



**An exploratory study of factors influencing the
supply chain quality in a selected South
African company**

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ABSTRACT

The study explored factors that influenced the supply chain quality in a South African organisation referred to as company X. It was limited to the financial year ended January 2022. The study was motivated by a 6% increase in supply chain costs company X incurred during that period. The study was qualitative in nature with structured questions, and the sample included six participants purposively selected as knowledgeable decision makers.

A literature survey was conducted which defined supply chain, explained the history of supply chain, supply chain costs and its drivers as well factors that disrupt the quality of a supply chain.

Ten factors were subsequently identified as long lead times, communication issues, inventory problems, production processes delays, ERP Systems/Technology issues, environmental (Acts of God), supplier/sourcing constraints, management issues, labour/teams, and politics.

These factors were examined by the Pareto and HSIM (BIM) technique and it was concluded that inventory issues, management, production processes, lead times and sourcing were the major factors that bedevilled the supply chain for Company X. Inventory and management issues were the most sensitive factors. These were the only factors influenced by changes in the other factors.

Recommendations were proposed on how to improve the supply chain quality. Dashboards, lean methodologies, vigorous risk assessments and talent management, amongst other initiatives were proposed. It was noted that dashboards would improve processes, communication and inventory issues experienced by the supply chain quality of Company X. A study that focuses on multiple organisations within the same sector is needed to formulate sector-based supply chain quality issues and further studies that can quantify the contribution of each factor to the supply chain is suggested to fully understand the impact of each factor.

Keywords: *Supply chain management, quality, supply chain quality, efficiency, continuous improvement.*

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List of Abbreviations

Abbreviation	Meaning
AHP	Analytic Hierarchy Process
ANP	Analytic Network Process
BIM	Binary Interaction Matrix
CAD	Computer Aided Design
DMADV	Design, Measure, Analyse, Design, and Validate
FMEA	Failure Modes and Effects Analysis
HSIM	Hybrid Structural Interaction Matrix
PDCA	Plan, Do, Check and Act
QFD	Quality Function Deployment
RFID	Radio-frequency identification
SERVQUAL	Service Quality

CHAPTER ONE – INTRODUCTION AND BACKGROUND

1.1 Introduction

This study focuses on factors that influence supply chain quality in a selected manufacturing company. Good supply chain quality helps organisations identify and resolve problems with products or business processes before they lead to major problems like supply chain disruptions, input or product shortages, poor product quality, and lost revenue. To ensure an effective supply chain quality, it is of paramount importance to explore these factors.

In this chapter the problem statement will be introduced, and the primary and secondary objectives of the study will be discussed together with the methodology used to achieve these objectives. The limitations of this study are also evaluated. In conclusion, an overview of the mini-dissertation is given by briefly describing the contents of each chapter.

1.2 Background

The Gauteng based manufacturing company is a medium-sized company with hundred employees operating within the steel industry (Company X). It converts steel input material into specialised engineering solutions through the forging and rolling process.

Company X's supply chain and manufacturing processes are well-defined. They include planning and procurement of inputs, receiving and quality check, saw bay (cutting steel to meet required dimensions), forge and roll, heat treatment, final product machining, final inspection, packaging, and dispatch as depicted in figure 1 below.

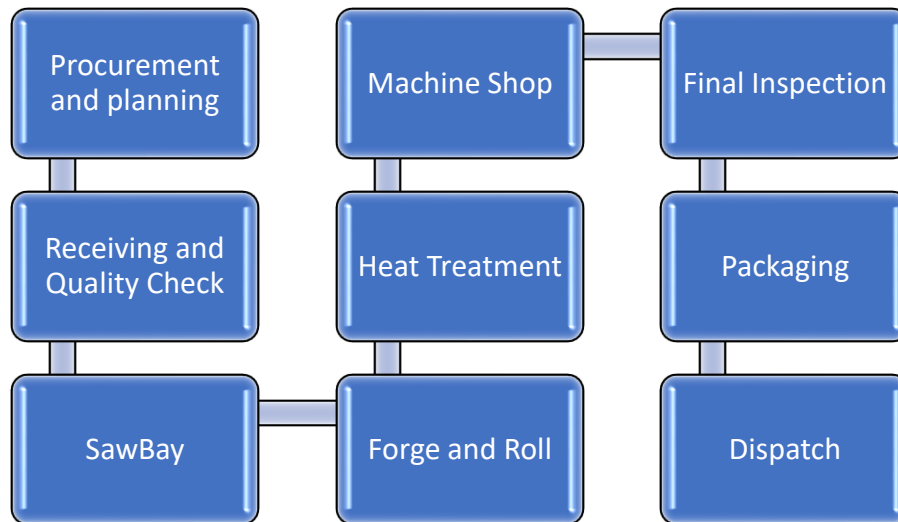


Figure 1: Supply Chain Process at Company X

1.3 Problem Statement

Supply chain operations include the systems, structures and processes to plan, and execute the flow of goods and services from supplier to the customer (Diaz, 2021). According to Kacan (2020), high supply chain costs constitute a threat to the financial health of any company.

If these costs are not effectively monitored, managed, and optimized, they can negatively affect the business as they refer to the costs that a company incurs in pursuit of operational activities and these play a major role in determining the profitability of an organisation. These costs manifest as investment costs, procurement costs, transportation, production costs, and inventory costs (Diaz, 2021).

Overall, supply chain quality plays a crucial role in increasing the organization's power and competitiveness (Mahdiraji, Arabzadeh, and Ghaffari (2012:2463-2472) since the goal of each company is to generate profits for its owners (Milovanovic 2014:120).

The selected company is supply chain based. In the financial reports for the period February 2021 to January 2022, an increase of 6% (supply chain costs) was reported. This increase was attributed to the general inefficiencies in the supply chain such as increases in scrap generation, rework, and administrative issues. This is a major concern for the management of the company as this is directly affecting the bottom

line. The company relies on efficient supply chain management to do business and ensure profitability.

Thus, this research seeks to explore the possible factors that are influencing Company X's supply chain quality so as to discern the strategic operational techniques that can be adopted to improve its supply chain efficiency.

1.4 Research Objectives and Research Questions

1.4.1 Primary objective/research aim

The primary objective is to explore the factors that influence supply chain quality so as to monitor and improve to achieve supply chain efficiency and the perceptions of key supply chain players within the organisation will form the basis of the exploration.

1.4.2 Secondary objectives

- i. To review relevant literature on supply chain quality and its associated elements and costs.
- ii. To design a research methodology that will explore the supply chain quality issues experienced by Company X.
- iii. To explore the major supply chain quality problem areas and prescribe relevant operations techniques to minimize or eliminate the supply chain quality issues.
- iv. To draw feasible conclusions and recommendations on the factors that affect supply chain quality.

1.4.3 Research Questions

- i. What are the supply chain quality challenges currently being faced by the organisation company?
- ii. What do these identified challenges (identified in question 1) mean for the industry in terms of operational performance?
- iii. Which operations techniques can remedy the supply chain quality issues?

1.5 Research Methodology

A qualitative approach was selected as the methodology for the study. This was selected as the researcher wanted to collect in-depth details using structured

interviews about the supply chain quality in the chosen Gauteng based manufacturing organisation

1.5.1 Literature Study

A literature study was conducted to better describe the scope of the supply chain quality aspects and to give the reader some background on definitions, supply chain performance, existing factors, and inefficiencies in the supply chain from previous studies. By orientating the reader on these aspects, the attempt was to provide a better understanding of the challenges that supply chain-oriented companies face.

1.5.2 Research Design

The research used a qualitative design approach with structured interviews conducted to obtain perceptions and gain the necessary insight to help answer the research question, thus making it a qualitative study (Kotze, 2007)

1.5.3 Study Unit, Population, and Sample Participants

The subject is the selected manufacturing company in Gauteng and the population is the whole workforce at this company. In total, it is 100 participants. A sample was selected from the population.

The sample comprised of six purposively selected participants. Casteel and Bridier (2021:341-362) defined study participants as a group of individuals who voluntarily become the subject of a research study. The six participants were selected as representatives of the procurement and planning, quality and health and safety, sales and finance, production (technical experts) and logistics (inbound and outbound) departments.

These targeted participants are key decision makers along the supply chain. All the participants have good knowledge of the field of the study and the information that was collected proved invaluable towards answering the research question

1.5.4 Data Collection Process and Analysis

Structured interview questions were used to collect perceptions from the six participants. The interviews were recorded with a mobile device and then later

transcribed verbatim for analysis. The information collected from the structured interviews was analysed using thematic analysis approach. Braun and Clarke (2021:37-39) defined the thematic analysis as a process of coding information and developing themes.

In addition to the thematic approach, a matrix method was used to prioritise the factors identified from the research participants.

1.5.5 Trustworthiness

Trustworthiness of a study according to Pilot and Beck (2014), refers to the degree of confidence in the information that was collected, how it was interpreted, and including methods used to ensure the quality of a study. Furthermore, the protocols and procedures necessary for a study to be considered worthy of consideration by readers should be applied.

Purposive sampling was used in this study. According to Campbell *et al.* (2020:652), the reason for purposive sampling is that it allows better matching of the sample to the research objectives, hence improving the trustworthiness of the data and results.

In addition, the participants were selected based on their experience, knowledge, qualification, key decision-making capabilities, and their impact on the supply chain, thus increasing the trustworthiness of the findings.

Furthermore, the verbatim recordings ensured the accuracy (transferability) of the transcribing process and the debriefing with the Participants.

1.6 Definitions of Terms

Key terms that will be used in the study are defined on Table 1 below.

Table 1: Definition of key terms

Term	Definition
Material requirement planning (MRP)	A system for calculating all the materials and components required in order to manufacture a complete product (Amri and Latief, 2020-1117-1126).
Cost of poor quality (COPQ)	The amount of money a nonconforming condition costs your organization (Harrington,1987; Teplická and Hurná, 2021:20-26).
Prevention costs	(Cost of efforts to avoid non-conformances) this includes the cost to investigate, prevent, or mitigate the risk of error, and also the cost of quality-based improvements. Examples of preventative costs include the costs of various quality analysis, planning, information systems, motivation(incentives) and education/training (Buthmann, 2012).
Detection/Appraisal costs	(Cost of assessing the quality status) this includes the cost to evaluate whether the specified quality requirements are met. Examples of detection costs include the costs of measuring, checking, testing and verification of products, and processes in an organisation (Tamboli, 2022).
Internal failure costs	The cost an organisation incurs due to handling errors on a quest to fulfil all the quality requirements of customers. This includes all costs such as the removal of disagreements with the documentation, overtime of personnel for repairing, and re-inspections amongst others (Teli, Majali, and Bhushi (2013:1-10).
External failure costs	The cost an organisation incurs due to non-conformances after a delivery of the product to the end-user was done; the non-conformance may be a result of the poor quality of suppliers (Teplická and Hurná, 2021:20-26).

1.6.2 Scope and Field of study

This study explored factors that affect the supply chain quality in a selected Gauteng company and is set in an operations management environment. The focus was predominantly on the cost of poor supply chain quality associated with internal and external causes.

1.6.3 Sector/industry/business under investigation

The study was limited to a case company within the steel manufacturing industry.

1.6.4 Geographical demarcation

The manufacturing company is based in an industrial area in the Gauteng Province.

1.7 Contribution of the Study

The study is of vital importance to the manufacturing company as it explored the possible root causes of the supply chain inefficiencies that caused an increase of 6% in costs in the previous financial year.

Secondly, the study contributed to the existing body of knowledge on factors affecting supply chains in manufacturing industries.

1.8 Expected Limitations of the Study

The study was done in one organisation, and therefore due to cultural, environmental and other social factors, the findings of the study may not be generalised for other organisations. However, the study can be repeated to custom-fit other organisations.

1.9 Layout of the Study

The proposed study will consist of five chapters. A summary of the layout is indicated in the figure 2 below.

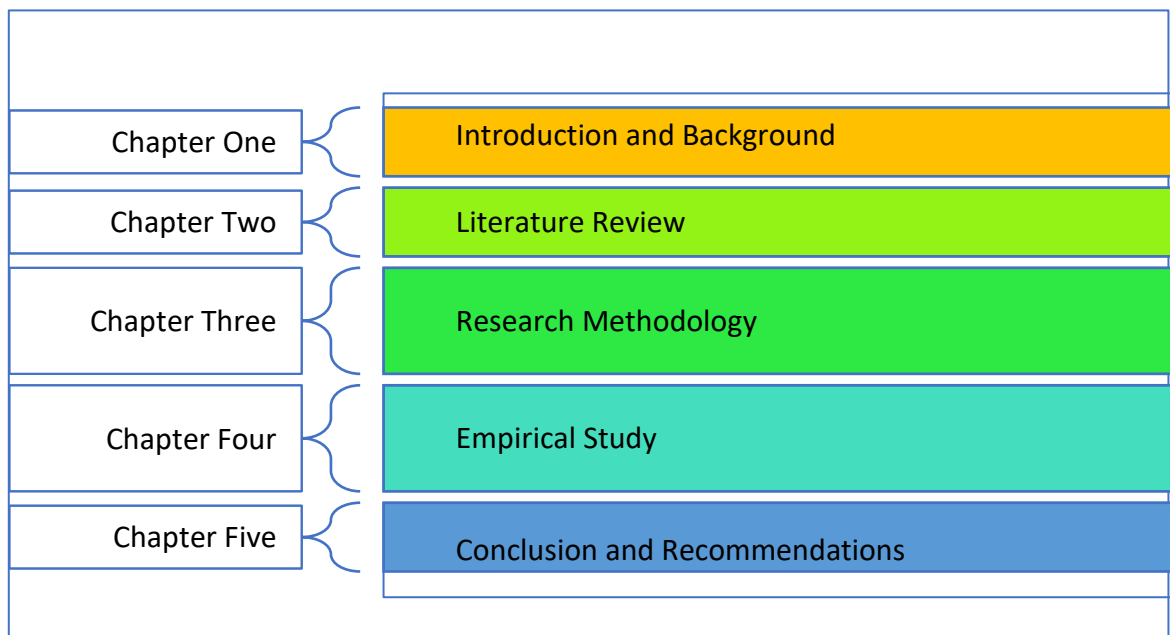


Figure 2: Summary of project layout.

Chapter 1: The chapter focused on providing the case company background, the problem statement, and the research questions the study was meant to answer together with the primary and secondary objectives amongst other aspects such as the study limitations and the contribution of the study.

Chapter 2: The chapter presented findings from the reviewed literature, which focused on the evolution of Supply chain management, Quality management, Supply chain quality management, and Factors that influence supply chain management. The review focussed on literature from 2011 to date, with an exception of origination of concepts.

Chapter 3: The chapter provided a brief discussion of methods adopted to carry out the study. The methods discussed include the type of research conducted, the methods used to collect and analyse data, and the trustworthiness of the process. In this chapter ethical considerations were also covered amongst other methods and approaches adopted.

Chapter 4: The chapter presented the research findings, which include the factors that influence the supply chain quality and the hierarchical priority of each factor. Based on the results of the hierarchy, an improvement plan based on issues influencing the supply chain quality in case organisation were proposed.

Chapter 5: The Chapter provided recommendations based on the findings of the study and the relevant conclusion was drawn.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The theoretical study is presented in this section. The purpose was to elucidate on the definition of supply chain, the history of supply chain, factors that affect supply chain, supply chain quality, and techniques to improve supply chain quality based on previous studies.

2.2 Definition of Supply Chain

The concept of supply chain came into existence in the 1980s (Pounder, *et al.*, 2002) and since then, different authors have defined supply chain from varied angles. The definitions have evolved from a simple planned production process that involves converting raw materials into finished products, and then distributing to end customers, to becoming the strategic and tactical technique that coordinates all business functions and procedures within an organisation according to Habib (2014:238-239).

Hayes (2022) defines supply chain as a network of all parties, both internal and external who are involved in all activities required for product creation and delivery to the consumer. Chopra and Meindl (2010) stated that it consists of stakeholders (manufacturers, suppliers, transporters, warehouses, retailers, and customers), within each organization, all the functions involved, directly or indirectly, in fulfilling a customer request. It encompasses all aspects from the delivery of raw materials, from the supplier to the manufacturer, to its final delivery to the end user.

According to Jenkins (2018), a supply chain is a system of all units involved in the manufacturing and delivery of a product or service. The elements of a supply chain include and not limited to suppliers, producers, transportation/logistics companies, warehouses, distribution centres, and retailers, while some of the functions include product development, operations, marketing, distribution, and customer service. And today, many supply chains are global in scale.

The common aspect taking into consideration the reviewed literature is that, the supply chain involves all processes in creation of goods and services.

2.3 Supply Chain History

According to Mehmeti (2016:1-2), the concept of supply chain management (SCM) started to gain popularity six decades ago. Researchers took interest in defining and understanding the concept and have since been evolving. The evolution can be broken down into three parts:

- i. **Creation Era** started in the 1980s when the buyers and suppliers understood the benefits that can be offered by maintaining a cooperative relationship.

- ii. **Integration Era** started in the 1990s when IT systems (ERP, EDI, etc.) were introduced. The systems not only focussed on managing the resources of the individual firm it also included managing resources of the integrated supply chain,

- iii. **Globalisation Era** started when trade liberalisation policies were created and institutions such as World Trade Organization (WTO) and other international institutions that deal with global/regional trade policies were established (Mehmeti, 2016:1-2).

Since the year 2000, integration between suppliers, producers, and retailers has gradually occurred until the formation of global supply chain management (Mehmeti, 2016:1-2).

A summary of the supply chain evolution is depicted in figure 3 below. It indicates that activities such as forecasting, buying, production planning, manufacturing inventory, transportation and distribution, marketing, finance, and sales were fragmented and managed in silos before the 1960s. The years 1960 to 2000 experienced the breaking of these silos into an integrated system resulting in the birth of supply chain management.

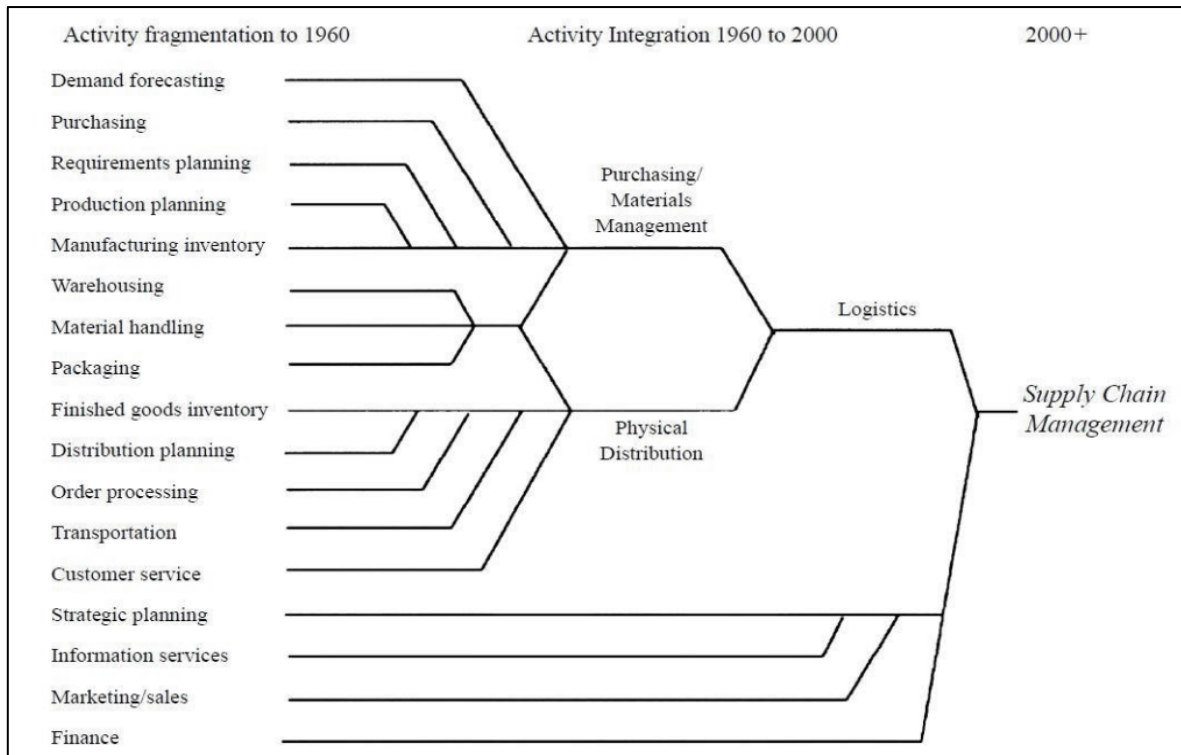


Figure 3: The evolution of Supply Chain Management

Source: Mehmeti (2016:1-2).

2.4 Supply Chain Management

The active management of supply chain activities that includes all processes that transform raw materials into final products to maximize customer value and achieve a sustainable competitive advantage is known as supply chain management (SCM) (Handfield, 2021). It represents a conscious effort by supply chain firms to develop and run supply chains in the most effective and efficient ways possible.

According to Vasiljević, Novakovic, and Đorđević, (2021:275), SCM is considered the act of managing the upstream and downstream relationships between customers and suppliers to deliver optimal customer value while incurring the lowest cost in the supply chain. It is all about delivering to the right customer, at the right time, the right product, the right quantity, and quality, and at the right cost.

SCM can be summarised as the proper handling of the planning and procurement of raw materials, inventory management, production (processes of converting raw

materials to finished goods), distribution of finished goods, returns from customers, and the flow of information within the organisation (Services, 2011).

2.5 Importance of Supply Chain Efficiency

According to Meredith (2022), supply chain performance focuses on the internal processes within the supply chain, and the effectiveness of each stage of the supply chain in reducing inefficiencies, optimizing costs, improving speed along the activities, and meeting customer expectations.

The purpose of SCM is to enable the company to earn profits. This translates to low supply chain costs and maximum possible deliveries. To achieve low supply chain costs, organisations need to achieve optimised internal and external operational performance (Pettersson, 2008). Production lead time, scrap rates, and rework can be examples of internal performance, while delivery lead times, customer service, and warranty claims indicate external efficiency. To remain competitive in cut-throat market competition, organisations have to seek ways to lower costs. This means that supply chain efficiency and effectiveness have become critical for survival.

A waste-free supply chain has a substantial effect on a firm's financial performance, as said by Zhou *et al.* (2021:387). This is achieved by eliminating waste within the supply chain, and therefore, minimising costs.

In their extensive study on the effect of lean practices, green practices and process innovation on the financial performance of an organisation, Cherrafi *et al.* (2018:79-82) concluded that these practices minimise the supply chain costs and improve the efficiency of firms.

2.6 Supply Chain Costs

Supply chains (SC) are highly interconnected and generate costs (Kacan, 2020). If these costs are not controlled, they can negatively affect profit margins. Therefore, it is vital to understand the interrelationship between various processes in the SC. Supply chain costs are a ratio that measures the total cost incurred by a company for performing supply chain activities (Diaz, 2021). Supply chain costs are measured as a percentage of revenue for the same period and calculated as:

$$(COGS + Distribution Costs + Other) / Revenue * 100\%$$

where

- Cost of Goods Sold = COGS
- Distribution Costs = Annual distribution costs
- Other = Total of other annual supply chain expenses (Other Operational Expenses)

A lower percentage indicates better performance. As businesses evolve, processes of consumption and production are getting faster and more efficient, and therefore, companies need to minimise costs to compete in their respective markets.

Supply chain expenses in manufacturing organisations play a crucial role in the overall costs. According to Lapinskaitė and Kuckailytė (2014:106-126), supply chain costs constitute about 55% of the total product cost.

Minimising supply chain costs is an incredibly challenging but necessary undertaking.

These costs include:

- Investment costs
- Transportation
- Procurement
- Production costs
- Inventory

2.6.1 Investments Costs

These are costs incurred in investments in new facilities and networks of suppliers, manufacturers (factories), distributors, resources (equipment and employees), and retailers that stretch around the world. Making sound strategic investment decisions is critical (accurate & data-driven demand forecasts) to bring down investment costs (Karlsson, 2018)

2.6.2 Transportation Costs

Transportation can negatively affect supply chain costs. Typically, the root cause of higher transportation costs for inbound and outbound activities comes from inefficient supply chain network planning, routing, and deployment of resources (Tien, Dinh, & Thuc, 2019).

2.6.3 Procurement Costs

Procurement costs are the expenses incurred by organisations in securing goods and services required by customers. To avoid and manage these costs, it is vital to have suppliers who are consistently able to deliver the right products and materials at the right times and the lowest prices (MNB1601, 2022).

2.6.4 Production Costs

According to Hayes (2022), production costs are the total expenses (direct or indirect) incurred by a business in producing a product or service. Production costs include labour, raw materials, equipment, rent, and other supplies or overhead.

2.6.5 Inventory Costs

Inventory costs includes all expenses associated with ordering, holding, and managing the inventory levels of a product-based business. Total inventory costs are frequently broken down into three distinct categories: ordering costs, carrying costs, and stock outage costs (Hayes, 2022).

Therefore, it is very important to continuously improve the supply chain processes to reduce overall costs and provide customers with reasonable and competitive prices.

2.7 Supply Chain Quality

Supply chain quality management is the controlling of all activities along the supply chain to achieve and maintain an expected level of performance (Rahmah and Marlina, 2018:148-153). It includes all activities in the supply chain to ensure that products and services delivered to clients are up to specifications and at the appropriate cost (Pambreni *et al.*, 2019:1397-1406).

Zhang, Guo, Huo, Zhao, and Huang (2019:227) defined supply chain quality as the strategic collaboration between an organisation's internal and external supply chain

partners, intending to manage quality-related processes, communications, and other relationships to achieve high-quality performance at the lowest cost.

The goal of every business is to produce good quality. However, poor quality can inadvertently happen. Teli, Majali, and Bhushi (2013:1-10) defined poor quality as any activity within the supply chain that is non-value-adding and wasteful, leading to failure to meet the requirements of the customers. The authors further discussed that the cost of poor quality (COPQ) is large and, for most companies, it varies between 25% and 40% of the operating expenses. Mahdiraji *et al.*, (2012:2463-2472), in their study, highlighted that supply chain quality plays a crucial role in increasing the organization's power and competitiveness.

Furthermore, Mahdiraji, Arabzadeh, and Ghaffari (2012:2463-2472) indicated that supply chain quality plays a crucial role in increasing the organisation's power and competitiveness. Failures in a supply chain mean companies leave their reputation in the hands of suppliers.

2.7.1 Supply Chain Cost of Quality

According to Buthmann (2012), quality comes at a cost. There are costs for good quality and costs for bad quality. These categories cost are highlighted on Figure 4 below.

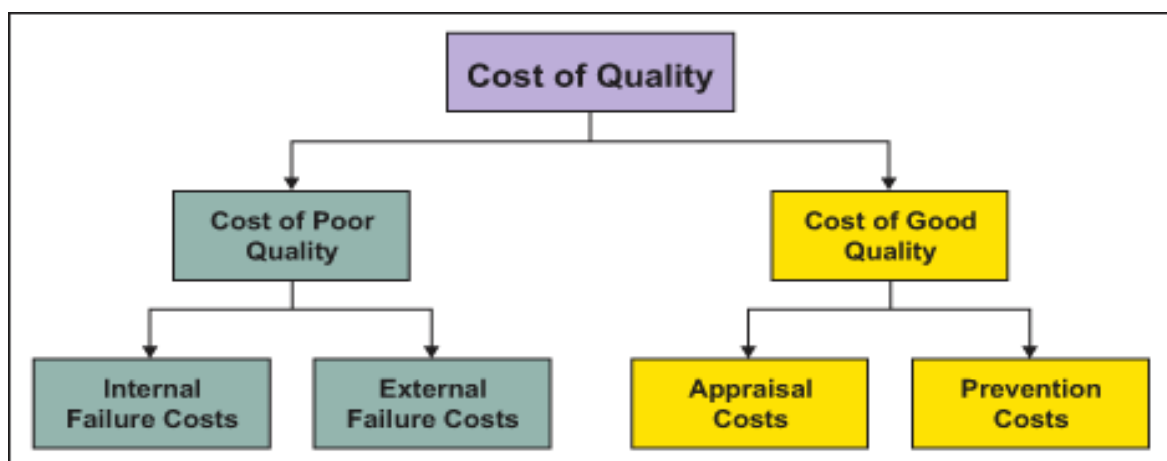


Figure 4: The costs of quality (Buthmann, 2012)

The cost of good quality includes all the costs a company incurs for investing in measures that will prevent bad quality/non-conformances. This includes non-conformance detection and appraisal costs. On the other hand, the cost of bad quality includes all the costs incurred as a result of failing to meet the required specifications (Buthmann, 2012).

Supply chain cost of quality plays a significant role when it comes to determining the product cost and its margins. Therefore, any cost reduction initiatives within the supply chain will help in increasing profit margins (Tamboli, 2022).

Tamboli (2022) further identified parameters used to measure the cost of quality in supply chains. These parameters are grouped into three major categories:- prevention costs, failure costs, and appraisal costs.

(i) **Preventative:** Cost an organisation incurs with efforts to avoid non-conformances, these includes the cost to investigate, prevent, or mitigate the risk of error, and also the cost of quality-based improvements. Examples of preventative costs include the costs of various quality analysis, planning, information systems, motivation (incentives), and education/training (Teli, Majali, and Bhushi, 2013:1-10).

(ii) **Appraisal:** cost incurred due to assessing quality status operations within the organisation. This includes the cost to evaluate whether the specified quality requirements are met. An example of appraisal costs includes the costs of measuring, checking, testing, and verification of products and processes in an organisation (Teplická and Hurná, 2021:20-26).

(iii) **Failures:** Can be internal or external.

Internal-The cost an organisation incurs due to errors occurring during the quest of fulfilling all the quality requirements of customers. This includes costs such as the removal of disagreements with the documentation, overtime of personnel for repairing, and re-inspections to name a few (Buthmann, 2012).

External-The cost an organisation incurs due to non-conformances that are traced only after the final product is delivered to the customer, the non-conformance may be a result of poor quality of the supplier (Teplická and Hurná, 2021:20-26).

These categories can assist organisations with mapping the cost spent on various areas, and therefore be able to strategise on ways to manage the identified costs (Tamboli, 2022). The categories are summarised in table 2 below.

Table 2: Quality Cost parameters

Source: Tamboli (2022)

Categories	Failure Cost	Prevention Cost	Appraisal Cost
Parameters	1. Rejection 2. Rework: Measured in time and cost. 3. Delays 4. Logistics 5. Inventory 6. White collar errors	7. Inspection & Testing 8. Design & Specification 9. Evaluation & Improvement	10. Seminars & Surveys

2.7.2 Supply Chain Quality Management

The concept of supply chain quality management came up almost twenty years ago. The literature has focused more on evaluating the effect of supply chain quality management performance measures such as quality performance, operational performance, and financial performance (Abdallah, Alfar, and Alhyari, 2021:785-812).

Omar (2021:139), on the other hand, defines quality management as a long-term and continuous improvement strategy that enables the company to increase its market share, and gain customer and employee loyalty by developing and enhancing quality in all internal processes. The common aspect between supply chain and quality management is that they are both customer satisfaction-driven.

Abdallah *et al.* (2021:785-812) further indicated that one of the advantages of supply chain quality management is that it enables organisations to achieve quality integration with both customers and suppliers to enhance supply chain performance and

maximize the value provided to customers. The application of supply chain quality management has grown since it was first introduced.

Supply chain quality management, according to Noor and Pribadi (2020:2160), is a systematic and holistic approach to continuously improve work performance, considering internal processes, downstream and upstream processes, and all other aspects that occur within the supply chain.

Hong, Zhou, Li, and Lau (2020:99-122) conducted a study to investigate supply chain quality management and firm performance in China's food industry.

The study revealed a positive relationship between supply chain quality management and the enterprise's quality, safety and sales performance.

According to Lin, Kuei, and Chai (2013:347-370) supply chain quality management (SCQM) is focused on the design, linking, and managing of strategic and tactical tasks within the supply chain system to mitigate unwanted deviations, and therefore ensuring accountability between partners, creating optimisation on the system-level, and lastly building efficient supply networks. The author highlighted that globally recognised brands such as Apple, Wal-Mart, Toyota, and Hewlett-Packard have designed their strategies to include supply chain quality management, by identifying external drivers and internal enablers of SCQM, initiating training and quality audit programs, building collaborative supplier relationships and creating IT platforms amongst other things.

In recent years, businesses have been optimising their operational performance by managing their supply chains effectively, to minimise operating costs and maximise profits. A study by Cherrafi *et al.* (2018:79-82), revealed that lean practices such as waste elimination amongst others play a major role in improving performance.

From the above studies, supply chain quality management practices minimise variance in processes, which has a direct impact on the performance of supply chain measures, such as inventory and time measures (Cherrafi *et al.*, 2018:79-82).

2.7.3 Factors that influence Supply Chain Quality

The supply chain quality or performance is influenced by various factors (George & Madhusudanan, 2019). Several authors have summarised these factors and these are presented in table 3 below.

Table 3: Factors affecting supply chain.

AUTHOR	YEAR	IDENTIFIED FACTORS INFLUENCING SUPPLY CHAIN QUALITY
Joby George and V. Madhusudanan Pillai	2019	Inventory control policy, Customer demand, Lead-time, and Review period length, supply chain structure, Forecasting methods and information sharing
Groznik, A. and Xiong, Y.	2012	Government Support, Environmental Uncertainty, Supply Chain relationships, Business Management, Customer Satisfaction
Arash Apornak and Amiri Hezaveh	2019	Customer and market focus, Leadership, Information and their analysis, Developing and managing human resource, Process management, Strategic planning.
Sushanta Tripathy et al.	2016	Information Technology.
Nejah Ben Mabrouk, Anis Omri and Bilel Jarraya	2020	Environmental uncertainty, Business Management, information Technology, Manufacturing, Supply Chain Relationships, Customer satisfaction, SCM performance.
Sohrab Nadali, Seyed Foad Zarifi and Hadi Rezghi Shirsavar	2016	Strategic management. Product management, Product process management, human resources, customer orientation and industry capacity.
Ka-Yin Chau <i>et al.</i>	2021	Supplier quality management, Customer focus, quality of IT system, leadership and process integration.
Ravinder KumarRajesh K. SinghRavi Shankar	2015	Top management commitment, An effective strategy of SCM processes, Resources devoted for supply chain, Trust within SC partners, Strong focus on core strengths, Logistics synchronization, Information sharing, Use of latest technology, Forecasting of demand on point of sale, Just

		in time (JIT) capable systems, Reliable suppliers, Flexibility and agility in production system, Survival and growth based on long-term vision.
Lina Anatan	2014	Downstream: Relationships with customers, The level and quality of information sharing, Internal supply chain processes: Postponement. Upstream: Strategic supplier partnerships.

Of particular importance, Chau, Tang, Liu, Ip and Tao (2021:1418-1437) conducted a study to identify critical factors for improving supply chain quality. They identified five critical factors namely:

(i) Leadership drives supply chain quality and ensures overall business excellence. The quality management program in organisations is usually dependent on the decisions made by top management.

(ii) Process integration which is about integrating production requirements and delivery processes when designing and introducing a product or service in a company. This also includes redesigning of the existing products and services.

(iii) Quality of IT system, an IT system is often used to assess both productivity and quality, however, but few companies consider IT system quality. It is an enabler in building and sustaining a supply chain that meets organisational requirements.

(iv) Supplier quality management, refers to the efforts made by management/executives in improving overall quality, as well as performing effective management in product or service quality from the suppliers, supplier quality management emphasises supply quality rather than price and,

(v) Customer focus, which provides greater attention to downstream relations with customers.

Furthermore, Kuei, Madu and Lin (2011: 4457-4481) conducted a study to develop a global supply chain quality management system. The study identified important factors

that can lead to good supply chain quality at a global scale. In their study with executives around the world, several factors were identified included

(i) Outsourcing - affects the procurement process of manufacturing organisations, together with the logistics part of the suppliers.

Outsourcing raises other crucial themes to consider such as process integration, consumer relationship management, demand management, fulfillment management, and multi-vendor interface management (Kuei *et al.*, 2011: 4457-4481).

(ii) Wastes within the processes -there are seven common lean wastes, which can be found in various processes within the supply chain, and these are defects, excess processing, excess inventory, excess transportation, excess motions, over-production, and waiting.

(iii) Advanced Technology –has a massive influence on every process of the supply chain, in their study Kuei *et al.*, (2011: 4457-4481) highlighted that not only does it help with effective decision-making, but technology also enables any organisation regardless of size to digitally connect all the units within its supply chain, buy the best goods at the best prices, and develop an efficient supply chain system with overall competence.

2.7.4 Supply Chain Improvement Techniques

Lee (2021:5138) indicated supply chain strategies that can have a positive impact on an organisation's financial performance and cost reduction. Strategies such as enterprise resource planning, collaborative planning, forecasting and replenishment, warehouse management system, outsourcing, organizational competence, R&D capability, technology, production capability, marketing capability, and quality were found to have a positive effect on supply chain when properly managed.

A study by Zhang *et al.*, (2011: 87-97) highlighted that co-ordinating several supply chain partners with advanced manufacturing technology can be used to connect numerous departments in an organisation for better teamwork and therefore improve both the physical product and information flow. The author further indicated the use of RFID to ensure traceability and assuring that quality covers all members.

A study by Foster Jr, Wallin and Ogden (2011: 2285-2300) explored fifty-seven tools that can be utilised to improve supply chain quality. These tools were broken down into six categories.

Process tools

These tools focus mainly on improving the effectiveness and quality of production methods in an organisation. Enterprise resource planning (ERP) systems are focused on managing production processes, communication, and information within the organisation holistically (Hietala and Päivärinta, 2021:419-426). JIT (just in time) and lean are techniques that focus on improving the efficiency of processes and resource usage Green *et al.* (2019:26-47). Six sigma on the other hand use DMAIC (define, measure, analyse, improve and control) method to aid in improving process performance and cost (Makinde *et al.*, 2022). Benchmarking is one such tool. Mangul *et al.* (2019:1-11) argue that benchmarking is deemed useful when managing processes. This allows companies to compare processes and chart courses for continuous improvement.

Basic tools

The classification of basic tools is expansive. The seven tools of quality include flowcharts, control charts, Ishikawa charts (Fishbone diagram), histograms, Pareto diagram (80%-20% rule). scatter diagrams, and check sheets (Memon *et al.*, 2019: 4044-4047). Advanced managerial tools such as affinity diagrams can be used to handle more subjective data in managerial decision-making (Bouranta *et al.*, 2020:729-769).

5-S (sort, set in order, shine, standardise and sustain) is an approach to standardising and housekeeping with a view to improve layouts and orderliness of operations (Polancich and Pilon, 2019:53-79). Program evaluation and review technique (PERT) on the other hand are tools used in managing and continuously improving projects according to Calp and Akcayol (2018: 615-627).

Statistical tools

Statistical tools include control charts, computer-aided inspection, testing, and Gage R&R amongst others. Control charts are used in monitoring the stability of processes based on the sampled data (Memon *et al.*, 2019: 4044-4047). Computer-aided testing on the other hand is used to check that parts, sub-assemblies, and full systems are within acceptable specifications and Computer-aided inspection is often used to examine products for defects before, during, and/or post-production (Muravyov and Pogadaeva, 2020:259-267). Gauge repeatability and reproducibility (Gage R&R) are used to ensure accuracy in measurements (Muravyov and Pogadaeva, 2020:259-267).

Supply chain tools

These supply chain tools are used to focus on continuous improvement on the downstream and upstream activities:

- (1) Customer relationship management which is meant to create value through long-term relations with customers (Makinde *et al.*, 2020:743-750);
- (2) Complaint resolution, which can be considered a closed-loop process for gathering, resolving, and utilising customer complaints for improvement (Foster , Wallin, and Ogden, 2011: 2285-2300);
- (3) Supplier development which on the other hand involves sharing knowledge with customers to improve their quality and service (Makinde *et al.*, 2020:743-750);
- (4) Supplier evaluation which is defined as the process of grading and registering suppliers using benchmarking standards such as ISO 9000 (Makinde *et al.*, 2020:743-750);
- (5) The customer benefits package also known as the tool to identify those services that will be provided to customers (Foster, Wallin, and Ogden, 2011: 2285-2300) and also
- (6) Single sourcing which is a process utilised for reducing the number of suppliers for a particular item to one (Foster, Wallin and Ogden, 2011: 2285-2300).

Design tools

Design tools are predominantly tactics to improve products to satisfy and meet customers' needs. Design tools include an environmental or green design that focuses on the reduction of the negative impact of products and processes (Foster, Wallin and

Ogden, 2011: 2285-2300). Teams of engineers brainstorm and identify probable flaws in design so that designs can be improved during the design phase using design tools such as failure modes and effects analysis (FMEA) (Faludi *et al.*, 2020:8174). Quality function deployment (QFD) also known as the 'house of quality' is an approach to design that enforces communication between engineers and marketers (Faludi *et al.*, 2020:8174).

Management tools

Management tools can be considered not only as tools but also as concepts and approaches utilised with a great view to achieving customer satisfaction (Foster, *et al.*, 2011: 2285-2300). Management tools include:

- (1) On-the-job training, which creates a work culture, which is encouraging quality production (Bouranta *et al.*, 2020:729-769);
- (2) Change management this involves different approaches to directing the implementation of new ideas and strategies to perform tasks (Foster, *et al.*, 2011: 2285-2300);
- (3) Human resources management (HRM) is the process with major focus on talent management which includes leading and guiding people toward the benefit and goals of the organisation (Ren *et al.*, 2022:75-90);
- (4) Systems thinking is a tool utilised to holistically view processes with a view to comprehend and understand how components of a system interact in creating value for customers (Hulme *et al.*, 2019:164-183);
- (5) Contingency theory argues that companies are different; therefore, managers/leaders need to practice agility and adapt to bring forth positive change given their particular organisational context, culture and competitive setup (Foster *et al.*, 2011: 2285-2300).

The tools are a broad collection of approaches that can be utilised to improve supply chain quality and operations of organisations (Foster *et al.*, 2011: 2285-2300). Furthermore, the author alluded that companies are different and it is, therefore, important for organisation to first conduct and determine the challenges faced to select and utilise relevant tools in problem-solving. A summary of the tools and their relevant categories are summarised in table 4 below.

Table 4: Summary of tools to improve supply chain quality

Process tools	Benchmarking, Focused Factory, JIT, ERP, Lean, Awards, Six Sigma, Fail-safing and DMAIC (Foster, Wallin and Ogden, 2011: 2285-2300).
Basic tools	Data Analysis, Project Mgt., Surveys, JIT PIT Teams, Costs of Quality , PERT , seven Managerial and basic Tools and 5-S (Foster, Wallin and Ogden, 2011: 2285-2300).
Statistical tools	Control charts, Computer-aided Testing (CAT), Computer-aided Inspection and Gage R&R (Foster, Wallin and Ogden, 2011: 2285-2300).
Supply Chain Tools	Supply Chain Management, Single Sourcing, Customer Relationship Management, Complaint Resolution, Supplier Evaluation and development, Customer Benefits Package, ISO 9000 and SERVQUAL (Foster, Wallin and Ogden, 2011: 2285-2300).
Design Tools	Environmental Design, QFD, Design Teams, FMEA, DMADV, CAD, Concurrent Design, Prototyping, Quality Assurance Design, DOE, Design for Manufacture and Robust Design (Foster, Wallin and Ogden, 2011: 2285-2300).
Management tools	Leadership, Human Resources Management including on the job Training, Reliability Measure, Systems Thinking, Contingency Theory, Deming, Quality circle, PDCA, Crosby, Change Management, Juran, Hoshin Planning and Malcolm Baldrige Award (Foster, Wallin and Ogden, 2011: 2285-2300).

2.8 Methods of prioritising of factors that influence supply chain

Literature provides several methods to analyse factors to derive trends and relationships. These methods are discussed below.

2.8.1 Analytic Hierarchy Process (AHP)

An Analytic Hierarchy Process (AHP) is a multi-criteria decision-making method that is broadly used to determine the weights of criteria and priorities of alternatives in a structured way that is based on the pairwise comparison (Liu, Eckert and Earl, 2020:1). AHP is highly useful when finding decisions regarding complex problems. It is different from other decision-making methods since it quantifies criteria and options that traditionally are difficult to measure with just numbers, said Liu, Eckert and Earl (2020:1).

2.8.2 Analytic Network Process (ANP)

Analytic Network Process also known as “ANP method” is a decision-making method that adapts to the non-independent “hierarchical structure”. The main difference between the ANP and AHP methods is that the ANP rule is applied to problems that are related where the schemes or criteria are mutually dependent, while the AHP method, on the other hand, is only utilised to solve related problems when criteria are mutually independent (Rahmayati,2021:259-270).

2.8.3 Hierarchical Structural Interaction Method (HSIM)

This matrix helps in relating one factor to the other. The problem of prioritising factors has been pursued using various research methods for centuries. HSIM considers all elements/factors through a pair wise comparison matrix. A given element pair may interact in several ways. However, only interaction according to some particular contextual relationships is relevant to the problem under consideration. Contextual relations often consider an orientation that exists among factors influencing a system of study.

2.9 Conclusion

The literature discussed the origins of supply chain and supply chain management, and its evolution from individually managed entities to an integrated approach.

Secondly, the literature review also discussed quality management, supply chain costs, supply chain quality, and factors that influence supply chain quality. In addition, quality management techniques, as well as improvement tools, were also discussed.

CHAPTER 3: RESEARCH DESIGN AND METHODS/METHODOLOGY

3.1 Introduction

This chapter discusses the research design, interview questions (measuring instrument), and the data analysis techniques used to meet the objectives described in chapter one. This study was qualitative in nature. The data was collected from a purposively selected sample in the selected Company X.

The researcher used the research onion to develop a research framework for the study. A research onion is a six-layered framework with each layer covering a detailed aspect of the study as depicted in Figure 5 below.

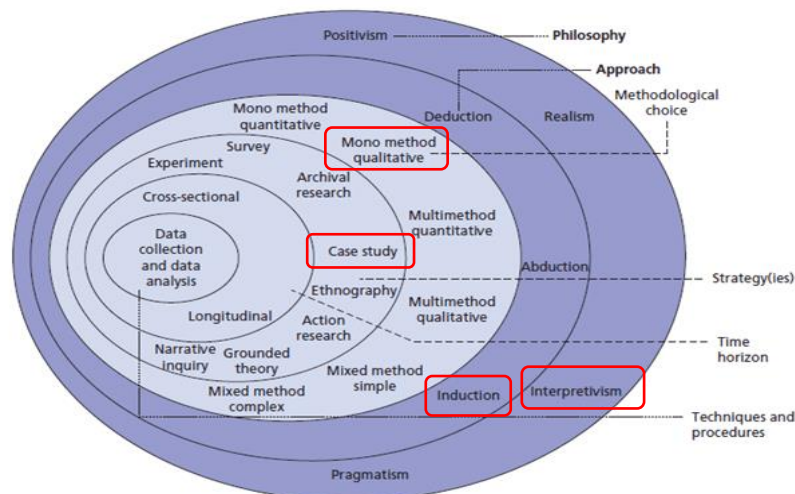


Figure 5: Research Onion

Source: Saunders *et al.*, (2019)

3.2 Research paradigm/philosophy

A paradigm can be described as an important set of beliefs shared by scientists/researchers. It defines a set of agreements on how problems are understood. There are four main philosophies namely:

1. Pragmatism, this paradigm is often used to find the weaknesses in the study and therefore strengthen it by applying a mixed method.

2. Positivism, this paradigm is also called the Scientific Method or Empirical Science study, this paradigm is focused on obtaining knowledge through observation and experiments.
3. Realism, which is also called advocacy, this paradigm is also known as the critical paradigm, it is meant to address issues of inequality, empowerment, suppression, oppression, domination, and alienation. and lastly,
4. Interpretivism, this paradigm is also called the constructivism paradigm, is focused on obtaining a deep understanding and interpretation of concepts said Rahi (2017:1-5).

The study followed the interpretivism philosophy. Interviews were conducted to understand the supply chain quality challenges being experienced by this Gauteng-based company. The purpose of this was to effectively answer the research questions.

3.3 Research approach

There are two popular research approaches, namely the inductive and deductive. The inductive approach drives the researcher to make up themes from the collected data and therefore develop a theory. On the other hand, the deductive approach drives the researcher to identify the theme or patterns before collecting the data, and therefore use the analysed collected data to match the pre-defined themes. In this way, the predefined themes/theories are either proved or disproved (Rehman and Alharthi. 2016:56).

The study adopted the inductive approach. From the interview responses, the researcher will identify trends and themes, and develop key factors that influence the supply chain quality challenges being experienced by the Gauteng-based organisation.

3.4 Methodological choice

Amongst the five methodological choices presented on the research onion in figure 5, the three most common choices are the qualitative, quantitative, and mixed methods (a combination of the qualitative and quantitative methods) said Rahi (2017:1-5).

Researchers use the qualitative method to collect in-depth details on a specific topic. It is highlighted that this method is used when researchers want to observe an environment to develop a theory.

On the other hand, the quantitative method is a scientific method that focuses on describing the data instead of interpreting data (Rahi, 2017:1-5).

The qualitative method was selected for the study. This is because the researcher wanted to collect in-depth details using structured interviews in an attempt to achieve the objectives of the study.

3.5 Research Strategy

A research strategy can be defined as an overall plan on how to answer a set research question. There are several research strategies as indicated in the research onion. However, the common ones are:

- Experiments are used to examine the dependency of variables.
- Surveys, are a strategy that is often used in social sciences and is mostly linked with the deductive research approach.
- In case of studies, with this strategy, the focus is on a particular issue it is usually selected when the researcher has little control over events.
- Action research, this strategy involves collaboration, discussion, and action among the participants and researcher (Edwards and Burns, 2016:6-15; Rahi, 2017:1-5).

The research study was characterised as a case. Company X was selected for the study. The researcher had little to no control or influence over the supply chain.

3.6 Time horizon

Researchers define a time horizon as a specific period covered by a study in conjunction with the time the data collection and analysis were carried out. There are two types of time horizons:-

- Cross-sectional which highlights a single snapshot in a specified period, and
- Longitudinal time horizon on the other hand highlights multiple snapshots over a certain period said Alturki (2021).

The study adopted the cross-sectional approach (the primary data collected from the sample was limited to a set period).

3.7 Study Participants

Casteel and Bridier (2021:341-362) define study participants as a group of individuals who voluntarily become the subject of a research study. The study comprised of six purposively selected participants. The six participants were selected as representatives from six departments namely: the procurement and planning, quality, health and safety, sales and finance, production (technical experts), and logistics (inbound and outbound) departments. These targeted participants are key decision-makers in the respective departments.

As a contingent measure, and to ensure saturation, an additional six other participants were identified. These were on standby and were to be approached to replace any in the sample due to unforeseen circumstances or if saturation was not achieved. The additional six were selected on the same basis as the initial six.

3.7.1 Description of study participants

In this research, participants were selected based on the following three factors:

1. Years of experience – participants should have been working at Company X for at least 2 years.
2. Role in supply chain division: Participants should have an active role in the supply chain departments, whether by overseeing or operational.
3. Academic qualification:
The participant should have a post-matric qualification relevant to their role in the supply chain.
4. Key decision makers who impact the supply chain system.

According to Campbell *et al.*, (2020:652) when the participants are selected according to how knowledgeable they are about the subject matter, they can provide value-adding responses, which is essential in effectively answering the research questions and ultimately achieving the research objectives.

3.8 The measuring instrument

A qualitative approach through structured interviews was used to generate information. The main purpose of a structured interview is to ensure that the same

questions are asked to every participant. This makes it easier to compare information between participants and conclude.

To maintain consistency across interviews, the following was observed:

- All questions were typed and emailed to the participants in advance.
- The typed questions were in detail so that they can be used verbatim during interviews.
- The sequence of questions was pre-decided and consistent across interviews.
- Permission to record was obtained.

The questions were adapted from a study conducted by Frederick and Elting (2013:164-184), “Determinants of green supply chain implementation in the food and beverage sector” which will be used as guideline interview questions for the proposed study. The researcher modified the questions to suit the study objectives. Permission to use the interview was sought and granted. The interview questions utilised are tabled below.

Table 5: Interview questions for proposed study

Question	Purpose
1 What (if any) are the common supply chain issues you have faced in the organisation for the past 12 months?	To explore the major quality issues in the supply chain of the Gauteng based manufacturing organization and identify major themes/factors.
2 What are the cost implications for the supply chain quality issues?	To explore the main root causes of the issues, based on their expert opinion.
3 How (if need be) can we improve the supply chain quality issues in the organisation, what steps should be taken?	To explore if good quality is part of the strategic plan from the senior management of the steel manufacturing company.
4 Which stakeholders (internal and external) get involved in the supply chain quality related decisions and what is their involvement?	To explore if the organization collaborates with customers and suppliers
5 How is the supply chain quality of your work and /or subordinates work measured?	To explore if individuals are accountable for the quality of their work

3.9 Collection of Information

The information was collected using structured interviews. The interview meeting request was sent to each participant, which indicated the time and place of the interview. All interviews took place online via Zoom meetings.

This eliminated the risk of the interview schedule being affected by COVID 19, where a participant could have been isolated/quarantined and unable to attend the interview session. The recorded data was stored on Google drive and only the researcher and study leader (supervisor) will have access to the drive.

The participants received the interview questions before the interview date to give them time to prepare. The interview questions were:

- Relevant: prompting the participants to discuss the current processes and common supply chain quality issues in this Gauteng-based company. For example, each question prompted the participants to refer to the case organisation only.
- Open-ended questions: Allowed the participants to answer diversely. Open-ended questions also encouraged the participant to justify their response allowing the researcher to obtain more detailed data.
- Unbiased Questions: the questions were not leading.

3.10 Data analysis

The data collected from the interviews were analysed using the thematic analysis approach. Braun and Clarke (2021:37-39) defined thematic analysis as a process of coding and developing themes. Linneberg and Korsgaard (2019:259-260) defined coding as the process of minimising data by examining a portion (statement, a paragraph, or a page) and then labeling that portion with a word or short phrase that will summarise its overall content.

Given the information, the study followed the data analysis presented in Figure 6 below.

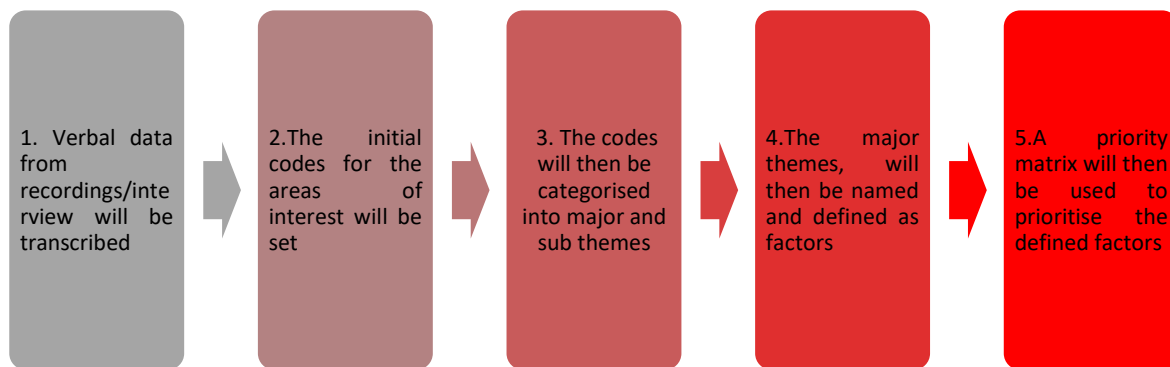


Figure 6: Data analysis steps

Step 1: Transcription of recording

The recorded interviews were transcribed verbatim as per appendix B-F.

The reliability of the transcriptions was enhanced by checking and re-checking of the transcription against the original recording.

Step 2 and 3: Coding and Theme identification

Coding is described as the process of marking data with identifiers that include a theme, phrase or keywords (Myers, 2013). In this study, the data was grouped into categories based on the identified codes. Grouping coded data allows diversity in the data to begin to take form (Myers, 2013). The coding process used in the study is summarised on the figure below.

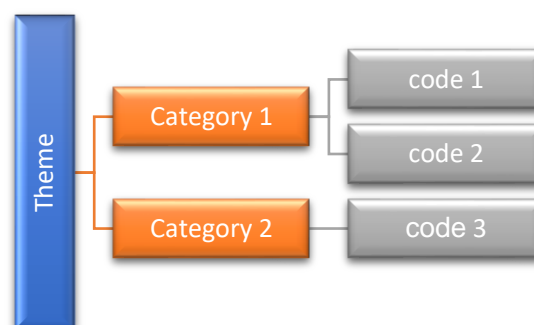


Figure 7: Coding Process

Step 4: Identification of factors from major themes

In order to identify the major themes, the number of frequencies at which each theme was recorded from the interview transcript. These major themes were considered and listed as the factors that influence to supply chain quality.

Step 5: Prioritising factors using HSIM

The step-by-step approach to implementing the HSIM prioritisation scheme is presented on the flow chart below. The flow chart depicts the necessary steps mandatory to carry out the pair-wise interface of factors; this is conducted prior to the consolidation of the binary interaction matrix (BIM), which takes into consideration all factors that interact.

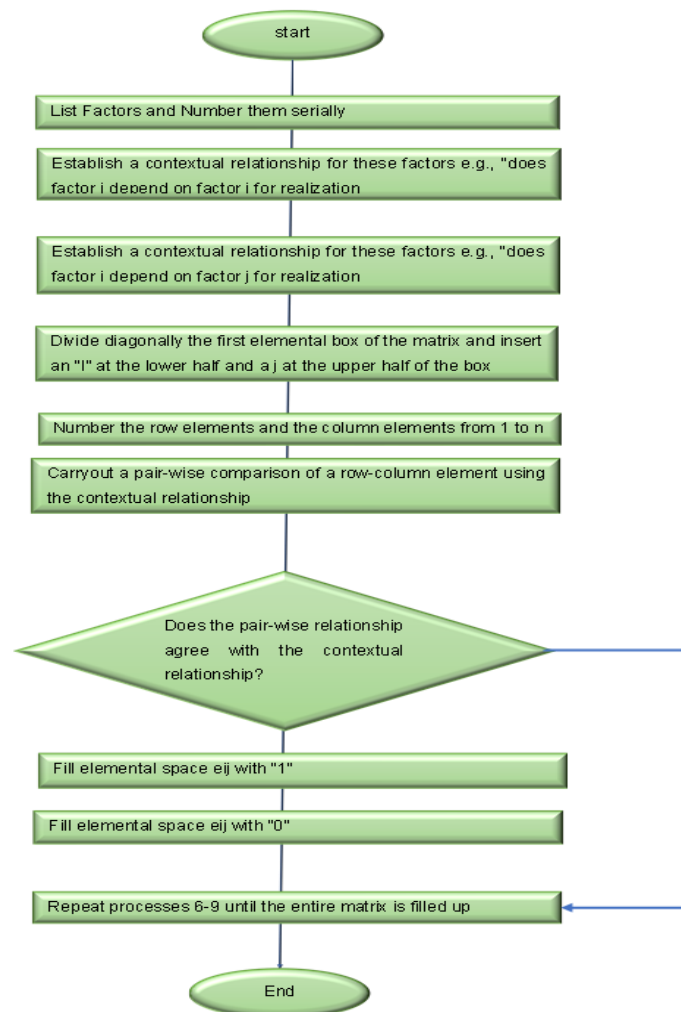


Figure 8: HSIM Implementation process

3.11 Trustworthiness

Trustworthiness of a study according to Pilot and Beck (2014), refers to the degree of confidence in the information collected, how it was interpreted, and methods used to ensure the quality of a study

Furthermore, the protocols and procedures necessary for a study to be considered worthy of consideration by readers should be applied.

Purposive sampling was used in this study. According to Campbell *et al.* (2020:652), the reason for purposive sampling is that it allows better matching of the sample to the research objectives, hence improving the trustworthiness of the data and results.

In addition, the participants were selected based on their experience, knowledge, qualification, key decision-making capabilities, and their impact on the supply chain, thus increasing the trustworthiness of the findings.

Furthermore, the verbatim recordings ensured the accuracy (transferability) of the transcribing process and the debriefing with the Participants.

3.12 Ethical considerations

Research ethics incorporates the application of fundamental ethical philosophies to all research activities which include the research design and implementation, respect towards humanity, the fair use of resources and research outputs and the holistic regulation of research (Resnik, 2020). There a lot ethical consideration which can differ from study to study, however the key amongst all is to ensure protection of human participants, ensure welfare of animal subjects, protection of personal data and also respecting intellectual property, Resnik (2020) further highlighted.

The sample in this research does not include vulnerable groups such as minors (people under the age of 18 years), prisoners, pregnant women, fetuses, mentally disabled persons, and economically and educationally disadvantaged persons.

Secondly, the researcher acquired written permission (Appendix B) from the owners of Company X (the executive team)

Thirdly, it was made clear to the study participants that participation was voluntary. An informed consent form (Appendix C) was sent to each participant. The consent form acknowledged the conflict of interest, and anonymity of the participant and provided the awareness that participation is voluntary.

Concerning the POPI Act that took effect on the 1st of July 2021 (the act is focused on data protection for citizens), the informed consent form was to inform the participants that the recordings of the interview are to be secured. The participants'

names, job titles, etc. were protected. The results of the study will be shared with organisation

3.13 Summary of Research Methodology

Table 6 below summarises the selected research methods for the proposed study.

Table 6: Summary of Research Methodology

Research paradigm	Interpretivism
Research approach	Inductive
Methodological choice	Qualitative
Research strategy	Case Study
Time horizon	Cross-Sectional
Study population and sampling	Non-probability- purposive sampling
Designing the measuring instrument and data collection	Semi-structured interviews
Data analysis	Thematic and content analysis
Reliability and validity (trustworthiness)	<ol style="list-style-type: none"> 1. Participants selected based on their knowledge on the subject. 2. Recorded interviews for referring 3. Debriefing with participants.

CHAPTER 4: FINDINGS AND DISCUSSION OF RESULTS

4.1 Introduction

This chapter provides the interview findings. The findings indicated the topical factors which were then coded to show the corresponding frequencies and significance.

A sample of six participants was used in the study. Each participant was asked five structured questions. The questions were designed to answer the research objectives presented in chapter one.

4.2 Interview Results

Presented below are the responses. One interview question is presented in each section, and all responses to that question from the six participants are discussed at once.

4.2.1 Results and discussion of Interview Question One

“What (if any) are the common supply chain issues you have faced in the organisation for the past 12 months?” Annexure B

An array of factors such as long lead times, poor communications (internal and external), low process stock inventory, production losses, inefficient ERP System/Technology, and environmental and political factors were sighted as problem areas affecting the supply chain system of Company X by the six participants.

A majority of the participants highlighted that most of their supply chain issues were due to the lack of input inventory i.e. stock-out. It was stated that raw material stock-outs were being caused by poor internal planning, lack of cash flow, unreliable suppliers, and the inability to source specialised input material. Furthermore, participants mentioned that there are a few suppliers and the supply chain is global. This lack of inventory affected the inbound, production, and outbound processes within the organisation, it was further explained.

Environmental (nature) and political factors were identified. However, the participants separately acknowledged that these were beyond their control. Participant 2 indicated that these factors played a major role in disrupting the supply chain. The issue of Covid-19 was topical. This led to world-wide restrictions that disrupted global supply chains such as the temporary closure of the Shanghai Harbour. Company X sourced input material was affected by this.

During the first quarter of the year 2022, South Africa experienced major floods. Durban (a port city in Kwazulu-Natal), which is home to one of South Africa's biggest docking harbour, experienced massive floods and the destruction of supply chain infrastructure. Company X was not spared by this.

Also, Russia and Ukraine's political conflict turned into a war, which has affected the global supply chain and demand status. This ultimately affected Company X. Prices of raw materials increased and suppliers prioritised customers with the best cash flows (suppliers were managing their debt collection period), thus Company X was not prioritised.

The participants further highlighted that technology at Company X, especially the ERP systems contributed to the supply chain issues experienced. One of the Participants mentioned that the two systems in use are not synchronised (work in silos). This is despite that both are used to make critical supply chain decisions, thus opening room for errors and making decisions with limited information.

In addition, the accuracy of the ERP systems was also questioned. Participants said that the information obtained from the ERP systems was not reliable. This is detrimental to Company X as decisions are based on the information from the ERP systems.

The reviewed literature in chapter 2 identified these same common factors that affect the quality of supply chains. The above results and discussion on interview question 1 also helped to answer the research question presented in Chapter one: **“What are the supply chain quality challenges currently being faced by the organisation company?”**

4.2.2 Results and discussion of Interview Question Two

“What are the cost implications for the supply chain quality issues? – Annexure C

The participants generally agreed that all the factors identified in question one had cost implications on Company X.

It was highlighted that stock-outs (lack of inventory), not only contributed to the loss of potential sales but contributed to labour and other manufacturing overhead costs. Without stock, the company could not manufacture any product and this led to idle employees. However, the employees expected to get fully remunerated. The company incurred costs due to this in the past 12 months. In addition, there was the threat picketing and striking from employees, loss of talent, low employee morale, and employee self-rewards (theft).

The participants also highlighted that Company X still used paper-based transactions as part of the ERP system. Apart from the huge cost of printing paper, the system has high lean waste (time and speed related). This has hindered the ability of company X to compete efficiently in the market for the past 12 months.

Furthermore, it was stated that Company X has 17 sustainable development goals to be achieved by 2030. Goal number 15 speaks to preserving life on land by protecting, restoring, and promoting sustainable use of ecosystems, sustainably managing forests, combating desertification, and also eliminating and reversing land degradation and biodiversity loss. The paper-based processing is, unfortunately not aligned with the goal.

From the above, supply chain quality had cost implications. This is supported by literature. The literature presented in Chapter 2 revealed that inefficient processes lead to waste, which has cost implications. Also, the literature indicated that up to 55% of the costs are from the supply chain i.e. purchase price of the material (inbound), processing of the product which includes labour (underutilised as well), and manufacturing overheads (production), and costs related to the distribution of the product to the customer (Lapinskaite and Kuckailyte, 2014).

The discussion on interview question 2 also helped to answer the research question presented in Chapter one: “***What do these identified challenges (identified in question 1) mean for the industry in terms of operational performance (cost)?***”

4.2.3 Results and discussion of Interview Question Three

“How (if need be) can we improve the supply chain quality issues in the organisation, and what steps should be taken?” – Annexure D

The participants agreed that the inventory levels, production processes, suppliers/sourcing, technology/ERP systems, and communication are the factors that need improvement to ease the supply chain issues experienced by the organisation.

It was highlighted that the adoption of inventory management techniques such as consignment stock and safety stock can remedy the supply chain issues experienced by Company X. In addition, the participants mentioned that automation of some processes through technology should also be considered together with the sourcing of an ERP system that provides a better fit, and reflects the organisation’s operations.

Participant 2 indicated that localising the sourcing of raw materials can improve supply chain issues related to longer lead times which are prone to delays, especially due to factors beyond the organisations’ control. This confirmed that suppliers play a major role in the success and efficiency of supply chains.

Lastly, the communication channels should be improved to ensure accurate and timely information flow to avoid misunderstandings and uninformed decisions.

The discussion on interview question 3 helped to answer the research question presented in Chapter one: “***Which operations techniques can remedy the supply chain quality issues?***”

4.2.4 Results and discussion of Interview Question Four

“Which stakeholders (internal and external) get involved in the supply chain quality-related decisions and what is their involvement?” – Annexure E

The participants indicated that the executive/management team, the employees, and the suppliers are involved in decision-making processes that influence the supply chain quality within the organisation.

It was explained that the executive team, together with some of the senior managers were responsible for the development of strategies regarding supply chain quality, and the employees, on the other hand, were responsible for the execution thereof. In most cases, employees were the ones that carried out the day-to-day running of the supply chain activities.

The participants further added that suppliers also played a role in the decision-making regarding supply chain quality, especially during new product design stages.

Contrary to the literature, the participants did not mention customers or competitors as stakeholders within the supply chain. According to the literature, customers should be the main drivers of SC quality decisions in every organisation (Virima, Sandada, Ndoro, & Chuchu, 2019). It is important to have all the stakeholders who play a role in supply chains get involved in decision-making.

On the other hand, competitors should also influence every quality decision made in the organisation. The aim is to always be better than the competitor in all aspects of the business (Virima, Sandada, Ndoro, & Chuchu, 2019).

Government and Society were also not identified as stakeholders. The government often imposes national and international regulations that affect supply chain activities, which can then further influence the quality. From the factors identified in question 1 (4.2.1), the organisation experienced issues based on decisions made by the government and for the betterment of society. Thus, the organisation must develop initiatives that will involve all stakeholders.

4.2.5 Results and discussion of Interview Question Five

“How is the supply chain quality of your work and /or subordinates' work measured?”

– Annexure F

The results of the interview revealed that: lead-times, inventory, and processes are factors monitored as key performance indicators of the supply chain.

The participants indicated that lead times throughout the supply chain holistically are one of the key performance indicators. These are the lead times to source raw material from the inbound perspective, the lead time to process whether inventory or documentation from the production perspective and lastly the lead time to deliver the final product to the customers from the outbound perspective. The lead time also includes the turnaround to give feedback internally and to the customers.

Inventory, a major asset in every company, was mentioned as one of the key performance indicators in the organisation as well. Participant 4 indicated that inventory turnover is monitored since it is critical for operations.

The participants also mentioned that production and ERP processes are key. It was highlighted that adhering to procedures (doing it right the first time) is important and is monitored.

However, based on the responses provided in interview questions one and two, and coupled with the 6% increase in supply chain costs, the organisation did not do well in the period under review. For example, miscommunications and unreliable ERP systems were singled out to have negatively influenced the production processes.

4.3 Analysis and Prioritisation of identified factors

Table 7 below summarises the individual factors and their frequencies. The frequency is the number of times the factor was mentioned by the six participants during the interviews.

Table 7: Factors influencing supply chain quality in Company X

No.	Factor	Colour code	Frequency
1	Lead time	Yellow	9
2	Communication	Light Green	3
3	Inventory	Blue	14
4	Processes	Dark Green	12
5	ERP Systems/Technology	Purple	4
6	Environment	Red	3
7	Supplier/Sourcing	Pink	9
8	Management	Light Grey	5
9	Labour /Team	Dark Grey	3
10	Politics	Orange	1

The factors were subjected to the Pareto analysis technique and table 8 and figure 9 shows the trend.

Table 8: Representation of factors – Pareto table

Factor	Frequency	Factor contribution (%)	Cumulative frequency (%)
Inventory	14	22	22
Processes	12	19	41
Supplier/Sourcing	9	14	56
Lead time	9	14	70
Management	5	8	78
ERP Systems/Technology	4	6	84
Labour /Team	3	5	89
Environment	3	5	94
Communication	3	5	98
Politics	1	2	100
Total	63	100	

The Pareto analysis showed that inventory issues, process problems, sourcing problems, management, and lead times issues accounted for 80% of the supply chain disruptions over the past 12 months.

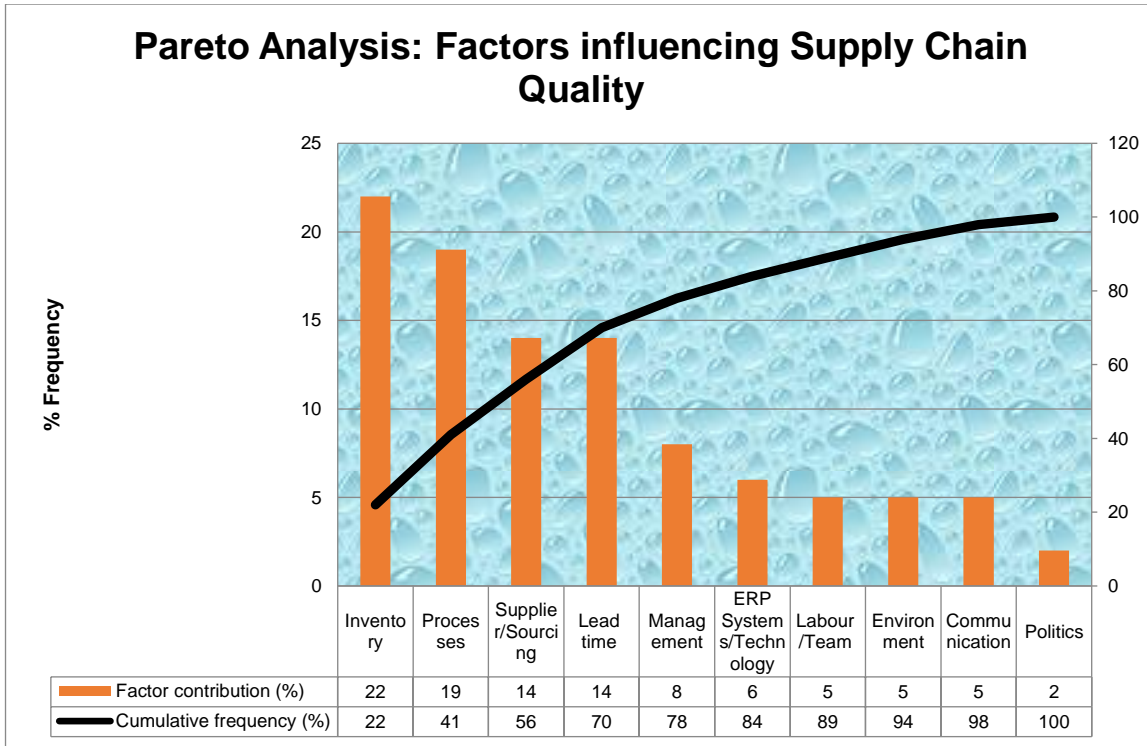


Figure 9: Pareto Analysis of major factors influencing supply chain quality at Company X

In addition, a **HSIM (BIM)** analysis was conducted in order to identify how the factors influence each other. The BIM matrix is presented in table 9 below.

Table 9: Results of BIM matrix

i \ J	Lead time	Communication	Inventory	Processes	ERP Systems/ Technology	Environment	Supplier/ Sourcing	Management	Labour /Team	Politics	Influences
Lead time	1	0	1	1	1	0	0	1	1	0	6
Communication	1	1	1	1	1	0	1	1	1	0	8
Inventory	0	1	1	1	0	0	0	1	1	0	5
Processes	1	1	1	1	1	0	1	1	1	0	8
ERP Systems/Technology	1	1	1	1	1	0	1	1	1	0	8
Environmental	1	0	1	1	0	1	1	1	1	1	8
Supplier/Sourcing	1	1	1	1	0	1	1	1	0	0	7
Management	1	1	1	1	1	0	1	1	1	0	8
Labour /Team	1	1	1	1	1	0	0	1	1	0	7
Politics	1	1	1	0	0	1	1	1	1	1	8
Influenced by:	9	8	10	9	6	3	7	10	9	2	73

The results of the BIM Matrix revealed that, out of ten factors:

- i. **Lead time is** influenced by nine (9) factors while influencing six (6) factors.
- ii. **Communication** is influenced by eight (8) factors while influencing eight (8) factors.
- iii. **Inventory is** influenced by ten (10) factors while influencing five (5) factors.
- iv. **Processes are** influenced by nine (9) factors while influencing eight (8) factors.
- v. **ERP Systems/Technology** is influenced by six (6) factors while influencing six (6) factors.
- vi. **Environmental** is influenced by three (3) factors while influencing eight (8) factors.
- vii. **Supplier/Sourcing** is influenced by seven (7) factors while influencing six (6) factors.
- viii. **Management** is influenced by ten (10) factors while influencing eight (8) factors.
- ix. **Labour /Team** is influenced by nine (9) factors while influencing seven (7) factors.
- x. **Politics** is influenced by two (2) factors while influencing eight (8) factors.

From the BIM matrix results, inventory and management are affected by all the identified factors. Factors such as production and hand processes, communication, ERP system/technology, management, and politics affect the majority of the factors.

The Pareto analysis showed the 20% factors that influence 80% of the supply chain quality within Company X. On the hand, the BIM matrix highlighted that inventory, management, leads times, processes, and labour/teams are the major problematic issues and that inventory is affected by all the other factors. This means these issues are of paramount importance and sensitive to the variation of the other nine factors. This supported the Pareto results.

4.4 Chapter Summary

Six participants were involved in this qualitative study to explore factors that disrupted the supply chain and resulted in a 6% increase in costs for the financial year ending January 2022. A total of 10 factors were found and these were lead time,

communication issues, inventory, processes, ERP Systems/Technology, Environment, Supplier/Sourcing, Management, Labour /Team, and Politics.

A Pareto analysis of these factors showed that inventory issues, process problems, sourcing problems, management, and lead times issues accounted for 80% of the supply chain disruptions over the past 12 months. The mechanisms of how these factors disrupt the quality of the supply chain were explained.

BIM matrix highlighted that inventory, management, lead times, processes, and labour/teams are the major problematic issues and that inventory is affected by all the other factors.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The study thus far consisted of a literature study, followed by a qualitative study. Six participants were interviewed to come up with the factors that influenced supply chain efficiency in Company X.

These responses were analysed qualitatively and then the derived ten factors analysed using Pareto and HSIM (BIM) techniques. Some conclusions can be drawn from the analyses. Due to the trustworthiness of the research, the results can therefore be regarded as valid and reliable.

5.2 Results from the Literature and the Interview Studies

From the literature study, several factors have been found to affect quality in the supply chain. The analysis of the qualitative study results indicated a total of ten factors that influenced supply chain quality in the company. Conclusions and recommendations regarding these factors will be presented in this section.

Furthermore, the results of the literature and the qualitative study will be compared and measured against the primary and secondary research objectives.

5.2.1 Conclusions from the literature

The literature gave all aspects of the supply chain. The definition, history, and most importantly the factors affecting supply chains were given. In addition, the supply chain costs drivers and their implications were also explained together with the improvement methods. This ensured that the first secondary objective was met by the study (to review relevant literature on supply chain quality and its associated elements and costs).

A proper research design was presented in chapter 3. This ensured that the second secondary objective of the study was met (to design a research methodology that will explore the supply chain quality issues experienced by Company X).

5.2.2 Conclusions from the study

The structured interviews revealed ten factors that influenced the supply chain at Company X. These were inventory (stock-out) issues, production processes, supplier/sourcing problems, lead times, management issues, ERP systems/technology, labour /team, environment, poor communication, and politics.

The Pareto analysis showed that inventory issues, process problems, sourcing problems, management, and lead times accounted for 80% of the supply chain disruptions. Furthermore, the HSIM (BIM Analysis) indicated that inventory and management issues were the major drivers of the supply chain issues. These two were the only factors under the influence of all the other factors.

This analysis ensured that the main objective and third secondary objective of the study were met. The main objective was to explore the factors that influence supply chain quality and the perceptions of key supply chain players within the organisation (sample) while the third objective was to explore the major supply chain quality problem areas and prescribe relevant operations techniques to minimize or eliminate the supply chain quality issues.

These ten factors were isolated as the causes of the 6% increase in supply chain costs over the one-year financial period ended January 2022.

5.2.3 Recommendations

Therefore, the initiatives that can improve the supply chain quality in Company X should focus on stabilising all factors but primarily the inventory, management, lead times, processes, and labour/teams.

Table 10:Recommendations table

Factor	Recommendations/Improvement Action	Who and When
Inventory Issues	<p>Inventory management techniques such as safety stock and consignment stock can be utilised.</p> <p>Lean techniques can be implemented i.e. Just –in-time, that allows the organisation to only hold inventory that is required on a certain period, this allows for a company to have liquid cash that can be re-invested whether for process improvement initiatives or interest bearing savings.</p>	<p>Executive team</p> <p>Medium term</p>
Lead-time	<p>Conduct time motion studies in order to set and monitor targets in order to improve internal processing lead times. This also enables realistic lead-time delivery to customers to avoid unplanned overtime and outsourcing costs.</p> <p>Supplier evaluation can be used to monitor suppliers and the lead times. Imported materials however carry many uncertainties that cannot be monitored beyond the supplier lead-time.</p>	<p>Executive team</p> <p>Should be implemented immediately</p>
Supplier/ Sourcing	<p>Supplier relationship management</p> <p>Consideration of localising the sourcing of raw material to minimise the lead-time and negotiate on better pricing when buying in bulk.</p> <p>The organisation can in the future also consider and run a feasibility check to consider an upward vertical expansion.</p>	<p>Executive team</p> <p>Should be implemented immediately</p>
Management	<p>Management to adopt systems thinking culture and deployment of technology in not only production processes but also all processes required to complete the supply chain cycle. Set the initiative to get the employees voice heard during strategic planning. Employees implement the strategies.</p>	<p>Executive team</p> <p>Should be implemented immediately</p>
Processes	<p>Creating process visibility by implementing dashboards, which will allow everyone to view processes progress.</p> <p>The dashboard can be set to view only the important KPI's on the organisation such current sales, open orders, availability of inventory and efficiency of production. This will also enable</p>	<p>Executive team</p> <p>Should be implemented immediately</p>

	<p>key decision makers to act quicker when there are big variances without waiting for weekly or monthly reports.</p> <p>Making use of platforms such as adobe sign integrated with the cloud to minimise paper-based transactions and unnecessary movement of staff.</p>	
Communication	<p>High-level documentation of processes</p> <p>A reliable ERP system, which is linked to a dashboard that can be viewed by everyone in the organisation.</p> <p>A social internal communication platform such as connect teams that can be used to communicate the performance of the organisation and announcements within the organisation.</p>	<p>Executive team</p> <p>Medium term</p>
ERP Systems/ Technology	<p>A reliable ERP system and all key team members buy in. ERP systems are often custom made to fit the organisation process a reliable developer and a manager that will be able to obtain buy in from the staff and ensure that the "teething" problems of the system do not last longer than necessary.</p>	<p>Executive team</p> <p>Medium term</p>
Environment	<p>A rigorous risk assessment of potential environmental factors. In addition, collaboration with entities such as World health organisations (WHO) and United Nations or their partners will result in a more influential and informative risk analysis of environmental factors especially for non-natural events.</p> <p>Organisation must develop initiatives that will involve all stakeholders.</p>	<p>Executive team</p> <p>Medium term</p>
Politics	<p>A rigorous risk assessment of potential environmental factors using Contingency theory tool</p>	<p>Executive team</p> <p>Medium term</p>

The conclusions and recommendations given in table 10 above prove that the fourth objective was fulfilled (to draw feasible conclusions and recommendations on the factors that affect supply chain quality).

5.3 Limitations of the study

Firstly, this study should be repeated with a bigger sample size or more organisations so that the results can be generalised.

Another limitation was the issue of confidentiality. In most cases, participants' views are only possible if total confidentiality is assured. The organisation is small and so full confidentiality may not be guaranteed despite all the efforts (the participants were still in the employ of the company). The results may have some element of bias.

The study was limited to 12 months only. This may have induced some bias as the results would be limited to the period.

5.4 Future Studies

A study that focuses on more organisations within the same sector is needed to formulate sector-based supply chain quality issues.

Further studies that can quantify the contribution of each factor to the supply chain is suggested to fully understand the impact of each factor.

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7.0 ANNEXURES

ANNEXURE A: Questionnaire and Informed Form

Questionnaire

Key info: Please note that in this study, supply chain quality takes into consideration the following aspects: planning, sourcing, and receiving of raw materials, production, and distribution and storing of finished goods.

Kindly receive the following questions that seek to find answers to this research study. You have been selected as a participant because you are the subject expert and best suited to offer insightful answers to the below research questions

Questions:

1. What (if any) are the common supply chain quality issues you have faced in the organisation for the past 12 months?
2. What are the cost implications (if any) for the supply chain quality issues highlighted in question 1 (if any)?
3. How (if need be) can we improve the supply chain quality issues in the organisation, what steps (if need be) should be taken to mitigate the issues (if any) articulated in questions 1 and 2?
4. Which (if any) stakeholders (internal and external) get involved in the supply chain quality related decisions and what is their involvement?
5. How (if any key performance measures are available) is the supply chain quality of your work and /or subordinates work measured (if it is measured or measurable)?

Regard
RL SELEPE



Informed consent Form

INFORMED CONSENT FORM

RESEARCHER: NORTH-WEST UNIVERSITY: MBA-Research project
RL SELEPE 40057003
Cell: 0729220549
Email: Fentse3@gmail.com

STUDY SUPERVISOR BADNOCK MANDA (0718898674)

Dear respondent,

This Informed Consent form serves to confirm the following information as it relates to the research project titled: "An exploratory study of factors influencing the supply chain quality in a selected South African company"

1. The purpose of this study is to explore factors influencing the supply chain quality in a selected South African company.
2. The procedure to be followed is that of a qualitative research design, using structured questions in the interview whereby respondents are given the opportunity to communicate their views in response to each question.
3. The estimated duration time for the interview is 30 minutes, the interview will be recorded and recording will be stored on a Google drive for at least 3 years after the study, the recordings will however be accessed by ONLY the researcher and study leader/supervisor during that period.
4. The research is only for academic purposes and the results will be made accessible to the company and will not be published in the public domain
5. The name of the company will be identified as a forging company only
6. Should you feel uncomfortable at any point during the interview, you can make your discomforts known and immediately withdraw from participating, without any consequences.
7. Your participation is voluntary; therefore, no incentives (of any form) will be given.
8. The researcher is aware of the conflict of interest with reference to the roles within the company, therefore the anonymity will be maintained throughout the interviews. As such, the participants will be referred to as participants A or B or C at all times during the research.

9. The information you will provide will be used for academic research purposes and the research will not be published as a journal article or conference paper etc.).

10. The results of the study will be shared with the organisation, the anonymity will remain maintained.

11. With Reference to the POPI Act that took effect on the 1st July 2021, the act which is focused on providing protection for the citizen's private information, the interview will not ask for names, age, gender, position, department as these are clear identifiers. The interview recording will be password protected.

12. A summarised copy of the final report will be made available to the participant on request.

RL Selepe



I _____ hereby declare that I have read and understood the content of the Informed Consent Statement, and give my full consent to RL Selepe (40057003) to use the information from the interview in her MBA research project.

ANNEXURE B: Question 1 Coding

Factor	Colour code
Lead time	Yellow
Communication	Light Green
Inventory	Blue
Processes	Dark Green
ERP Systems/Technology	Purple
Environment	Red
Supplier/Sourcing	Pink
Management	Light Grey
Labour /Team	Dark Grey
Politics	Orange

Interview question 1: “What (if any) are the common supply chain issues you have faced in the organisation for the past 12 months

Response	Transcribed information
Participant 1	<p>“In the past 12 month, we faced supply quality issues such as delays on the sub-parts that are imported, we also experience miscommunication amongst teams where you find the planning team communication customer required materials over the phone with the stockyard personnel and the stockyard personnel misunderstanding the planner, this has occurred a number of times. I have to add that not having stock led to some supply chain quality issue we experienced in the past year, because we had to change suppliers to accommodate lead times with limited time to evaluate the suppliers”</p>
Participant 2	<p>“For us the the biggest issue was delays in Shanghai Harbour due to COVID lockdown there. So quality not so much the issue, but more or less the issue we had with delays. There was locked down for three months in in Shanghai. We tried to utilize other harbours but the main hub is Shanghai and that is that resulted in the delay of material to our supply chain. So that was one of the biggest issues we had there.</p> <p>We had problems regarding getting shipping containers. Containers are not available from overseas or locally, and there was very limited shipping schedules and shipping bookings available. Usually we could get a ship even a week. Now we have to wait for maybe two or three weeks for availability of a ship due to congestion due to so much backlog on transport or shipments.</p> <p>Both export import and export. We have issues with availability of shipping. On the supply side as well on the manufacturing of the "Sub-parts", we have problems there in China as well due to the Ukraine war.</p> <p>There's a global demand for the "sub-parts", is now directed to China for supply, since Russian market can be supplied anymore, therefore making difficult for China to meet all of the world's demand.”</p>
Participant 3	<p>“Stock out, Aging of smaller pieces of raw material inventory, poor reverse logistic process. In the past year we have been experiencing stock out of key raw material and non-moving inventory of other inventory, we call the "shorts". In addition, the process of return stock is not working. Stock can be returned for various reasons and yes one of the reason would be not meeting the specifications.”</p>
Participant 4	<p>In the past year we have been struggling with stock and we are stock out as we speak, this now lead to under-utilisation of machinery and staff, I think it is also important that I mention also that we have different systems that we use, one being an internal system and another being our ERP system.</p>
Participant 5	<p>“The ERP System requires a lot of human intervention which compromises the quality of the feedback or let me rather say the output information we extract from it.”</p>
Participant 6	<p>“The ERP system is unreliable, the information obtained from it cannot be trusted. One needs to make a call to the department in question to verify the information found on the system. The paper-based transaction lead to delays or processes not followed.”</p>

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ANNEXURE C: Question 2 Coding

Interview question 2: “What are the cost implications for the supply chain quality issues? “

Response	Transcribed information
Participant 1	“So the fact that we ran out of raw material stock, which we normally import, led to us having to locally source the raw material for quicker turnaround times, however an almost double the price. Because we could not carry all the cost, the unit price was increased and customers did not take it well.”
Participant 2	“Manufacturing loss due to shortage of stock is one of the cost we incur. The shipping cost also increase due to the increase in demand and no capacity (law of supply and demand) “
Participant 3	Some of the dead stock or non- moving inventory will need to be scrapped, which is costly. Customers get upset when they are not properly helped when they return a product that can lead to loss of a client and reworking in the units is addition labour cost and other materials cost. In addition, customer get upset when you do not have inventory to meet their demand.
Participant 4	The cost associated with this is that the staff still are paid for idling.
Participant 5	The admin of updating is the system is labours therefore people spend more time updating the system rather than doing their primary job. Therefore, labour cost is incurred.
Participant 6	Printing cost, storage cost, labour cost people are paid for non-value adding activities.

ANNEXURE D: Question 3 Coding

Interview question 3: “How (if need be) can we improve the supply chain quality issues in the organisation, what steps (if need be) should be taken to mitigate the issues (if any) articulated in questions 1 and 2?”

Response	Transcribed information
Participant 1	Having consignment stock can maybe help with the stock related issues.
Participant 2	To mitigate the issues, there are two options, firstly is to localise the supplier and keeping safety stock either on site or at sea goods in transit or by the supply.
Participant 3	Having safety stock can help resolve the stock out issues, and outlining a proper goods return process.

Participant 4	Safety Stock, localising suppliers and Capacity planning, Systems integration plan. In order for us not to experience stock-outs, we can have enough safety stock and maybe negotiate better prices from local suppliers so we can buy from them.
Participant 5	Something that can be done is re-assessing processes, evaluate if all are still relevant, and consider automating the process.
Participant 6	Get another ERP system, this one is not working and invest in paperless transactions technologies.

ANNEXURE E: Question 4 Coding

Interview question 4: “Which stakeholders (internal and external) get involved in the supply chain quality related decisions and what is their involvement?”

Response	Transcribed information
Participant 1	EXCO normally gets involved to provide direction. Also, The planner, Quality superintendent, all the supervisors in production since they are responsible for producing quality. The suppliers as well to deliver good quality and lastly the customers whose responsibility is to provide feedback Customers to provide overall quality feedback
Participant 2	The stakeholders would include the freight forwarder and the supplier. The organisation’s Management
Participant 3	EXCO for planning and all employees to execute
Participant 4	Exco , suppliers and shareholders play a role in ensuring good quality.
Participant 5	Executive team for supply chain quality strategies and employees to execute and Suppliers to meet specified requirements
Participant 6	Executive management team they set KPIs, Investors to fund ideas that improve the process and also employees to deliver good quality.

ANNEXURE F: Question 5 Coding

Interview question 5: “How is the supply chain quality of your work and /or subordinates work measured?”

Response	Transcribed information
Participant 1	The number of times a product or raw material were delivered on time, without any errors. This is based on our goal of delivering quality all the time.
Participant 2	On time Delivery, No damage to components this includes incoming raw material and finished products

Participant 3	Quality KPI's on our side include On-time delivery, good quality outputs and good inventory turnover.
Participant 4	The major KPI is an increase on the return on investment that only happens when you get outcome of what you paid for and that can't be the case if we pay staff for idling.
Participant 5	The number of tasks completed on time without any mistakes is one of the key performance indicators we having pertaining quality in our department.
Participant 6	Quality KPI on our side include tasks that are completed on time and doing so without any errors.