction. The addition of extra workers to the supply chain introduces a heightened potential for a decline in the quality of the final product. Mondragon et al. (2021) argue that within a complex supply chain environment characterized by multiple layers, company executives may encounter challenges in accurately predicting the interdependencies and repercussions of their actions on various sections of the chain. The complexity of the supply chain situation is the primary cause for this. Indeed, determining the extent to which the potential for substandard quality may spread across a supply chain is a complex task that lacks a clear-cut methodology.

In order to sustain profitability and achieve optimal performance within its market sector, a company must be capable of mitigating quality risks and implementing suitable risk

management procedures. The ability to effectively manage and mitigate quality risks is of utmost importance, as it guarantees the delivery of products to clients that are free from any form of damage or potential harm. In both the immediate and extended timeframes, it is imperative for organizations and decision-makers to deliberate upon the most efficient ways for effectively managing and mitigating the risks associated with product quality throughout the global supply chain. It is imperative to provide equal importance to these factors.

The existing body of research on managing quality risks in complicated international supply chains is insufficient, and there is a lack of understanding of the nature of risks within the framework of a global supply chain (Emrouznejad et al., 2023). Furthermore, there is a dearth of research on the management of quality hazards across intricate global supply networks. Both of these inquiries have been sufficiently addressed within the limitations of the written context. Despite the extensive study undertaken by Tang (2011) on the subject of supply chain disruption risk management and strategy, there remains a lack of familiarity among individuals regarding the foundational principles of risk management. Conversely, these literary works offer a lucid elucidation of fundamental principles and exemplify their potential real-world applications. Despite the considerable advancements in understanding the underlying principles of risk management, this problem continues to persist. The absence of knowledge has necessitated the need to address the matter. Supply Chain Quality Risk Management, commonly referred to as SCQRM, is the systematic approach to mitigating risks associated with the quality of goods and services delivered at different stages throughout a supply chain. Furthermore, to commence a scholarly investigation on this really consequential issue confronting contemporary society, it is imperative to obtain authorization for a comparable technique.

1.1 RESEARCH PROBLEM

Despite the scholarly community's keen interest in SCRM, there is a need to advance the research on SCRM. However, the majority of these approaches are prescriptive in nature, aiming to persuade managers in practice to adopt SCRM within their organizations. They do so by highlighting the potential advantages of effectively controlling the risk of supply chain disruptions and mitigating the consequences of inadequate supplies. The purpose of this endeavor is to encourage operational managers to adopt the implementation of SCRM. The

concepts underlying solutions for supply chain quality risk (SCQR) have received limited attention in the current global context (Daghfous et al., 2023).

Organizations that fail to adequately consider the functioning of SCQRM in mitigating quality risks within their primary supply chain are also susceptible to disregarding the significance of SCQRM in their operational processes. Most research undertaken in the field of quality management has mostly focused on investigating issues about quality, including flaws, contamination, and hazardous products. Finally, a comprehensive compilation of the research gaps has been assembled and is available here.

a. Although it is widely acknowledged by scholars that risk prevention and control are crucial elements of SCQRM, the biased focus of the research on prevention and control may suggest that there is no obligation for buyers and sellers to share economic losses. Furthermore, the research failed to explore the intricate and diverse aspects of SCQRM thoroughly. As a result of this, an official definition of the multidimensional aspects of the subject has not yet been formulated in the form of a measuring construct. To facilitate comprehension of SCQRM among students and professionals, developing a clear framework that elucidates its construction by integrating diverse components is imperative.

b. In the past, empirical research on SCRM and SCM rarely incorporated proven metrics for assessing the effectiveness of SCQRM practices. This phenomenon persisted even in instances when they did so. In the context of operations management (OM), researchers have emphasized the significance of SCQR as an essential element in SCRM (Choi & Hwang, 2015). However, there is a lack of empirical examination of SCQRM measures using extensive datasets. Consequently, there has been a lack of concerted effort to develop a comprehensive measure that adequately encompasses the diverse elements inherent in SCQRM (Can Saglam et al., 2021).

c. Based on current scholarly research, the significance of SCQRM is predominantly influenced by its ability to efficiently handle product recalls and the subsequent impact of these recalls on the organization's profitability.

This research will address supply chain quality risk management and its impact on supply chain activities. Moreover, it also explores the supply chain quality risk management on performance.

1.2 RESEARCH QUESTIONS

The research questions are as follows:

RQ1: How does supply chain quality risk management reduce the risk of quality in services and products along the supply chain?

RQ2: How do dimensions of supply chain quality risk management impact on the organization performance?

1.3 SIGNIFICANCE OF THE STUDY

The purpose of this research is to investigate the many ways in which SCQRM could be used to mitigate the risks associated with product quality. This study does not take into account other risks that are associated with supply networks, such as the risk of demand, the danger of interruption, or the risk of reputational harm. Although there is a large body of literature on the subject of general supply chain risk management practices, the objective of this research is not to establish supply chain risk management strategies for every possible form of risk that can occur within supply networks. Instead, the research will focus on developing supply chain risk management strategies for specific types of risks that can occur within supply networks. The primary focus of the research will be on the creation of supply chain risk management systems that can be adapted to address a variety of different kinds of dangers that may be present within supply networks. The study has a limited focus on supply chain risk management, and as a result, it does not contain a comprehensive framework for managing a variety of supply chain risks. This is the source of the highlighted shortcoming, which was found in the study. This research will generate tremendous benefit in a variety of ways thanks to its broad applicability.

- a. Conceptualization and operationalization of SCQRM.
- b. Proposing dimensions of SCQRM to reduce risk quality.
- c. Investigating SCQRM practices and their impact on quality and organization performance.

2. LITERATURE REVIEW

In the past decade and a half, scholars and enterprises have extensively researched supply chain risk management (SCRM) (Ghadge et al., 2020). This investigation was conducted from multiple angles. Consequently, SCRM is well recognized by numerous scholars as a rapidly developing area of study (Colicchio and Strozzi, 2012). The primary catalyst for this phenomenon in research is the transformation of supply chain networks' structure, leading to a notable escalation in the risk associated with supply chains. Some of the advances in supply chains include the globalization of these networks, the centralization of manufacturing and delivery systems, a heightened reliance on outsourcing, and a reduction in the overall number of suppliers. In addition, the detrimental effects resulting from both human-induced and naturally occurring disasters, including acts of terrorism, outbreaks of diseases such as SARS, seismic activities, tidal waves, and labor disputes in industrial sectors, have fostered the notion that prioritizing risk management is imperative within the realm of supply chain management. The emergence of this concept might be attributed to the observation that risk management is widely recognized as a primary objective within the field of supply chain management. Numerous risk-management models and solutions have been established and advocated for in academic research (Tang, 2011; Munawar et al., 2022). The presence of supply chain disruptions is correlated with a diverse range of risks.

This chapter delves into an analysis of prior research conducted on Supply Chain Risk Management (SCRM) and emphasizes the existing gaps in knowledge, specifically within the realm of global logistics risk management. The research's exploratory nature requires a focus on the methodology employed to acquire SCRM information, ensuring that the findings are relevant to scenarios pertaining to international logistics. The significance of this matter lies in the limited extent of comprehensive investigations conducted on the hazards linked to global logistics. Subsequently, a framework for studying Supply Chain Risk Management (SCRM) is provided with the aim of delineating and structuring existing knowledge pertaining to SCRM. This study framework is implemented in accordance with the principles of Social Customer Relationship Management (SCRM). This facilitates the comprehension and integration of previously published material by readers. The subsequent sections will provide a more comprehensive examination of the components of the framework. This will enable its application as a theoretical framework for analyzing SCRM studies and highlighting areas that have received limited research attention. This action will

be undertaken to facilitate the utilization of the framework. Consequently, the formulation of a prospective research strategy will become feasible.

2.1 SUPPLY CHAIN

According to the Royal Society (2015), risk can be defined as the quantitative probability of a specific hazard occurring. In contrast, Spekman and Davis (2015) provide a definition of risk as "the likelihood of encountering deviations from an anticipated outcome" (p. 421). Norrman (2020) defined the term "risk" as possessing a versatile nature, as it can be applied in diverse contexts and situations throughout numerous industries, contingent upon the particular perspectives through which hazards are seen. The identification of eight diverse perspectives on risk highlights the multidimensional nature of this concept, revealing its varied interpretations across different industries (Barney & Hesterly, 2019). In the realm of classical decision theory, risk is conceptualized as the degree of fluctuation within the probability distribution of potential profits and losses linked to a certain alternative (Pettit, 2014,). The definition in question is expounded upon in the essay authored by Pettit (2014). Conversely, as posited by Reinsel (2022) in the Capital Asset Pricing Model, a comprehensive understanding of financial markets necessitates proficiency in managing both idiosyncratic risks and systematic risks. the comprehensive understanding of risk in the context of strategic decision-making has expanded beyond mathematical models to incorporate behavioral aspects and psychological techniques.

Nevertheless, owing to the divergence in individuals' interpretations of dangers, there exist essentially two approaches to delineate risk: 1) the amalgamation of danger and probability, and 2) the sole consideration of danger (Wagner & Bode, 2011; Gurtu & Johny, 2021). The notion presented is somewhat substantiated by the observation that the initial comprehensive examination of risk commenced by employing mathematical models within the domain of gambling (Khan, 2022), encompassing the possibility of both favorable and unfavorable outcomes. This notion is substantiated to some extent by the inclusion of the possibility of both success and failure inside this concept. Markowitz's investment portfolio model, published in 1952, is widely regarded as a seminal study on risk within the field of business. This landmark work elucidated the manner in which investors navigate the delicate equilibrium between risk and return. the term "decision-making under risk" is being used to describe the cognitive process of selecting alternatives with differing probability and

potential consequences. Similarly, portfolio management examines investors' perceptions of risk and return, aiming to reframe risk as an opportunity for financial gain (Schroeder & Lodemann, 2021). The principle being discussed holds significant significance within the realm of investment, and the adage "high risk, high return" can be considered a viable representation of this notion about risk.

In contrast, within social science and management, risk is commonly perceived solely as the possible adverse consequences that may arise from the manifestation of unforeseen occurrences. Chiles and McMackin (2022) define risk as an unintended negative event, which is consistently associated with the notion of loss. Risk is contingent upon both the probability of experiencing a specific type of detriment and the magnitude of the detriment. The extent of possible loss, the probability of experiencing loss and the vulnerability to being affected by loss. Yates and

2.2 SUPPLY CHAIN RISK

It is widely held among experts in the field of supply chain management that engaging in risky behavior is likely to lead to undesirable consequences. The adverse consequences of supply chain risk are becoming more evident due to the limited avenues for generating financial gains from such risks (Zsidisin, 2016). Within the realm of supply chain management, the concept of "risk" can be interpreted in two distinct ways. Firstly, it can be defined as "the probability of encountering harm, detriment, loss, harm, or any other unfavorable consequence" (Hachicha, & Elmsalmi, 2014). Alternatively, it can be understood as "the adverse deviation from the anticipated value of a specific performance metric, resulting in undesirable outcomes" (Wagner and Bode, 2011, p. 309). Empirical research has demonstrated that supply chain managers typically priorities their attention towards prospective dangers that may lead to unfavorable consequences.

Risk can be defined as the anticipated outcome arising from an occurrence characterized by uncertainty (Kwak, 2014). Additionally, it is believed by proponents that the presence of prospective losses and the probability of their occurrence are two fundamental elements that constitute risk. Supply chain risk can be characterized as an occurrence with a relatively low probability of occurrence, however with rapid and significant detrimental consequences on the overall system (Tang & Musa, 2011).

The categorization of supply chain risk is commonly divided into two distinct categories, namely business risk and disruption risk, as Tang (2011) outlined. In the present context, operational risks are perceived as inherent uncertainties arising from supply, demand, and cost fluctuations. These movements occur regularly, but their influence on the overall situation is not substantial. In contrast, disruption risks pertain to significant natural or man-made calamities that have a much greater impact than operational risks despite their relatively lower probability of occurrence (El Baz & Ruel, 2021). The categories above are commonly denoted as LFHI and HFLI, correspondingly. Due to the stochastic nature of low-frequency, high-impact (LFHI) hazards, which exhibit variability in terms of occurrence timing, duration, location, and magnitude, it is imperative to adopt distinct risk treatment strategies for LFHI hazards as compared to those employed for high-frequency, low-impact (HFLI) hazards.

2.3 SUPPLY CHAIN MANAGEMENT

According to the study conducted by Chen and Paulraj and Blome in 2017, The concept of "supply chain management" (SCM) pertains to the efficient Coordination of common needs of a consortium of firms that cooperate to streamline the fulfillment of consumer demands for an organization. To posit that supply chain management (SCM) facilitates a business in meeting the demands and preferences of its consumers is an alternative phrasing. The transportation and modification of commodities from their extraction to consumption by end users is a fundamental component within the supply chain management framework (Rolf et al., 2023). This notion also encompasses the exchange of information in both the upstream and downstream directions within the supply chain. The feature of supply chain management that holds paramount importance is the extensive range of actions required to facilitate the efficient and effective movement and transformation of resources. The completion of these operations is vital, commencing from the initial extraction of resources and extending until the products and services are utilized by end customers. The concept of "supply chain management" pertains to the systematic and structured coordination of regular company operations and strategies, which may occur inside a solitary entity or through collaborative efforts with other organizations throughout the supply chain. The overarching goal of this strategy is to facilitate the independent growth and prosperity of each constituent company inside the supply chain. Supply chain management is a concept that encompasses the intentional and organized coordination of regular business actions and strategies, both

internally inside individual firms and externally amongst the several entities that constitute the supply chain. Upon contemplation of a supply chain, one will come to the realization that the management of said supply chain encompasses a scope that extends beyond the mere conversion of raw materials into final goods (Wieland, 2021). The importance of collaboration among firms in order to improve the operational efficiency and efficacy of logistical distribution channels has been emphasized. Supply chain management (SCM) refers to the collaborative endeavor of several stakeholders throughout a supply chain, aimed at enhancing an organization's overall performance through the promotion of collaboration across its various business divisions. The achievement of this objective is facilitated by employing supply chain mapping techniques. Despite the historical existence of supply chain management (SCM) since the 1980s, there has been a recent surge in interest and attention from corporate professionals and scholars. Extensive scholarly research has been dedicated to examining and analyzing supply chain management (SCM). The significance of this notion lies in its comprehensive coverage of many management approaches. Extensive research is conducted on a diverse range of subjects about the domain of supply chain management, commonly referred to as SCM. Consequently, specialists in the industry strive to optimize the performance of a firm through the establishment of a completely integrated supply chain, leveraging the collective expertise of internal and external stakeholders. Furthermore, it is imperative to consider that in the current business landscape, rivalry extends beyond individual firms and encompasses the supply networks that interconnect them. The competitive landscape within the realm of business has undergone substantial transformations, resulting in consequential impacts. In the domain of supply chain management (SCM), the performance of a specific company is no longer deemed significant. The overall success of a company relies on the collective performance of its supply chain, which encompasses all the organizations involved.

The management of the supply chain encompasses not only the pre- and post-activity events, but also the intra-organizational processes within a certain business entity. The upstream task involves vigilant monitoring of supplier activities and integrating them into the product production process. Conversely, downstream operations involve the coordination of manufacturing and logistics activities in collaboration with customers. Control and management are implemented to oversee the production, marketing, and purchasing processes as an essential component of internal operations (Altekar, 2023). The concept of

"supply chain management," sometimes abbreviated as SCM, involves a range of operations, although only select details are included in this discussion. The basic aim of supply chain management (SCM) is to effectively coordinate and oversee the movement of goods and information within the supply chain, aiming to meet customer demands and ensure timely service delivery. The optimization of tasks in both the upstream and downstream processes can enhance the efficiency of supply chain management for firms. This facilitates the enhancement of inter-organizational competitive advantage for businesses.

2.4 RISK MANAGEMENT

Risk management (RM) is a systematic methodology employed to safeguard a company's assets and financial gains. The achievement of specific objectives that mitigate potential risks is facilitated through the strategic allocation and utilization of a business's resources, encompassing its tangible assets, financial assets, and human resources. While it is acknowledged that it is impossible to entirely eliminate risk and establish "zero risk" with certainty, contemporary risk management strategies encompass a range of preventive measures and risk reduction approaches that can be employed to safeguard organizations (Kreibich et al., 2022). During the 1980s, scholars with a focus on strategy also directed their attention towards the examination of risk.

Nevertheless, there is a persistent endeavor by both organizations and people to diligently explore novel strategies to effectively manage the trade-off between the risks they assume and the profits they generate. Individuals' risk preferences, potential financial gains, and the organization's risk appetite influence the decision-making process concerning trade-offs. Based on the research conducted by Hachicha, & Elmsalmi, (2014), it has been observed that there exists a disparity in the willingness to undertake risks among different businesses and individuals. There exist two primary forms of relationship management (RM), namely those that focus on the procedural aspects and those that priorities the broader perspective. The approach of process-based risk management centers on understanding and mitigating risks by considering their likelihood of occurrence and potential direct harm. This is accomplished by considering the probability of the risk eventuating. A systematic methodology is necessary in order to identify, assess, and priorities risks prior to achieving a comprehensive understanding of them (Teague et al., 2021). Resource planning is essential for minimizing, monitoring, and regulating the probability and impact of adverse events. In

contrast, the approach of strategy-based risk management aims to develop a set of strategic alternatives that can effectively mitigate the risks arising from uncertainty. An effective approach to strategic risk management entails carefully selecting operational processes that can effectively mitigate potential loss exposures. This can potentially indicate a reduction in the probability of experiencing loss, a decrease in the magnitude of failure, or a stabilization of the variability in loss over a given period.

A wide range of RM methods have been formulated for application across diverse contexts (Rao et al., 2011). For example, the field of financial risk management focuses on the identification and strategic utilization of diverse financial instruments to mitigate potential risks that may result in significant financial losses. The utilization of risk management in construction project management is vital for the development of effective strategic plans. Various strategies for risk management encompass the maintenance of risks, the transfer of risks to external parties, the mitigation of risks, and the complete avoidance of hazards (Teague et al., 2021).

One aspect of the ex-ante approach involves implementing proactive measures to avert potential issues or problems. From a quality management standpoint, it is imperative to proactively implement measures to prevent errors and guarantee that solutions are deemed as "correct the first time." The existing system will incorporate a mitigating step if complete risk elimination is unattainable. The ex-post method pertains to the issue of managing unfavorable outcomes, similar to the proactive approach of rectifying service quality lapses in order to maintain high standards. The risk management structure which is focused on performance has also been suggested for advanced research and development (R&D) initiatives (Ivanov & Dolgui, 2021). The researchers integrated several project management approaches with corporate strategy and implemented a tracking system to enhance the probability of successful implementation of new research and development (R&D) initiatives, hence advancing the company's progress towards its strategic objectives. There exists a diverse range of risk management systems, all of which share a common goal: mitigating risks and hazards encountered by the organization to enhance its overall operational effectiveness. These solutions have been created across a diverse range of sectors.

2.5 SUPPLY CHAIN RISK MANAGEMENT PROCESS

Given the potential adverse consequences associated with disruptions in supply chains, it is imperative to priorities implementing efficient risk management strategies. The initial iteration of the SCRM technique was predicated on the longstanding tradition of having a "arms-length" association with its distribution partners. The implementation of contracts achieved the objective, regular monitoring of sales performance, and timely resolution of any arising issues. Ritchie and Brindley (2007) assert that organizations have recently recognized the significance of adopting a proactive stance towards risk management to mitigate their exposure to risk and enhance their operational effectiveness.

Ho, Tian Zheng, and Talluri (2013) argue that numerous qualitative and quantitative strategies have emerged during the past few decades to mitigate the risks inherent in supply chain operations. This research aligns with the definition proposed by Kwak (2014) as it pertains to the management of global supply chain risk (GSCRM). The concept of Global Supply Chain Risk Management (GSCRM) involves the identification and assessment of risks and losses within the global supply chain, as well as the implementation of appropriate strategies through a collaborative approach. The primary objective of GSCRM is to reduce one or more of the following factors: losses, probability, event duration, loss duration, time required for event detection, frequency, and exposure (Hohenstein, 2022). Furthermore, the desired outcome of GSCRM is to align supply chain outcomes with actual cost savings and profitability, thereby achieving optimal results.

Risk management applies to three main areas of planning conducted by management. Three distinct categories of planning exist: ordinary, tactical, and strategic variations. The techniques above entail inherent risks that necessitate acknowledgment and appropriate measures to minimize them (Tang, 2011).

The strategic planning enables organizations to make informed decisions at a high level, considering long-term considerations. These decisions encompass various areas, including developing new products, market expansion, technological advancements, and pursuing increased value while simultaneously reducing costs. The tactical planning process encompasses the formulation of decisions pertaining to the immediate and intermediate future. These decisions encompass several aspects such as determining the volume of work

to be accomplished within a week or a month, establishing delivery schedules, evaluating sales outcomes, fostering organizational learning, and other related considerations.

Identifying routine activities that will support the realization of an organization's long-term goals is an integral aspect of operational planning. The ability to exercise discernment in several aspects of daily operations, including production, tools, processes, inventory management, and other related areas.

A comprehensive comprehension of the interrelatedness of the three strategies and the potential impact of supply chain risks on the success metrics of each plan is crucial. Consequently, it is imperative to thoroughly analyses the risk management plan and strictly follow to its guidelines. There are many measures that organizations can do to mitigate the probability of encountering disruptions in their operational processes. The company implements mitigating strategies to address any delays proactively. This strategy entails the execution of a certain action.

There exist multiple methodologies for addressing possible issues within the supply chain. The four components comprising Supply Chain Risk Management (SCRM) encompass the identification of risks, the assessment of said risks, the implementation of measures to minimize those risks, and the ongoing monitoring of the identified risks. The framework comprising of these four processes is essential for the development of comprehensive strategies aimed at mitigating or reducing the impact of risks associated with the global supply chain (Okudan et al., 2021). The framework can be utilized to develop strategies aimed at mitigating or reducing the impact of risks associated with the global supply chain. Following the explanation of risk minimization, the final method presented was risk monitoring. The examination of this phenomenon has experienced a decline in its level of intrigue, accompanied by a decrease in the number of efforts made to progress it in a structured manner (Ho et al., 2013). In the contemporary day, it is crucial to recognize the critical necessity of implementing an effective risk management plan. In this discussion, we will go further into the four elements of Supply Chain Risk Management (SCRM), namely identification, assessment, reduction, and monitoring. These processes are crucial in safeguarding performance through a proactive plan and mitigating the impact of risk occurrences through a reactive plan (Pasi et al., 2023).

2.5.1 Risk Identification

The first step in the Supply Chain Risk Management (SCRM) process is to identify potential hazards. Ho, Tian Zheng, and Talluri (2013) argue that it is imperative to ascertain either the kind of risk or the specific risk event. The vulnerability of supply networks to a diverse range of attacks has already been shown. Instances of operational hazards encompass situations when there is a lack of knowledge pertaining to the extent of client demand, supply, or cost. A multitude of variables, encompassing natural calamities, human-induced catastrophes such as warfare and acts of terrorism, and economic challenges arising from volatile market prices, currency fluctuations, and related expenses, can give rise to significant challenges (Kong et al., 2021). Most operational risks can be quantified, however managing disruptions poses greater challenges due to their inherent unpredictability and limited scope for proactive planning. Olson (2014) asserts that the implementation of quantitative risk management solutions is a common approach in addressing issues related to disruptions.

Identifying hazards is considered a crucial element in developing a comprehensive risk management strategy. As previously said, the primary objective of risk management is to attain a competitive edge and mitigate the occurrence of unfavorable events. An approach for identifying possible hazards that is based on two fundamental concepts: activity-based identification and objective-based identification. This is achieved by aligning organizational goals with operational objectives, forming the foundation of this approach. During the activity-based labelling process, it is essential to ascertain the intended function of risk management. In this particular context, possessing a high degree of velocity corresponds to experiencing a reduced number of interruptions or setbacks crucial step within the objective-based detection method involves the identification of functional risk objective components. In order to rephrase the statement in a more academic manner, it is necessary to ascertain any prospective risk occurrence that could potentially lead to a delay. According to Olson (2014), the aforementioned compilation encompasses a comprehensive inventory of risk occurrences and risk groups that possess the capacity to impede performance by causing delays in the delivery of goods.

Ho, Tian Zheng, and Talluri (2013) argue that risk assessment encompasses the evaluation of both the probability of an event occurring and the magnitude of the resulting effects. Risk events with higher probabilities are typically prioritized for consideration. However,

decision-makers often have to address risk occurrences that have no chance of occurring. Based on findings from a study in the field of cognitive psychology, it has been shown that managers often disregard potential outcomes due to their perception of unlikelihood. Also, they lack awareness regarding the probability assessments associated with specific events. One additional concern pertains to the failure of managers to account for the inherent unpredictability that accompanies exceptional achievements. According to Olson (2014), the RM approach's relative importance is diminished compared to the stated performance goals due to the emphasis placed on major performance goals. Qualitative methodologies in risk management are increasingly becoming embraced due to their consideration of diverse aspects, including the likelihood of an incident transpiring and the inherent ambiguity present in the presently accessible data. The efficacy of these risk management systems lies in their ability to equip organizations with the necessary skills and knowledge to handle foreseeable disasters, as opposed to unforeseen events, effectively. The implementation of resilient strategies enables businesses to sustain their operations amidst substantial hurdles.

Risk matrices, a multidimensional methodology, are employed by enterprises to assess the risks associated with various domains such as projects, commodities, supply chains, and other relevant areas. The utilization of this approach facilitates the identification of employment opportunities that entail a higher degree of autonomy and enables individuals to make more precise assessments regarding the likelihood of success or failure (El Baz & Ruel, 2021). After identifying risk events, each event will be awarded a score based on a scale that considers both the probability of occurrence and the possible impact of the event. It has been previously stated that every category of risk has the potential to give rise to specific risk events that can affect on-time delivery (OTD) performance. In order to comprehensively address risks, risk models must incorporate a diverse range of perspectives. Each perspective is assigned a specific degree of importance based on its relevance and significance to the senior leadership. There exists the possibility that certain features may hold greater significance than others, however this is not invariably the case. The utilization of different colors in traffic lights serves as a mechanism for classifying dangers based on the frequency of occurrence and the resulting results of such events. The color green signifies that no further actions are necessary. The color yellow signifies the necessity of conducting a cost analysis in order to ascertain the requirement for further work. Moreover, the presence of the color red serves as a conspicuous indicator of the pressing need for prompt

intervention to mitigate the potential impact of the risk event on the supply chain. The utilization of risk grids incorporating a diverse range of hues confers advantages by simplifying the comprehension of information.

2.5.2 Risk Mitigation

Risk mitigation is the systematic approach of minimizing the adverse effects of risk events on the supply chain by implementing preventive measures. To achieve this objective, one may utilize risk management initiatives that can be categorized as either proactive or defensive. When preventive measures are implemented effectively, they exhibit efficacy in advance by reducing the likelihood of an unwanted event. Reactive measures can be differentiated from other types based on their specific consequences. In other words, the impact of the approach will only manifest after the occurrence of the risk event. Individuals engaged in global supply chains must engage in collaborative efforts to enhance safety standards. To assess the efficacy of preventative measures, monitoring their implementation and outcomes is imperative.

Risk avoidance is a strategic approach aimed at mitigating risk by reducing one's exposure to potential risks, as implied by the name itself. The procuring insurance from an underwriter to safeguard one's financial assets has been a longstanding practice in mitigating potential financial risks. The operational efficacy of proactive payment lies in its capacity to offer a pre-established monetary amount as compensatory recourse in the event of an unforeseen circumstance or failure (Choudhary et al., 2023). There are a multitude of diverse measures that can be implemented to mitigate the inherent risks within the production chain. The possession of stock is a protective measure, while retaining a greater quantity of stock results in supplementary costs. The conventional methods, such as the maintenance of a greater inventory and the exploration of additional sources, can mitigate risks to a certain degree. However, it is important to note that these practices also result in higher operational expenses, longer cycle times, and increased costs associated with urgent orders. Cost reduction can be achieved by the implementation of several enhancements, including supplier alliances, electronic procurement, just-in-time (JIT) delivery, information exchange, and other alterations that enhance the transparency of supply chain processes. Despite the relatively reduced risks inherent in the supply chain, it is plausible for safety concerns and price escalations to arise.

Various methodologies can be employed to effectively control risks within a supply chain network (SCN). It is widely recognized among the general populace that the impact of hazards on the supply chain can vary significantly. Consequently, it is imperative to implement supplementary measures to mitigate the probability of incidents that may lead to delays, as opposed to those that do not.

A group of researchers devised quantitative methodologies to explore potential approaches for alleviating the adverse impacts of supply chain risks. Increasing flexibility (Kwak, 2014), collaborating with other supply chain (SC) member, exchanging information, and effectively managing suppliers have been identified as effective strategies for mitigating risks in supply chains (Um & Han, 2021). There exists a multitude of methodologies that individuals might adopt to alleviate risk, and a substantial corpus of scholarship is dedicated to the examination of risk mitigation. Hence, strategies for mitigating risk can be classified based on the specific nature of the hazard that needs to be addressed. Henceforth, the ensuing sections will expound upon several methodologies by which mitigation might be employed while also elucidating the diverse array of risk reduction strategies at one's disposal.

2.5.3 Supply Risk Management

Numerous organizations have recognized the benefits of collaborative relationships with their suppliers. By doing so, these companies can focus on their core competencies, achieve cost savings, expedite the product development process, and improve the overall quality of their offerings. The advent of various e-markets and information technology has facilitated the transformation of firms from engaging in one-time sales to achieving virtual integration using information exchange. Due to this, it is imperative to verify the source's credibility. A partner is commonly regarded as a provider of goods or services, whereas a selected supplier is typically designated as the sole supply source. The term "supplier" can also be used interchangeably with "vendor." There are variations in the lengths of contracts, the modes of information transmission, the price structures, and the release schedules across different types of contracts. The management of supplier relationships encompasses a range of strategies, including the implementation of discounted contract modules, the enhancement of contracts through the provision of aligned incentives, the evaluation of customer loyalty, and the adoption of teamwork levels informed by simulations (Meng, 2021). Additional ways that can be employed include the utilization of discounted contract modules, enhancing

contracts through the implementation of aligned incentives, improving the overall quality of contracts, and applying discounts to contract modules.

A three-step method for selecting a provider. The first stage involves establishing the criteria for selection. The second stage involves determining the vendors that meet the established criteria. Finally, the third stage involves making the ultimate selection from the identified suppliers. In the event of a breakdown, individuals have a consensus that a plan dependent on two sources is more desirable than a strategy dependent on a single source. When difficulties arise, or reliance on existing suppliers is uncertain, including other providers becomes necessary.

Nevertheless, the advantages are of limited significance, and their extent depends on the specific characteristics of the problem. Selecting and assigning seller orders can be approached using many quantitative methods. The models falling into this category include the newsvendor model, the fuzzy stochastic multi-objective programming model (, and the unconstrained and restricted mathematical modelling (Manners-Bell, 2023). Suppliers exhibiting problematic behavior or requesting exorbitant prices are either excluded from consideration or allocated the smallest proportion of the overall demand.

Partners within a supply chain, hired by separate organizations or departments, diligently priorities their respective aims and strive to make autonomous decisions wherever feasible. The bullwhip effect refers to the situation when enhancing order quantities at the local level leads to decreased operational efficiency. When customers' desires are predicted and exhibit a declining trend as prices rise, vendors engage in competitive behavior to maximize their profits. These decisions have a negative impact on the overall profitability of the supply chain. Numerous research has been conducted on the utilization of seller contracts as a means to enhance supply chain coordination and operational effectiveness. Various supplier contracts, such as buyback contracts, quantity-based contracts, revenue-sharing contracts, and wholesale pricing contracts, are designed on the premise that changes in demand and price may occur throughout the contractual period.

2.5.4 Risk Monitoring and Control

The scholarly discourse on risk tracking is comparatively limited compared to the extensive emphasis on risk assessment and mitigation. Finding written content that guides monitoring and mitigating supply chain risks can be a challenging endeavor. This exemplifies the

criticality of formulating a comprehensive strategy that includes the surveillance of potential hazards (Hida Syahchari et al., 2022). The integrated anomaly detection approach involved the combination of fuzzy set theory and a radial basis function neural network. The study's objective was to identify preliminary signals that could indicate potential quality issues in the food production supply chain within the manufacturing sector. The simulations revealed that the system could identify unforeseen events and decide on issuing a warning.

It is imperative to employ a dependable risk-tracking system to effectively monitor and evaluate the risks inherent in the supply chain (Walters, 2021). The hazards above can be categorized into distinct areas, namely inventory management, worker safety, and product quality. The term "Internet of Things" (IoT) is a globally interconnected network that facilitates the seamless data exchange across diverse objects using advanced technology. If necessary, this technology can effectively oversee and manage risk in the present moment. Continuous monitoring of the product and the surrounding environment is necessary in various domains, including medicine and food, as it is essential for ensuring the preservation of quality and safety standards.

The initial stage in mitigating or eradicating risk involves disseminating knowledge, which can be achieved through collaborative efforts among many businesses within a supply chain. Organizations can enhance the alignment between their long-term and capacity planning forecasts by utilizing action plans. Engaging in detailed planning enables individuals to enhance their perceptual abilities, leading to a clearer understanding of various phenomena. Consequently, this heightened clarity facilitates anticipating future demand, simplifying the process. Despite the swift dissemination of information inside organizations, not all issues are resolved. In complex systems such as the grocery store industry, concerns over stock shortages may emerge. A possible area of apprehension arises from the probable inadequacy of timely supply to match the rate at which orders are being placed. In certain circumstances, it becomes necessary for retail establishments to maintain a substantial inventory of a specific product due to the ongoing possibility of customers placing orders for said product after its initial purchase. Another possible concern arises when little products are purchased, as the buyer often obtains many items (s). Due to the accessibility of these resources and the stringent quality standards upheld by the parent company, subsidiary companies must furnish their suppliers with accurate and comprehensive information. This practice serves the dual purpose of averting stock shortages and facilitating prompt responsiveness.

2.5.5 Coordination System of Supply Chain

Retailers and their suppliers have the potential to engage in various mutually beneficial collaborations aimed at effectively fulfilling their customers' delivery requirements within specified timeframes. Olson (2014) identifies several strategies in the realm of supply chain management, which encompass cooperative planning, forecasting, and replenishment; continuous replenishment; vendor-managed inventory; and consumer response. Furthermore, it is imperative to obtain satisfactory feedback from clients.

The initial phase in mitigating or eradicating risk involves disseminating knowledge, which can be achieved through collaborative efforts among many companies within a supply chain. For example, businesses can enhance the alignment between their long-term and capacity planning forecasts through the utilization of action plans. The act of engaging in detailed planning enables individuals to enhance their perceptual abilities, so facilitating a clearer understanding of various phenomena. Consequently, this heightened clarity simplifies the process of anticipating demand. Despite the rapid dissemination of knowledge inside organizations, not all issues are effectively resolved. In complex systems such as the grocery store industry, concerns over stock shortages may emerge. A possible cause for apprehension is the probable inadequacy of supply in meeting the demand generated by the rate at which orders are placed. In certain circumstances, it becomes necessary for retail establishments to maintain a significant inventory of a specific product due to the continued possibility of client orders being placed after its initial purchase (Pan et al., 2022). Another possible concern arises when little products are purchased, as the buyer often obtains many items. Suppliers must be provided with precise and comprehensive information to ensure smooth operations and prompt response, given the primary firm's stringent requirements for short lead times and high service standards. This is crucial to avoid stock-outs and enable rapid action.

An alternative approach to effectively managing the supply chain is delegating inventory management responsibilities to external providers. This phenomenon is alternatively known as "channel coordination." It can be inferred that the party responsible for managing and maintaining the store's inventory is the seller. The layout of most grocery stores is similar to the one depicted here. Corporations such as Pepsi and Coca-Cola, alongside snack producers, exhibit awareness and accountability about the inventory maintained by

distributors. In such situations, the merchant assumes the intermediary function, facilitating transactions between buyers and sellers. By employing this strategy, the firm can exert a higher level of authority over the specific placements of its items. Based on many research studies, the strategy above exhibits a higher level of effectiveness when compared to traditional supply chain methodologies. This phenomenon occurs due to the producer's ability to maintain a competitive advantage and the supplier's capacity to monitor the distributor's inventory via electronic data interchange. However, this methodology provides certain obstacles (Collier & Sarkis, 2021). One potential limitation could be the lack of comprehensive visibility throughout the production chain. The method is impractical for small quantities or products with rapidly shifting trends. However, it proves to be effective for large quantities of regularly available commodities and for stable sales conditions. There is a potential for diminished efficacy of the process following the implementation of the substitute.

2.5.6 Coping With Supply Chain Disruptions

Companies have a responsibility to employ robust risk-mitigation measures if they are unable to precisely quantify the likelihood that problems will occur or the outcomes that they will produce. According to Tang (2011), there should actually be present two key qualities of resilient approaches.

- a. Effectiveness: The strategy would assist the organization in managing business risks, even in the event that a significant issue arose.
- b. Resilience: The strategy would make it possible for the organization to continue operating normally even if a serious difficulty emerged, and it would be simple to get things back to normal afterwards.

In order for a firm to remain profitable and in operation, the company must be strong and efficient. In addition, he says that when a solid strategy is in place, businesses can frequently support their plans to become more efficient by pointing out the costs and advantages or the return on investment. This is something that he says is possible when there is a strong strategy in place.

Within the realm of product management, standardization helps to postpone the point at which individual products begin to diverge from one another. The article by Tang (2011) discusses a variety of topics, some of which are standardized parts, subassemblies, modular

design, operations delay, and resequencing. When the aggregate demand approach of demand forecasting is utilized for manufacturing, this makes it much simpler to personalize specific aspects of the finished product at a later stage in the production cycle. Olson (2014) demonstrates how this strategy might be utilized by using Nokia's response to the disastrous fire that occurred at Philips in 2010. Businesses are now able to offer a greater variety of products, accurately estimate customer demand, and more effectively manage supplies even when there are delays. Utilizing this strategy makes it easier to manage demand concerns such as ambiguous demand.

You can generate money off of safety stock without having to maintain a large quantity of stock on hand thanks to this. Toyota was successful in putting this strategy into action by maintaining a stock of automobiles at important distribution hubs in order to guarantee a consistent supply in specific regions. When this is done, we are able to keep expenses low while maintaining a high level of service. The increased availability of products that result from strategic stockpiling enables enterprises to respond to changing market conditions more rapidly.

This strategy lessens the dangers inherent in relying on a single source for a variety of various sources, which is mitigated by the plan. Having a supplier that operates in more than one region or country is one illustration of this phenomenon. The majority of the items would be manufactured in the primary factory, which would be located in a nation with significantly cheaper production costs. The other would be close by and used to accommodate any shifts in demand that may occur. This strategy assists firms in resolving issues that arise throughout the supply chain by increasing the chain's degree of adaptability.

The fundamental purpose of taking this method is to guarantee that delivery can take place in a variety of different ways. You might do this in a number of ways, one of which is by collaborating with delivery services that make use of a fleet of vehicles that features automobiles, trucks, helicopters, bicycles, and motorbikes. This means that businesses can sell their products and services at any time and from any location. A second option is to use a lot of different companies to move stuff. This makes sure that there is always a source of materials. As an example, agreements for goods lines give lower transport costs and the freedom to swap carriers in the event of political turmoil. Taking a number of various routes

is a third method to be open with your transportation. With this method, you can get around short-term obstacles like strikes, natural disasters, closed ports or airports, and so on.

2.6 SUPPLY CHAIN RISK QUALITY MANAGEMENT

The utilization of Supply Chain Quality Risk (SCQR) has the potential to detrimentally impact a company's positive reputation, resulting in substantial decreases in sales and market share, necessitating expensive product recalls, and nullifying the extensive efforts dedicated to establishing brand equity (Spieske & Birkel, 2021). Consequently, a growing body of scholars is directing their attention towards investigating the impacts of SCQR on the worldwide supply chain. These effects encompass various aspects, including the efficacy of marketing strategies, the fairness of brand equity, the reaction of the stock market, and the management of quality. Nevertheless, the existing body of literature in operations management fails to adequately address the importance of quality and safety concerns, nor does it provide a comprehensive understanding of their implications, particularly in the context of a complex supply chain in China.

Scholars have formulated several decision models in the field of resource management to effectively address supply chain quality risks, overseas production challenges, and penalties imposed on suppliers for subpar performance. These tools assess the extent of a prospective quality issue and its financial implications for an organization. Furthermore, a multitude of research projects exist that provide resolutions to concerns pertaining to the safety and quality of items. The majority of these challenges can be addressed by focusing on three key factors: (1) design-related difficulties, (2) production-related issues, and (3) supply chain-related issues.

The presence of design faults that result in a decrease in quality is deemed unacceptable and poses significant risks when considering the aspect of planning. Inadequate construction of toys can potentially result in a choking hazard for children, while substandard building of electrical equipment may lead to overheating and subsequent fire incidents. The literature on ergonomics offers a wealth of information pertaining to design challenges. The design and design process has the potential to effectively address the fundamental problem.

Potential challenges that may develop throughout the production procedure encompass the utilization of hazardous substances, inadequate assembly techniques, non-compliant components, and contamination issues (Ahmed & Huma, 2021). Conversely, any concerns

pertaining to the sector that are deemed insufficient can be considered inadequate. The application of quality management and process development methodologies i.e., 6-sigma can effectively address industry-specific challenges and problem-solving endeavors. Supply chain difficulties arise when subcontracting tasks or purchasing products.

2.7 RISK SHIFTING

The act of safeguarding a company's internal interests against the unforeseen adverse effects of Supply Chain Quality Risk (SCQR) is commonly known as risk shifting. Risk shifting occurs when a firm endeavors to move the financial risk linked to a transaction from its own position as the buyer to one or more other parties. Nevertheless, the business does not employ risk mitigation as a strategy to decrease supply chain quality risks (SCQR) across the entire supply chain. In the event that faults are identified subsequent to the arrival inspection, the corporation effectively transfers the adverse consequences of Supplier Compliance with Quality Requirements (SCQR) to the supplier by the imposition of a substantial penalty fee. The price is allocated towards the financial coverage of addressing issues arising from internal failures, encompassing the supplementary labor involved in repairing damaged goods and procuring replacement components from external suppliers. The expenses are encompassed within the charge (Althaf & Babbitt, 2021).

Nevertheless, it is conceivable that the inspection protocol employed by the corporation failed to detect all faulty components, resulting in the inclusion of some of these components in the end product that was delivered to the customer. Consequently, the practice of risk shifting encompasses the transfer of financial responsibility for repairing or replacing a defective product from the corporation to the supplier, if the failure can be attributed to a component provided by the seller. In the given situation, the firm has the option to impose an extra penalty fee on the supplier (Negri et al., 2021) as a means to mitigate the overall expenses associated with repairing and replacing warranty-covered products. In the process of formulating the purchasing model for the organization, it is imperative for the management to consider the expenses linked to the mitigation of risks associated with the acquisition of contaminated or counterfeit goods. Furthermore, it is imperative for the seller to exercise meticulous scrutiny over the quality of the goods to prevent incurring a substantial penalty from the purchasing entity. Consequently, the purchasing firm will be required to allocate reduced time and resources towards the inbound review process (Ali et

al., 2022). Hence, risk shifting serves not only as a mechanism for dispersing financial losses but also as a means of altering the party responsible for ensuring quality control at its origin. Risk shifting refers to a strategic approach aimed at modifying the allocation of responsibility for quality control at its origin.

Tse et al. (2012) propose that agency theory explains the occurrence of Supply Chain Quality Risk (SCQR) in situations where the consumer (referred to as the owner) and the vendor (referred to as the agent) have divergent objectives for the transaction. For example, the vendor may have a goal of maximizing their financial gain, while the customer may priorities acquiring goods of superior quality. From another perspective, the vendor expressed confusion regarding the purchaser's strong emphasis on guaranteeing the impeccable quality of the acquired goods. Furthermore, it is important to note that the buyer may not always have the opportunity to directly see the measures taken by the seller in ensuring the superior quality of the product. Risk shifting can be understood as a strategy that focuses on altering the objectives of the supplier to align them more closely with the buyer's goals. This approach is rooted in agency theory. This objective can be achieved by implementing a policy that involves augmenting the monetary penalty for any instances of harm.

Implementing an outcome-based contract can serve as a deterrent for providers to engage in opportunistic activity. Hence, if the seller harbors apprehensions regarding the imposition of a substantial penalty, their level of concern for the quality of the merchandise being offered will be heightened, thereby reducing their propensity to exploit customers or circumstances. The risk-shifting method becomes advantageous for both the purchaser and the vendor, as it allows the client to get goods of superior quality while allowing the seller to secure complete payment with reduced financial penalties. In other words, the principal's interests, representing the customer, and the agent's interests, representing the service, exhibit a higher degree of alignment, reducing conflicts between them.

Another astute strategy to employ when faced with a restricted number of variables is to partake in risk shifting. Using outcome-based practices may not be a viable approach for effectively managing risks in scenarios where the outcome cannot be controlled. Hence, it is plausible that risk shifting may be inadequate in managing the Supply Chain Quality Risk (SCQR) when confronted with a substantial and unforeseen degree of unpredictability inside the supply chain. In the context of a corporate setting, the question arises as to how the

business might implement an effective punitive measure against the supplier, particularly when technical issues arise during the testing phase of the items. When a purchasing firm lacks knowledge of the number of tiers of the supply chain of suppliers and sub-tier providers, a pertinent inquiry arises as to how said company might ascertain the suitable magnitude of penalty to be imposed.

The company acquiring the risk must allocate further resources to ensure a smooth loss transfer. It may be inferred that the cost associated with risk shifting will escalate in tandem with the escalation of uncertainty. Product liability insurance is acquired to provide legal protection to a business entity in the event of potential litigation arising from issues related to the manufacturing and sale of its products. Implementing this measure can provide the company with protection against legal responsibility for any damages or losses experienced by customers, irrespective of whether such issues arise from errors in production or design. The extent of financial compensation provided by product liability insurance can be substantial, with the magnitude of coverage influenced by the market size.

2.8 RISK SHARING

The primary objective of the organization is to establish enduring partnerships with vendors who possess a strong reputation and expertise, enabling them to provide superior components. This is achieved by implementing risk-sharing mechanisms. It is imperative for corporations to engage in collaborative efforts with their suppliers to strengthen the supply chain and effectively execute a risk-sharing strategy (Gurtu & Johny, 2021). Hence, the management of the acquiring company must make a decision regarding the allocation of funds towards enhancing the facilities of the seller, with the aim of augmenting the overall quality of the resultant product. The responsibility of funding education and training opportunities for vendors lies with the purchasing organization. This practice serves to enhance the vendors' skills, while also ensuring the preservation of quality and safety standards for the goods being traded. The responsibility for enhancing vendors' quality performance and knowledge lies with the purchasing organization. Once the purchasing firm has ascertained that the supplier's production meets the desired standards of quality and safety, it will have the capability to assign the responsibility of manufacturing different components to the supplier. Furthermore, the acquiring entity possesses the discretion to

determine whether or not and in what manner to distribute the risk linked to the seller's production process.

The concept of "sharing the risk" encompasses more than simply guaranteeing the adequate quality of a product and alternating responsibility for handling unpleasant situations as they occur. There is often a correlation between the sharing of risks and the sharing of gains. This phenomenon can be attributed to the perception of benefits, which serves as a motivating factor for both parties to engage in collaborative efforts aimed at minimizing the Supply Chain Quality Risk (SCQR). The establishment and the supplier necessitate a framework for establishing a mutually advantageous agreement that enables the equitable sharing of risks and rewards. Hence, it is crucial to elucidate the underlying justification for the allocation of benefits and drawbacks. In order to mitigate the uncertainties related to risk and reward sharing, it is imperative for the company and its supplier to engage in collaborative efforts towards the development of collective production. The establishing of an equitable distribution of risk among participants necessitates the establishment of transparent and candid channels of communication.

When analyzed from the perspective of agency theory, the concept of risk sharing can be interpreted as a strategic approach that is based on the behaviors and decisions of individual actors. The use of behavior-based practices is recommended when there is a higher level of ambiguity surrounding the provider, as these practices can effectively mitigate risk. Behavior-based training prioritizes procedures, occupations, and activities with reduced risk. (Payne, & Petrenko, 2019). posits that task programmability is a direct approach to assessing behavior. The term "predictability" pertains to the degree to which the agent's (the supplier's) actions can be predetermined. In commercial operations, the adoption of risk sharing entails a collaborative process between the buyer and the seller. This process involves identifying and agreeing upon a set of tasks to be undertaken by both parties. When a task can be automated, it is typically more convenient for the purchasing organization to exercise control over the provider's activity. When the purchasing firm jointly designs the component and the selling company, evaluating the product's quality becomes easier due to the increased availability of information regarding the supplier's performance (Yusuf & Soediantono, 2022).

Typically, the purchasing entity possesses comprehensive knowledge of both the supplier's production procedures for the product's components and the subsequent assembly process. This suggests that there is a higher level of open and honest communication between the firm supplying the goods or services and the company procuring them. Furthermore, the acquiring entity possesses comprehensive knowledge regarding the provider, encompassing its operational procedures and financial implications. The utilization of task programmability has the potential to mitigate the knowledge asymmetry between buyer and seller organizations.

2.9 RISK REMEDY

The focal point of this inquiry pertains to the response to the risk query, which involves the withdrawal procedure. This procedure encompasses the act of either returning defective products to the manufacturing organization, or disposing of them in order to eliminate them. The SCQRM technique distinguishes itself from other approaches by focusing on risk sharing, risk avoidance, and risk shifting as means to address the issue of procuring hazardous or defective components from the supply network. The primary objective of risk sharing is to address the issue of procuring components from the supplier network. Risk remedy, within this particular context, pertains to the course of action undertaken to mitigate potential risks that may impact the quality or safety of a product. These risks can be either real or perceived. In order to protect consumer interests, it is imperative to address these risks, regardless of whether they were posed by the manufacturer or the supplier. A risk remedy refers to a proactive intervention that is enacted after to the manifestation of a risk event, with the aim of addressing and mitigating its impact.

This study examines the remedial measures, encompassing both product recalls from end consumers and the withdrawal of defective items from direct customers. Both categories of acts are encompassed within the scope of this study. In essence, the actions undertaken within the realm of solution management encompass a spectrum that spans from the retrieval of consumer goods to the reclamation of items from downstream purchasers within the supply chain. These two instances serve as mere illustrations of the extensive range of activities that can be implemented. The terms "product recall" and "product withdrawal" are often used interchangeably by individuals, despite their shared reference to a singular activity. A "product recall" refers to the action taken by a firm to withdraw a previously sold

item from the market, prompting consumers to either return the goods or appropriately dispose of it. Removing a product from sale by a manufacturer, packer, distributor, or retailer without prior consumer return request is commonly known as "product withdrawal". "product withdrawal" refers to the procedural steps involved in removing a product from the marketplace. When a "recall" situation arises, the management team sometimes faces difficulties in effectively withdrawing the hazardous product from circulation within the market. To meet the demands of the trade association, laboratory, and media, the firm must do certain actions. The scenario of "withdrawal" can manifest in one of two possible manners. In the initial scenario, the product presents a potential hazard to consumers during its transit inside the distribution network. In the second scenario, the product's concern is confined to quality, without posing any risks to consumers' health. As a result of this circumstance, businesses may opt against recommending product returns to clients, instead choosing to retrieve the damaged items from direct purchasers, such as wholesalers and manufacturing organizations. Furthermore, the consumer expects the corporation to either replace or repair the defective goods without imposing any further charges.

An imperative aspect for companies to address when faced with an issue is their approach in managing customer grievances pertaining to product recalls. The potential harm caused by defective products to individuals underscores the importance of a company's approach to managing consumer complaints over product recalls. The management of a product recall has a crucial role in shaping customers' perceptions of the product in the aftermath of a product damage occurrence. Several regrettable incidents have occurred due to inadequate handling of product recalls by management. The case of Sanlu's tainted milk, which led to significant health-related liabilities, serves as a prominent illustration of a situation wherein a company's delayed recognition of a recall ultimately compelled it to declare bankruptcy.

As an integral element of the passive strategy, the act of product recall may experience a delay, hence resulting in the transfer of responsibility to alternative enterprises or organizations. It is customary for corporations to withhold the public disclosure of recalls until a substantial volume of customer complaints has been accumulated. Regrettably, it is often the case that these recalls are announced after a client experiencing a significant accident or fatality (Katsaliaki et al., 2021). Conversely, inadequate management of the product discontinuation process is unlikely to provide favorable consequences. Nevertheless, the efficacy of the exit method, specifically the promptness in addressing

issues such as the replacement of damaged items, holds significant weight in a client's decision-making process over the initiation of a purchase. Furthermore, it is possible that the selling company may lack awareness of any potential challenges about the reliability or longevity of the product until after it has been successfully delivered to the customer. In certain instances, the management team may exercise discretion in refraining from notifying the purchasing business if there is no pressing need to do so. However, it remains disadvantageous to the organization's reputation and results in an increase in warranty expenses, contrary to the company's objectives.

Both the mismanagement of "recall" and "withdrawal" lead to different degrees of punishment, but the underlying conditions for exerting control over these two processes are identical. Several concepts of product management encompass the timely withdrawal or recall of products, the expeditious return of items, and the swift replacement of defective goods. Implementing a well-organized recall or removal plan facilitates a more efficient approach to the return of a product. It is strongly advised to have a prepared plan in place before initiating a product recall. The process of planning for a product recall or withdrawal lacks universally applicable criteria that can comprehensively address the various potential scenarios that may emerge. Conversely, it was indicated that implementing a meticulously devised strategy can facilitate comprehensive understanding and appropriate handling of unsafe or faulty items across the supply chain. Hence, more efficient responsive measures can be implemented to rectify malfunctioning products within the supply chain expeditiously.

Effective risk response planning, such as implementing a robust product recall/withdrawal strategy, has been found to facilitate the achievement of substantial financial gains. Consider a hypothetical scenario where a corporate entity or governmental body identifies a defect in a product, hence necessitating a recall of said product. In the given context, it is more probable that the company that assumes the proactive stance will comply with the agency's orders and promptly initiate the recall process by issuing a notice. Instances of such recollections are of regular occurrence when a corporation undertakes internal inspections and identifies a product that potentially poses safety risks to customers, even before any issues have been reported to the company or relevant authorities. On the contrary, preemptively withdrawing a product from the market before any potential concerns may yield cost savings about insurance and, in the long run, foster enhanced customer relations.

Consequently, evaluating a company's risk mitigation activities primarily revolves around two key criteria: the thoroughness of its planning for product withdrawals or recalls, and its willingness to promptly withdraw or recall any defective products.



3. METHODOLOGY

3.1 RESEARCH DESIGN

Researchers employ a variety of methodologies to get data of the same nature. One form of quantitative multiple-method research is the utilization of a survey that integrates quantitative inquiries with an observational methodology. Moreover, the data will undergo statistical analysis. Both qualitative and quantitative methodologies are equally valid in academic research. The third design category is the mixed-method approach, regarded as a prominent data collection and analysis methodology. To initiate the research process, a researcher may commence by amassing and evaluating qualitative data prior to the acquisition and subsequent statistical analysis of quantitative survey data.

When researchers gather data of the same nature through different approaches, they deploy diverse procedures. One form of quantitative multiple-method research is the implementation of a survey that integrates quantitative questions with an observational approach. Furthermore, the data will undergo statistical evaluation. Both qualitative and quantitative methodologies are considered valid in research. The mixed-method approach, widely recognized as a prominent data collection and analysis methodology, constitutes the third research design category. A researcher may initiate the research process by gathering and examining qualitative data, followed by the subsequent collection and statistical analysis of quantitative survey data.

When a researcher gathers data of the same nature through diverse approaches, they will utilize many procedures. An instance of quantitative research that employs various approaches is the integration of traditional quantitative inquiry with an observational strategy in a survey. Furthermore, the data will undergo statistical analysis. The validity of quantitative methodologies does not impact the validity of qualitative methodologies. The mixed-method approach, which is widely recognized as a prominent design, has gained significant popularity in the realm of data collecting and analysis. The initial phase of a research study often involves collecting and analyzing qualitative data, followed by the subsequent acquisition of quantitative survey data, which is then subjected to statistical analysis.

the predominant methodologies employed to structure a study encompass mono, mixed, and multiple-method frameworks. Nevertheless, there are various methodologies for structuring a research endeavor. In the context of data analysis, the mono approach employs identical tools to those utilized by other techniques. Furthermore, this tool can gather and amalgamate many forms of data into a unified entity, irrespective of whether the data is qualitative or quantitative. Pattern recognition and thematic analysis are two methodologies used to examine qualitative data from interviews. If the data were collected through a survey, the responses would be analyzed using appropriate statistical methods, namely a questionnaire.

When a researcher utilizes multiple procedures to acquire knowledge of the same nature, they are considered to be applying various approaches. An instance of quantitative research that utilizes multiple research approaches is exemplified by a survey that integrates both quantitative and observational questions. Furthermore, a scientific perspective will be duly considered during the data analysis. Both qualitative and quantitative methodologies can be considered valid in their own right. The mixed-method methodology is recognized as the third design approach. This methodology is widely employed in the process of data collecting and analysis. The initial step for a researcher may involve collecting and analyzing qualitative data, followed by acquiring quantitative survey data, which can then be subjected to statistical analysis. The order of tasks can be determined according to personal preference. The collected data will be analyzed using multiple regression with IBM SPSS to test the hypotheses.

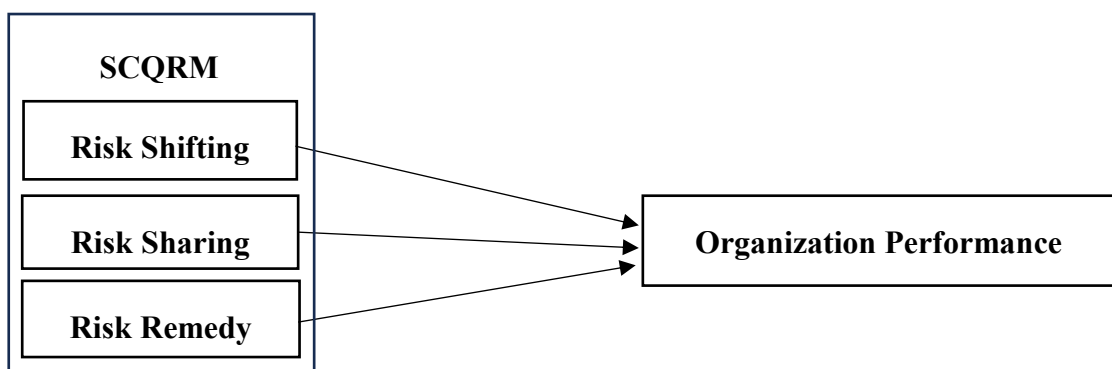


Figure 3.1: Theoretical Framework.

3.2 HYPOTHESES

H1: Successful risk shifting will have a significant positive impact on organization performance.

H2: Successful risk sharing will have a significant positive impact on organization performance.

H3: Successful remedy shifting will have a significant positive impact on organization performance.

3.3 RESEARCH METHOD

A survey will be used to collect the data from Basra Oil Company (BOC) Basra, Iraq. The questionnaires on risk shifting, risk sharing, risk remedy, and organization performance will be adopted from Tse (2012). The doctorate thesis of Tse (2012) has developed and tested new scales on the basis of an extensive literature review of the earlier scales.

3.4 SAMPLING

An appropriate sample is necessary that accurately and equitably represent the entire population. This study will use purposive sampling because the responses are required from only one company. Moreover, the respondents will be carefully selected—as only the middle level, upper level, and executives of the company will be invited for responses. The data is collected from the employees of Basra Oil Company (BOC) Basra, Iraq.

3.5 MEASUREMENT SCALES

In order to conduct any inquiry, it is important to employ a reliable methodology for assessing the pertinent variables. The concept of validity should not be conflated with dependability, as the latter pertains to the consistency of an instrument in generating similar outcomes. As a consequence, employing unsuitable measurement instruments can result in the production of erroneous data. A novel scale is being employed to assess the fourth structure, alongside the three others, each of which possesses its own dedicated measuring apparatus. The scales are illustrated in the appendix 1.

4. DATA ANALYSIS

This chapter examines the data that will be utilized for the purpose of testing hypotheses and models. This chapter provides a comprehensive analysis of the authenticity and credibility of the data. Factor analysis can also be employed for the purpose of determining factor loadings. Subsequently, the application of multiple regression analysis is employed to evaluate the aforementioned theories.

4.1 RELIABILITY

Cronbach's alpha is widely regarded as the predominant method for assessing a given construct's coherence or reliability. This approach is commonly employed in situations where a survey or poll has a substantial number of Likert scale items, with the objective of assessing the scale's reliability. The Cronbach's alpha coefficient for all items included in the questionnaire is 0.932, as presented in Table 4.1. The numerical data indicates a high level of reliability in the scale.

Table 4.1: Cronbach's Alpha.

Cronbach's Alpha	N of Items
.932	27

Table 4.2 displays a value of 0.932 for each of the 7 items in the scale of risk shifting. The numerical value indicates a high level of reliability in the scale.

Table 4.2: Risk Shifting.

Cronbach's Alpha	N of Items
.932	7

Table 4.3 displays a value of 0.926 for each of the 8 items in the scale of risk sharing. The numerical value indicates a high level of reliability in the scale.

Table 4.3: Risk Sharing.

Cronbach's Alpha	N of Items
.926	8

Table 4.4 displays a value of 0.924 for each of the 7 items in the scale of risk remedy. The numerical value indicates a high level of reliability in the scale.

Table 4.4: Risk Remedy.

Cronbach's Alpha	N of Items
.924	7

Table 4.5 displays a value of 0.924 for each of the 5 items in the scale of performance. The numerical value indicates a high level of reliability in the scale.

Table 4.5: Performance.

Cronbach's Alpha	N of Items
.786	5

4.2 FACTOR ANALYSIS

Factor analysis is a viable method that can be employed to acquire substantial quantities of data. This process involves the identification of latent variables through the analysis of observable variables, referred to as manifest variables, which are already recognized inside the system. There exist numerous perspectives through which one can analyses the diverse array of elements involved, encompassing the primary axis factor, maximum likelihood, generalized least squares, unweighted least squares, and various other methodologies. Following the first factor extraction, it is possible to apply various rotation methods to the factors, which can be selected based on the specific objectives of the research. When utilizing orthogonal rotations such as varimax and Equifax, the linkage between the components is unattainable. Conversely, when employing angled rotations like ProMax, it becomes feasible to establish connections among the constituent parts. The aforementioned constraint is applied to the feasible operations involving orthogonal movements, such as varimax and Equifax. Additionally, it is necessary to ascertain the overall quantity of components that will be extracted from the entirety. The existence of a diverse range of options and methodologies in factor analysis contributes to the potential for analysts, working with identical datasets, to reach disparate interpretations regarding the underlying meaning of the data. In any circumstance, the primary goal of analysts is to streamline the framework in order to enhance comprehension. When each element exerts an equal influence on an individual component, the observed results can be regarded as exhibiting a clear pattern.

The values inside this column denote the proportion of variance in each variable that can be attributed to the conserved components. The universe of common factors exhibits a significant abundance of variables with big values, while the occurrence of variables with tiny values is rather scarce. The chart presented lacks any values that may be categorised as significantly low. The inconsistencies that arose among replicated parts due to the process of replication.

Table 4.6: Factor Loadings.

	Loadings
RSHI1	.789
RSHI2	.750
RSHI3	.773
RSHI4	.790
RSHI5	.657
RSHI6	.629
RSHI7	.715
RSHA1	.666
RSHA2	.673
RSHA3	.620
RSHA4	.652
RSHA5	.745
RSHA6	.592
RSHA7	.647
RSHA8	.626
RRMY1	.752
RRMY2	.845
RRMY3	.833
RRMY4	.838
RRMY5	.823
RRMY6	.803
RRMY7	.832
FP5	.864
FP1	.752
FP2	.845
FP3	.833
FP4	.866

4.3 HYPOTHESES TESTING

The Pearson correlation coefficient, ranging from -1 to +1, indicates the presence of a linear relationship between two quantitative variables.

- a. When comparing two scores, a correlation coefficient of -1 indicates a negative relationship, implying that higher scores on one measure are associated with lower scores on the second measure.

- b. The correlation coefficient is zero when there is no statistically significant association between the variables under investigation. However, it is possible that a robust nonlinear relationship exists between the two variables.
- c. A correlation coefficient of 1 indicates that the two variables exhibit a perfect linear relationship, with their values increasing or decreasing in a consistent and proportional manner. The values in the second variable should exhibit a proportional increase with respect to the values in the first variable.

Table 4.7: Correlation.

Correlations					
		Risk Shifting	Risk Sharing	Risk Remedy	Org_Performance
Risk Shifting	Pearson Correlation	1	.853**	.790**	.704**
	Sig. (2-tailed)		.000	.000	.000
	N	139	139	139	139
Risk Sharing	Pearson Correlation	.853**	1	.873**	.803**
	Sig. (2-tailed)	.000		.000	.000
	N	139	139	139	139
Risk Remedy	Pearson Correlation	.790**	.873**	1	.787**
	Sig. (2-tailed)	.000	.000		.000
	N	139	139	139	139
Org_Performance	Pearson Correlation	.704**	.803**	.787**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	139	139	139	139
**. Correlation is significant at the 0.01 level (2-tailed).					

A correlation is statistically significant if its significant level is <0.05 for 2-tailed. Table 4.7 indicates that risk-sharing has the strongest correlation with all other variables which is above 0.803. Similarly, the risk-shifting correlation value with all other variables is above 0.704 which is highly significant. Moreover, organization performance also has a highly significant relationship with other variables.

4.4 REGRESSION ANALYSIS

Linear regression is a logical progression following the establishment of a connection between two sets of data. This approach is employed to gain a comprehensive understanding of the magnitude of one variable by examining the magnitude of another variable. The phenomenon under investigation, whose characteristics are of interest for prediction, is referred to as the "dependent variable" (alternatively known as the outcome variable) in relevant contexts. The objective of our study is to make predictions about the value of a "independent variable" by examining the value of another variable. The term "independent variable," often known as the forecast variable, derives its nomenclature from this particular variable. Linear regression can be employed to estimate the potential performance on a test by considering the amount of time dedicated to studying for it. Additionally, this tool can be utilized to make predictions regarding the number of cigarettes an individual is likely to consume, taking into account factors such as duration of smoking, among others. When confronted with the need to examine multiple independent variables, employing multiple regression analysis is considered the most suitable approach.

The values for the variables R and R² are presented in Table 4.9. The R column's correlation coefficient ($r = 0.822$) indicates a significant correlation. The primary factors that account for the variability in the dependent variable are indicated that Adjusted R Square = 0.669 is the effect of independent variables risk shifting, risk sharing, and risk remedy. The R² statistic, shown as Adjusted R Square 0.669, is indicative of this observation. This implies that a response of 44.6% is probable to be effective.

Table 4.8: Model Summary.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.822 ^a	.676	.669	2.73826
a. Predictors: (Constant), Risk Remedy, Risk Shifting, Risk Sharing				

The regression equation that corresponds to the data is presented in Table 4.9. The statement provides information regarding the identification of the dependent variable. The findings indicate that the regression model has a high level of accuracy in predicting the variable. The significance value of the regression coefficient is 0.000, indicating that the regression model

possesses a high level of statistical accuracy in predicting the level of organization performance.

Table 4.9: ANOVA.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2109.586	3	703.195	93.783	.000 ^b
	Residual	1012.241	135	7.498		
	Total	3121.827	138			
a. Dependent Variable: Org_Performance						
b. Predictors: (Constant), Risk Remedy, Risk Shifting, Risk Sharing						

Table 4.10 coefficients show the strength of the relationship that indicate how significant a variable is in the model and the magnitude of the impact on the dependent variable Table. 4.10 helps to test the hypotheses. The study has the following hypotheses on the basis of standardized coefficients B, t-values, and p-values.

H1: Successful risk shifting will have a significant positive effect on organization performance.

Table 4.10 indicates risk shifting has B=0.012, t-value=0.126, and p-value=0.900—the results indicate that there is no statistical relationship since the t-value is less than 1.96 and p-value=0.900 at the degree of freedom 5%. Thus, risk shifting cause no significant change in organization performance. H1 is statistically insignificant.

H2: Successful risk sharing will have a significant positive effect on organization performance.

Table 4.10 indicates risk sharing has B=0.478, t-value=3.994, and p-value=0.000—the results indicate that there is a statistical relationship since the t-value is greater than 1.96 and p-value=0.000 at the degree of freedom 5%. Thus, risk sharing causes a significant change in organization performance (1% increase in the risk sharing, the organization performance will be increased by 29.2%). H2 is statistically significant.

H3: Successful remedy shifting will have a significant positive effect on organization performance.

Table 4.10 indicates risk remedy has $B=0.360$, $t\text{-value}=3.530$, and $p\text{-value}=0.001$ —the results indicate that there is a statistical relationship since the $t\text{-value}$ is greater than 1.96 and $p\text{-value}=0.000$ at the degree of freedom 5%. Thus, risk remedy causes a significant change in organization performance (1% increase in the risk remedy, the organization performance will be increased by 36 %). H3 is statistically significant.

Table 4.10: Coefficients.

Coefficients ^a					
Model		Unstandardized Coefficients		Standardized Coefficients	t
		B	Std. Error	Beta	
1	(Constant)	3.406	.751		4.536
	Risk Shifting	.007	.055	.012	.126
	Risk Sharing	.262	.066	.478	3.994
	Risk Remedy	.215	.061	.360	3.530
a. Dependent Variable: Org_Performance					

Business leaders and policymakers worldwide have been aware of instances of product damage occurring during global transportation. Furthermore, they have facilitated the exploration of novel research domains, specifically within the realm of logistics. SCQR has provided several opportunities for scholars to investigate and enhance existing theories and models pertaining to risk management and quality management. This scenario is characterized by mutual benefits for all parties involved. Nevertheless, the methods employed to effectively handle supply chain risk pertaining to quality and safety concerns are not widely acknowledged or evaluated.

The exacerbation of SCQR can be attributed to two key factors: the substantial proliferation of global material sources and the increasing production of brand-name goods through contract manufacturing (Roth et al., 2016). Consequently, the field of SCRM has developed into a crucial element within the realm of efficient supply chain management. In recent years, the academic literature on SCRM has highlighted the significance of efficiently managing operational risks in supply chains with extensive linkages. Researchers have developed a range of risk management decision models to aid in mitigating SCQR occurrences. Research has demonstrated that service quality declines when customers seek compensation for issues such as damage, delayed delivery, or other problems. Handling product recalls entails

meticulous planning regarding the procedures and duration for which a product may be returned. This measure is undertaken with the aim of alleviating the adverse consequences associated with SCQR.

The increasing complexity of collaborating with overseas suppliers has exacerbated the product quality issue, leading to a growing and increasingly troublesome problem over time. In contemporary business practices, many companies integrate the course of global sourcing as a fundamental component of their comprehensive procurement strategies. Consequently, the production chain can exhibit considerable length and sometimes require involvement from multiple locations. Unsurprisingly, plant sales account for almost 50% of all identified commodities produced. It was observed that introducing extra vendor plants to assist in completing a task negatively impacted the quality of the final product (Lindberg et al., 2021).

At every level of the manufacturing process, the quality of the product undergoes a progressive and cumulative reduction. Adding extra workers to the supply chain introduces a heightened potential for a decline in the quality of the final product. Mondragon et al. (2021) argue that within a complex supply chain environment characterized by multiple layers, company executives may encounter challenges in accurately predicting the interdependencies and repercussions of their actions on various chain sections. The complexity of the supply chain situation is the primary cause for this. Indeed, determining the extent to which the potential for substandard quality may spread across a supply chain is a complex task that lacks a clear-cut methodology.

The existing body of research on managing quality risks in complicated international supply chains is insufficient, and there is a lack of understanding of the nature of risks within the framework of a global supply chain. Furthermore, there is a shortage of research on managing quality hazards across intricate global supply networks. Both of these inquiries have been sufficiently addressed within the limitations of the written context. Despite the extensive study undertaken by Tang (2011) on the subject of supply chain disruption risk management and strategy, there remains a lack of familiarity among individuals regarding the foundational principles of risk management. Conversely, these literary works offer a lucid elucidation of fundamental principles and exemplify their potential real-world applications. Despite the considerable advancements in understanding the underlying principles of risk management, this problem persists. The absence of knowledge has

necessitated the need to address the matter. Supply Chain Quality Risk Management, commonly called SCQRM, is the systematic approach to mitigating risks associated with the quality of goods and services delivered at different stages throughout a supply chain. Furthermore, to commence a scholarly investigation on this really consequential issue confronting contemporary society, obtaining authorization for a comparable technique is imperative.

The concept of "sharing the risk" encompasses more than simply guaranteeing the adequate quality of a product and alternating responsibility for handling unpleasant situations as they occur. There is often a correlation between the sharing of risks and the sharing of gains. This phenomenon can be attributed to the perception of benefits, which serves as a motivating factor for both parties to engage in collaborative efforts aimed at minimizing the Supply Chain Quality Risk (SCQR). The establishment and the supplier necessitate a framework for establishing a mutually advantageous agreement that enables the equitable sharing of risks and rewards. Hence, it is crucial to elucidate the underlying justification for the allocation of benefits and drawbacks. In order to mitigate the uncertainties related to risk and reward sharing, it is imperative for the company and its supplier to engage in collaborative efforts towards the development of collective production. The establishment of an equitable distribution of risk among participants necessitates the establishment of transparent and candid channels of communication.

When analyzed from the perspective of agency theory, the concept of risk sharing can be interpreted as a strategic approach based on individual actors' behaviors and decisions. The use of behavior-based practices is recommended when there is a higher level of ambiguity surrounding the provider, as these practices can effectively mitigate risk. Behavior-based training prioritizes procedures, occupations, and activities with reduced risk. (Payne, & Petrenko, 2019). posits that a task programmability is a direct approach to assessing behavior. The term "predictability" pertains to the degree to which the agent's (the supplier's) actions can be predetermined. In the context of commercial operations, the adoption of risk sharing entails a collaborative process between the buyer and the seller. This process involves identifying and agreeing upon a set of tasks to be undertaken by both parties. When a task can be automated, it is typically more convenient for the purchasing organization to exercise control over the provider's activity. When the purchasing firm jointly designs the component and the selling company, evaluating the product's quality becomes easier due to

the increased availability of information regarding the supplier's performance (Yusuf et al., 2022).



5. CONCLUSION

Nevertheless, there is a persistent endeavor by both organizations and people to diligently explore novel strategies in order to effectively manage the trade-off between the risks they assume and the profits they generate. Individuals' risk preferences, potential financial gains, and the organization's risk appetite influence the decision-making process concerning trade-offs. Based on the research conducted by Hachicha, & Elmsalmi, (2014), it has been observed that there exists a disparity in the willingness to undertake risks among different businesses and individuals. Two primary forms of relationship management (RM) exist: those that focus on the procedural aspects and those that priorities the broader perspective. The approach of process-based risk management centers on understanding and mitigating risks by considering their likelihood of occurrence and potential direct harm. This is accomplished by considering the probability of the risk eventuating. A systematic methodology is necessary in order to identify, assess, and priorities risks prior to achieving a comprehensive understanding of them. Resource planning is essential for the purpose of minimizing, monitoring, and regulating the probability and impact of adverse events.

In contrast, the approach of strategy-based risk management aims to develop a set of strategic alternatives that can effectively mitigate the risks arising from uncertainty. A practical approach to strategic risk management entails carefully selecting operational processes that can effectively reduce potential loss exposures. This can potentially indicate a reduction in the probability of experiencing loss, a decrease in the magnitude of failure, or a stabilization of the variability in loss over a given period.

Various RM methods have been formulated for application across diverse contexts (Rao et al., 2011). For example, the field of financial risk management focuses on the identification and strategic utilization of various financial instruments to mitigate potential risks that may result in significant financial losses. The utilization of risk management in construction project management is vital for the development of effective strategic plans. Various strategies for risk management encompass the maintenance of risks, the transfer of risks to external parties, the mitigation of risks, and the complete avoidance of hazards.

One aspect of the ex-ante approach involves implementing proactive measures to avert potential issues or problems. From a quality management standpoint, it is imperative to proactively implement measures to prevent errors and guarantee that solutions are deemed

as "correct the first time." The existing system will incorporate a mitigating step if complete risk elimination is unattainable. The ex-post method pertains to the issue of managing unfavorable outcomes, similar to the proactive approach of rectifying service quality lapses in order to maintain high standards. The risk management structure, which is focused on performance, has also been suggested for advanced research and development (R&D) initiatives (Ivanov & Dolgui, 2021). The researchers integrated several project management approaches with corporate strategy and implemented a tracking system to enhance the probability of successfully implementing new research and development (R&D) initiatives, advancing the company's progress towards its strategic objectives. A diverse range of risk management systems exist, all of which share a common goal: mitigating risks and hazards encountered by the organization to enhance its overall operational effectiveness. These solutions have been created across a diverse range of sectors.

The company acquiring the risk must allocate further resources to ensure a smooth loss transfer. It may be inferred that the cost associated with risk shifting will escalate in tandem with the escalation of uncertainty (Payne, & Petrenko, 2019). Product liability insurance is acquired to provide legal protection to a business entity in the event of potential litigation arising from issues related to the manufacturing and sale of its products. Implementing this measure can provide the company with protection against legal responsibility for any damages or losses experienced by customers, irrespective of whether such issues arise from errors in production or design. The extent of financial compensation provided by product liability insurance can be substantial, with the magnitude of coverage influenced by the market size.

The presence of design faults that result in a decrease in quality is deemed unacceptable and poses significant risks when considering the aspect of planning. Inadequate construction of toys can potentially result in a choking hazard for children, while substandard electrical equipment building may lead to overheating and subsequent fire incidents. The literature on ergonomics offers a wealth of information pertaining to design challenges. The design and design process can potentially address the fundamental problem effectively.

Potential challenges that may develop throughout the production procedure encompass the utilization of hazardous substances, inadequate assembly techniques, non-compliant components, and contamination issues. Conversely, any concerns pertaining to the sector

that are deemed insufficient can be considered inadequate. Applying quality management and process development methodologies, i.e., 6-sigma can effectively address industry-specific challenges and problem-solving endeavors. Supply chain difficulties arise when subcontracting tasks or purchasing products.



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APPENDIX A

MEASUREMENT SCALES

A.1 RISK SHIFTING SCALE

“Please indicate the level of agreement to the following statement. (1=strongly disagree; 7=strongly agree)”								
RSHI1	“We think that the supplier should take most of the responsibility for quality problems that are caused by the supplier, and/or even from the supplier's suppliers.”	1	2	3	4	5	6	7
RSHI 2	“We think that the supplier should take most of the responsibility for quality problems that are caused by the supplier, and/or even from the supplier's suppliers.”	1	2	3	4	5	6	7
RSHI 3	“For reducing the loss caused by material defects, we propose a higher penalty for the supplier.”	1	2	3	4	5	6	7
RSHI 4	“If we have any loss due to defects or have any quality problems with the sourced materials (e.g. clients' penalty, product recall, unconditional replacement), we penalize the supplier additionally by asking for compensation.”	1	2	3	4	5	6	7
RSHI 5	“We have laid down a detailed description of suppliers' responsibilities which will be applied if defects are found in the purchased materials.”	1	2	3	4	5	6	7
RSHI 6	“If our product has a high potential risk in quality and safety, we would purchase product liability insurance.”	1	2	3	4	5	6	7
RSHI 7	“We have product liability insurance to cover liability for losses or injuries to the consumer that are caused by product defects.”	1	2	3	4	5	6	7

A.2 RISK SHARING SCALE

“Please indicate the level of agreement to the following statement. (1=strongly disagree; 7=strongly agree)”								
RSHA1	“We regularly solve problems jointly with our key suppliers”	1	2	3	4	5	6	7
RSHA 2	“We help our key suppliers to improve their product quality in the long run.”	1	2	3	4	5	6	7
RSHA 3	“We hold meetings with suppliers on a regular basis to solve quality problems.”	1	2	3	4	5	6	7
RSHA 4	“We invest in our key supplier's facility to improve product quality.”	1	2	3	4	5	6	7
RSHA 5	“We provide training for suppliers on quality requirements.”	1	2	3	4	5	6	7
RSHA 6	“We set up tasks and procedures for supplier production with our key suppliers”	1	2	3	4	5	6	7
RSHA 7	“We require our key suppliers to return the documents or statistical process control (SPC) data so we can keep track of the production quality”	1	2	3	4	5	6	7
RSHA 8	“We include key suppliers in the design stage of new products.”	1	2	3	4	5	6	7

A.3 RISK REMEDY

Please indicate the level of agreement to the following statement. (1=strongly disagree; 7=strongly agree)									
RRMY1	“We have set up a product recall/withdrawal strategy.”	1	2	3	4	5	6	7	
RRMY 2	“We recall/withdraw the products from our customers proactively if the products are defective.”	1	2	3	4	5	6	7	
RRMY 3	“If our product has a quality problem, we will unconditionally replace the defective products”	1	2	3	4	5	6	7	
RRMY 4	“We have a slow response in recalling/withdrawing defective products (reverse code)”	1	2	3	4	5	6	7	
RRMY 5	“If our product has a quality problem, we will have an unambiguous assumption of responsibility.”	1	2	3	4	5	6	7	
RRMY 6	“We investigate the cause of product recall/withdrawal in order to avoid it happening again.”	1	2	3	4	5	6	7	
RRMY 7	“Checklists are typically provided detailing the appropriate managerial actions to follow when we need to recall/withdraw a product.”	1	2	3	4	5	6	7	

A.4 ORGANIZATION PERFORMANCE SCALE

“Over the past 3 years, please indicate the level of change in your firm. (1=decreased significantly; 4=no change; 7=increased significantly)”									
FP1	“Return on investment”	1	2	3	4	5	6	7	
FP2	“Market share”	1	2	3	4	5	6	7	
FP3	“Customer loyalty”	1	2	3	4	5	6	7	
FP4	“The number of successful new product introductions”	1	2	3	4	5	6	7	
FP5	“Long-term profit”	1	2	3	4	5	6	7	