



**Use of electronic supply chain management in
overcoming uncertainty constraints:
South African textile industry**

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in fulfilment of the requirements for
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in Supply Chain Management

by

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Declaration

I, Muhammad Hassan Adam (210526175), declare that:

- i. The research reported in this dissertation; except where otherwise indicated, is my original research.
- ii. This dissertation has not been submitted for any degree or examination at any other university aside from the University of KwaZulu-Natal.
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Respondent wishes for anonymity were respected throughout the data collection, analysis and conclusion depiction stages of the study.

Signature 

Date: 24 July 2020

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- The research participants. To those who could not participate despite agreeing, thank you for being willing initially. To those who did participate so willingly and entirely voluntarily, thank you for your time and knowledge. This study would truly not be possible without your insights. I hope to pick your brains again soon in the future because there is so much more to ask.

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Abstract

Background: The impact of the internet and other technological advancements of the 21st century have improved business capability through speeding up global supply chains, driving innovation and widening the geographic scope of purchasing activities. However, such enhancements have detrimentally affected labour-intensive industries including the South African clothing and textile industry which has faced multiple job losses.

Problem: Economies of scale, enhanced technologies and lower labour costs have put international competitors at an advantage. Increased import tariffs have had a marginal impact. The impacts of Covid-19 have negatively impacted the spending power and confidence of consumers, causing demand uncertainty.

Purpose: It was proposed that the alignment of industry operators with the electronic supply chain management (eSCM) activities of worldwide industry leaders may provide respite to operators in the sector amidst uncertainty. The purpose of this study was to study the truth of this proposal.

Methodology: This proposal was tested in three stages. Firstly, a review of previous literature set out to explain the current uncertainties faced in the industry before providing an understanding what the possible forms of eSCM implementation are. Highlighted technologies included ERP, e-marketplaces and automation. Thereafter, the study shifted toward qualitative primary research.

First, a case study was conducted to the perspective of a selected company which had implemented eSCM practices. Comprising of open-ended questions posed to managers at the company, the case study studied the uncertainties it faces and eSCM activities used to thrive amidst these uncertainties.

The second part of the primary research involved face-to-face interviews with industry experts on the generalisability of the case study.

Results: It was evident that eSCM technologies positively impacted business' aims for efficiency, flexibility and improved communication to manage amidst uncertainty.

However, participants cite that inadequate commitment often rendered technology futile. Participants cited that gradual implementation would be fruitful.

Contribution: ESCM adoption has been studied in numerous industries globally. Not much literature focuses on local eSCM adoption, with previous research focusing on customer-facing organisations in the sector. This study included multiple tiers in the supply chain, with the company performing both retail and manufacturing activities.

Implications: SMME's nationwide should adopt needs-based eSCM practices, whether they are customer-facing or are involved in the transformation of clothing and textile goods.

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List of Acronyms

SCM: Supply Chain Management

eSCM: Electronic Supply Chain Management

ERP: Enterprise Resource Planning

EDI: Electronic Data Interchange

RFID: Radio Frequency Identification

EAI: Electronic Application Integration

POS: Point of Sale

GIS: Geographic Information System

B2B: Business to Business

B2C: Business to Consumer

SMME: Small, Medium and Micro Enterprise

QR: Quick Response

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Chapter One:

Introduction to the Study

1.1.Introduction

Operators in the national clothing sector face numerous challenges. Harsh economic conditions, labour disputes and the impacts of globalisation are amongst the issues which have created an environment wherein many could not survive. Despite being a significant contributor to the national economy (contribution toward GDP is 8%), the industry is a shadow of its former self, evidenced by a 52% decrease in employment between 2002 and 2010 (Booyesen, 2015).

A once-prosperous industry, the South African textile industry has declined considerably over the last 15 years, evidenced by numerous company closures and significant employment loss. Amongst the major roots of this deterioration is a failure to compete on a price basis with foreign competitors from Asian countries including China, India and Bangladesh who are capable of manufacturing finished garments at substantially lower costs than local counterparts (Moodley, 2016:10), (Barnes, 2014).

This chapter introduces this research study whose primary aim is to investigate the ability of eSCM adoption to assist companies operating in the sector to thrive amidst uncertainty constraints. This would fill the gap of industry-wide research pertaining to the benefits of eSCM on the sector and will add to research pertaining to the benefit of POS systems at a major retailer (Raza and Kilbourn, 2017).

1.2. Background and Motivation of the Study

The national textile industry has been reshaped drastically in the past 20 years, with changes being brought about through the impacts of globalisation and growing worldwide marketplace creating a greatly saturated sector wherein lower-level members of the clothing and textile supply chain such as consumers and retailers have more choice for both quality and price (Manson, 2016).

Hamdulay (2017) highlights the fact that, since the influx of globalisation has resulted in increased competition and market saturation, many companies have attempted to reduce their wage bills by downsizing to remain competitive and keep their market share. Other companies have been forced to close, with over 30 major companies closing in the past five years, costing over 50 000 people their jobs (Moodley, 2016).

These closures have affected more than just the owners and employees of these companies. Research suggests that a vast majority of the newly unemployed in the sector were the primary breadwinners in their respective households, resulting in an indirect detriment to approximately 400 000 citizens (Moodley, 2016).

These figures give credence to economist Michael Porter's statement of "Competing internationally is a necessity rather than a matter of discretion for many firms" (Kampanje, 2012), with companies compelled to compete with external factors whether they choose to or not. This study seeks to provide a basis for which local manufacturers can stake a claim in the industry by improving competitiveness through the management of uncertainty in such an uncertain environment.

With a national population of almost 55 million (Statistics South Africa, 2015:2), and the impact of globalisation causing an ever-changing fashion industry, the need for clothing and amenities like blankets creates an endless demand and the potential to create jobs for skilled and unskilled labourers and an opportunity for smaller growing companies to stake a market share. Globalisation, however, if used correctly may also enable a nation to improve its Gross Domestic Product (or GDP), with economies of scale, improved infrastructure, fewer requirements for imported technological goods and higher international sales resulting in growth for developing nations, as it did for China, which accounted for up to 13.6% of global exports as recently as 2016 (Elson, 2019).

Several stalwarts of the sector have altered their business models to cater for these changes, including Cape Union Mart's subsidiary K-Way (Hartzenberg, 2017), but many have been forced into either downsizing or ceasing to operate. Government

intervention including the inculcation of import tariffs and the rewarding of local manufacturing are positives, but evidence shows that there needs to be an effort by companies in the sector to alter their practices to cater for uncertainty.

Research in the United States of America shows that, “uncertainty is the biggest challenge,” facing textile companies. The impact of Covid-19 has affected many, with retailers in the United States such as J.Crew and Brookes Brothers closing down amidst reduced demand (Stone, 2020).

Similar sentiments have surrounded South African retailers and their suppliers, with Edcon, one of the nation’s oldest textile retailers, facing an uncertain future over the past decade (Manson, 2016). Uncertainties over the future of Edcon has resulted in uncertainty throughout supply chains, with cotton farmers fearing the impacts of Covid-19 may result in job losses along the entire cotton supply chain (van der Walt, 2020).

Uncertainties in business are inescapable. It is impossible to avoid the likelihood of unanticipated occurrences in the business context. (Zheng, 2012: 2) suggests the benefits of the studying of uncertainties which present themselves in the business environment and tackling them individually, citing the fact that uncertainties present themselves differently in different industries and companies. Sastac, (2014:3) discusses occurrences wherein uncertainty manifests for operators in the national textile industry.

According to Flynn, Koufteros and Lu (2016), supply chain uncertainty primarily unfolds in two ways; the uncertainty of demand and the uncertainty of supply. These forms of uncertainty are discussed below:

Demand uncertainty relates to risks related to the demand of goods or services which include distribution issues, the actions of industry rivals, the reputation of a brand, social media trends and customer sentiment (Schlegel and Trent, 2014). In the local

textile sector, demand uncertainty presents itself in numerous ways, for example, the bullwhip effect, which sees excess inventory and manufacturing occurring and the reduction of demand for local products due to the presence of new entrants such as H&M (Buthelezi, 2020).

Supply uncertainty relates to risks to supply of goods or services and relates to risks such as lead-time delays, quality failure, supplier continuity risks, compliance failure, channel complexity and a failure to communicate (Schlegel and Trent, 2014). This form of uncertainty too manifests in a multitude of ways, including labour strikes and wage disagreements, with unions holding a dominant position in a labour-intensive sector. (Moche, 2019) cites that South Africa has the world's worst recorded labour-employer relationships, with an "us against them" mentality existing between parties involved.

Giménez and Lourenço (2008:311) define eSCM as "the impact that the internet has on the integration of key business processes from end-user through original suppliers that provides products, services and information that add value for customers and other stakeholders". Wu and Chang (2012:474) extends on this, defining it as "the physical implementation of supply chain management process with a support of information technology". It is a collaborative use of technology to improve the operations of supply chain activities as well as the management of supply chains (Turban et al., 2012).

The benefits of this aspect of supply chain management include the rapid and precise sharing of information amongst supply chain partners. eSCM tools such as Point of Sale software, which is used in the dissemination of real-time data along the supply chain, and Enterprise Resource Planning (ERP) software, which is an organisation-wide tool used to connect supply and demand through data sharing, enable rapid and accurate information sharing (Mbhele, 2014:86), (Giménez and Lourenço, 2008:322).

Sectoral trade deficits noted by (Moodley, 2016) are an indication that there is a requirement to improve productivity and efficiency in the sector. Research advocates

use of the collaborative and cooperative nature of SCM activities, along with its emphasis on flexibility to deliver an adaptable model for businesses to function in a more efficient manner. However, apart from a study undertaken on the benefits of POS systems for forecasting activity, (Raza and Kilbourn, 2017:4), there are gaps in research on the usage of electronic supply chain management systems in the national textile sector.

This study takes a case study approach to study the impacts on eSCM on a company in the sector, referred to as Company A, which primarily supplies Edcon, the Mr Price Group and other major retailers items such as linen and curtaining, whilst also providing component parts for the manufacture of thermal wear. The researcher selected the company as it has gradually shifted from manual management and operations over the past decade, with newer members of management instilling the adoption of eSCM through the inclusion of email technology, an intranet, and an ERP system amongst others. The study focuses on the benefits of eSCM to the company which operates under uncertainty constraints. Thereafter, the study seeks to assess the generalisability of findings at the company.

1.3.Problem Statement

Supply chain uncertainty presents itself both internally and externally for organisations. A lack of communication and collaborative teamwork, amongst departments and companies alike, results in the reduced certainty amongst supply chain members.

The presence of uncertainties which are caused by consumer confidence loss, labour disputes, increased imports, the Covid-19 pandemic (Naidoo, 2020) and other factors has led to closures of companies which have historically fulfilled similar roles to Company A, which supplies Edcon and Mr Price. Such mass closures and the loss of jobs provides additional impetus for companies to mitigate these uncertainties.

Companies hoping to succeed in such saturated industries have an imperative need to find ways to mitigate uncertainty by tackling it at its causes. The main aim of this study is to establish the effect of eSCM adoption on organisations in the national textile

industry, both internally and externally with suppliers and customers, with the aim of thriving amidst uncertainty.

1.4. The aim of the study

The goal of the study is to research how electronic supply chain management can improve the textile industry through the reduction of uncertainty, through identifying the sources of uncertainty present and plugging these gaps of uncertainty through electronic supply chain management implementation.

1.5. Research objectives

The objectives of this study are:

1. To identify uncertainties prevalent in the South African textile industry
2. To investigate the use of electronic supply chain management technologies to lessen the detriments of these uncertainties.
3. To study the current situation of companies using eSCM in order to understand their successes as well as barriers to implementation.

1.6. Research questions

1. What are the uncertainties prevalent in the South African textile industry?
2. How can electronic supply chain management activities lessen the detriments of these uncertainties?
3. What is the current situation of companies which are currently implementing eSCM activities in terms of their successes and barriers to implementation?

1.7. Significance of the study

Apart from improving productivity for companies in the sector, resolutions to uncertainty drivers gained from the study will provide employment stability for the employees within the sector. Additionally, it would create a benchmark for other industries to adopt whilst dealing with the ever-turbulent economic conditions which

are in a constant state of flux through the globalisation of trade, information and commerce.

As cited in the literature review, the sector's success ensures the stability of thousands of jobs. (Buthelezi, 2020) notes that the success of companies in the sector represents a social issue in addition to a profit issue, citing the number of employees who stand to be affected by downsizing in local textile businesses as significant. Furthermore, the industry's input toward a considerable portion of the nation's GDP. The importance of the sector can be seen through the commitment which the nation's president, Cyril Ramaphosa who promised that he and the national government firmly intended on rectifying the state of the sector (Bushtec Adventure, 2019).

As per Knott-Craig (2018), the nation has fallen behind in each of the last three industrial revolutions, namely the mechanical, electrical and technological-industrial revolutions. This study intends to find a means for South African textile companies to bridge the gap between themselves and their international counterparts before the engulfment of the fourth industrial revolution (the digital industrial revolution) entirely occurs.

This would fill the gap of industry-wide research pertaining to the benefits of eSCM on the sector. There is limited such research and the study will add to research pertaining to the benefit of POS systems at a major retailer by Raza and Kilbourn (2017). The study will finally contribute toward the researcher's attainment of an Masters in Supply Chain Management degree.

1.8.Delimitations of Study

- The primary research is study and focuses on one company due to financial restrictions of the researcher
- The study has been limited to textile companies operating in the borders of South Africa

- The study has been limited to eSCM and does not specifically focus on other Supply Chain Management facets such as logistics management and operations management, although its impact on these facets of SCM are discussed by participants.

1.9. Proposed Structure of Chapters

<p>1. Chapter One: Introduction to the Study</p>	<ul style="list-style-type: none"> - Background - Research Problem - Purpose of the Study - Research Objectives and Research Questions - Significance of the Study - Limitations of the Study - Proposed Structure of Chapters
<p>2. Chapter Two: Literature Review</p>	<ul style="list-style-type: none"> - The national textile industry - What is Supply Chain Management? - What is supply chain uncertainty? - What is electronic supply chain management?
<p>3. Chapter Three: Research Design and Methodology</p>	<ul style="list-style-type: none"> - Research Design - Research Strategy - Research Methodology - Target Population - Sample Size - Sampling Strategy - Research Instrument - Interviews - Validity
<p>4. Chapter Four: Research Findings and Data Analysis</p>	<ul style="list-style-type: none"> - Summary of Results - Demographic Information - Presentation of Results by Objectives

	<ul style="list-style-type: none"> - Reliability of the Study
<p>5. Chapter Five:</p> <p>Conclusion and Recommendations</p>	<ul style="list-style-type: none"> - Findings from the Study: Lit Review and Primary Research - Conclusion from the findings: Significant findings - Recommendations of the Study - Future Research Opportunities

1.10. Conclusion

This chapter provided an overview of the background of the study, the research objectives and research questions, accompanied by a detailed look at the research problem. The study of the local textile industry from the perspective of uncertainty reduction is one which has not been directly focussed on in the context of electronic supply chain management and this chapter has highlighted the need to do so.

The next chapter, the review of past literature, focuses on: explaining in detail what the national clothing and textile industry is, assessing the historical size of the industry and presenting the uncertainties its operators face. Thereafter, it defines electronic supply chain management and elucidates on how this facet of supply chain management can reduce and rectify the uncertainties as mentioned above.

Chapter Two: Literature Review

Chapter one was an introduction to the study. This chapter delivers a review of past literature and research on the textile industry and its relationship with uncertainty. It is formatted as follows: it begins with an introduction before discussing the national textile industry. Thereafter, the concept of supply chain uncertainty is discussed. Supply chain management is discussed, along with electronic supply chain management. Lastly, the benefits eSCM may have on uncertainty reduction in the industry are discussed.

2.1. Introduction

Organisations regularly face challenges, which enforce an adaptation of methodology and operational practices. The challenge of uncertainty is a major one which is ever-present in many industries, including that of clothing and textiles. ESCM adoption such as enterprise resource planning (ERP) implementation assists through increased productivity, profitability and efficiency, reducing uncertainty. In the modern global marketplace, the perpetual struggle for competitiveness requires a mindset shift. This global marketplace has affected the national textile industry, which has much potential for improvement through eSCM (Gopaul, 2016).

2.2. The National Textile industry

2.2.1. What is the textile industry?

The textile industry is one which focuses on the design, production and distribution of yarn, cloth, linen and clothing products. This can range from the manufacturing of natural fibres like cotton and leather to synthetic yarns of fabrics such as nylon and polyester. A textile supply chain may consist of all the steps it takes to create yarns, the steps it takes to convert the yarns into cloth or thread, the final uses of the cloth such as clothing manufacturing up until the stage of consumption, i.e. the purchase of a t-shirt or tent from a retailer (Karabuk, 2007). The diagram below graphically depicts the stages of the conversion of a cotton plant to a t-shirt.

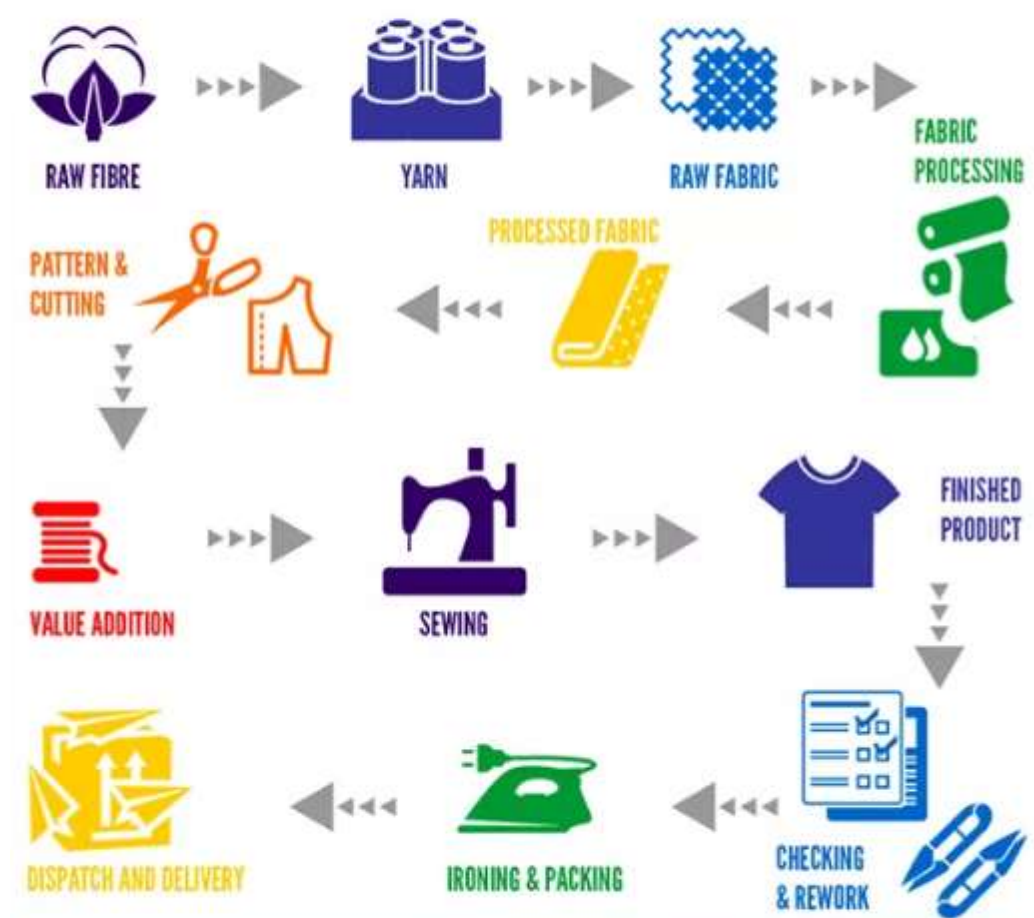


Figure 2.1: A simplified textile supply chain

Source: (NNR Apparel, 2016).

Psychologist Abraham Maslow's Hierarchy of Needs lists clothing among the most important requirements for people to survive and flourish (Pichère, Cadiat and Probert, 2015:2) (Hopper, 2019). Thus, there will always be a demand for clothing and textile products which provides an opportunity for sellers to fulfil. The necessity of clothing ensures the longevity of demand in the sector.

The necessity of these goods means that virtually every country has a textile industry. However, due to the labour-intensive nature of production, manufacturing mostly takes place in areas with lower labour costs. Among the leading exporting nations in

the industry are Asian countries such as China, Vietnam, Pakistan and India and the nations which make up the European Union (Lu, 2019).

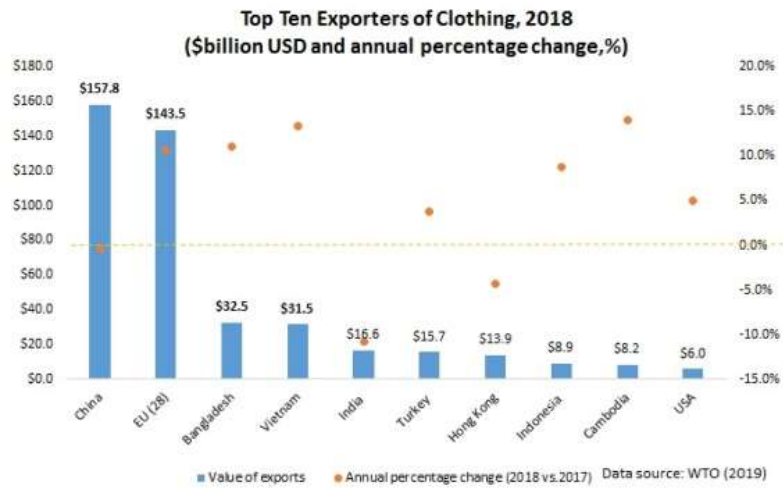


Figure 2.2: Textile exporters in 2018 ranked by monetary value

Source: (Lu, 2019)

2.2.2. An overview of the South African textile industry

The South African textile sector is the textile manufacturing industry located within the confines of the borders of South Africa. As a labour-intensive sector, it is one of the country's largest manufacturing industries, creating up to 14% of national manufacturing employment. It facilitates the provision of clothing, footwear and leather goods to citizens of the country and neighbouring countries. Additionally, the industry earns the nation approximately 8% of its GDP (Business Partners, 2014), (Hamdulay, 2017).

However, local entities in the industry have lost a market share of demand in recent years. Uncertainties and an inability to compete in a saturated contemporary market have caused liquidations of former market leaders such as the Kit Group. Once a leading safety gear and workwear supplier, the group was forced to shut down

operations affecting the company's staff and those of its suppliers negatively (S & V Protect Magazine, 2016: 3).

Political and economic turbulence has resulted in reduced consumer confidence and also resulted in sales reductions for several of the nation's major clothing retailers. Edcon, the nation's largest non-food vendor, faced a sales decline of 6.7% between March 2016 and 2017, with rivalling vendors such as The Foschini Group and Mr Price facing similar reductions (Goko, 2017).

Smaller entities have also been forced to shut down, with the impacts of globalisation reducing their competitive ability and market share. Colleagues of the researcher were victims of violence caused by wage protest activities, with tensions escalating when disagreements occur (Sastac, 2014:3), (Kriel, 2014).

The importance of the industry is seen through the commitment which the nation's current president, Cyril Ramaphosa, has promised to the sector. The following post by Mr Ramaphosa on his official Twitter account shows this promise. "Working together, we will create more opportunities for women entrepreneurs, worker-owned businesses and SMMEs and consider a special economic zone for clothing, textile and footwear". This level of commitment represents the significance of the sector to the national economy and highlights the need for improvement in it (van Niekerk, 2019).

2.2.3. Size of Industry

Industries which consist of manufacturing activities are typically labour intensive (Fin24, 2011). Similarly, the South African textile industry is labour intensive. Therefore, a measurement of the employment of the sector is an accurate depiction of the extent of it. The industry in 2014 employed approximately 80 000 people (Hicks, 2014), and 90 000 people in 2017 (Tshetlo, 2017).

Whilst these figures represent between 7 to 14% of manufacturing employment nationwide according to some statisticians, this number is approximately 30% lower

than it was 25 years ago, with the industry losing approximately 200 000 jobs (Businesspartners, 2014), (Tshetlo, 2017). The diagram below illustrates the national manufacturing sector which has approximately 1.2 million employees, with the maroon portion representing the input of the national textile industry as per June 2019 (South African Market Insights, 2019).

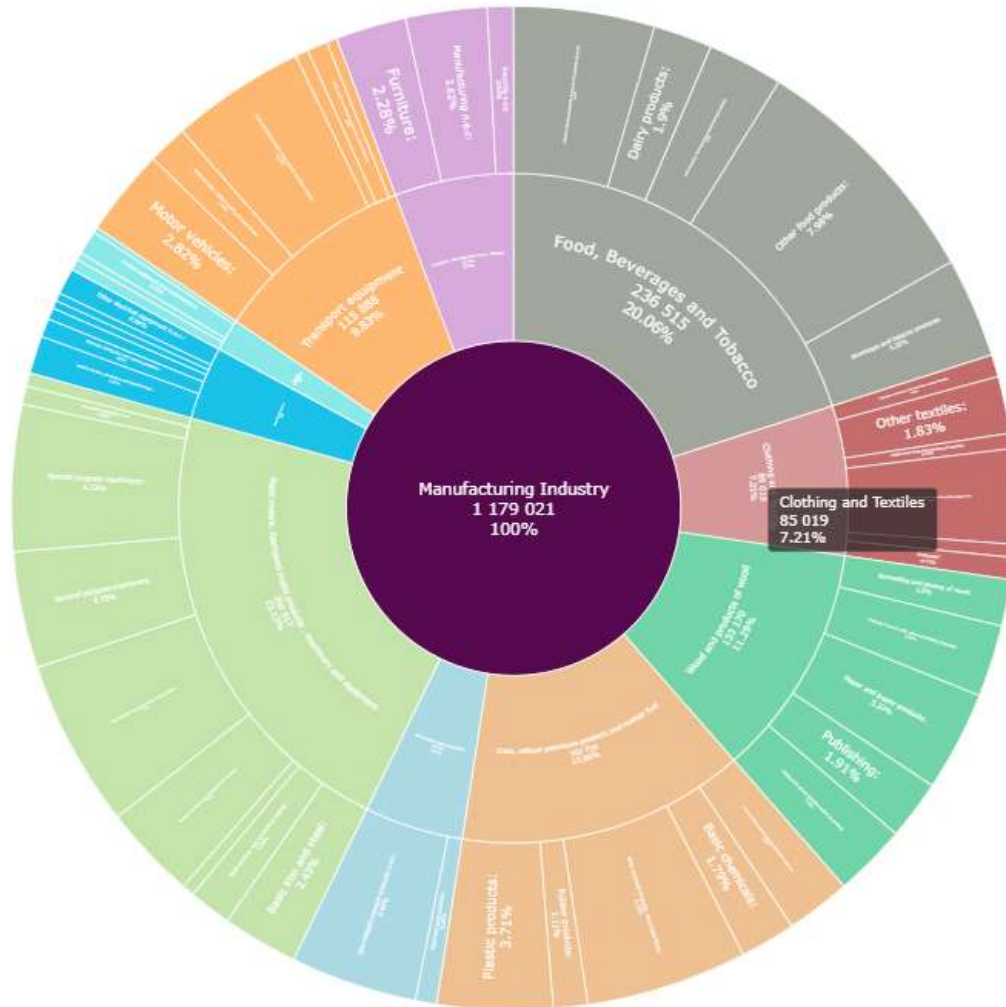


Figure 2.3: Clothing and textiles in the context of South African manufacturing
 Source: (South African Market Insights, 2019).

2.2.4. South Africa in context of the Fourth Industrial Revolution

Defined as “a rapid major change in an economy marked by the general introduction of power-driven machinery or by an important change in the prevailing types and

methods of use of such machines”, an industrial revolution serves to advance the way businesses operate and resources are converted (Sentryo, n.d.).

Over the past 100 years, three such major revolutions have propelled businesses and manufacturing capability to unforeseen levels, increasing competitiveness, reducing overall costs and improving standards of living drastically worldwide. The diagram below illustrates these three industrial revolutions and introduces the fourth, which we are currently entering (Sentryo, n.d.).

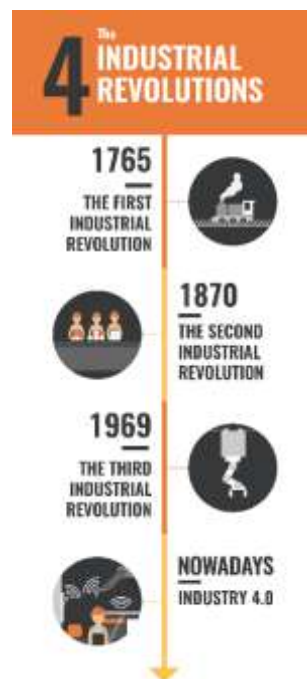


Figure 2.4: The four industrial revolutions

Source: (Sentryo, n.d.)

As per Figure 2.4, the first industrial revolution saw the emergence of mechanisation and with it the replacement of agriculture within industry as the primary foundation of the economic structure of society. Mass extraction of coal along with the invention of the steam engine created a new source of energy that thrust forward all processes through the development of railroads and the acceleration of economic, human and material exchanges (Sentryo, n.d.).

In 1870, the second industrial revolution saw the emergence of a new source of energy: electricity. This industrial revolution found industrial activity being enhanced further through the use of coal in applications such as combustion engines and the increased demand for steel (Sentryo, n.d.).

The third industrial revolution which involved the introduction of nuclear energy saw the rise of electronics, with transistors microprocessors, biotechnology and computers. The recent effects of this industrial revolution can be seen through the merging of programmable logic controllers and robots; a merging commonly referred to as automation (Sentryo, n.d.).

The fourth industrial revolution

The fourth industrial revolution, commonly known as “Industry 4.0” or “4IR”, as per the diagram above, is one which the world is currently undergoing (Sentryo, n.d.). This revolution began with the emergence of the internet and represented the first revolution which is based on technological advancement, digitalisation, rather than based on the emergence of a new source of energy. Through the following additions to the industry, this revolution is reshaping communication and management in industry:

- Cloud computing, which refers to the storing and accessing data and programs over the Internet instead of a local source such as a **computer's** hard drive or a USB stick.
- The Internet of Things, or IoT, which refers to a system of interrelated computing devices, mechanical and digital machines, **objects**, animals or people which are provided with unique identifiers and the capability of transferring data over a network such as the internet without needing human-to-human or human-to-computer interaction (McClelland, 2019).

As per Knott-Craig (2018), the inability of South Africa to benefit from the first three industrial revolutions already has South Africa starting on the back foot in comparison

to rivals such as India and China. Thus, there is a need for companies to embrace the technological advancements of 4IR to compete successfully. With Mbanje and Lunga (2015) citing information as a critical driver of supply chain performance, improving an organisation's ability to receive and disseminate information speedily presents an opportunity for such growth.

2.3. Context: The business environment of Company A

A significant contributor to the formulation of competitive strategies lies in successfully relating a business to its environment. As per (Nip, 2004), an analysis of the nature of the business' environment helps understand uncertainty. The business environment is typically divided into three environments. These are the internal environment, the external microenvironment and the external macro-environment. These environments can individually and collectively directly influence a firm's planning, competitiveness and development and are thus important for decision-makers in a firm to understand.

Understanding Company A's relationship with its environment can assist the researcher in understanding the values of the company and can provide qualitative input toward understanding whether the case is generalisable.



Figure 2.5: The business environment

Source: (Erasmus, Strydom and Rudansky-Kloppers, 2016).

For the context of this study, Company A's internal environment will be discussed with the use of identifiable direct quotations being avoided, due to the promise of anonymity given to the company, following the ethical values stipulated in Chapter Three. Company A is a manufacturer and supplier of textile items including fitted sheets, duvets, pillows and other bedroom textile items. The company is headquartered in the Clairwood area of Durban and was founded in 1987 according to its official website (Company A, n.d.).

2.3.1. The internal environment of Company A

The internal environment represents the internal elements of an organisation used to create, communicate and deliver value and fulfil customer requests.

It includes the following factors:

- The vision, mission, strategies and objectives of the business.
- Management and organisational functions.
- The resources of a business, such including its tangible resources, intangible resources and organisational capabilities.

The discussion of the internal environment of Company A which follows will analyse these three factors.

2.3.1.1. Mission and vision of Company A

As per Erasmus, Strydom and Rudansky-Kloppers (2016), a company's mission is its reason for existence and its vision depicts what the company hopes to become. These are used as guiding statements by management in planning and implementation activities.

Since then it has grown into, "one of the largest and leading manufacturers of textile in South Africa as well as Africa". The company's mission statement states that the objectives and aims of the business are "to supply both standard and high-end quality

linen to all markets.” There is evidently an organisational emphasis on providing high-quality service at competitive price levels. The company aims to ensure that its clients gain to benefit from their expertise, operational excellence and technological strengths.

2.3.1.2. Resources and management functions

The researcher’s experience at the company, coupled together with statements made by the CEO, have highlighted that one of the company’s strengths lies within its labour resources. This includes an employee base of over 250 workers employed directly by the company, with its first-tier suppliers employing approximately 200 workers.

The researcher understood the company, having previously worked with the company on a professional basis. From this exposure to the company, the researcher found that an ethos of relationship-building and connectivity is encouraged with suppliers, both locally and internationally. The 250 direct employees range in their responsibilities, with design, quality control, planning and some manufacturing activities being done inhouse. The design team is responsible for undertaking extensive research in the latest trends both locally and abroad in order to create “intriguing and beautiful designs for a variety of styles, price points and global markets.”

Additionally, the management team consists of 13 people who are responsible for liaison with the company’s customers and suppliers. The strong management ability of the company has allowed it to grow into a supplier for retailers including Sheet Street, Edgars and Pep Stores (Company A, n.d.).

2.3.2. External Microenvironment

A company’s external microenvironment, alternatively referred to as the market environment represents forces external to the company that affect its ability to serve its customers (Erasmus, Strydom and Rudansky-Kloppers, 2016). The elements of this environment are discussed below.

2.3.2.1. The market

According to Erasmus, Strydom and Rudansky-Kloppers (2016), a market for a product refers to any person who has a need, the ability to fulfil that need and the willingness to spend on the product which fulfils the need. As such, the market for operators in the clothing and textile sector would include people who use end products of clothing and textiles including clothing and apparel, linen and safety gear amongst other end-products. Whilst it is true that it enables foreign suppliers to operate locally, the potential of exports which have been brought about by globalisation has also increased the potential size of this market. Exports have been encouraged and enabled through trade agreements such as BRICS, an agreement between Brazil, Russia, India, China and South Africa and SADC, the Southern African Development Community. As per Kretzmann (2016), taking advantage of exports could represent a saving grace for the sector, as represented in the success of the Clothing and Textiles Competitiveness Improvement Programme, which has created approximately 7000 since jobs 2009 through a focus on exports to neighbouring nations and those in the Middle East.

2.3.2.2. Suppliers

The company has three main “CMT suppliers”, who are responsible for the manufacturing and packaging of finished goods for the company’s retail and wholesale customers. In addition to this, the company has several suppliers of materials and components used in operations which include fabric and trims suppliers, both locally and in China, with management citing the inability to source cheap fabric locally as the primary reason for sourcing these supplies internationally.

2.3.2.3. Labour markets and labour unions

As mentioned, the company operates within the confines of South Africa, specifically in the Durban area of KwaZulu-Natal. A densely populated province, this province has a significant number of experienced machinists, which enables the company to source staff adequately in order to operate efficiently. However, the oversupply of workers in an industry with 80 000 employed personnel and 40 000 who have lost their jobs in

the last ten years does not allow companies flexibility with wage negotiations. This is majorly due to the presence of labour unions which make wage prices largely inflexible and often unattainable for companies aiming to obtain sustainable competitiveness (Natrass, 2013).

2.3.2.4. Intermediaries

An intermediary plays a pivotal role in bridging the gap between the manufacturer and consumer. Intermediaries include wholesalers, retailers and in a South African context, even spaza shops (Erasmus, Strydom and Rudansky-Kloppers, 2019).

The company is midway on the textile supply chain. Being in-between fabric suppliers, manufacturers and retailers on the supply chain, the company is often referred to as a finishing house. In the context of the conversations where this was mentioned, it depicts the company as one who engages in sourcing activities and consolidates orders for retailers like the Mr Price Group and Edcon. There is the outsourcing of some activities, including transportation activities. Intermediaries facilitate the delivery of goods and stock to customers. Only a minor part of the company's sales comes from direct-to-customer sales.

2.3.2.5. Competitors

Competitors are responsible for providing competition to businesses attempting to sell a product or service (Erasmus, Strydom and Rudansky-Kloppers, 2019). As the company primarily supplies goods to retailers like Mr Price and Edgars and engages in retail in the Durban area, their direct local competitors include Maytex (Maytex, n.d.) and Dreyer Linen (Dreyer Linen, n.d.).

2.3.3. The external macro-environment

The external macro-environment represents larger societal forces that affect the survival of the organisation. These are regarded as uncontrollable aspects of the

business environment, with companies needing to adapt to these forces to succeed (Erasmus, Strydom and Rudansky-Kloppers, 2019). Its variables are discussed below.

2.3.3.1. The technological environment.

The technological environment represents one of the most important drivers and managers of change in any economy. According to (Nip, 2004) the technological capacity in the country has historically not been adequately translated into dynamic textile and clothing industry, sentiments that are shared more recently by (Knott-Craig, 2018). (Nip, 2004) also states that the level of business creation is low, especially in small factories, citing a lack of entrepreneurial behaviour of most of the South African people. The core purpose of this study is to use the advancements of technology in improving the sector.

Telecommunications: As per (Nip, 2004), telecommunications advancements are great impactors on a business' economic and operational viability. A key provider of business communication, the ability to keep up with countries like China rests on the acceptance of technological innovation by local manufacturers and retailers.

As the primary focus of this research study is on electronic supply chain management, the importance of understanding this facet of technology is vital to the success of a business. To this end, social media penetration, which refers to the percentage of citizens who regularly use social media stands at approximately 38%, which is below the worldwide average of 45% as per Kemp (2019).

Additionally, internet penetration for South Africa is approximately 54%, with a "connected" population of over 31 million people. The nation's internet speeds are below the worldwide average, with an average speed of 18.3 megabits per second, which is well below the global average of 54.3 megabits per second, but approximately three times that of continental peers like Egypt (Businessstech, 2019).

2.3.3.2. The economic environment

Erasmus, Strydom and Rudansky-Kloppers (2019) note, that the nation needs an annual GDP growth rate of over 7 percent in order to ease the excesses of unemployment faced by its citizens. However, since the 2008 global recession, GDP has grown at an annual rate of under 1 percent, impacting consumer behaviour negatively. Additionally, the country's inflation rate is higher than most of its significant trading partners, negatively affecting its international competitiveness (Erasmus, Strydom and Rudansky-Kloppers, 2019).

2.3.3.3. The social environment

Company A is based in South Africa, which has a diverse social landscape. There is a balance between the traditions of citizens and their expectations. A nation with 11 official languages and much cultural heritage, the average consumer has adapted to a contemporary world by paying close attention to value, variety and convenience (PMA, n.d.). This may also be noted with the improved education levels gained through the nation's government's commitment to providing free higher education to citizens.

2.3.3.4. The physical environment

This environment consists of factors such as the cost of energy and the availability of resources. The presence of resources including coal and oil affect the prices of petrol and energy which directly influence the abilities for businesses to thrive. South Africans pay a greater percentage of their salaries toward petrol than most other nations according to (Businesstech, 2019). Additionally, the price of electricity per kilowatt hour ranks amongst the highest in comparison to the prices in other emerging nations.

2.3.3.5. The institutional-government environment

This environment assesses the impacts of legislature on business. It is imperative for businesses to understand the laws in the locality in which it operates along with the impacts these laws have on its operations and competitiveness. Legislation regarding

the promotion of businesses owned by previously disadvantaged business, wage floors and the hiring of employees of specific demographics to conform with the Employment Equity Act require careful assessment.

2.3.3.6. The international environment

The impacts of globalisation and the creation of an international marketplace makes business management more complicated. With the inclusion of greater opportunities and threats, operators in the sector have found both benefit and disadvantage from the nation's relationships with other nations. Companies such as Gelvenor have benefitted from exporting novel inventions such as the world's first microfibre low bulk parachute fabrics (Gelvenor, 2017) whilst the Edcon group faced decline due to competitors such as H&M and Zara opening stores in the country (Buthelezi, 2020).

2.4. Theoretical Framework

2.4.1. Supply Chain Uncertainty

Uncertainty refers to the presence of variability and a lack of knowledge of upcoming events. By its very nature, business is uncertain, with profit being a businessman's reward for embracing and taking on uncertainty. Such is the importance of understanding uncertainty and managing it that Winston Churchill, Britain's former Prime Minister is credited with saying, "true genius resides in the capacity for evaluation of uncertain, hazardous, and conflicting information," (Sweeting, 1995).

Simangunsong, Hendry and Stevenson (2012) note that every manager faces supply chain uncertainty, including internal uncertainty, external demand-side uncertainty and external supply-side uncertainty. Supply chain uncertainty represents a look at uncertainty from the viewpoint of supply chain management, which is done by taking a holistic view of uncertainty which affects a business venture and its processes. By default, the management of a supply chain considers managing both demand-side uncertainty and supply-side uncertainty.

Regarding uncertainty and risk, (Zheng, 2012:30) clarifies that change is not a risk, but that risks are posed by the future uncertainties associated with change. After defining risk as the likelihood of fetching misfortune or loss and explaining that uncertainty is related with events that cannot be precisely known or predicted, he explains that whilst uncertainty does not assure misfortune, it poses risks. A deviation between expectation and reality always poses risks.

Wagner and Bode (2008) note that uncertainty is dissimilar to risk in that it covers instances where negative impacts and possible impacts are possible, whilst (Li and Hong, 2007) argue that it is not necessary to distinguish between risk and uncertainty. (Simangunsong, Hendry and Stevenson, 2012) acknowledge that risk forms a part of the holistic concept of uncertainty. For the purpose of this study, supply chain uncertainty (inclusive of risk) will be defined as uncertainties which may occur at any point in the supply chain.

Mbanje and Lunga (2015) further state that the emphasis of visibility, reduction of costs and the improvement of responsiveness are trends of modern supply chain management, with the certainty that it offers enabling faster reaction times and collaborative ability. Scholars such as (Davis, 1993) and (Mason-Jones and Towill, 1998) concur that amongst its primary benefits is uncertainty reduction.

In looking at uncertainty from a supply chain management standpoint, (Zheng, 2010) states that it stems from four significant angles. These are the uncertainty of demand, the uncertainty of supply, the uncertainty of manufacturing and the uncertainty of distribution.

The uncertainty of demand plays a major role in decision making in business. A principally uncontrollable aspect of business, demand uncertainty is based on oscillations, contractions and surges of demand. Demand is flexible through its inherent reliance on consumer emotions such as product necessity, consumer desire and consumer financial confidence (Zheng, 2012).

The bullwhip effect is directly related to the uncertainty of demand (Zheng, 2012: 32). It describes how inaccurate information, a lack of supply chain transparency and a detachment between production and real-time supply chain information result in lost revenue, reduced customer service, varying inventory levels, increased expenditure and unrealised profits (Agarwal, 2009:4). The reduction of demand uncertainty can be obtained through information sharing (Naidoo, 2014).

(Schlegel and Trent, 2014) note that demand uncertainty relates to risks related to the demand of goods or services which include distribution issues, the actions of industry rivals, the reputation of a brand, social media trends and customer sentiment. (Schlegel and Trent, 2014). In the local textile sector, demand uncertainty presents itself in numerous ways, for example, the bullwhip effect, which sees excess inventory and manufacturing occurring and the reduction of demand for local products due to the presence of new entrants such as H&M (Buthelezi, 2020).

The uncertainty of supply, which is looked at from a broad perspective in supply chain management, denotes uncertainty presence at all links in a supply chain from the point of origin (Zheng, 2012: 33). Supply uncertainty relates to risks to supply of goods or services and relates to risks such as lead-time delays, quality failure, supplier continuity risks, compliance failure, channel complexity and a failure to communicate (Schlegel and Trent, 2014).

This form of uncertainty too manifests in a multitude of ways, including labour strikes and wage disagreements, with unions holding a dominant position in a labour-intensive sector. (Moche, 2019) cites that South Africa has the world's worst recorded labour-employer relationships, with an "us against them" mentality existing between parties involved.

The uncertainty of manufacturing, an internal form of uncertainty is influenced by factors such as staffing issues, time uncertainty and the effects of unexpected order quantities (Zheng, 2012: 34). (Negahban and Smith, 2016) state that production

uncertainty includes machine failures, maintenance operations and a lack of accurate information on the production process. (Schlegel, 2014) notes that uncertainty is present with regards to process risk, which includes risks of inventory shortages, disruptions relating to quality problems, capacity shortages, equipment breakdowns and late deliveries.

The uncertainty of distribution. Distribution activities, by their very nature, include multiple participants. This factor relates to uncertainty from handling goods internally as well as external logistics and moving activities. The research on distribution uncertainty often focuses on either delayed delivery time or delivery frequency. This form of uncertainty is directly linked by many scholars to demand uncertainty and often can leave supply chain-wide operations at a standstill (Zheng, 2012: 35).

(Rezapour, Allen and Mistree, 2014) clarify that the bullwhip effect is caused by either demand uncertainty or time-lags in information dissemination within the supply chain whilst also stating that supply-side uncertainty propagation occurs due to uncertainties in the performance of production and volume outputs in supply chains.

(Schlegel and Trent, 2014) add that environmental risk adds to uncertainty, with energy risks, geopolitical turmoil, natural disasters, currency fluctuations, economic fluctuations, pandemics and civil disobedience contributing to uncertainty within supply chains.

Research suggests that the use of technology to enhance collaboration could potentially provide a basis to reduce uncertainty (Ma, 2018), with (Nemati and Durai, 2020) citing the requirement for technology to ensure flexibility. From a local perspective wage uncertainty, interruptions of flow from downtimes through unionised strikes, electricity cuts and logistics uncertainties are amongst the uncertainties which affect companies in the sector. These uncertainties are discussed in Section 2.5.

2.4.2. Electronic Supply Chain Management

The implementation of eSCM has noteworthy effects on business process change, cooperative relationships among supply chain partners, (Mbhele, 2014) and even the reduction of uncertain situations (Geunes et al., 2010). ESCM can be viewed as the adoption of information technology that refers to the adoption of new methods, processes, or production systems. Adoption of IT aims to maintain or enhance organisational performance and to adapt to variations in the external environment. eSCM adoption uses features of IT adoption such as information exchange capabilities, joint decision-making support and business process integration, to conduct supply chain activities (Mbhele, 2014).

In attaining the integration of value chain activities, eSCM uses the internet and related technologies to perform integration activities across entire organisations and throughout the supply chain networks. In South Africa's constantly evolving consumer landscape, clothing and textile retailers have acknowledged the need for the efficient strategic diffusion of electronic information through integrated supply chain information technology (Rambaran, 2016). On the importance of technology adoption in the sharing of information, (Naidoo, 2014: 86) says that "optimised information sharing across the extended enterprise depends on information systems and technological tools."

(Ghasemi, Shirmohamadi and Taimouri, 2015) note that electronic supply chain management has significant impacts on the economic and social of SMME's. Whilst noting that businesses need to adapt to constantly a changing business landscape, they further add that eSCM has positive impacts on the internal performances and the growth and learning of SMME's. (Shamout and Emeagwali, 2016) note that eSCM assists in customer relationship management, demand management, customer service management and reverse logistics activities.

The reduction of demand uncertainty can be gained through information sharing (Naidoo, 2014). Supply chain integration correlates with a reduction in uncertainty on a micro and meso level (Flynn, Koufteros and Lu, 2016). This study aims to look at

the sources of uncertainties in the sector and the implications of eSCM adoption on managing these uncertainties at Company A and others in the sector.

2.5. Uncertainties in the textile industry

2.5.1. Sources of Uncertainty in the South African Textile Industry

Supply chain uncertainty refers to the potential, chance or speculation of the availability or price of a resource on a supply chain fluctuating. It is an aspect of business which causes much instability as well as anxiety for stakeholders. Often, it can be detrimental with the uncertainty of price increases resulting in investment to tie down goods at specific prices or exchange rates for future purchases with fear of changes in market values. At times, the predicted changes may even fail to occur, leaving companies paying higher amounts than necessary (Flynn, Koufteros and Lu, 2016: 21).

The sources of uncertainty in the industry are looked at below.

2.5.1.1. The uncertainty of fashion

An issue faced in clothing supply is the uncertainty of fashion and trends which can be seen through increases or decreases in demand and prices for individual lines and styles. The textile industries' association with fashion have it entrenched in seasonal uncertainty. Seasonal demand may be predicted partially, but absolute accuracy is rarely guaranteed. (Sastac, 2014:11). This uncertainty stems through fashion's reliance on consumer psychology and preferences (D'Arpizio, 2016).

Regarding demand, much volatility remains in the industry, with (Raza and Kilbourn, 2017:4) asserting that some products are, by their very nature, volatile, being characterised by a high level of demand uncertainty. Similarly, Sintec (2012:1) states that any operator in a textile and clothing industry faces oscillations and fluctuations through the impacts of fashion and seasons. Reduced customer satisfaction and increased costs have directly contributed to numerous closures of manufacturing

companies, with major suppliers like Kit Group and their manufacturing suppliers undergoing enforced closure (S & V Protect Magazine, 2016: 3).

Another contributing factor to this is that consumers have replaced television and magazines with social media such as Instagram and streaming services like YouTube and Netflix for their sources of fashion inspiration, meaning that they are able to discover new trends quicker than before. Many companies use these medium to get discovered quicker and further than before (Mcdowell, 2019), (Oszi, 2020).

Amed et al. (2019) cite the need for companies to keep a closer tab on consumer demand in times of uncertainty. The arrival of ‘fast fashion’ suppliers which specialise in producing cheaper items rapidly to keep up with the latest trends has left retailers with reduced market shares, with many consumers preferring these brands to traditional South African labels (Khumalo, 2019). The emergence of such suppliers, which are capable of dividing the year into “52 micro seasons”, each representing the latest trends, has been made possible through their superior information systems and quick responses to demand patterns (Vecchi and Buckley, 2016).

(Chiromo, Nel and Sebele, 2015) state that the use of traditional management practices has left companies unable to deal with this fluctuation, affirming it leads to overproduction, excessive inventory usage and bottlenecks in garment factories.

2.5.1.2. Imports and Globalisation

Importing refers to the purchase of goods from foreign sources. These may be items which are ready for consumer usage or others which are used as components in other supply chains. Importing allows numerous benefits, including an improved choice for consumers and lower cost prices due to economies of scale overseas and increased competition. However, imports may also have detrimental effects on local economies, such as increased unemployment and the “squeezing” of domestic suppliers out of supply markets (Mbanje and Lunga, 2015).

The dangerous nature of the impact of a failure to compete with imports has been emphasised by the Western Cape's Minister of Economic Development Alan Winde, who spoke of the need for improvements in the local manufacturing in the sector, citing the loss of around 4000 jobs from 2011 to 2017 in the province alone (Malingo, 2017). The impact of an inability to compete with Chinese imports has been reaffirmed qualitatively, with (Moodley, 2016) citing the fear of business owners that Chinese imports would put them out of business.

With the impact of globalisation including improved communication, improved international trade relations and faster transportation, there has been an upward trend of imports in the sector over the last 30 years, with textile-related imports increasing from 15 billion South African Rands in 2014 to 20 Billion Rands in 2018 (CottonSA, 2018).

However, contradictory statistics state that in 2014, imports may have been as high as 27 billion South African Rands (Trading Economics.com, 2016). Additionally, the presence of illegal imports is widespread, with retailers and manufacturers complaining about a lack of fair competition with importers who undervalue dutiable imports to pay reduced customs-clearing costs.

Imports and globalisation have affected numerous industries and countries worldwide. For example, retailers in numerous countries in Europe have shifted from manufacturing locally a means of importing clothing made in Bangladesh and the surrounding countries. Countries like Bangladesh, which is the 2nd largest apparel supplier worldwide, with 6.5% of the market share, can benefit from economies of scale and price garments competitively, whilst allowing an investment for infrastructure development (Rahman, 2018). Such international retailers like H&M, which has recently entered into South African retail, are reliant on such countries for their supply and further saturate the retail market locally (Sangbad, 2018).



Figure 2.6: “Made in Bangladesh” tag found at H&M.

Source: (Sangbad, 2018)

2.5.1.3. Consumer price sensitivity

Relationships between suppliers and retailers have reduced. With GDP growth slowing down and interest rate increases, consumer spending confidence has reduced (Fin24, 2018). As such, price sensitivity has increased, with consumers who were previously loyal preferring to buy cheaper imported products instead of locally produced ones.

Exports often provide respite for companies which supply consumers in other countries. However, export quantities and prices are dependent on a country's relationships and the strength of its currency (Moodley, 2016).

2.5.1.4. Rising input costs

Rising input costs, such as the following have also reduced the competitiveness of local manufacturers, allowing importing companies to thrive:

- Economies of scale reduction. Economies of scale refer to cost reductions which occur when production is increased. This occurs when fixed costs, such as administration and rent, are spread over more units of production (Amadeo,

2019). Whilst not all companies have closed down in the sector, the few who are running still face challenges regarding importing. Economies of scale are less prevalent currently, with manufacturers producing fewer garments than previously. The absence of economies of scale results in increased costs per unit in comparison to rival companies.

- Labour cost increases. The impact of minimum wages has increased costs of manufacturing, overheads and raw material supply. The unionisation of the sector has led to enforced wage increases and the implementation of wage floors which have resulted in a disability to compete based on price for local manufacturers. This phenomenon concurs with assertions expressed by (Fields, 1994), which states that wage floors increase cost prices, thereby reducing demand for local labour.
- Wage disputes have further led to disruptions in production, further reducing the ability for companies to manufacture consistently (Nkomo, 2017).
- In terms of the local textile industry, one such uncertainty relates to the price of petrol. A reliance road transportation medium leaves companies susceptible to oil price changes, currency fluctuations and their detriments (KZN Transport, n.d.), (Ovi, 2017).
- From a manufacturing viewpoint, research by (Chiromo, Nel and Sebele, 2015:1970) demonstrates a case of overproduction occurring, leading to unwarranted industry costs, added labour expenses for the management of redundant stock along with an excess of unused raw materials. This case cites the implementation of supply chain management activities as being remedies to this uncertainty.
- Evidence shows that that efficiency improvement in the sector and that use of supply chain management's collaborative and cooperative nature and its focus on flexibility can provide a flexible model for business operations in uncertain times. Previous research sheds light on the need for training and for business process reengineering to keep factories competitive (Gopi, 2017). However, not much research has been conducted on the usage of eSCM to aid the national textile sector.



Figure 2.7: Striking union workers.

Source: (Nkomo, 2017)

2.5.1.5. Disruption of supply

As noted in the previous section, wage uncertainty leads to disrupted supply chains. Additionally, a nation which has been plagued with load-shedding over the past decade, South Africa has found its manufacturing sector negatively impacted by the disruptions of supply. Such disruptions have led to reduced revenue, whilst fixed costs remained constant, according to (Smith, 2018).

For clothing manufacturers, reduced productivity remains even once load shedding is complete, with factories often requiring up to two hours to regain optimum capacity, resulting in some manufacturers cancelling production and sending staff home early to save on wages (eNCA, 2015). Others claim that load-shedding schedules are not strictly followed, with outages starting before the scheduled times, resulting in delays, order cancellations, wastage of materials and damaged equipment (Boucher, 2020).

2.5.1.6. Covid-19

The impacts of Covid-19 have been felt on a global scale. Much debate surrounds whether the pandemic represents a Black Swan (an unpredictable, high impact event)

with some stating that it was impossible to predict the magnitude of the virus' impact, whilst others cite that the proper use of technology and available resources lie at the core of predicting its impact (Parameswaran, 2020).

Whether it was unpredictable or not, common ground is found on the fact that the pandemic has disrupted supply chains to an unprecedented extent and at an unprecedented speed. Some note that the virus may be responsible for a reversal of globalisation, with international trade slowing down due to travel restrictions. Scholars cite that this has led to many consumers and businesses around the world choosing local suppliers at a higher cost, a phenomenon which may become permanent (Bloom, 2020).

Conversely, some research notes that the pandemic's impact on consumer spending has had a detrimental effect on consumer confidence and spending patterns, with many consumers choosing to shop online or halt spending amidst uncertainty (Robinson et al., 2020). This is evidenced by the Edcon Group's struggles during the nationwide lockdown. A stark decline in turnover for the Edcon group has led to the closures and multiple job losses since lockdown began. (Wiener, 2020)

Demand has been fluctuating, with companies in the sector facing no sales under stage 5 of lockdown. The demand for items clothing and homewares fluctuated as the nationwide lockdown was eased, with demand in the period since the company was allowed to operate being significantly different than it was in previous years at retailer Mr Price. The company cited ongoing operational disruptions and future uncertainty as significant challenges, with rivals Truworths experiencing similar uncertainty alongside Brexit-related uncertainty (Businessstech, 2020), (Thukwana, 2020).

From a supply perspective, manufacturing companies have faced positives and negatives, too. With some reeling from Edcon's inability to pay suppliers (Wiener,

2020) and the lack of demand, others have found opportunity, with demand for items like facemasks increasing locally (Omarjee, 2020).

For portions of lockdown, operations at certain labour-intensive manufacturing facilities have been halted or slowed down. Albany, a local bread manufacturer, was forced to shut down manufacturing due to the spread of the virus, a common occurrence in the country (Bhengu, 2020). Amidst the rise of new threats and opportunities, one company was caught illegally manufacturing untested facemasks with workers being locked in a factory and forced to work in unsanitary conditions, manufacturing masks for hours on end, undermining the opportunities for other suppliers (Naidoo, 2020).

2.6. Supply Chain Management

Supply chain management is the facet of management which deals with the planning, implementation and controlling of activities and data-sharing across supply chains which lead to the conversion of raw materials to finished goods fit for consumer demand. This aspect of management focuses on the streamlining of production activities through collaborating activities by aligning multiple divisions of companies and entities along the supply chain to operate in tandem toward a mutual goal of satisfying demand (Mentzer, 2001).

Through a holistic outlook on management, it offers a foundation for companies to continuously increase efficiency, reduce costs and improve customer satisfaction (Mangan, Butcher and Lalwani, 2008:4).

2.6.1. Outlining Supply Chain Management

Supply chain management is the aspect of business management which deals with the planning, implementation and controlling of materials, activities and information along the supply chain from the raw material stage until the stage of finished goods which are fit consumption. This aspect of management streamlines the activities of production by co-ordinating processes of several divisions internally and externally to

act in tandem toward the common aim of fulfilling demand in an efficient manner (Mentzer, 2001).

It does so by improving communication, availing forecasting materials and the willingness to share information with the mutual goal of creating improved responsiveness and operational efficiency. Supply chain management processes offer collaborative efforts by benefiting all parties involved in the transformation of raw materials into final products (Mentzer, 2001).

Collaboration between members along a supply chain is a core necessity to the success of the modern business as it improves responsiveness, reduces miscommunication and enables planning and organisation of processes to produce goods. The scope of supply chain management aims to move beyond singular production lines, as what may be seen as finished goods by some may be used as raw materials on another supply chain (Mentzer, 2001).

Slack and Brandon-Jones (2018: 240) extend on this definition, reflecting that supply chain management is the “management of the relationships and flows between the ‘string’ of operations and processes that produce value in the form of products and services to the ultimate consumer.”, further citing that modern supply chain management focuses more on the flow of information upstream and downstream on a supply chain than it does on the flow of goods and services.

(Hugos, 2011) defines supply chain management as the things we do to influence the behaviour of the supply chain and get the results we want.

2.6.2. Potential for Improvement within the Industry Using SCM Activities

From the definition of eSCM in (Wu and Chang, 2012:474), it is the ability for the use of technology to aid supply chain management’s capability of improving efficiency and reducing uncertainty. Therefore, to fully understand the benefits of eSCM to any

industry, it is necessary to understand the benefits of supply chain management to the industry.

The South African Textile industry adds much value to the nation. Apart from the provision of necessities like clothing and warmth, it has great economic value, by providing about 8% of the GDP whilst providing over 80 000 jobs according to some researchers. Therefore, the prosperity of businesses operating in this industry, especially SMME's, are of great benefit to the government, the employees within the sector and the national economy (Hicks, 2014).

However, business uncertainty is unavoidable. Supply chains worldwide have been affected by economic recessions and the impacts of globalisation, which has saturated many marketplaces. Activities such as planning, sourcing, sales, customer service and transportation have been affected by this uncertainty, with inefficient planning and forecasting taking place (Mangan, Butcher and Lalwani, 2008:4).

The South African clothing industry has suffered a great recession over the past 15 years. The impacts of globalisation and a cut-throat market have companies battling to sell goods and being forced to lower mark-ups, with numerous manufacturers being forced to shut down. Closures of large companies such as the Kit Group (S & V Protect Magazine, 2016: 3) affected their employees and their supplying manufacturers whose debts they were unable to pay.

Additionally, seasonal factors of the textile sector, electricity load shedding and water cuts have caused downtime, reduced economies of scale and increased uncertainty in the production planning process. The inability to predict what will happen in the market reasonably leaves companies either over investing in unproductive undertakings or, alternatively, failing to take advantage of opportunities (Sastac, 2014:11).

Production uncertainty increases expenses for businesses too. Distrust between employees; employers and worker unions and the potential for wage protest action causes higher wage demands than other manufacturing countries such as China and Swaziland; downtime; decreased yield and economies of scale. These have also reduced investor trust in the sector (George, 2014). Many companies have involuntarily outsourced production to factories in countries like Madagascar which benefit from lower costs.

Additionally, this inability to compete on price has South Africa lagging behind these countries in terms of exports to first-world nations like the USA (Morris and Sedowski, n.d.).

This production uncertainty has been increased by external factors as well with an insufficient supply of inputs limiting output capacity. Unforeseen weather conditions have slowed cotton production, with farmers opting for more efficient crops in times of drought (Mokhema, 2016). Electricity cuts through government-implemented load shedding have forced textile companies to close abruptly, reducing economies of scale, interrupting manufacturing activities and causing downtime, which has further fuelled labour relation breakdowns (Meintjes, 2015).

Supply chain management activities can ease the issues of uncertainty by providing a holistic approach to planning (Sastac, 2014:11). The focus on undertaking thorough research before decision-making enables greater information-gathering and proactivity instead of reactivity in operations. Forecasting, lean manufacturing and just in time processes are among the supply chain management activities which reduce unforeseen situations, cultivating efficiency (Mangan, Butcher and Lalwani, 2008:4)

Previous literature proves that green supply chain management activities can aid in wastage reduction and efficiency creation. Moreover, the failure to compete on a price basis can be resolved by research and development activities and innovation in the

industry (Botha, 2014), as seen by Gelvenor, a local manufacturer who scooped the Industrial Fabrics Foundation's 2016 IFF Innovation Award for research and development aimed at creating fabrics which assist with water filtration (Gelvenor, 2017).

In reducing the variability of supply and demand, both reactive and proactive methods are used. Reactive risks management methods which only kick in when risks are present are an option such as:

- The possession of safety stock or capacity buffers to accommodate reduced output levels or increased demand levels
- Using alternative suppliers to handle unexpected or excessive orders or disagreements/shortages with suppliers
- Using safety lead times

Though not guaranteeing accuracy and flexibility, these strategies do not require cost-intensive research activities and are less time-consuming than proactive supply chain management techniques (Reina et. Al, 2014:54).

Proactive supply chain management techniques may also reduce uncertainty.

- Outsourcing and splitting, such as the outsourcing of sewing activities
- Risk pooling
- Entering agreements of flexible supply, which can settle costs in times of fluctuating quantities
- Manufacturing products with component commonality.
- Reducing setup and lead times
- Transport flexibility

The use of proactive supply chain management activities permits improved flexibility, responsiveness and quicker reaction times to unforeseen circumstances without the requirement for much stock on hand (Reina et. Al, 2014:55).

The Theory of Constraints is another SCM paradigm which presents the opportunity to manage uncertainty in business (Schrageheim, 2016) textile companies in India are using this theory to improve their lead times (Vector Consulting, n.d.).

To comprehend the relationship between the textile industry and supply chain management, an understanding of the elements of each is required (Ali and Habib, 2012). Supply Chain Management's elements include informational capturing and sharing, reduced communication time with suppliers, the efficient arrangement of transportation, availability of proper warehouses to store goods, inventory planning and controlling, availability of enhanced maritime infrastructure, as well as in-house operational collaboration between departments within a company (Ali and Habib, 2012). These elements reduce the lead time and its associated cost.

Textile manufacturing can be characterised by a chain stemming from raw materials extraction and construction such as the planting of cotton plants and the conversion of these into yarns and fabrics. Thereafter, complement production and sourcing occurs, which includes the manufacturing of items such as zips, embellishments and buttons. The final step of clothing manufacturing is the putting together of these goods in a meaningful way which adds value to the product precedes consumption (Ali and Habib, 2012).

Figure 2.1 in Section 2.2.1 depicts the stages of production of a simple cotton t-shirt. With the need for a holistic enhancement of efficiency, it would be appropriate to apply supply chain management practices which at each link in the chain of a company's activities. The additional value for members along the chain may allow members of the business, its customers and its suppliers to be able to improve their relationships in a willing, mutually beneficial and amicable way.

2.7. Electronic supply chain management

Electronic supply chain management or eSCM denotes the use of information technology and technology application to complement the use of supply chain management in improving efficiency through improved speeds, reduced errors and relaxed labour reliability implementation. As per (Mbanje and Lunga, 2015), information is a key supply chain driver, with information technology shifting economies toward collaboration. This is due to the improvement of inter-departmental and inter-company networking, the synchronising of value-adding activities and the flow of information (Mbanje and Lunga, 2015).

ESCM application has considerable benefits for business process change, collaborative relations amongst supply chain partners and business transformation. It can be defined as “the impact that the internet has on the integration of key business processes from end-user through original suppliers that provides products, services and information that add value for customers and other stakeholders” as per (Giménez and Lourenço, 2008:311). Extending on this definition, (Wu and Chang, 2012:474) refers to it as “the physical implementation of supply chain management process with a support of information technology”.

Daly and Bruce, (2002:11) express the benefits of internet technologies in enhancing business-to-business partnerships through the enablement of quick, cost-effective communication between parties.

Recent studies show the impact of the digital marketplace, which has enhanced business-to-customer communications, with specification, preference and quantity information promptly communicated through website order placement, email and instant messaging. Websites also provide a cost-effective means of competing in new markets for manufacturers who are no longer tied down to local retailers, who usually abuse their superior financial strength in business-to-business relationships.

Several definitions of eSCM exist. (Giménez and Lourenço, 2008:311) describe it as “the impact that the internet has on the integration of key business processes from end-user through original suppliers that provides products, services and information that add value for customers and other stakeholders”. (Wu and Chang, 2012:474) extend on this definition, defining it as “the physical implementation of supply chain management process with a support of information technology”.

The advantages of this aspect of supply chain management comprise the capability for speedy and precise information sharing. eSCM tools such POS software, which disseminates real-time data up the supply chain, and ERP software, which links supply and demand through information sharing allow this (Mbhele, 2014:86), (Giménez and Lourenço, 2008:322). (Mbanje and Lunga, 2015) add that a firm’s ability to achieve corporate strategies and goals is directly dependent on its ability to use information technology.

Evidence of the successful implementation of information technology can be seen in the successes of multiple worldwide corporations. These include the improvement of operations management at Liverpool Football Club, the current world champions, whose success is largely attributed to the introduction of optical sensors, similar to those used by missile tracking systems, to track player movements and the decisions which needed to be taken (Burt, 2019). (Kale, 2016) cites that due to the level of change and uncertainty in business the use of information systems is, “business incarnate.”

Similarly, clothing giant Zara has used customer relationship management software to keep revenues steady, despite the lack of advertising effectively. This is done simply through the usage of product-popularity data propagating software, which allows the company to assess trends faster than previously (Binns, n.d.).

Information boosts which are brought about through information technology such as customer demands, order status reports, real-time inventory stock reports, delivery schedules and tracking and invoicing systems are helpful to decision-makers in supply chains, particularly those who deal with purchasing, materials handling and logistics activities (Mbanje and Lunga, 2015).

As per (Al-Mashari,2002), the implementation of information technology has been driven by companies focused on harnessing the benefits of TQM (Total Quality Management) and BPR (Business Process Reengineering).

Total Quality Management represents the implementation of the principle that every member organisation-wide must be committed to maintaining high standards of work in every aspect of a company's operations along with developing a climate of continuous improvement and value-adding ability (Heizer, Render and Munson, 2017).

Business Process Reengineering represents the act of recreating a core business process with the goal of improving product output, quality, or reducing costs. It usually consists of the analysis of company workflows, finding processes which are substandard, needless or inefficient and figuring out ways of eliminating or altering them (Srinivasan, 2011).

The next section describes several types of eSCM which may prove to be useful for clothing and textile participants and highlights the benefits of each technology.

2.8. Types of eSCM technologies

As stated in Section 2.7, eSCM provides the potential to manage uncertainty through the improvement of collaboration, integration and operations improvement. This section lists and explains some of the eSCM technologies which may make this possible.

2.8.1. Enterprise Application Integration (EAI):

EAI is a cross-platform framework which allows different types of software in an enterprise to communicate efficiently. According to (Kale, 2016: 96), EAI manufacturers, also known as “middleware vendors”, develop solutions to “transform, transport, and route the data among various enterprise applications.” (Khan and Yu, 2019) define EAI as, “the tools and techniques used in linking ERP and other enterprise systems together,” further citing that linkage of systems is vital for success.

2.8.2. Extranet

Extranets are intranets which grant partial access to external users, allowing businesses and stakeholders such as management and alternative branches to exchange information securely on the internet. (Garfield, 2018) defines it as a controlled private network that allows access to partners, vendors and suppliers or an authorised set of customers – normally to a subset of the information accessible from an organisation's intranet.

Advantages offered by extranets are highlighted by (Lloyd and Boyle, 1998) and include the following:

- Ease and speed of set-up, use, management and maintenance. (Lloyd and Boyle, 1998). The setup of an extranet requires basic information technology nous, with advancements in cloud-based extranets making their setup and usage simpler (Senior, 2019).
- Scalability. This refers to an extranet’s flexibility to grow to include additional users or organisations, or to expand to a new hardware server array without compromising the system’s usability or integrity. Care needs to be taken to ensure this scalability is in place but can be advantageous to companies if done correctly (Lloyd and Boyle, 1998).
- Versatility. Extranets provide versatility at the setup stage, with extranets providing functions such document exchanges, collaborative discussion groups, on-line submission forms, database queries, manage tasks, organise calendars, and provide feedback quickly (Lloyd and Boyle, 1998). This

eliminates the usage of email messages, which can result in clogged up inboxes and limited file sizes. It also provides real-time access to up-to-date versions of previously exchanged documents (Senior, 2019).

- Security. The setup of secure and accountable frameworks provides the basis for system usability and dependability and access-control (Senior, 2019).
- Low costs and greater return on investment. Costs associated with building, launching and maintaining an extranet presence are remarkably low, especially since the advent of cloud computing (Lloyd and Boyle, 1998), (Senior, 2019).

2.8.3. Electronic Data Interchange (EDI)

An EDI is the concept of businesses electronically communicating information, which was traditionally communicated manually, like purchase orders or invoices or “the transfer of data from one computer system to another by standardised message formatting, without the need for human intervention” (Rouse, n.d.). EDI provides an alternative to postal mail, fax and email, another electronic form of communication. The difference between EDI and email is primarily that the handling of documents is done by computers, rather than people.

The comparative diagram below depicts the ease which EDI allows communication precision and speed.

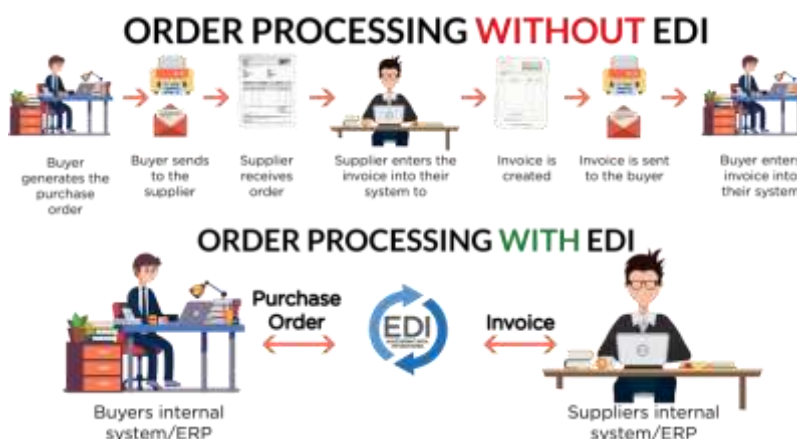


Figure 2.8: Traditional ordering VS EDI systems.

Source: (Medium, 2019).

The advantages of using an EDI system are:

- Long term cost savings, with savings on consumables such as paper, storage, copying and postage.
- Accuracy as compared to email, which could have typographical errors or end up in spam and physical order placements which could suffer as a result of illegible handwriting.
- Security
- Environmental sustainability (OpenText, 2017).
- Speed and responsiveness as compared to postage and email which may have emails sitting in the spam or junk mail inboxes. This, in turn, allows for greater responsiveness to consumer demand fluctuations (Fazlollahtabar, 2018).

The disadvantages or limitations of using an EDI system, however are:

- High setup costs (OpenText, 2017). However, this has been alleviated with recent innovations such as cloud computing, which reduces the requirement for infrastructure such as servers (Babati, 2019).
- Too much standardisation
- The initial setup is time-consuming
- System electronic protection
- Proper backup (OpenText, 2017).

2.8.4. Intranet

An in-house system or intranet is a local connection between multiple computers at one location. It is typically used by computing devices to share information and instructions with access to outsiders being prohibited. When used with additional software, intranets also allow employees access to databases and real-time information, enabling collaboration (Buttle and Maklan, 2015).

2.8.5. Enterprises Resource Planning (ERP)

Often regarded as one of the most innovative information technology developments of the 1990s, Enterprise Resource Planning or ERP, is a system whereby a company manages and integrates vital aspects and departments of business within a singular software. The key factor being integration, this software allows all functions and departments of a business to engage and communicate seamlessly and in unison (Heizer, Render and Munson, 2017). Syspro ERP and Sage ERP are ERP software applications commonly found in South Africa (Osman, 2017).

The benefits of ERP systems include the following:

- Internal Benefits
 - Integration of a single source of information
 - A real-time source of information
 - Improved productivity
 - Reduced operating costs
 - Improved internal communication
 - Reduction of errors
 - Product life cycle management which facilitates enhanced waste management and promotes environmental sustainability (Heizer, Render and Munson, 2017).
- External Benefits
 - Improved customer service and order fulfilment
 - Improved communication with suppliers and customers
 - Enhanced competitive position
 - Increased sales and profits
 - Reduced lead times (Heizer, Render and Munson, 2017).

The diagram below shows the integrative nature of the Enterprise Resource Planning System.

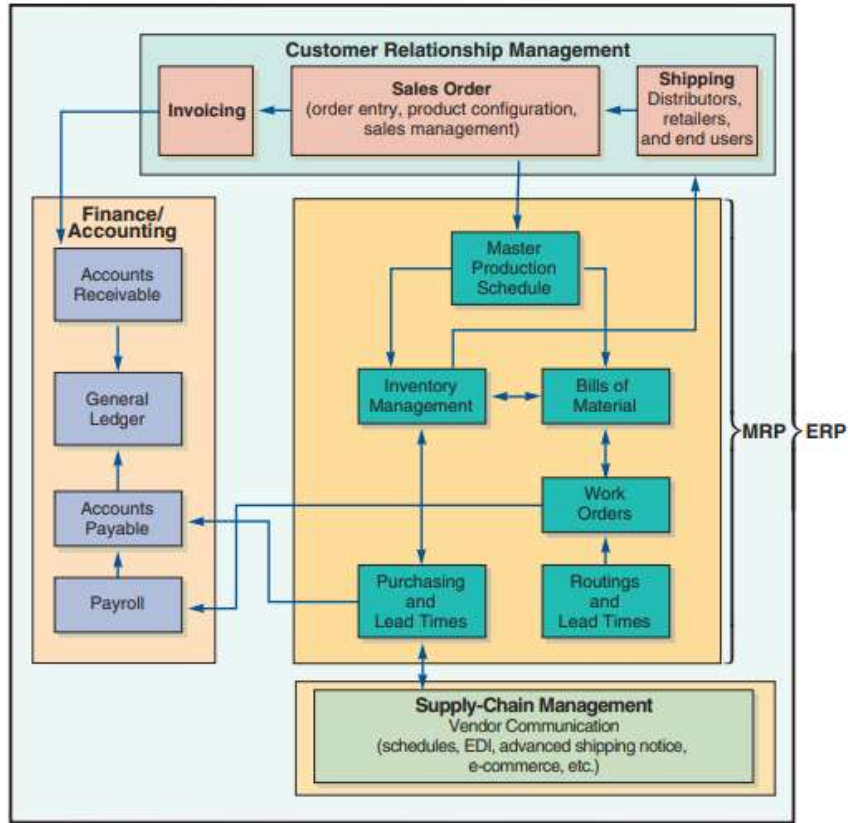


Figure 2.9: ERP System

Source: (Heizer, Render and Munson, 2017: 623).

The importance of these systems can be seen in an American perspective, with (The University of Scranton Online, n.d.) stating that usage of this software has benefitted several sectors including the aerospace, entertainment and telecommunications industries amongst others. Specifically in the textile sector, (Carlton, 2019) states the benefits of ERP software for clothing and textile operators in the United States, citing software such as PolyPM and A2000 which were developed to be customised specifically for textile operators and enabled companies like Gamewear of Miami to successfully “create one BOM that dynamically configured all of the product options.”

Which in turn “greatly reduced our development costs and enabled us to expand our product offerings” as per their CEO.

Context and an analysis of cost-effectiveness are imperative (Payne, 2016), with an individualised analysis of the costs-versus-benefits of different ERP packages being vital before selecting ERP technologies.

2.8.6. Barcoding

The most common form of automatic identification, barcoding is the use of physical numbers or patterns to label, identify and track objects. This form of identification typically involves the use of machine-readable codes in the form of numbers and a pattern of parallel lines which are printed on or stuck onto goods (Attwood and Cresswell, 2002:82). The technology has also evolved to include QR or Quick Response codes. These lines or patterns are scanned using a scanner, which in turn communicates with the computer system which contains the information which is extracted from the barcode. In the local clothing and textile sector, it is often used when goods are received and despatched (Raza, 2017).



Figure 2.10: One-dimensional versus QR barcode.

Source: Adapted from (Brian, 2000) and (Nayak, 2019).

The benefits of this type of identification include reduced costs by eliminating excess employees and the time required to find inventory making companies more efficient and increases the bottom line. Additionally, inventory is located faster and with fewer errors, enabling just-in-time activities (Johnson, n.d.). These advantages are suggested by (Muller, 2011) to justify the significant initial cost outlay when investing in such systems in most instances.

2.8.7. Radio Frequency Identification

Radio frequency identification or RFID systems are a form of wireless communication which use radio frequencies to detect and identify such goods without the need of line-of-site contact (Mbhele, 2014) (Robbin, 2016). It consists of three parts, an RFID tag or stamp which stores and transmits information, the RFID receiver and the RFID controller. As seen in the image below, the scanner picks up information from the stamp (or multiple stamps simultaneously) and sends them through to the Central Processing Unit, which decodes it using suitable software (Nayak, 2019).

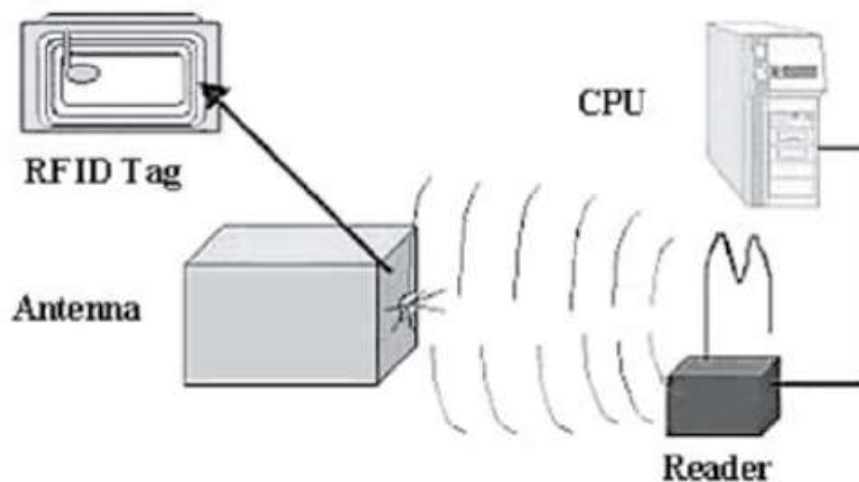


Figure 2.11. RFID In Action

Source: (Nayak, 2019)

The benefits of RFID technology in the fashion and clothing sectors are many, including the following:

- The combating of counterfeit products
- The development of the in-store shopping experience, with some stores implementing technology such as tags which link to mobile phones and give further product information to users instantly. The technology has been implemented by Polo Ralph Lauren to assist in fitting rooms, with tags being connected to smart screens which allow consumers to see how an item would look on them in different colours (Swedberg, 2015).
- Controlling of inventory levels and prompt replenishment activities
- Organisation of events

The diagram below depicts the way RFID has been used to reduce the bullwhip effect successfully by Walmart.

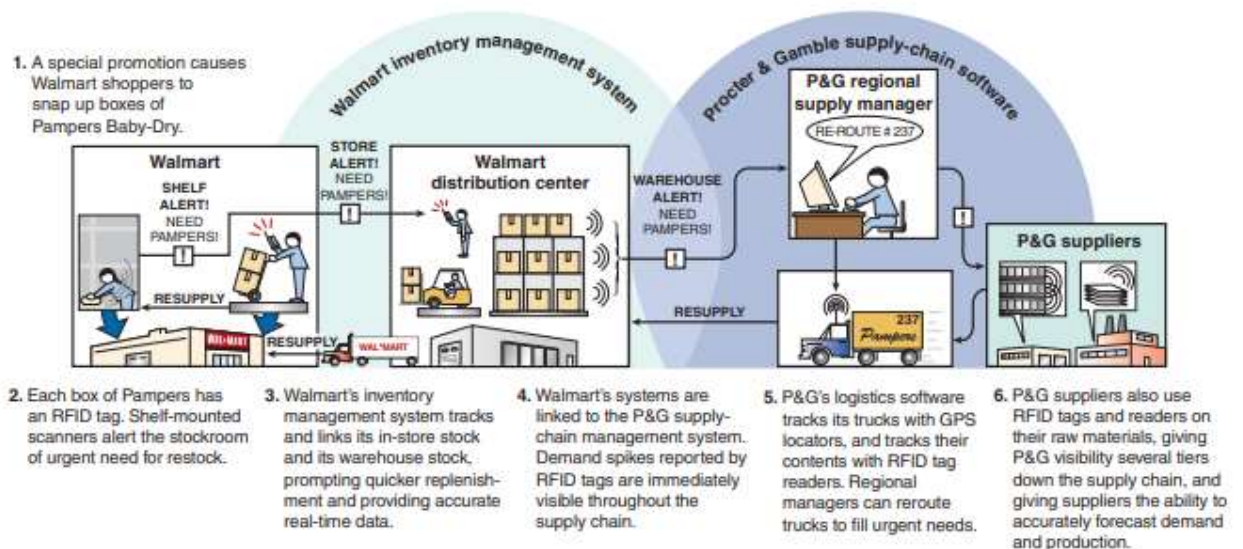


Figure 2.12: RFID implementation at Walmart.

Source: (Heizer, Render and Munson, 2017: 513)

Internationally, Italian sportswear manufacturer Benetton uses RFID to enable the automation of its distribution centre which includes the management of ordering, availability, production, warehousing, order tracking and planning (Heizer, Render and Munson, 2017). The House of Busby, a local clothing retailer, based in Johannesburg uses this technology successfully, with RFID tags allowing speedy product description communication and facilitating inventory tracking, allowing for savings on labour costs and reducing lead times.

2.8.8. E-marketing

E-marketing refers to marketing activities done online. The importance of merging marketing activities with supply chain management activities is noted by (Folinas and Fotiadis, 2017), who stated that most literature on the topics address them separately when they should be considered together. This statement fits in line with the understanding of the fact that a supply chain consists of the activities involved in the production and distribution of a commodity. Marketing assists supply chain management activities as it enhances the internal and external communication abilities of an organisation (Knilans, 2019). E-marketing is a means of communicating with downstream members of a supply chain.

It consists of activities such as the following:

- Email refers to the transmission of messages over networks such as the internet. Such systems can be used for supply-side and demand-side communication (Arnold, 2011). Email marketing which is the act of using email messages to convey commercial messages such as newsletters and promotions (Stokes, 2018).
- Social media marketing which refers to techniques which use social networks and applications to convey messages, create brand awareness and promote products. It is a cost-effective means of brand development and consumer feedback retrieval and customer relationship management. It includes the use of medium such as Instagram, Twitter and Facebook (Stokes, 2018).
- Display advertising, which is a form of online advertising that includes banner advertising and rich media. In contrast with text-based advertising, display

advertising depends on elements like images, audio and video to communicate an advertising message (Stokes, 2018).

- Search engine marketing which is a form of internet marketing that uses the promotion of websites through increased search engine result visibility. It includes keyword research, search engine optimisation and pay-per-click subscriptions which are discussed below.
 - Search engine optimisation or SEO refers to techniques used to increase visibility and traffic to a company's website by increasing its search engine page rank. It involves improving the quality of the content, ensuring that it is rich and contains relevant keywords and organised by using subheadings, bullet points, and bold and italic characters. It also ensures that a site's coding is optimised to enable search engines to determine what is on the webpage and display it as a search result for relevant searches.
 - Pay per click subscriptions are a model of internet advertising used to drive traffic to websites, in which an advertising company only pays a service provider when the ad is clicked.
- Content marketing which is a type of marketing which involves the creation and sharing of online material that does not explicitly promote a brand or product but is intended to stimulate interest in its (Stokes, 2018). It includes:
 - Video marketing, which refers to the use of video technology in portraying messages. This is often included in the use of social media marketing, with networks like YouTube being used for this purpose. It is beneficial to create a user-friendly way of explaining products, specifications and user guides.
 - Blog activity
 - Social media posting
- Marketing analytics which is the action of using information systems to track user preferences, demand patterns and other valuable information which assist demand planning. This form of social media and website usage analysis facilitates (Stokes, 2018)

2.8.9. E-marketplace

An e-marketplace refers to an electronic commerce system where third parties supply products and services with transactions being processed by the marketplace operators. A locally used example of such a marketplace is Bid or Buy. It is a virtual online market platform where businesses register as buyers or sellers through the internet. The connectivity of the internet has assisted both buyers and manufacturers, offering to remove intermediary companies from transactions.

Such systems allow buyers to compare goods and services according to measures including performance, quality and price. They also allow an access to a larger range of goods and services. Similarly, sellers are able to reach customers more conveniently and affordably. By gaining affordable entry into new markets, the ability to target new buyers. This allows companies to focus on value-adding activities.

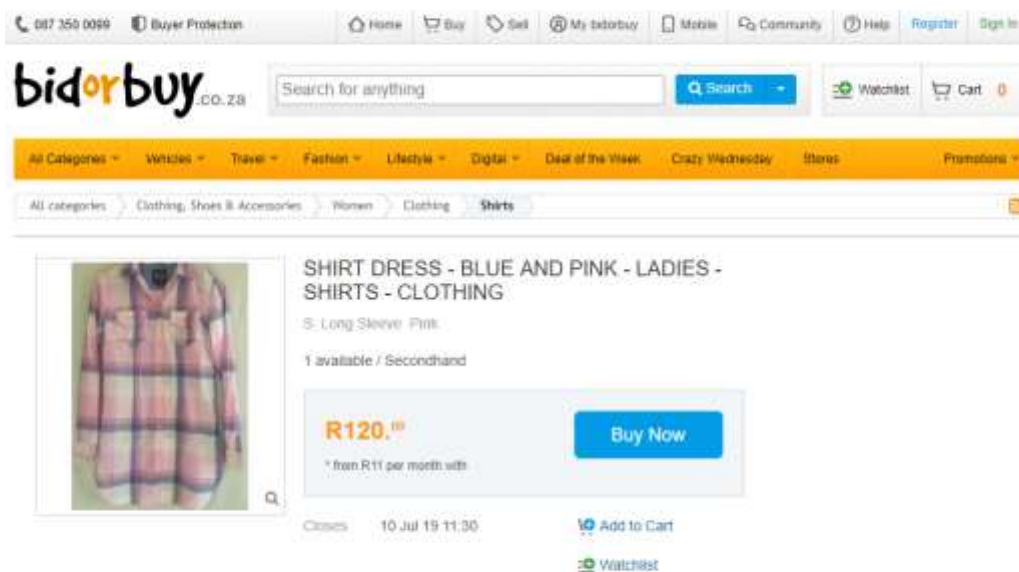


Figure 2.13: Clothing being sold on Bid or Buy.

Source: (Bidorbuy, 2019).

2.8.10. Automation

Automation means the use of automatic equipment in manufacturing or other processes. Automation technology offers a safe and efficient substitute for labour in physical activities. Such technologies range from automatic storage and retrieval systems, automated sewing machines to the use of electronic lasers for garment design.

Automation of operations facilitates the following benefits:

- The speeding up of waste elimination
- The reduction of variable and total costs
- Improved safety of employees
- Improved communication between and within departments due to connections with the internet
- The streamlining of activities, resulting in just-in-time delivery (Lawson, 2017).

Automatic storage and retrieval systems are computerised systems which are controlled by a host computer and are used to move components to required storage or assembly points (Attwood and Cresswell, 2002:82). In the textile industry, such systems have been used to transport heavy fabric bales, allowing labourers to focus on value-adding activities



Figure 2.14: Automation for fabric storage and movement

Source: (Attwood and Cresswell, 2002).

A key benefit of automation developments is the improved employee safety assurances, with Levi's, a global jeans brand's development of technology which radically changed how denim is washed. Washing refers to a process under which denim or fabric which has been previously dyed undergoes intense chemical and water treatment in an effort to alter the appearance, comfortability, and design of clothing items (Raaz, 2016).

Levi's' development of laser washing technology reduces lead times of what was a time-consuming process whilst assuring employee safety through its limiting of their exposure to the harmful substances previously used. The image below of the laser washing process shows the technology which reduced labour time from about half an hour to below two minutes, enabling workers to concentrate on value-adding activities (Segran, 2018).



Figure 2.15: The automatic denim washing process

Source: (Segran, 2018)

Automated sewing machines pose an alternative to manual machines. These machines can provide a substitute to companies who are overly reliant on labour forces. Work may not reach a standstill and these machines, which are developing to gain immaculate accuracy, are almost capable of cutting and sewing entire garments in approximately 4 minutes. Additionally, with the reduction of manual activities, the labour cost for an average t-shirt is estimated to be about 0.33 USD (approximately 5 South African Rands at the time of writing), which is lower than the cheapest rates worldwide per garment in factories using manual sewing machines. (Noe, 2017) also cites that companies which implement these machines will balance the scales against international competitors, creating jobs locally.

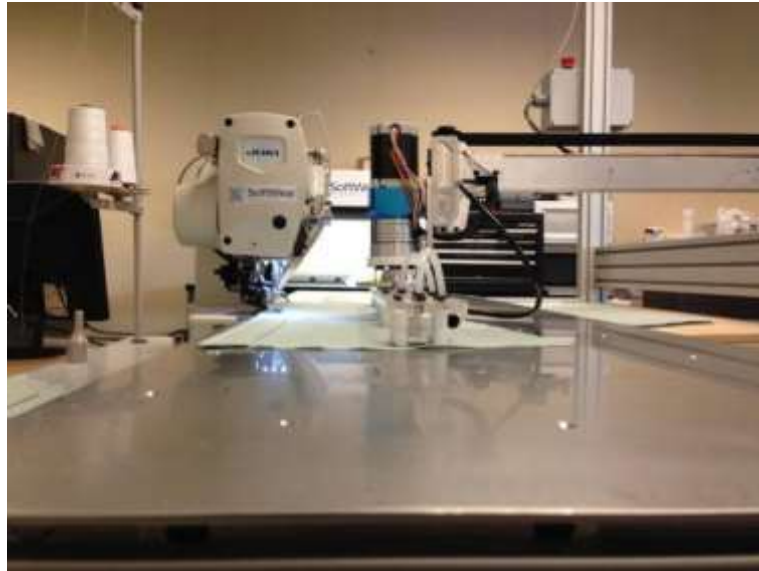


Figure 2.16: Automatic sewing machine

Source: (Noe, 2017)

2.8.11. 3D Printing Technology

3D printing technology, alternatively referred to as additive manufacturing, is the process of manufacturing three dimensional solid objects from digital files. The term additive manufacturing refers to the methodology of manufacturing items layer by layer way until one has a fully formed structure. It presents a form of manufacturing which is less costly and time-consuming. It also presents the ability to use different materials and eliminates the need for specialised tools which were previously required (Nayak, 2019). This form of technology has provided sustainable and cheap manufacturing substitutes in the food industry, the construction industry, the healthcare industry and now the clothing industry.

The diagram below shows a simple 3D printing process using the Electroloom Mini 3D printer, which starts off with a mould designed by the user, which is inserted into the machine. The machine then has a liquid solution into it, which it guides using an electronic field. The liquid solution rapidly converts into a solid cloth whilst being sprayed onto and evenly coating the mould. Thereafter, once it solidifies, the fabric is removed from the mould as a fully seamless garment (Molitch-Hou, 2016).

However, the main downfall of this technology is the inability to manufacture in bulk as yet (Nayak, 2019), which may rule it out for larger manufacturing companies wishing to remain competitive in the near future. An increase in the speed of printers and improved filaments, the material used to create garments, may see it become more commonplace worldwide according to (Winick, 2017).

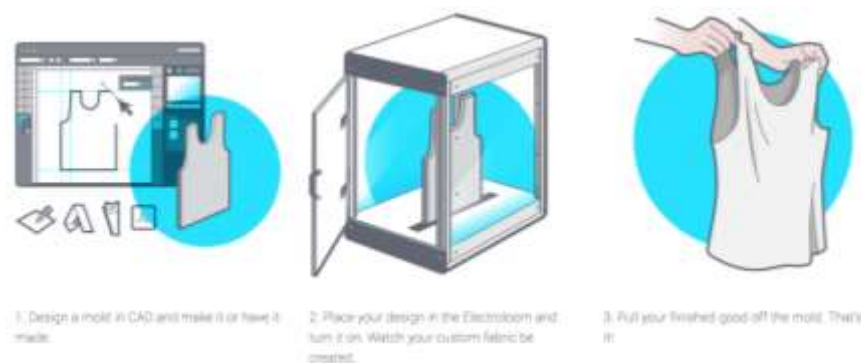


Figure 2.17: The garment manufacturing process using 3D printing.

Source: (Baggaley, 2018)

2.8.12. Geographic information system

A geographic information system or GIS is a computerised tool which is used for the capturing, storing, manipulating, analysing, managing, and presenting of geographical data, typically on a map. It is used to provide geographic information and spatial analysis and provides information to businesses and governments regarding patterns such as weather patterns and population dynamics and demographics. This system simplifies complex analysis and decision-making through the geographic representation of data, which was previously done on spreadsheets (Du, Zhang and Zheng, 2009).

As per (Du, Zhang and Zheng, 2009), (Tayman, 2011) and (Roig-Tierno, Baviera-Puig and Buitrago-Vera, 2013), the business intelligence attained with GIS can assist in:

- Picking the location for stores based on consumer demographics, location and demand patterns. This can assist with pricing, operating hours and inventory management.
- Helps decision making regarding stocking specific stores for specific needs and specific demand patterns. For example, stores nearby to beaches and swimming destinations would require more stock of swimming costumes than inland destinations.
- Choosing delivery and transport routes.
- Manage organisational performance
- The customisation of marketing to suit specific consumers.

2.8.13. Tracking systems

Vehicle and goods tracking systems allow for real-time information on goods and shipments to be received and despatched. Among the benefits of these systems are that they allow one to know where goods are, when they are expected to arrive, identify where losses and inefficiencies occur (itSHOWCASE, 2019). Service providers like CHEP and Tacho-Data provide such technologies to enable the tracking of both in-house and in-transit inventory (CHEP, n.d.; TachoData, n.d.)

(Africa Automotive News, 2019) cites the use of pocket-sized internet and GPS enabled trackers which allow tracking of speeds of drivers, monitor harsh driving and reduce maintenance costs, track driver productivity and allow for real-time tracking which is necessary in the event of an accident.

2.8.14. Warehouse Management Systems

Warehouse management systems, or WMS are software applications designed to support and optimise warehouse functionality and facilitate distribution centre management. WMS assist management personnel in planning, organising, staffing, directing, and controlling the utilisation of existing resources, when moving and storing material resources into, within, and out of a warehouse. Traditionally, WMS systems only allowed users to track the location of goods. Improvements to the software have led to the ability of the software to assist with picking and packing

decision-making. WMS software can be sourced individually or can be included in ERP software (IQMS, 2016). This software works in-tandem with barcoding or RFID systems to facilitate efficient and effective picking and packing (Adiono et. Al., 2017).

Freight management system (FMS)

Freight management systems, or transportation management systems, enable distribution optimisation. It assists with both inbound and outbound flows of goods, freight invoicing and settlement, and provides performance reporting. These systems may also be found in a stand-alone format or be a module within ERP systems (Oracle, n.d.).

2.8.15. Maintenance report software

The use of information technology and automated systems for maintenance applications provides a real-time report system wherein servicing and repair are done timeously. This also saves time when troubleshooting issues or errors. This, in turn, leads to increased labour productivity, with the system directing maintenance staff to areas of concern instantaneously, allowing technicians to source repair materials in advance and complete their tasks without interruption (Christiansen, 2018).

An example of such technology can be seen with The Cat App, which gives farmers the opportunity to access real-time information about location, utilisation, fault logging and maintenance data on the user's mobile phone (HarvestTECH, 2019) and has been used by farmers in South Africa (South African Heavy Equipment Magazine, 2018). Similarly, in the textile industry, similar technology has been implemented in France, allowing textile sector participants to reduce errors in maintenance scheduling in a shift away from manual or MS Excel-based maintenance scheduling and (Sourget, 2019).

Juki, a leading supplier of machinery such as sewing machines and assembly systems in Africa, has implemented a similar software which it has provided to its Asian customers, called Juki JaNets machine operation management system, citing that the system helps multiple stakeholders understand the status of a machine (Juki, n.d.).

These stakeholders include corporate managers, production managers, maintenance managers and operators who can see the real-time work-in-progress statistics of a machine and production line, machine failure rates, target fulfilment and early detection of trouble in machines (Remington, 2018).



Figure 2.18: Maintenance network at a factory.

Source: (Juki Europe, n.d.).

2.8.16. Nanotechnology

(Nip, 2004) mentions the need for South African clothing and textile firms to invest in machinery and in research and development activities, citing that this could lead to more considerable competitive advantages. With the potential to revolutionise clothing, nanotechnology proposes one such potential avenue for investment. A field which is developing itself in recent years, nanotechnology allows for different applications of currently used textiles and the potential for the creation of entirely new ones (Berger, 2016).

Initially allowing companies to adapt the finishes of garments, nanotechnology began by allowing manufacturers to change the relationship between textiles and their

environment. This included giving textiles the ability to contain ultra-violet-blocking, antimicrobial, antistatic, flame retardant, liquid repellent, wrinkle-resistant, and self-cleaning properties. This phenomenon is termed nano finishing (Berger, 2016), A commercialised example of this phenomenon can be seen in Australia, where clothing retailer Treadsmiths created an almost unstainable t-shirt using this technique (Pirolini, 2014).

Recent developments in the technology have resulted in research and development supporting the fusing of electronic components with textile fibres which can bring about developments like solar textiles, which are used to harness the energy and can turn a t-shirt into a power source and the potential inclusion of smart screens in textiles (Berger, 2016).

Additionally, nanotechnology represents a means to create textiles which are responsive to changes of the wearer. Prototypes developed have seen nanotechnology embedding sensors into fibres which allow them to detect temperature and oxygen levels amongst other factors. This development has led to textile companies diversifying into healthcare, with pharmaceutical research and soldier health analysis being done using it (De Lange, 2014).

Nanosensors may also assist in warehouse management. (Jianjun and Bowles, 2013) state that nanotechnology is particularly useful in, “temperature monitoring, humidity detection, hazardous gas and vapour detection in storage.”

These advancements also provide a basis for differentiation of garments based on attributes, allowing South African manufacturers to export garments which are not found in countries like Bangladesh. This differentiation could provide a direct competitive advantage to local manufacturers (Nip, 2004).

2.8.17. Printed marker technology

Printed market technology represents a form of automation commonly used in the clothing manufacturing process. Previously done solely manually, the designing, laying and cutting up of markers is imperative to the clothing manufacturing process. Markers represent a guide used in the cutting stage of a garment manufacturing process. It is typically a sheet of bond cardboard paper with all of the pattern pieces used to make a style laid out in a configuration intended to reduce fabric wastage. Patterns allow for the cutting room team to know the sizes and specification of a garment which needs to be cut (Fasanella, 2012).

Economies of scale are reached through the use of printed or digitised markers when cutting up garments. The manual methodology of this process involves placing stencil-like pieces of cardboard over a number of layers of fabric and cutting it accordingly. Printed clothing markers provide a time-saving alternative to manually laid markers in clothing cutting rooms. Additionally, digitisation assists with grading, which is the process of resizing a pattern along the size spectrum. This technology provides the efficiency of lead time speeds and a cost-saving on labour which can be used on value-adding activities (Gutierrez-Diaz, n.d.).

Systems such as Gerber Technology's AccuMark software allow pattern modification for personalised garments and have eliminated the need to invest in digital scanners, with digital cameras sufficing to input the patterns onto the system. The software has several benefits including reducing the number of samples required and has allowed a seamless transition from traditional patternmaking for manufacturers like American-based suit manufacturer Adrian Jules and Lilanz, a Chinese menswear brand (Mageean, 2020).



Figure 2.19: Manual Pattern Laying versus Digitised Laying of Patterns

Source: Adapted from (El-Alam, n.d.) and (Marker Express, 2016).

2.8.18. Augmented reality

Augmented reality refers to, “a technology in which computer-generated images (sometimes sound and textual info is also added) are imposed on reality,” (Loijens, 2017: 56). It provides potential for operators in multiple sectors, including the jewellery, furniture and clothing industries, to allow consumers to attain a visual match to a certain situation (Loijens, 2017).

The technology has been used in the clothing sector by several international retailers including Asos in the United Kingdom which has used the technology to allow consumers to virtually try on clothes in their own environment, allowing the company to create an “intimate buying experience,” (Wightman-Stone, 2017).

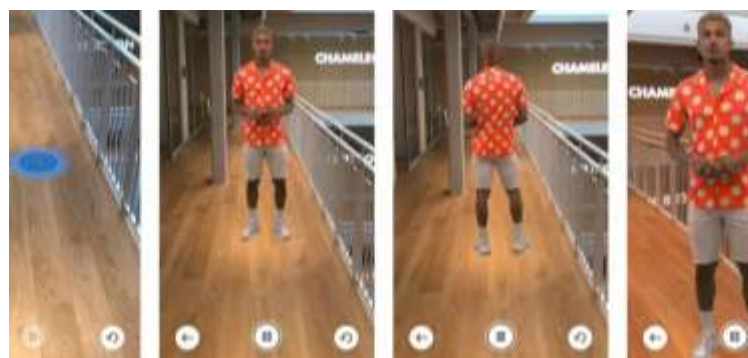


Figure 2.20: Augmented Reality for clothing sampling

Source: (Wightman-Stone, 2019).

Locally, the technology has been used by paint manufacturers such as Dulux to allow consumers to see how a shade of paint would look in their home environments (Witepski, 2018).

2.8.19. Customer relationship management systems

Customer relationship management or CRM is defined by (Binns, 2019) as the strategies or techniques companies use to engage and retain existing clientele. There is often disagreement whether CRM stands for these strategies or the software used to manage customer relationships. For the purpose of this study, “CRM” refers to these strategies, whilst “CRM systems” denote the software discussed below.

Customer Relationship Management systems represent the actual computerised systems used to manage interaction with current and potential customers through careful collating of their information. Examples of this are produced by Sage and Hubspot (D’Angelo, 2020). These systems assist organisations in managing leads, deals, and clients, whilst allowing the company to create targeted marketing campaigns. (Holland, 2019) notes that CRM systems are a business’, “single source of truth,” which connects customer information together and allows the personalisation of marketing content.

The type of consumer-based data brought together by a CRM system include consumer responses to campaigns, shipping dates, purchase histories, account information, demographic data and service records. The integration of these types of data results in rich information which can be used to assist the duties of customer service agents and simplify marketing processes (Brown, Suter and Churchill, 2017).

Clothing retailers such as Zara use such systems to track consumer transactions, preferences and habits (Binns, 2019).

2.8.20. Supplier relationship management systems

(Kale, 2016) defines supplier relationship management as the supply chain management process which includes all activities related to interactions with

suppliers. He further states that SRM processes are used to develop and sustain relationships with key suppliers to enhance a supply chain's ability to create value.

From an eSCM perspective, supplier relationship management systems, such as mySAP SRM are software which allow the strategic planning and centralised control of relationships between a company and its suppliers (Kale, 2016). (Stevenson and Spring, 2007) note that SRM systems allow the sharing of real-time information, and in turn more exceptional communication and collaboration.

(Schuh et al., 2014) note that a functional SRM solution allows businesses to view spending patterns with regards to specific suppliers, contract compliance records supplier contact registers and records of relationships between a company and its suppliers. It is essentially a company's supply side equivalent of a CRM system.

2.8.21. Demand planning software

Demand planning is a planning process that allows businesses to develop demand forecasts with the aim of producing goods or services with greater accuracy and efficiency. Demand planning and forecasting enables organisations to fulfil customer requirements whilst keeping the costs of holding inventory low (Thomopoulos, 2015).

Demand planning software is computerised software which allows organisations to conduct this form of planning and forecasting. Such software has opened up the ability to plan due to the bringing together of historical data into one system, creating accurate, unbiased forecasts cost-effectively and quickly (Gilliland, Tashman and Sglavo, 2016)

2.8.22. Point of Sale systems

Point of sale systems are used by brick-and-mortar retailers to conduct in-person sales. They include the use of cash registers, computers and even tablet computers. Point of Sale or POS software refers to software typically included with cash registers or other devices. The use of such systems allows the dissemination of sales statistics to flow through the company quickly and consistently (Gomzin, 2014).

Research by (Raza and Kilbourn, 2017:4) shows that there is abundant benefit added for leading entities who use resource management software such as Point of Sale (POS) to identify consumer demand patterns and describes the opportunity for qualitative research to act in collaboration with the evidence of this software. There is a clear opportunity for other supply chain management actions to challenge uncertainties in a South African textile industry context, with a movement toward lean thinking in management allowing Cape Union Mart to streamline its processes and ensure demand and supply probability amid uncertainty (Hartzenberg, 2017).

2.9. Reducing Uncertainty

As discussed previously, uncertainty prevails in all aspects of life. From a business perspective, the management and reduction of uncertainty is imperative in every sector. The impacts which SCM can have on doing so will be discussed in this section, followed by a discussion of the ability of eSCM to do so in the national clothing and textile sector.

2.9.1. SCM's role in reducing supply chain uncertainty

As eSCM's definition has been established to represent the ability for technology to aid the impacts of supply chain management on business operation, to understand its benefits in uncertainty reduction, an understanding of the benefits of supply chain management on uncertainty reduction is required.

Through its holistic overview of management, SCM has the ability to manage uncertainties through:

- Enhancing communication and therefore enabling enhanced and swift communication of demand requirements and supply capabilities swiftly.
- Lining up suppliers and operations to fit demand.
- Cultivating trust and relationship building between departments and amongst supply chain stakeholders.

- Reducing storage costs through just in time activities.
- Reducing transport expenses through efficient logistics and distribution planning.
- Improving post-transaction communication.
- Cultivating a continuous improvement culture within the supply chain (Cooper, and Ellram, 1993:20).

Specifically, in the textile industry, SCM provides the potential to generate efficiency and predictable, sustainable situations. The advantages of vendor selection with a supply chain-wide outlook have been explained by (Koprulu, 2007), as the correct selection of suppliers at any stage of a supply chain has a domino effect which generates chain-wide flexibility and organisation through reduced, flexible lead times, waste reduction and cost-saving.

Evidence of the positive influence of supply chain management is seen in (Vidhani, 2016:55-56), wherein lean manufacturing activities and a lean mindset were found to improve lead times at Tektex in Cape Town, and at retailer Cape Union Mart (Hartzenberg, 2017).

2.9.2. eSCM's role in reducing supply chain uncertainty

From a eSCM viewpoint (Raza and Kilbourn, 2017:4) have discussed the benefits of Point of Sale software for in demand forecasting, adding that there is room for collaborative usage of such software. (Rambaran, 2016) studied the impacts of omni-channel distribution on a retailer in the sector. Apart from this, a lack of in-depth eSCM research on the sector is evident, particularly higher up the supply chain. Albeit in another industry, eSCM implementation has proven to be fruitful in the management of local FMCG demand forecasting inefficiencies such as the bullwhip effect (Mbhele, 2014:6).

Globally, the evidence is present that eSCM implementation is beneficial to textile companies in search of competitive advantage. In India, several market leaders have successfully adopted the use of information technology for production monitoring, quality monitoring and control, whilst SME's have started ERP software adoption to ensure growth (Aarthy and Venkatesh, 2016:5).

In the United States of America, Boston's Henderson Sewing's use of automated robotics technology created by Rethink Robotics allowed labourers to focus on value-adding activities, with the Baxter robot relieving them of physical activities (Rethink Robotics, 2015). The aim of such automation is the transformation of jobs as opposed to their loss, with an emphasis on employee training and skills development enabling employees to work together with robots allowing efficiency and creativity unseen previously (Gownder, 2015).

2.9.3. ESCM for overcoming uncertainty in the textile industry

The role of eSCM in overcoming uncertainty in the South African textile industry has not been researched extensively. However, positive results obtained through research by (Raza and Kilbourn, 2017:4) has shown that there is potential for enhancement of business activities for organisations which use software such as Point of Sale (POS) through the enhanced identification of consumer demand patterns. This research qualitatively describes the chance for POS systems to assist business activities.

Additionally, from a supply chain management perspective, a move away from traditional management activities has helped Cape Union Mart streamline its processes and improve the predictability of demand and supply amid industry uncertainty (Hartzenberg, 2017).

The ability for eSCM implementation to assist SCM activities in benefitting the sector can be seen by the ways eSCM aids the purposes of SCM. (Raza and Kilbourn, 2017:4) discuss the positive effect which point of sale software has on supply chain management forecasting activities with the provision of real-time demand information. Added to ERP systems, this could directly benefit just-in-time systems, in markets

which require flexible supply due to fluctuating demand (Mbhele, 2014:86) without requiring excess inventory investment.

The ability to forecast precisely and the efficient sharing of information can directly lessen the effects of forecasting inefficiencies like the bullwhip effect with (Mbhele, 2014:5) finding that eSCM is a direct alleviator of this effect in the South African FMCG industry, highlighting the beneficial use of SAP for forecasting, replenishment and data management.. Additionally, the use of websites and online stores enables shop space reduction and the passing of accurate information along the supply chain speedily (Daly and Bruce, 2002:11).

2.9.3.1. The use of technology to thrive amidst the Covid-19 pandemic

As noted in Section 2.5.1.6, Covid-19 has had major impacts on business worldwide, creating opportunities and threats alike. The creation of opportunities for local suppliers of previously imported goods is balanced out by a decrease in consumer confidence and an increase in unemployment.

However, amidst uncertainty, many companies have leveraged eSCM capabilities to ensure success despite lockdowns and the reluctance of consumers to shop at brick-and-mortar stores. Having initially started its online store in 2012, and already benefitted with the purchase of clothing representing the most popular form of online shopping pre-Covid-19 (Davis, 2019), retailers such Mr Price have taken advantage of e-commerce to substitute its regular retail stores (Gernetzky, 2020), with the company finding an e-sales increase of up to 75% beneficial in the months following the strict government lockdown of 2020 (Naidoo, 2020).

Online sales increased by over 90%. Additionally, local, smaller branches have experienced upturns in demand as compared to larger stores, with consumers opting for convenience. However, there is still uncertainty on whether such sales patterns will continue at this rate in the foreseeable future, with “ongoing operational disruptions and future uncertainties,” being noted as significant challenges going forward (Gernetzky, 2020).

(Duenwald, 2020), (Coker, 2020) and (Rybol, 2020) note that augmented reality provides opportunities for clothing retailers to allow consumers to virtually try on items on their person or in their homes without having to leave the comfort of their homes. Cloud-based ERP has also provided the ability for workers to practice social distancing, allowing them to engage in work-from-home activities (Fowlkes, 2020).

From a manufacturing perspective, (Chiromo, Nel and Sebele, 2015:1970) explain that overproduction may occur due to uncertainty, wielding high industry costs, extra labour costs for the administration of redundant inventory as well as excess raw materials inputs, signalling that lean supply chain management techniques such as the Kanban boards can remedy this matter.

Evidence from (Raza and Kilbourn, 2017:4) proves benefits of implementation of software such as Point of Sale systems in determining consumer demand patterns. There is evidently opportunity for other supply chain management actions to tackle uncertainties in a South African textile industry context, with a move toward lean manufacturing aiding Cape Union Mart in streamlining its operations and ensuring predictability amidst uncertainty (Hartzenberg, 2017).

2.10. Conclusion

This chapter was a literature review which covered secondary research pertaining to the research objectives. It described the nature of uncertainty, delved further into the South African textile industry and the issues uncertainties faced in it. Thereafter it looked at defining the concept of electronic supply chain management, listed and explained several types of electronic supply chain management and lastly provided evidence of the potential for electronic supply chain management to bring about predictability and stability with the aim of rectifying the ramifications of uncertainty faced in the industry.

In doing so, it partially answered the first two research questions which were:

1. What are the uncertainties prevalent in the South African textile industry?

2. How can electronic supply chain management activities lessen the detriments of these uncertainties?

The next chapter, Chapter Three, will cover the research methodology used for primary research activities. This includes the research design, research paradigms, study site, population sampling strategy, data collection methods, data analysis and quality control, ethical considerations of the study and finally, the limitations of the study. It will be followed by Chapter Four, which consists of the data presentation and analysis of primary research and finally Chapter Five, which provides conclusions and recommendations.

Chapter Three: Research Design And Methodology

3.1 Introduction

This chapter covers the research design and research methodology which was used for primary research activities. Defined as the, “systematic approach to solve research problems,” (Adam, 2017: 60), a study’s research methodology represents a blueprint for how the primary research activities of a study are conducted.

This research methodology aims at explaining the way which primary data collection will take place and includes the research design selected, the chosen research philosophy, the target population of the study, the selected research instruments, the data examination techniques and procedures along with the assessment criteria of validity and reliability for the study.

As per the study of previous literature, there is a present need for the study of sources of uncertainty and for the management of uncertainty in the national textile industry. Factors like labour relations, energy inefficiency, trends and seasonality of fashion are causes of much uncertainty and expenditure to companies operating in the sector.

The management of these uncertainties through supply chain management has the potential to reduce costs and inefficiencies, improve service delivery to customers, and enhance the competitiveness of an organisation. In the clothing and textile industry, an example of this would be the use of multiple suppliers for trims to cater to fluctuating demand. Such practices would allow the flexibility of production and improve the efficiency in multiple lines creating opportunities which have less risk and are more attractive to investors (Cannivet, 2018).

To uncover specifically the causality of emplacing of eSCM in the sector, along with the potential to actually curb uncertainty of this management facet, primary research is needed to ascertain how many issues are present for companies who may not

implement them properly, as well as the opinions of experts who may have insight into how to use it and its effectiveness.

3.2. Research Methodology

Defined as the, “systematic approach to solve research problems,” (Adam, 2017: 60), a study’s research methodology represents a blueprint for how the primary research activities of a study are conducted. The research onion, as can be seen in Figure 3.1, was initially developed by (Saunders, Lewis and Thornhill, 2012) and graphically presents the methodology used in conducting a research activity. It categorises research into five stages including research philosophy, research approaches, research strategies, time horizons and data collection methods.

This Research Onion guided the design of the primary research, allowing the researcher to systematically arrive at a suitably understood and well-explained research design.

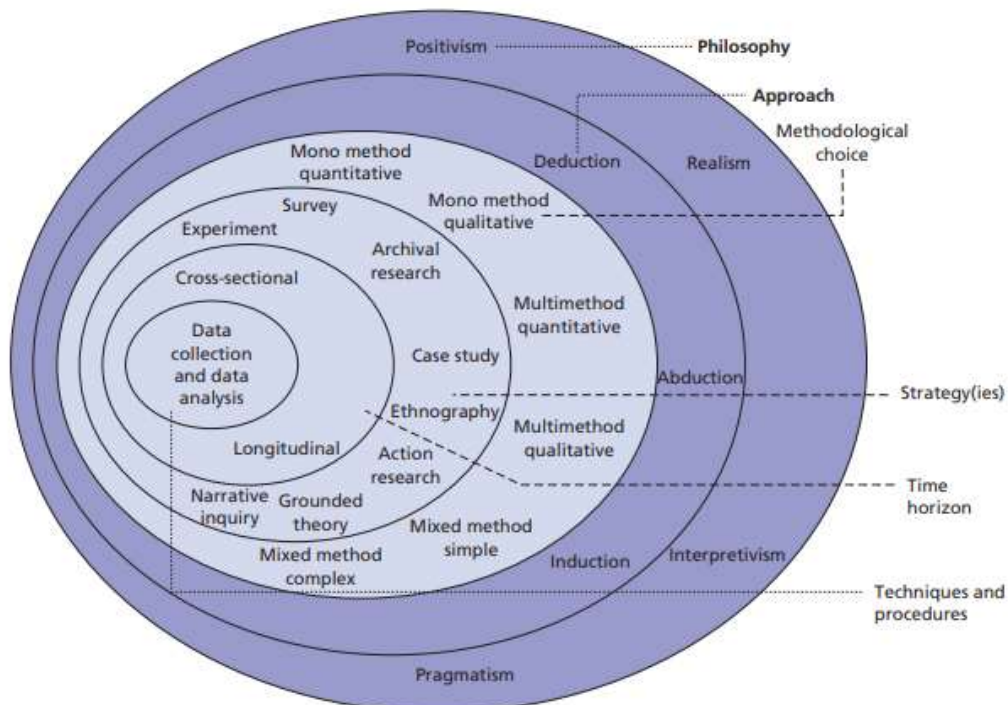


Figure 3.1: Research Onion

Source: (Saunders et al., 2012: 128).

3.3. Research Design

This refers to the strategy and design of how the research problems and questions were posed and answered. As per (Sekaran and Bougie, 2010:94), it refers to the structure of how primary research activities will be carried out and is the research professional's equivalent of an architectural blueprint.

Once secondary research had been completed and had established the presence of negative ramifications of uncertainty on the textile and clothing manufacturing sector and the presence of solutions to these issues through electronic supply chain management activities, descriptive studies were done to identify these issues precisely in the industry as well as their causes.

These studies, which are typically used as observation techniques with unchanged conditions are typically used to understand presently occurring existences, behaviour, attitudes or other characteristics of the present situation (Fowler, 1993). These studies answer questions like, "what is", "or "what was" (Sekaran and Bougie, 2010).

They can be used to understand what sources of uncertainty are prevalent for operators in the industry and in identifying the ways used by successful companies to rectify such uncertainties. Additionally, it may explain the current education levels of eSCM concepts, current implementation levels of eSCM tactics and the levels of acceptability to shifting toward eSCM processes and thinking (Kumar, 2005).

To elucidate on the causes of such inefficiencies, explanatory research was undertaken. This research explores and explains the reasons for occurring phenomena and can, in theory, explain the solutions to questions like "how prevalent is this?" and "what caused this to happen?". Historically, many researchers and professionals believed that causality is gained best using quantitative methods and opposed the use of qualitative

research for this aim. However, qualitative methods were used in lieu of its ability to prove and elucidate on causality, as stated by (Lewis-Beck, Bryman and Liao, 2004:21).

Furthermore, the investigation consisted of exploratory research and confirmatory research. Exploratory focusses at an issue which has not been discernibly outlined yet. It typically happens before there is sufficient evidence existing to make theoretical conclusions and point out explanatory relationships. It assists the researcher in determining the best-suited research design, data collection processes and subject selection and sampling (Lewis-Beck, Bryman and Liao, 2004:359). The literature review of past work represented exploratory research.

Confirmatory research was used to confirm the presence of issues of uncertainty (Sekaran and Bougie, 2010: 94). This was used to confirm the presence of issues of efficiency and uncertainty and lead into exploratory research into specific problems that affect companies in the South African textile industry which may be eradicated using supply chain management will hopefully be proven true.

Further exploratory research was used to understand the specifics of the issues arising at certain locations, their frequencies, their causes and finally opinions and emotions toward these problems. Studying these emotions would elaborate on the severity of these problems and understand who or what causes these issues, whilst providing knowledge of gaps in communication and technology which may be filled to rectify these issues (Kumar, 2005).

Due to the large population size and a lack of literature and information in the form of government published lists of all companies in the sector, a more suitable method of research is the case study method. Comprising of in-depth analysis and study of a specific business operating in the sector, a case study provides empirical and observational information which can aid the analysis of a case on hand. In the context

of this research study, it would allow the researcher to gain an understanding of the company and its standing in the midst of uncertainty in the industry (Yin, 1984).

A comparative case study, which includes the analysis and synthesis of the similarities, differences and patterns across two or more cases that share a common focus or goal (Yin, 1984), would be suitable. A comparative study of a company which has only recently implemented eSCM activities would be apt to understand the benefits it brings to the industry. This may be done in the format of a before-after study, which compares the company's efficiency and effectiveness before and after eSCM implementation.

Thus, the primary research activities used aimed to delve into the success which recently implemented eSCM activities have brought to Company A, in terms of uncertainty reduction and efficiency improvement. Company A was selected because it has gradually been implementing more eSCM activities over the past decade and has shifted toward a continuous improvement strategy. ESCM activities introduced at the company range from ERP software, email usage and social media usage, amongst others.

3.4. Research Approach/ Paradigms

Understanding of the research paradigm of a study is of vital importance as it directly influences the research design, methodology, collection and analysis. A paradigm can be explained as the manner of examining phenomena so as to gain particular understandings of them and attempt explanations (Kruger, Mitchell and Welman, 2005). There are two main research paradigms, namely, positivism and post-positivism.

According to (Neuman, 2011), positivism stands for objectivity. It insists on the measurability and predictability and constructs laws and rules for researching phenomena. It focuses on quantitative research methods, including survey questionnaires and experiments.

Post-positivism, contrastingly, stands for subjectivity and understanding (Neuman, 2011). It focuses on qualitative research methods, including as face-to-face interviews and observations (Neuman, 2011).

Interpretivism, too focuses on subjectivity of participants, with an aim to develop rich understandings of realities present in a situation (Saunders, Lewis and Thornhill, 2012).

The research paradigm used for this study is post-positivism, as it was a qualitative study. It is characterised by its purpose, which is linked to providing insight into the opinions of participants, and the study's semi-structured interviews aimed to produce words as an alternative to numbers as data for analysis. Qualitative research thrives on the use of approaches such as in-depth interviews which result in a narrative and expressive explanation of a practice or phenomenon (Denzin and Lincoln, 2017).

3.5. Study Site and Target Population

3.5.1. Study site

A study site is the actual physical location which is used for conducting primary research (Sekaran and Bougie, 2010). As this would require information from Company A, trips were made to Company A's head office and warehouse to interview managers and decision-makers for Part A of the primary research.

For Part B of the study, social media, email, telecommunication and Skype will be used to communicate with industry experts who are not easily accessible physically, due to the variation in their locations.

3.5.2. Target population

A study's target population refers to the entire group of people which is of interest to the researcher and was studied or researched (Sekaran and Bougie, 2010:94). For the purpose of this study, it comprised of two groups of people, one for Part A and one for Part B. Both will be explained below.

3.5.2.1. Target Population: Part A

Part A's target population is management personnel from within Company A. From visits to the company and liaison with the CEO, it was established that there are 13 people who meet these criteria, from the planning, buying and quality team, with the CEO advising the researcher that the accounting team was not relevant to the topic as they had no exposure to many of the technologies included in the study.

All these 13 people were targeted to gain insight on what uncertainties are materially present and the benefits of eSCM implementation in rectifying uncertainty in the company through the transformation of information sharing and efficiency-induction in the company.

3.5.2.2. Target Population: Part B

For Part B, the target population is industry experts with an expertise in, or experience using information technology, along with supply chain management professionals who operate in the clothing and textile industry. These include members of the national Textile Federation, people working at leading companies in the sector and focuses on those who have adequate expertise and experience in the sector.

As it is not feasible to conduct quantitative analysis through interviewing all people who could be considered industry experts, qualitative research was used to gain insight. This was done using in-depth interviews to understand why uncertainties occur, how generalisable the results from Part A are and what eSCM tactics are relevant in tackling the industry's uncertainties.

These people will be selected according to specific attributes, such as experience in management or planning positions in the industry or must have a history of conducting research in the sector. Participants targeted are thus either researchers, business owners or directors or management or information technology specialists with experience in the sector.

3.6. Sampling Strategy

3.6.1. What is a sample?

A sample is defined as a subset of the entire population from whom data is gathered in a study. It is used as a representation of the entire population and is to derive inference about the population and highlight trends in large populations (Sekaran and Bougie, 2010:94). The sample will be explained herewith.

3.6.2. Sampling strategy of Part A of primary research

For Part A of the study, the population is the management members at Company A. For these participants the sample is the entire population as the population size is not too high. Thus, all managers and decision-makers were approached for feedback. In Company A, this population size of management personnel is 13.

3.6.3. Sampling strategy of Part B of primary research

For Part B, the selection of industry experts was as follows. (Morse, 1994: 2) states that qualitative research typically requires smaller sample sizes than quantitative research whilst still providing adequate inference on a population once adequate saturation occurs when a point is reached at which adding more participants to the study does not result in additional perspectives or information, suggesting that a sample size of between 30 to 50 people is adequate. (Guest, Bunce and Johnson, 2006) suggests that saturation occurs at when 12 participants are interviewed for homogenous groups which the participant group is. (Crouch and McKenzie, 2006) suggests that a sample size below 20 allows for relationships to be built between the interviewer and interviewees whilst allowing for open and frank exchanges of information. (Latham, 2013) has suggested that between 15 and 20 participants are adequate for qualitative studies to contain saturation, referring to this range as a “sweet spot” for saturation.

Thus, for Part B, a sample of 20 participants had been selected due to the impracticalities and limitations related to attempting to find out the exact population size for the purposes of a quantitative study.

Sampling method

Two types of sampling have been identified by (Sekaran and Bougie, 2010). These are probability sampling and non-probability sampling.

Probability sampling has been defined by (Lind, 2010) as a sample of items or individuals from a population which have been selected in such a manner that each member has an equal opportunity of being involved in the studied sample.

The alternative, non-probability occurs when certain members or elements of the target population have no chance of being included in the sampling (Sekaran and Bougie, 2010). An example of this can be seen in Part B of the study. With the population being all the industry experts in the industry, it would be impractical to reach out to these people individually. Thus, the researcher reached out to industry experts who were already within his professional circle and used social media, specifically LinkedIn, to approach potential participants. The use of this method of sampling results in the chance of an industry expert not being selected if he does not know the researcher or does not use LinkedIn. (this falls under convenience sampling)

Non-probability sampling is used in the following circumstances:

- When researchers aim at conducting qualitative research, pilot studies or exploratory research.
- When researchers have limited time to conduct research
- When researchers have limited budgets.
- When participant population is unknown or large enough to be considered almost "limitless."

There are two main types of non-probability sampling. These are convenience and purposive sampling (Sekaran and Bougie, 2016).

Convenience sampling is a technique where participants of a sample are selected from the population just due to the fact that they are conveniently available to the researcher and are easy to recruit. It is used often if a population size is too large to test. It is

regarded as the most common non-probability sampling technique. Its popularity stems from the speeding up of research it provides, its cost-effectiveness, and ease of availability of the sample (Explorable, 2009), (Fleetwood, n.d.). It is typically used in exploratory research when basic information is required quickly (Sekaran and Bougie, 2016).

Purposive sampling refers to sampling, which is done when a researcher desires to attain information from specific target groups, rather than just from the people who are most convenient and readily available. With this type of sampling, participants are selected based on them meeting a predefined criterion. Purposive sampling is split into two major types, judgement and quota sampling (Sekaran and Bougie, 2016).

Judgement sampling involves choosing subjects who are in the best position to provide the required information. These people are selected because of their expertise and the fact that they may be expected to have the desired information more than others. Generalisability may be hindered because researchers often use experts who are convenient to them, but this is merely a trade-off for what constitutes a rich data source (Sekaran and Bougie, 2016).

For Part A, the entire population of 13 management personnel was approached to be interviewed and no sampling was necessary due to a reasonably small population size.

However, for Part B of the primary research activities, purposive, judgement sampling was used to select specific people who have at least two years of experience in the industry and are in the fields of supply chain management or information technology (Kumar, 2005). This non-probability sampling was effective because it was used to sift out specific people who can provide relevant knowledge on the textile industry for these interviews (Kumar, 2005). There was obviously a hint of convenience to the researcher, with participants who fit the education and experience levels desired being selected from the user's professional circle or from reaching out to participants who use professional social media website LinkedIn.

Sampling and sample size

As mentioned in the review of previous literature, the nation's textile industry comprises of numerous companies and workers and there is insufficient access to information on all these companies, leading to the use of a qualitative case study for inference. A company, called Company A for the purposes of the study, has been selected due to its ongoing implementation of eSCM activities.

As a goal of this study is to understand the enhancement of activities through improved collaboration between departments and companies, just key supply chain decision-makers at Company A were questioned. This consists of the management members, the directors and the management of the three CMT companies. The number of participants that match this description being just 13, so the sample size was the entire population of these decision-makers.

Part B of the study pertains to the seeking of further qualitative information to understand the causes of the uncertainties, their prevalence, and advice on best practices of eSCM in rectifying them. For Part B textile industry and SCM experts were interviewed. In qualitative research, saturation, which refers to the quality of data, can be found in smaller samples than is necessary for saturation from quantitative research (Tracy, 2020).

For a similar study before the decline of the industry, (Moodley, 2003:28) used a sample size of 30 industry experts. (Maison, 2019: 8) suggests that between 20 to 50 is usually the sample size for qualitative research, further stating that "around a dozen individual interviews" would bring about adequate saturation and reliability. However, (Latham, 2013) has suggested that between 15 to 20 participants, referring this range as a "sweet spot" for saturation. In accordance with these pieces of advice, a sample size of 20 industry officials was selected.

People approached for this information were well-informed persons involved in the textile industry or textile research for a considerable amount of time. This includes

senior management at major industry players. Well-known people in institutions such as the Department of Trade and Industry, The Textile Federation of South Africa, The Cotton Board (SA), and the Industrial Development Corporation (IDC) were also approached accordingly.

3.7 Data Collection Methods

A qualitative study was conducted. According to (Wisdom and Creswell, 2013), this type of study, an alternative to quantitative research, involves the opinions, emotions and feelings to provide empirical evidence instead of numbers. It may deliver a broad understanding of events, data about human groups, and patterns behind events and people through the gaining of insight and opinion on the matter (Flick, 2013).

There are several commonly used data collection instruments. These include survey questionnaires, focus groups and projective techniques. However, the instrument used primarily for this study was an in-depth interview. Defined by (MBA Skool, n.d.) as a qualitative research technique which is used to conduct intensive individual interviews where numbers of participants are not many, and research is focused on a specific product, technique, situation or objective”, this form of data collection provides several advantages.

These advantages include the following:

- Interviewers are able to establish close relationships with participants, making them feel more comfortable, which in turn allows the generation more insightful responses – particularly when questions pertain to sensitive topics, which including a question regarding job-satisfaction.
- Interviewers are presented with the opportunity to think about and ask follow-up questions, probe for additional information, and revisit key questions at a later stage of the interview if necessary. These additional steps allow for the generation of a deep understanding of attitudes, perceptions and motivations.
- Interviewers can monitor changes in facial expression, body language, tone, volume and word choice to gain a deeper understanding of concepts which

participants may be passionate about, something which may not be present in written surveys or written questionnaires.

- There is a higher quality of sampling in comparison with some alternative data collection methods.
- Due to the open-ended nature of, researchers using this form of data-collection need fewer participants to obtain useful and pertinent insights.
- There are none of the possible distractions or peer-pressure dynamics that can often be present in focus groups.
- The insightful nature of in-depth interviews makes it possible to identify highly valuable findings quickly (Steber, 2017).

For primary information from management personnel of Company A, the survey instruments used were in-depth interviews consisting of open-ended questions. Open-ended questions are those which cannot be answered with simple "yes" or "no" responses or other similarly static responses. They are phrased as a statement which requires a response which can be compared to information that is already known to the researcher. The interview schedule for Part A was guided by the literature review.

These questions provided a qualitative understanding of perceptions of these managers on the deployment of eSCM at Company A whilst allowing for elaboration from participants, allowing them to respond in a manner which fully shows opinions as well as allows for questions and information to be altered and added based on their views and opinions.

For information from industry experts in Part B of the primary research, in-depth interviews were used, too. The benefit of this type of technique is the potential for informing participants on the meaning of questions and concepts being addressed, changing questions in accordance with responses and the ability to pose additional questions as such. These included both closed-ended (which were yes or no questions) and open-ended questions (which were used for the elaboration of the responses to the closed-ended questions (Kumar, 2005). The interview schedule for Part B was guided by the literature review, but room for adjustment and discretion was used by the researcher to account for the results of Part A when conducting Part B of the study.

The recording of these interviews took place. The benefits of recording in-depth interviews have been listed by (Saunders et al., 2013) and include:

- Allowing the interviewer to focus on the content of the interview, meaning the questions and the responses
- Allowing for the accurate and unbiased recording of responses
- Allow for re-listening of interviews
- Allowing for the use of direct quotations
- Allowing for the permanence of record-keeping

3.8 Data Analysis and Quality Control

3.8.1. Data quality control

Data quality control refers to the steps taken to assure that data sourced is ideal for the purpose of usage and of the correct quality. In understanding the relevance of data quality control, understanding the meaning of data is imperative. Data represents raw facts or figures from which information is derived. Therefore, to gain relevant and suitable information, which is usable in decision-making, data quality control is required.

Reliability and Validity

To assure quality evidence which contains substance and relevance, the aspects of completeness, consistency and validity was sought in data collection.

Validity represents the correctness of the information and the study's reliability in getting data and answers from dependable sources (Sekaran and Bougie, 2010:114). Completeness was strived for by ensuring that the literature is studied in an incremental way so that no information is omitted or left unexplained. It will also be sought within Part B of the study, wherein in-depth interviews with supply chain professionals will back up secondary research and Part A of the primary research and provide further reasoning behind occurrences which are found in the industry.

Validity and correctness of information was sought through triangulation of data. Gaining data from differing perspectives to gain a holistic understanding was done by firstly assessing multiple departments in Company A, backing the results of Part A up with results from previous literature and the opinions gained from industry experts in Part B.

With the number of potential participants, in this case, being small, the calculation of a saturated sample is not a requirement to gain validity and ensure the elimination of bias. This is because the small population size allows for all the management personnel to be approached. Consistency was sought to see if all participants from differing departments respond similarly in pointing out trends. For industry experts, a random selection of 20 experts were sought, with no preference given to any company or organisation (Sekaran and Bougie, 2010:114).

Unfortunately, with case studies, there is an inability to guarantee validity in terms of generalisability. To provide for this lack of validity, qualitative research is being used, with open-ended questions uncovering opinions from numerous members of the company and from its CMT suppliers were used to confirm that answers are reflective of the actual situation. Additionally, Part B of the primary research allowed for this.

In the context of qualitative research, validity and reliability are often substituted for trustworthiness, which consists of the following:

Prolonged engagement, which can be assured through the reliability gained through the researcher's history working at Company A previously, allows for an understanding of the social values and trustworthiness and credibility of participants questioned. At Company A, member trustworthiness was assured because the researcher has previously worked with the management members and knows their integrity (DeVault, 2016).

Triangulation was used by interviewing managers who are from several or all departments. This aided the researcher in gaining all perspectives present, providing validity. Peer debriefing, in the form of seeking the insights of other researchers corroborating or assisting the validity of the researcher's work, was also used. This enables researchers to uncover issues in the research including overemphasised points, underemphasised points, vague descriptions, general errors in the data and biases or assumptions of the researcher (Lincoln and Guba, 2011), (DeVault, 2016).

Two fellow academics agreed to undertake this activity, one with experience in quantitative research and one who is qualified and experienced in supply chain management in the textile industry.

The goal of the research was to completely understand the impacts of eSCM on a textile company's ability to thrive in periods of uncertainty. Using a case study method may provide limited generalisability, but it provides an in-depth analysis of the case being studied. Once this was gained, case studies could thereafter be used as a basis for further research by personnel and organisation with greater funding and access to industry records and statistics (Adam, 2017:262). (Flyvbjerg,2006:10) states that case studies are effective in helping researchers to "cut a path toward scientific innovation."

The use of triangulation of information through the interviewing of industry experts in Part B of the study allowed for dependability and generalisability of the case study. This dependability may be gained through the use of Part B to back up or assist Part A of the study. As is the case with most case study research, conformability and transferability of data are not fully assured. However, using Part B for this, Company A's case study's transferability was relatively assured using the opinions of industry experts to understand how common and relevant the findings of Part A are.

3.8.2. Data analysis

In understanding the need for data analysis, an understanding of the meaning of data is imperative. Data and information are often confused. Whilst these words are often

used simultaneously, their purposes are very different. According to, (Wiid and Diggins, 2015), data represent all available statistics, opinions, facts and predictions. Information, on the other hand, represents interpreted, formatted and organised data which is usable for decision-making, according to (Cant and Van Heerden, 2017)

Statistical analysis software refers to specialised computer programs developed for the purpose of analysis in statistics and econometrics. This type of software is primarily used in quantitative studies. Prominent examples include SPSS by IBM, MATLAB and SAS (Farnsworth, 2019). However, as the study is primarily qualitative by nature, no statistical analysis software is used (Kumar, 2005).

For the purposes of analysing and understanding responses in an effort to understand what opinions are present and why people feel as they do, a latent level of analysis was used, with the literature review being used to interpret occurring trends (Kumar, 2005).

To analyse the data and convert it into meaningful, usable information, data reduction was used to ascertain what data from the research is relevant in relation to the research questions and objectives. Thereafter, coding took place. This early step in the data analysis process is defined by (Charmaz, 1983, p. 111) as ‘the process of categorising and sorting data’. Coding is used for content analysis by deriving keywords with the aim of identifying patterns of those keywords and interpreting the meanings of these word patterns.

Thereafter, data display was used, with identified patterns being depicted using both text and visual aids where necessary (Miles and Huberman, 1994) before conclusions are drawn and described.

Similarly, (Frechtling and Sharp, 1997) highlights the following as the steps of data analysis and data display regarding qualitative research:

1. Processing and recording of data immediately as it is received.

2. Beginning analysis of data as soon as data collection takes place.
3. Data reduction which involves sifting out of unnecessary data.
4. The identification of meaningful patterns and themes.
5. Data display.
6. Conclusion drawing and verification. This was done by drawing conclusions from the primary research and confirming whether they match the research objectives and information gained from previous literature and secondary research.

The following diagram visually presents the steps taken by the researcher to analyse the data through coding and theme-finding.

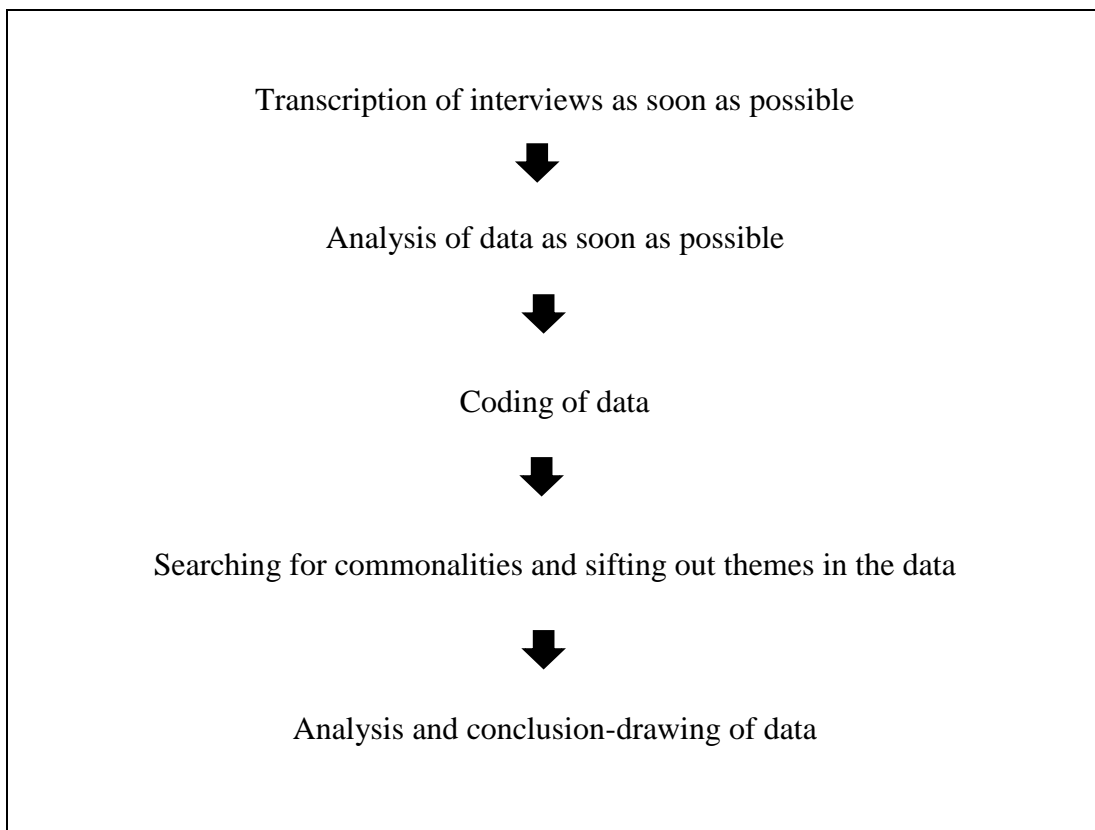


Figure 3.2: The data analysis process

Source: Adapted from (Cresswell, 2014)

3.9 Ethical Considerations

Ethical considerations, clearance and relevant permissions

Whilst the fundamental objective of the research is to uncover new information from either new or existing data in an effort to contribute to the larger body of knowledge, it is imperative that a researcher fulfils their ethical responsibilities to the research participants, the discipline and society (Mouton, 2001). It is imperative that the researcher adopts ethical ideals and gives esteem to participants and their rights. To ensure that this is done, the following aspects are given importance:

In ensuring that these ethical duties are fulfilled correctly, the objectives and intended outcomes of this study were communicated to participants in writing and reiterated verbally at the commencement of the research. Written informed consent was sought from participants, who were all voluntary participants. The option to decline to be a part of the study was kept for all participant throughout the course of the study.

- Confidentiality, which refers to the unambiguous or implied assurance by a researcher to a participant that any information given to the researcher, cannot be attributed to them. Additionally, the guarantee of confidentiality conveys along with it the added implication that non-researchers may not discover the participant's identity. Thus, confidentiality represents the active attempt by researchers to eliminate any trace of participant identities from the records or conceal the records from non-researchers (McDaniel and Gates, 2012).
- Consent refers to the informed consent which is ensured by ensuring that the personnel in the test subject are fully aware of the study which they are taking part in and where necessary who it is being undertaken for as well as seeking research permission from the university to use its name in primary studies once elucidating to the university in the first two chapters what information the study will require (McDaniel and Gates, 2012).

Gatekeeper's access was provided by a director at Company A, who has also verbally agreed to the study previously. Additionally, each participant signed a disclaimer providing consent for the study. For Part B of the study, each participant was provided

with a permission disclaimer individually, as they are not from a specific company, and their insights did not pertain to their companies specifically.

3.10 Pilot Study

A pre-test study was carried out with two participants who worked at a small clothing manufacturer in the Greyville area, responding in their own capacities. Adjustments were made to how the interviewer presented the questions from the interview schedule. For example, it was evident that with some participants, it would become very time-consuming explaining the difference between EAI and ERP. The interviewer also realised that more care needed to be taken when asking questions, as participants needed explanations on the technologies mentioned and the list of definitions were not consulted beforehand. This turned out to be evident in the actual study, as well.

3.11 Limitations of the study

- There is insufficient previous research available on the national textile industry thus far regarding both SCM and eSCM.
- There is no publicly accessible database listing all the companies operating in the sector, hindering the possibility of quantitative research activity.
- As with most self-reported research data, full honesty and validity of responses cannot be guaranteed
- Due to high market saturation and tensions caused by union disputes and lawsuits, there is tentativeness within companies who are sceptical about undertaking in studies which may possibly be unnecessarily probing, despite assurances of confidentiality from the researcher.
- Seeing as the population sizes of companies and participants within them are almost immeasurable, added to the fact that many of the sector's companies have displayed a hesitancy to participate in such research activities, a case study method has been selected in Part A of the study. Case studies, whilst providing qualitative

information, cannot guarantee a sample which is an accurate depiction of the entire textile industry. This limitation is, however, catered for in Part B of the study.

- The withdrawal of participation of some participants. In Part B, of the 20 participants who were approached, three declined thereafter. However, according to (Latham, 2013), a sample size of between 15 and 20 is adequate for qualitative studies, so it is felt that the study did not lose significant validity due to these refusals.

3.12 Conclusion

The study is conducted using a qualitative study approach. For each, Part A and Part B, interviews are designed and administered by the researcher. For Part A, an interview is used to study Company A, a company which has moved toward an eSCM mindset in recent years. This interview is given to management members at the company. For Part B, interviews are used to gain generalisability from industry experts on the results of Company A as well as opinions on what the solutions to uncertainties faced may be from best practices at industry leaders.

Due to time limitations, limitations of available industry databases and monetary limitations, a sample size of 20 industry experts were selected, a number which guarantees relevant saturation of opinion in qualitative research. It is however noted that there may be scope for quantitative research to understand prevailing trends further as the study undertaken is opinion-based. The sampling characteristics for Part A include only those people who fit the description of management personnel at Company A both males and females. For Part B it includes people who have over two years of industry experience and are either in supply chain management positions or information technology positions.

All participants were allowed to participate on a voluntary basis without expecting any form of remuneration. For Part A, respective permission was obtained from the Managing Director and individual participants. For Part B, each participant was

contacted individually for consent and permission be obtained from the organisations concerned. Where requested, confidentiality and anonymity are guaranteed throughout the study and after findings are published, with the researcher asking participants about their confidentiality requirements before and after their interviews. Interview questions are distributed to subjects beforehand with a glossary of terminology used in them to ensure validity, which has been included in the Appendices at the end of the study.

This chapter began by describing the research methodology of the study, which includes the population, sample size and sample selection methodology, data collection instrument, as well as strategies to ensure ethical standards are met. Reliability of the research is also of concern, and relevant tools are used to ensure the reliability of the research.

Chapter 4: Data Presentation

4.1. Introduction

The first three chapters of this research dissertation began by introducing the research objectives and research questions along with the aim, purpose and significance of this study in chapter one. Thereafter chapter two, the literature review, was used to discuss secondary research on the national clothing and textile industry and the challenges faces by it, as per the research objectives and research questions. Lastly, in chapter three, the research methodology which was used to guide both primary and secondary research laid out.

This chapter will deal with the analysis of the empirical data collected from the research participants during the field research. The findings are presented, analysed and discussed, before conclusions linked to the study's objectives are drawn in Chapter 5. The primary research for this study comprised of a qualitative method wherein the researcher employed the use of in-depth, open-ended questions in order to give participants a chance to express themselves freely and to cater for an inability to access and question a large sample from the entire population. This chapter is a presentation of the findings from the data obtained at Company A's premises in a section labelled Part A and the findings of expert interviews in a section labelled Part B.

The primary purpose of data presentation is to present data obtained through the research instrument used, in this case, in-depth interviews in this research activity, into usable and useful information. The presentation of data, regardless of whether it is qualitative or quantitative, serves to describe and summarise data. This presentation may also indicate existence or non-existence of relationships between variables and trends which may be present. As primary research was done in two parts, the data presentation for each part is done individually for each part.

The data presentation within this chapter begins by revisiting the research objectives. This is done as the study is guided by the research questions and objectives which are

directly related to the research findings. The data analysis is carried out with the objective of understanding, establishing and identifying the uncertainties faced at Company A, proposed solutions to these problems and industry best practices for these uncertainties. For both parts of the study, qualitative open-ended, in-depth interviews were used to get insights from participants.

The main purpose of this chapter is to present data and views obtained through the interview instruments used into meaningful, useful information. It has been divided into two main sections one for Part A of the study and one for Part B. As a qualitative study was conducted, responses will be depicted in a way which highlights the rich nature of the responses of the participants.

4.2. Revisiting the Research Objectives and Questions

As stated in Chapter One, the Research Objectives of the study are:

1. To identify uncertainties prevalent in the South African textile industry
2. To investigate the use of electronic supply chain management technologies to lessen the detriments of these uncertainties
3. To study the current situation of companies using eSCM in order to understand their successes as well as barriers to implementation

Thus far, the review of the previous literature has highlighted uncertainties which operators in the sector face and technologies which could improve a company's management of these uncertainties. The primary research targeted all three objectives by looking at the uncertainties faced at Company A and the industry and how technology application has enabled the management of uncertainty.

4.3. Part A Data Presentation

4.3.1. The Organisational Structure of Company A

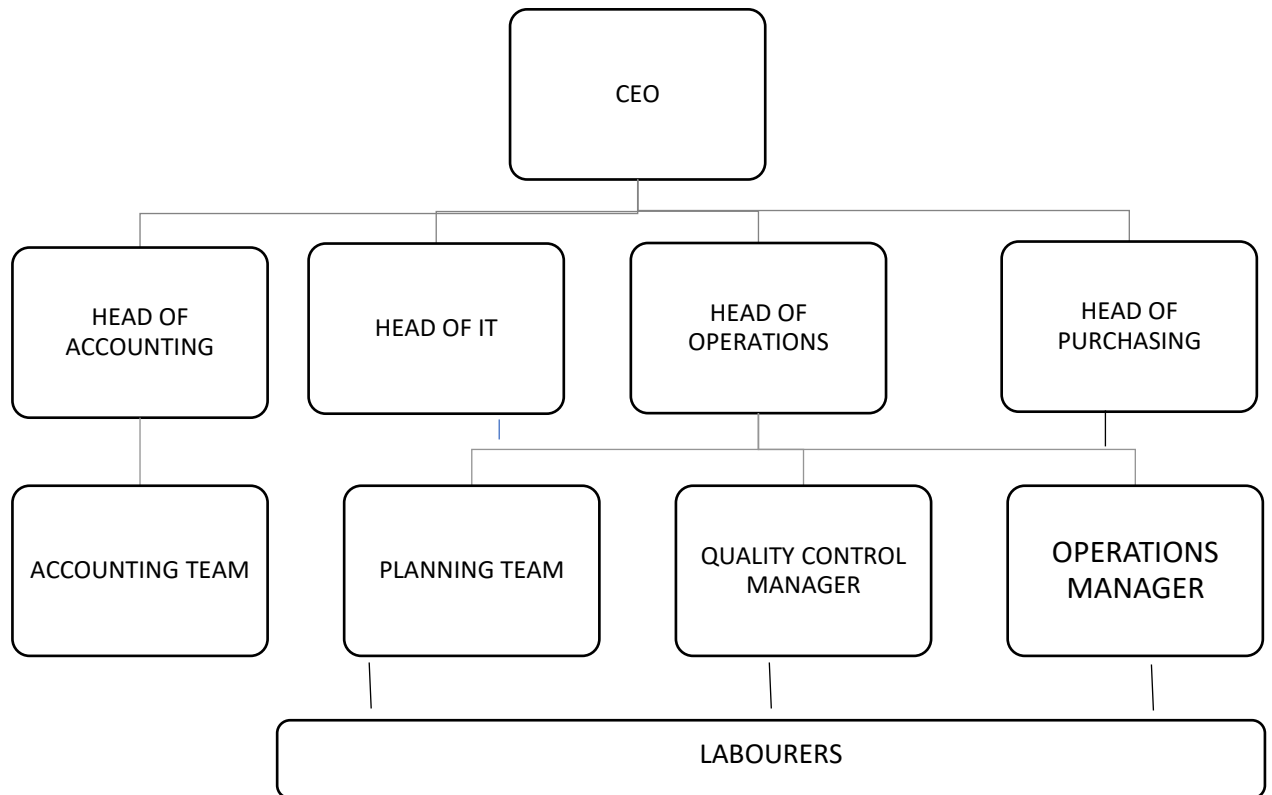


Figure 4.1: The Organisational structure of Company A.

Source: Created by the researcher when conducting fieldwork.

As can be seen in Figure 4.1 above, the company operates in a hierarchical system, with the CEO making strategic decisions. Medium to long-term decisions are made by the heads of accounting, IT, operations and purchasing. The people selected were those who were entrenched in the facets of supply and demand. The total number of management members who fit the criterion was 13.

This included:

- The CEO
- The head of IT
- The head of operations

- The head of purchasing
- Members of the planning team
- The quality control manager

4.3.2. Justifying why Company A was Selected

Company A was selected for study because of previous exposure of the researcher to the company and a professional history working with the IT manager which led to the researcher understanding that the company had adopted eSCM practices since the IT manager joined the company. The company's embracing of technology and innovation made it the perfect candidate to assess the impact of technology on companies in the sector, as participants would potentially have opinions on how technology directly influenced the company.

4.3.3. Participant/ Manager Demographics

4.3.3.1. Gender

While the study does not place emphasis on the distribution of gender, the inclusion of gender in the study will be mentioned to merely to integrate gender and socio-cultural differences in all phases of the study. Most of the participants at Company A were female, with females representing the preferred industry worker due to their perceived patience, reliability and nimble fingers. This has resulted in it being the only manufacturing sector where a majority of workers are female (Vika, 2016).

Table 4.0: Participant Genders

Gender	Number of participants	Percentage of total participants
Male	2	20%
Female	8	80%

Source: Created by the researcher based on primary research.

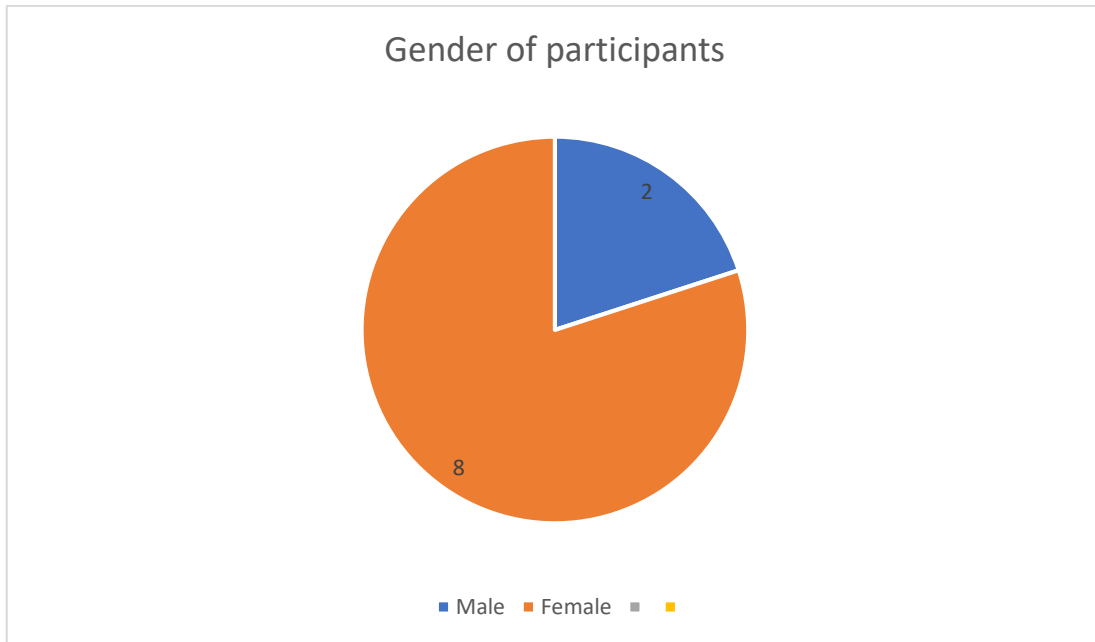


Figure 4.2: Gender of participants: Part A.

Source: Created by the researcher.

4.3.3.2. Experience at the company

In an effort to gain validity and understand how qualified the participants were to answer the questions posed regarding the impacts of eSCM implementation on the company, a look at the average level of experience in the company was taken. The average experience timeframe of these managers was approximately six and a half years. The table below depicts participants who fitted into the groupings of participants, followed by a chart which depicts this graphically.

Table 4.1: Experience of participants at Company A

Timeframe	Number of participants	Percentage of total participants
Less than one year	2	20
More than one year but less than five years	3	30%
More than five years	5	50%

Source: Created by the researcher based on primary research.

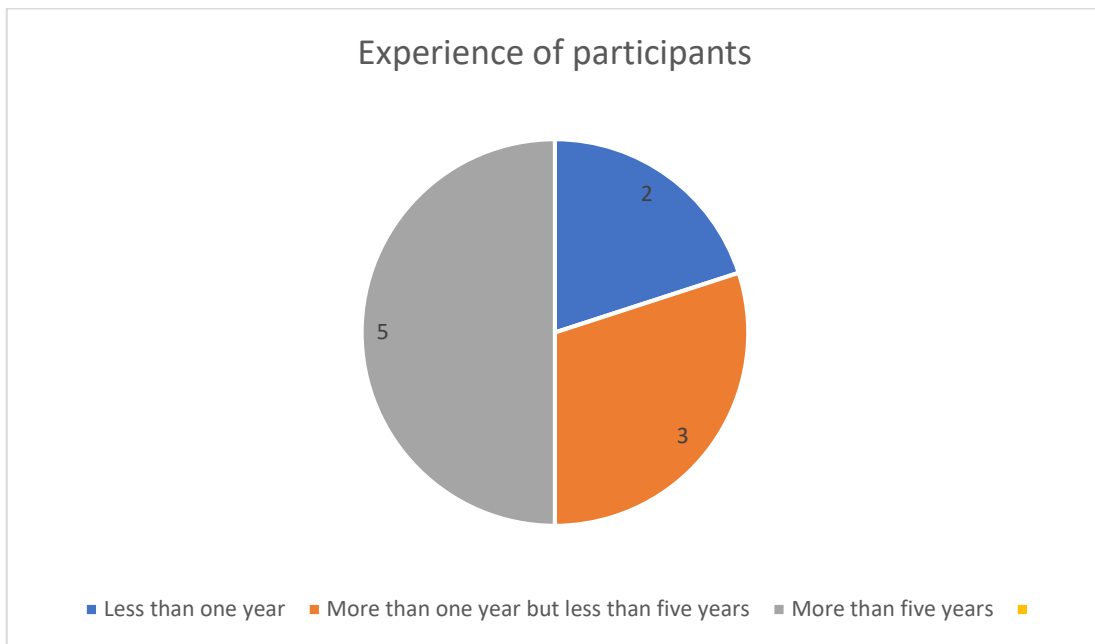


Figure 4.3: Experience of participants at Company A

Source: Created by the researcher based on primary research.

4.3.4. The response rate of sampled participants

As stated in Chapter Three, the entire population of management personnel was selected based on their roles in the company. The population size (and the sample size) of personnel who met this description was 13. Of the 13 participants selected, some refused to participate. Their refusal was accepted by the researcher, as participation was totally voluntary, as stipulated in Section 3.9.

The table and chart below show the number of participants who participated in comparison to those who did not.

Table 4.2: Participant participation: Part A

Participation status	Number of participants	Percentage of total participants
Participated	9	69%
Did not participate	4	31%

Source: Developed by researcher

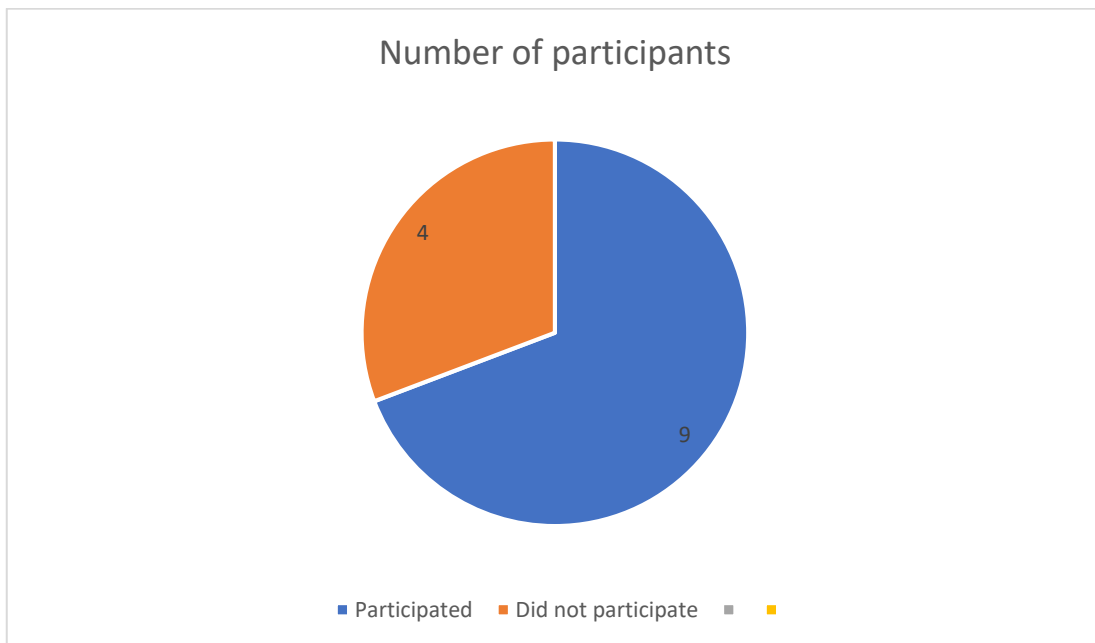


Figure 4.4: Participant participation: Part A

Source: Developed by researcher

4.3.5. Themes of Part A interviews

As explained in chapter three, an interview guide was drawn up and this is attached as Appendix A. Participants were presented with open-ended questions according to their functions in the company and their exposure to the types of technology. For example, some participants had no idea if POS systems were implemented in the retail division, so they were not pressed about how much they felt it helped the company.

Permission was granted by both the CEO and the individual participants to use a recording device during the interviews. The interviews took between fifteen and thirty minutes each. All the interviews were conducted at either Company A's head office.

Before the data is presented and analysed it is imperative to note that Company A's CEO and IT manager stressed that no information which would divulge the company's secrets and competitive advantages to rivals should be released. To alleviate their concerns, they were offered the opportunity to look at the interview schedule to see if there were questions which they did not want to be asked. They were then promised anonymity before the provision of access to the company. Thus, no mention is made of Company A's name.

Additionally, it is essential to mention that participants, upon displaying a hesitancy to participate, were ensured that their responses would not be tied to them and that this was an external research activity, and that their responses would not be shown to their co-workers or employers. Thus, responses which are mentioned below have had names omitted. With these promises and the University's ethical standards in mind, the common themes found at Company A are depicted in the diagram below.



Figure 4.5: Thematic Map – Part A of primary research.

Source: Developed by the researcher.

These themes will be discussed in Section 4.4 and Section 4.5.

4.4. Analysis of Part A, Main Theme 1: Uncertainty faced by the company

4.4.1. Subsection Theme 1: Labour Uncertainty

As per the review of previous literature, labour uncertainty presents itself in a saturated sector where organisations are unable to compete with international suppliers, leading to wage disputes between employers and employees. Several of the questions

stipulated in the interview template brought up this topic. The uncertainty of labour presented itself in a few ways, as discussed with the summaries of the responses to each of the following questions.

Question 1: Does strike activity downtime affect the predictability of operations?

The consensus amongst participants was that, when it occurred, strike activity did affect predictability and cause uncertainty. However, most of the participants felt that strike activity was not as rife as it was previously, with most of them saying that in the year prior to being interviewed, the company only had one, fairly negligible, strike activity.

The relationships between employees and employers at Company A were not as tense as literature research has suggested, with none of the participants reporting a constant foreboding feeling of the possibility of strike activities.

Question 2: How does labour wage uncertainty affect your company?

Despite the fact that participants worked at different levels of management, most of the staff felt that when occurring, wage disputes and uncertainty were material factors which led to underperformance and were especially significant contributors to demotivation. These managers spoke freely due to the assurance of confidentiality, and thus the feeling that they felt that they were underpaid was evident.

Question 3: Would you say that wage opinion differences with unions affects motivation and performance?

Despite participants being management personnel from different levels, including one who was an owner/manager, all participants acknowledged that motivation amongst themselves and their subordinates would be much higher if wages met desired wages and that this would cause production performance to increase. One participant in senior management even joked that it would certainly be ideal if wages were increased, but

it was evident from his responses that affordability was a primary factor behind the inability to do so.

Question 4: *Can technology benefit morale?*

As seen in literature research, the fear of jobs loss is a relevant factor behind the anxiety of switching to technological applications of business operations, seeing a potential shift as an ominous one. Some staff questioned whether technology would actually benefit morale as it would certainly cause job losses. However, from the participants questioned on this, all agreed that morale would be benefitted through the lessening of hard, timeous and strenuous labour.

Question 5: *Can technology reduce dependency on labour?*

Most of the participants agreed that technology could greatly reduce the company's dependency on physical labour as well as reducing time spent by administrative staff in planning and forecasting activities.

4.4.2. Subsection Theme 2: Demand uncertainty

As per the review of previous literature, demand uncertainty often presents itself in the forms of seasonality and an inability to calculate demand adequately.

Demand uncertainty is also present in the company. Often, wholesale chain store retail clients may decide that an item is less fashionable during a season than was expected, resulting in shifted orders.

Questioning around this uncertainty provided the following responses.

Question 1: *How does demand uncertainty affect your company?*

As the company supplies collaborative companies such as Mr Price and Edcon, most participants felt that demand was fairly stable as these companies typically provided

adequate time for orders to be made up. However, it was noted that sometimes customers make sudden last-minute changes to weekly plans.

One participant noted that such demand uncertainty caused a knock-on effect to the company's ability to supply customers. She said, "regarding the demand, it has a big effect on production because if an order was not in the plan and they decide to move it in or scratch it in for this week it messes up my CMT's because obviously I have to find a CMT that can produce the goods for that day. And obviously we cater to the CMT of how much they can sew for the week. We have like a certain figure of theirs of how much they can do per product for the week. If we go over that line, that means I have to push an order out to bring the current order forward that you're putting in so matching demand and supply is a big problem."

Question 2: How does demand price uncertainty affect your company?

Participants felt a bit wary answering this question, as many were not involved in price discussions with suppliers or customers. However, one participant did mention that price discrepancies lead to delays in planning activities. For example, she mentioned an instance a week prior to the interview where a last-minute price disagreement on an order between senior management and a customer meant that an order was delayed, leading to other orders being brought forward, putting her under pressure and causing her stress and anxiety.

On the subject of selling price, one participant who was a senior member of management at the company said that price discrepancies and instances of customers asking for reduced prices or wanting to cancel orders because they may have found cheaper suppliers occurred frequently when he said that it, "*happens plenty times.*"

Another participant mentions that price uncertainty is also present when price changes are not appropriately communicated to all relevant personnel in the company. For example, she mentions, "*it happened a couple of times. With a customer of ours we had an example of where the prices have changed, but the CMT wasn't aware of it and*

nor was the QA aware of it. So, the QA failed my order, because she wasn't aware of the price change, because, obviously the QA gets a sample of what the price should have been. And then when this price changed, and the QA wasn't aware of it way. They did fail an order. And I couldn't bring the order in.”

Question 3: *Do you feel that technology has a role in rectifying demand uncertainty? If so, how would you suggest it does so?*

Regarding technology's benefit, all participants felt that technology played a role in dealing with demand uncertainty, with the customers who used newer technologies communicating with planners at Company A better than those who just used email.

Most participants felt that Mr Price and Ackermans properly used technology to communicate timeously and appropriately through emails and other forms of internet communication.

Inter-company software, such as Mr Price's "Supply It" software allowed these managers to find cross-business information at the touch of a button. This software has greatly changed the way orders are received, allocated and communicated as compared to the use of data-intensive Microsoft Excel spreadsheets. Real-time order placement and cancellations and order due date visibility allow management members to focus on value-adding activities with a reduced risk of errors.

4.4.3. Subsection Theme 3: Supply uncertainty.

As per the review of previous literature, supply uncertainty relates to risks to supply of goods or services and relates to risks such as lead-time delays, quality failure, supplier continuity risks, compliance failure, channel complexity and a failure to communicate.

Supply uncertainty is one of the major forms of uncertainty facing the company, with supplying factories being notoriously unreliable, tardy and unpunctual. The delays and

extended lead times caused through this unreliability often results in management needing to cancel, previously placed, orders from chain stores such as Mr Price, Edgars and Jet, resulting in delayed or lost revenue.

Questioning around this uncertainty provided the following responses.

Question 1: *How does supply uncertainty affect your company?*

When questioned on this, all participants felt that there was an uncertainty of supply present. There was a sense of disunity present between employees of Company A and those of some supplying companies.

One participant said that CMT suppliers were often not flexible to requests. She said, “if I get an extra order, I have to get on my hands and knees to beg them to do the order.” Regarding order fulfilment, she went on to say that unfulfilled promises from CMT suppliers, “happen all the time, trust me, like if I have a delivery at 9 o’clock, I might get it later at 4 o’clock, unfortunately.”

The trustworthiness of CMT suppliers was also brought into question as well with one participant alluding that some CMT’s may lie and not give entirely accurate status updates. Many participants alluded to dishonesty internally and externally when speaking about the benefits of using e-mail, noting that e-mail stops people from denying saying or hearing something.

One participant said, “I don’t think systems can help with supply-side uncertainty because I think CMT’s will just put whatever information we want to hear on it. For example, they may input on the system that they are delivering 100 good units, when in fact there are ten rejects which you only find out once you receive the order which is sometimes after payment has been made.”

Such a phenomenon occurred both internally and externally frequently, with one participant saying that there is no proper communication from suppliers and inside the company, despite people having adequate facilities to do so.

Question 2: How does supply price uncertainty affect your company?

None of the participants was directly responsible for pricing negotiation. The managers in charge of price negotiations declined an interview. However, when questioned about this form of uncertainty, most participants felt that pricing was discussed early on in negotiations and did not affect their planning and operational activities. Additionally, the reasonably standardised nature of the products manufactured by the company means that the pricing of manufacturing activities is very similar.

The impact of pricing of materials and component parts, however, often had uncertainty. Due to the fact that some components are imported, the company faces uncertainty related to the exchange rate and has to continually adapt selling prices according to fluctuations in cost price in order to keep a similar mark-up.

One participant cited this, saying, *“say, for example, the US dollar sits at 12 today. And the US dollar sits maybe three months later at 14 Rands. It affects us in a big way. But the customer has to accept it because there's always rules. I can't go three months down the line and the customer says, “No, you know what? This thing we want to pay the 12 that you quoted us in January.”*

Question 3: Do you feel that technology has a role in rectifying supply uncertainty? If so, how would you suggest it does so?

Most participants felt that it did, but an overwhelming number of them felt that suppliers, particularly CMT suppliers, would not invest the adequate time and effort into making adequate use of the technology on hand.

4.4.4. Subsection Theme 4: Manufacturing uncertainty.

Question 1: How does manufacturing uncertainty affect your company?

Manufacturing uncertainty also played a significant role in the company. Managers often find the need to follow up on manufacturing teams, with the researcher actually observing a planner needing to go upstairs into the in-house factory multiple times to check up on orders mid-interview.

One respondent elaborated on this uncertainty form when he cited the fact that electricity loadshedding reduced certainty through operations being halted.

Question 2: Does technology implementation play a role in rectifying this form of uncertainty at the company?

Most participants responded positively to this, with a level of scepticism about the actual willingness of other supply chain partners to invest effort into using technology.

When speaking of collaborative tools such as ERP systems, one participant said, *“no technology is good enough if others don’t use it properly. What is the use of half of us using it if the others don’t?”*

This was a common sentiment amongst the more experienced participants.

4.4.5. Subsection Theme 5: Distribution Uncertainty

Question 1. How does distribution uncertainty affect your company?

Many members of the planning team complained about the inability for the despatching team to timeously send out items. Some even stated that at times, orders were severely delayed due to items being lost between the warehouse and despatch area, only to be found with items from different orders. Additionally, one staff member added that the company’s drivers needed added accountability for their whereabouts. Distribution is a crucial part of operating in the business, with a timely delivery being the difference between an order being accepted or rejected by retailers or chain stores such as Mr Price being five minutes from a booking time slot.

One participant said, *“we have a lot of issues with regards to distribution. Goods can be produced and then they, for some reason, mislay it at despatch and boxes are lying there.”*

One participant said that the receiving of goods was inaccurate and cited lost boxes as an issue as well. She said, *“we always have problems with despatch, with orders coming in, boxes being lost but it was received full on the system.”*

Another participant said, *“when despatch was done manually, mistakes did happen. You’d be packing a van and you turn around and miss a box, so mistakes do happen.”*

Question 2. Does technology implementation play a role in rectifying this form of uncertainty at the company?

Most participants felt that it was too soon to tell but were hopeful that the recent implementation of barcode scanners would improve despatch, tracking and distribution activities.

4.5. Analysis of Part A, Main Theme 2: ESCM Implementation at Company A

4.5.1. Subsection Theme 1: The company embraces technological change

Of the technologies discussed with the participants, many were already embraced by the company. Evidence from interviews shows that the head of IT was evidently the primary driver of the adoption of eSCM, with the adoption of technologies coinciding with his employment commencement at the company 15 years ago. The following were technologies found to be adopted by the company.

- ERP
- Email
- Barcoding
- POS systems.
- E-marketplace

- Intranet
- Social Media
- Web advertising

It was evident from the responses of interviewees that the two main drivers were wholesale customer expectations and the passion of the IT manager who began and constantly oversees the adoption of eSCM practices.

4.5.2. Subsection Theme 2: Communication easing are beneficial to operations

4.5.2.1. Intranet

As per the review of past literature, an intranet is a local connection between multiple computers at one location which typically used by computing devices to share information and instructions internally. Participants were asked, “Does your company make use of an in-house system/intranet, and would you say it benefits the operations of the company?”

The company did have an intranet in place which was used to transfer documents in-house and connect multiple staff to equipment like printers. Participants felt that this system allowed them to communicate better and saved planners and other management personnel time and effort as compared to before. The system was particularly helpful to personnel who used it to send documentation between different departments.

4.5.2.2. ERP

Does your company make use of Enterprises Resource Planning (ERP), and would you say it benefits the operations of the company?

An intranet had been installed in recent years along with an ERP system called iSync. This technology has evidently been a great improvement and has allowed order allocation and tracking to be done automatically, saving management members time and effort, allowing them to focus on decision-making activities.

One participant emphasised the way ERP made management easier, despite being relatively new. He referred to ERP systems as, “*chalk and cheese compared to manual systems.*” He further explained that he could, “*log on to the system and see anywhere*

in the factory what's happening and when a change is made here, it can be seen somewhere else."

4.5.2.3. E-mail

As per the review of previous literature, e-mail refers to the transmission of messages over networks such as the internet (Arnold, 2011). Participants were asked, "*does your company make use of E-mail and would you say it benefits the operations of the company?*"

From the eSCM activities mentioned, all participants agreed that e-mail activities were beneficial for e-fulfilment and e-procurement activities. Most participants were very passionate about this fact and stated that this was the most important piece of technology to the company. Emailing, according to most participants, ensured accountability in communication, and this is a major driver of efficiency and thoroughness in the workplace.

On the importance of email to both internal and external communication one participant said, "*even though we phone our suppliers, we talk to our planners, everything is still put over email. That is to back up ourselves(sic), and to back up the company and have backups of the conversation.*"

Another participant said, "*the most important thing we have is email. With email we communicate with buyers, we communicate with suppliers, we basically communicate with everybody.*" She further went on to note that the fact that email allowed communication with everyone, internally and externally, made it a more useful tool than the company's ERP system.

A third participant confirmed that email helps with accountability of communication when she said, "*now because of everything being on email, it's different to when buyers to us talk over the phone, where they could previously tell you that they never said something. Now everything is on e-mail, so we have proof of what they said.*"

4.5.2.4. Point of Sale System

As per the review of existing literature, POS includes the use of cash registers, computers, tablet computers and the software used on these devices to record and disseminate sales data into company databases. Participants were asked the following question. “*Does your company make use of Point of Sale (POS), and would you say it benefits the operations of the company?*”

The company does make use of a POS system in its recently founded retail store. However, most participants were not aware of its benefits other than managers who did deal with the shop team directly. The IT manager, for example, stated that the system was invaluable, with the software easing stock take activities, demand planning and forecasting activities.

4.5.2.5. E-marketplace

As per the review of existing literature, an e-marketplace refers to an electronic commerce system where third parties supply products and services with transactions being processed by the marketplace operators.

The company evidently uses Gumtree and Facebook’s classifieds service to advertise promotions and sales. According to most participants, they were not well-placed to comment on the success of the technology. Just one noted that it was very successful in “*getting the word out,*” to customers.

4.5.2.6. Social Media

The company makes use of Instagram and Facebook to inform customers about promotional activity. Most participants did not know about the success of these platforms as they were not directly related to it. One participant, who did have exposure to this aspect of advertising said that it represented a good way to inform customers about products and provided good exposure.

One participant said, “it does benefit the company in terms of advertising.” When asked if it allowed the company to receive feedback she said, “it helps, because if you

go onto our Facebook page, you'll see a whole lot of comments for example if customers are happy with a product.”

Applications such as WhatsApp are widely used for both customer and supplier relations. For demand-side communication, managers at Company A communicate with employees at retail companies such as Mr Price regarding order cancellations and allocations swiftly. For supply-side communication, social media services such as WhatsApp are used to communicate with factories locally. Additionally, due to restrictions on WhatsApp in China, alternative social media services such as WeChat are used to communicate efficiently with suppliers in that country.

4.5.3. Subsection Theme 3: Technology replacing manual activities are beneficial

A common factor with many participants was that technologies which automate processes and activities may be of benefit if brought into the company. Technologies such as barcoding, RFID and manufacturing automation were welcome by members of staff who were interviewed. However, only barcoding and automation were used currently at the company.

4.5.3.1. Barcoding

As per the review of past literature, barcoding is a common form of automatic identification, barcoding is the use of physical numbers to label, identify and track objects. This form of identification typically involves the use of machine-readable codes in the form of numbers and a pattern of parallel lines which are printed on or stuck onto goods (Attwood and Cresswell, 2002).

Company A implemented barcoding activities approximately a month before interviews were conducted. This included the utilisation of barcode printers and scanners.

Participants were asked: *“Does your company make use of Barcoding, and would you say it benefits the operations of the company?”*

From the responses, it was evident that the inclusion of such technology was brought about after the company was instructed to use it by one of its major customers, who deemed it necessary. When interviewed about the potential for barcoding to help the company, many participants regarded its potential greatly as they felt that barcoding would help despatch and stock-taking activities speed up and become more efficient.

One participant said, *“in regards to barcoding, if there’s one main label on one side and for example, if my customer switches on the other side, yeah, he’ll be able to see for example, if I send 50 boxes to my customer, and he scans it and sees that there is supposed to be 50 but it is only 49, he picks up the problem.”* He further stated that, *“each item is barcoded, so it saves time and definitely removes errors.”*

Despite the advantages of speed and accuracy being noted by participants at Company A, at the time of interviewing, many participants were unsure about the benefits of this system solely because they were unsure that the relevant personnel would use it appropriately and believed that either laziness or a reluctance to adapt would mean that the system may be a pointless addition to the company.

4.5.3.2. Automation

As per the review of past literature, automation technology refers to the use of automatic equipment in manufacturing or other processes. Participants were asked, *“does your company make use of Automation and would you say it benefits the operations of the company?”*

It was evident that there is an elementary form of automation, with the use of automated quilting machines, which are used in the company’s blanket conversion process. The use of these machines has brought benefit to the company’s blanket manufacturing processes, with participants citing that it has increased speed of production. Some responses on the benefit of this technology for the company are included below.

One participant said, *“it can be beneficial, depending on the output of the machine. Machines which have high output allow you to save time.”*

On the benefits of automation, the IT manager spoke of the benefits of automating more, *“definitely. It speeds up your process. For example, if you’re making a comforter, you have to take your fibre rolls and send it through material, whereas if you have automatic machine that already has a whole fibre line that goes to a quilting machine, and it’ll pack itself. So that basically triples up your whole procedure.”*

However, many participants questioned if the costs for automation would outweigh its benefits and state that they felt there would be severe job losses if automation took place.

Apart from the automation of quilting, no other form of automation has been looked at in the company. Participants however appreciated the potential which warehousing automation may provide.

4.5.4. Subsection Theme 4: Unused technologies which may benefit the company.

All participants felt that the company still had the potential for further technological implementation, with participants noting the following technologies as potentially being beneficial to the company if they were implemented.

4.5.4.1. RFID

As per the review of previous literature, RFID refers to a form of wireless communication which use radio frequencies to detect and identify such goods without the need of line-of-site contact (Mbhele, 2014). Participants were asked the following question. *“Does your company make use of Radio Frequency Identification Device (RFID) and would you say it benefits the operations of the company?”*

Company A does not make use of RFID technology and none of the participants had heard of it before. However, once the definition of RFID was explained to participants, most found it to be an *“obvious”* upgrade on barcoding. Evidently, loss of goods in the warehouse often causes delays to order fulfilment, something which RFID would be useful in rectifying. RFID technology was somewhat of a revelation to the participants.

An explanation of what this technology entails was met with excitement, with all participants seeing the benefits of it.

One participant simply laughed and responded with the words, “*of course*”, when asked about the potential benefits of RFID technology in comparison to the physical counting, sorting and inventory management which were previously applied.

One participant stated that it would primarily benefit despatching activities, which were inefficiently carried out and led to delays and uncertainty.

Another participant said that it would benefit receiving activities in the warehouse, “*it would be very logical to use the system as if you are receiving 20 boxes out, it can tell you what came in and would tell you if only 19 were received, it would have to pick up the error.*”

One participant, however, did have the opinion that the price of RFID implementation would outweigh the benefits as compared to barcoding. He said, “*it can be beneficial, but it depends how much you have to invest and pay out, you have to make the system work.*”

4.5.4.2. Customer Relationship Management Systems

As per the review of previous literature, CRM systems represent the actual computerised systems used to manage interaction with current and potential customers through careful collating of their information. Participants were asked, “*Does your company make use of CRM systems and how would you say it benefits the operations of the company?*”

The company did not implement a CRM system at the time of interviewing. Participants had not heard of the system before but agreed that, in theory, it sounded like a good idea.

One participant said, “it would definitely help. If you sold a duvet cover to a customer, you could offer him products which go with it like a pillowcase. But you must know that it depends because lower income customers come to a store knowing what they want beforehand and then they are gone.”

4.5.4.3. Electronic Data Interchange

As per the review of existing literature, EDI refers to concept of businesses electronically communicating information which was traditionally communicated manually, like purchase orders or invoices or “the transfer of data from one computer system to another by standardised message formatting, without the need for human intervention” (Rouse, n.d.).

Participants were asked, “*Does your company make use of electronic Data Interchange (EDI), and would you say it benefits the operations of the company?*”

None of the participants had come across this technology before. Upon the concept of EDI being explained to them, it became evident to the researcher that many participants felt that it could be helpful to their planning activities.

4.5.4.4. Geographic Information Systems

As per the review of existing literature, a GIS refers to a computerised tool which is used for the capturing, storing, manipulating, analysing, managing, and presenting of geographical data, typically on a map. Participants were asked, “*Does your company make use of GIS and would you say it benefits the operations of the company?*”

GIS is not used at all by the company. Citing the fact that the company is primarily a wholesaler, the company did not see the need for such software. However, once understanding the definition of GIS and its benefits, many participants felt that this would be beneficial to the company but only if it expanded its retail activities.

4.5.4.5. Enterprise Application Integration

As per the review of previous literature, EAI is a cross-platform framework which allows different types of software in an enterprise to communicate efficiently. Regarding this technology, participants were asked the following open-ended question: “*Does your company make use of Enterprise Application Integration (EAI), and would you say it benefits the operations of the company?*”

The participants did not know what EAI was, with none having previously come across this technology. Most felt that it would benefit their activities, with several laughing at how easy this would make their jobs, with manual data entry happening more than once with the current implementation of separate, unlinked computer systems.

The optimism that this technology could be of assistance is seen with the responses of this participant who said, “ *that would benefit greatly because normally, you download your on-order, then you manually entering your order number to print your labels, to get your kimbles in and other information, and the information has to be manually entered onto the ERP system.* ” She went on to say, “*because of the rush or stress that planners are under, wrong information can also be entered, and this can be avoided.*”

4.5.4.6. Extranets

As per the review of existing literature, extranets are intranets which grant partial access to external users, allowing businesses and stakeholders such as management and alternative branches to exchange information securely on the internet. Regarding this technology, participants were asked the following open-ended question:

“Does your company make use of an extranet and would you say it benefits the operations of the company?”

According to participants, the company does not make use of this technology. They did agree that it would make it very convenient, however, with the director stating that it would be easier to log in to the stock system offsite. However, many of the staff felt that this might pose a security threat if access fell into the wrong hands.

Many felt that whilst the company did not have its own software, they felt that Mr Price’s “*Supply It*” system, which enabled them to plan and implement orders fulfilled parts of the definition of an inter-organisational extranet.

The benefits of this system were greatly appreciated by planners, who stated that the system enabled a shift away from emailed Excel spreadsheets helped them speed up their tasks whilst allowing them to communicate with buyers at Mr Price easily.

Regarding the benefits of being a supplier of Mr Price since the technology was introduced, one participant said that it assists with holding people accountable for mistakes and reducing errors. She said, *“we have a system whatever errors are on the system is picked up. If we make it or MRP makes the error, even if we make it because each planner has their own account. Every activity is done on that person's account, Mr Price can view it.”*

One participant said, “it helps in a big way compared to using manual paper and phone calls. Verbally, you’re already going to forget, and manually you can lose pages.”

4.5.4.7. Supplier Relationship Management Systems

As per the review of existing literature, SRM refers to software which allows the strategic planning and centralised control of relationships between a company and its suppliers.

Participants were asked, *“Does your company make use of SRM systems and would you say it benefits the operations of the company?”*

Most participants replied that the company did not use SRM software when asked about the use of supplier relationship management software, instead relying on their intuition and relationship with suppliers.

Despite the advantages of SRM systems being clearly expressed, there was no evidence that Company A was considering using an SRM system to manage their relationship with suppliers.

4.5.4.8. Demand Planning Software

As per the review of existing literature, demand planning software is computerised software which allows organisations to conduct demand planning activities. This form of software was not used by the company as it was primarily a wholesaler, but as with GIS, such software would be beneficial, only if the company expanded its retail activities.

4.5.4.9. Tracking systems

Participants questioned about the impacts which tracking systems could have cited the fact that distribution uncertainty prevailed when logistics activities were outsourced. A lack of control and the absence of direct communication with the driver of a truck left participants in the dark with regards to deliveries once they left the warehouse. Participants felt that this form of technology would greatly benefit control of distribution.

One participant said, “it would make a very big difference to distribution, because I can see where my trucks are, and I can see how long they spend at one customer. We actually do have the technology but are yet to implement it.”

4.5.4.10. Webpage advertising

At the time of interviewing, the company was in the process of setting up an online store on its website. However, it was too soon for any participants to give feedback on the success of the platform. Nonetheless, participants felt optimistic about the benefits of this sales channel.

4.5.5. Subsection Theme 5: Technology is only as good as the willingness of users to implement it

An incontrovertible theme found amongst the participants and their responses was the fact that none of them, apart from the IT manager, really believed in technology’s ability to help the company, with the lack acceptance of others being to blame for this.

One participant perfectly summed up this phenomenon when he said, “*you see, the problem these days is that people are too lazy to move forward. They sit in a comfortable position, and they don’t want to move forward. They say, “oh this is working for us,” and they are either scared or just lazy.*”

One participant said, *“the system doesn’t matter because if I put everything on it and someone else doesn’t put their information on it, it doesn’t work,”* when referring to the ERP system.

When discussing distribution uncertainty, one participant said, *“boxes get lost and it shows that it was received fully on the system. With technology in place, even then too, you have instances where people take stock from here and put it there and then you go to the first spot to look for it, but it’s not there, it’s somewhere else.”*

Regarding the mismanagement of distribution at the company, one participant said that use of ERP may lead to better results in this part of the business. She said, *“distribution can be improved tremendously, especially during the busy times.”*

4.5.5.2. Automation Technology

As per the review of past literature, automation technology the use of automatic equipment in manufacturing or other processes. Participants were asked, *“does your company make use of Automation and would you say it benefits the operations of the company?”*

As discussed in Section 4.5.3. there is basic automation of quilting machines which are used in the conversion process. Apart from this, automation has not been looked at in the company with participants appreciating the potential which warehousing automation may provide.

However, many participants feel that the costs for warehouse automation would outweigh its benefits and state that they felt there would be severe job losses if automation took place.

4.5.6. Subsection Theme 6: Some technologies have no benefit whatsoever in the company's context

There were some technologies which participants felt had no benefit whatsoever to the company's running, with participants citing that these technologies were either unnecessary or that they would not provide enough benefit in relation to their costs.

4.5.6.1. 3D Printing

Regarding 3D printing, participants were asked, "*does your company make use of 3D Printing Technology and would you say it benefits the operations of the company?*"

All participants felt that this did not have any benefit in the upcoming future for the company. However, many felt that this might be suited in specific high-end fashion companies, whose target market is wealthy consumers. Most participants agreed that the average national consumer confidence and average incomes in South Africa were not aligned with those if consumers found purchasing such technology.

4.5.6.2. Nanotechnology

Regarding nanotechnology, participants were asked, "*Does your company make use of nanotechnology and would you say it benefits the operations of the company?*"

Opinions on this form of technology were mixed, with participants noting the benefit of this technology. However, many felt that this might be suited in specific high-end fashion companies, where consumers may be wealthy. Whilst some felt that the demographic and average incomes in South Africa were not aligned with purchasing garments which featured such technology, others felt that it could create a better product and make the company more competitive.

One participant said, "*that technology would be a big benefit, it would bring in more customers.*"

Another said, *“I think it could work on bedding, because you can make an item which lasts longer. Obviously if you are spending like three hundred Rands on a duvet cover, you expect it to last long and through many washes. So, if you could spray something on it that would make it last up to six years, that would totally benefit you in the long run.”*

Several disagreed with this. One said, *“maybe nanotechnology can be something for the future, it can be good, but with regards to our field, but maybe in the future, but not now.”* He went on to further elaborate that, *“nanotechnology would automatically pick up the price of your product, and nobody would buy your product.”*

4.5.6.3. Printed Marker Technology

As per the review of past literature, printed marker technology is a form of automation commonly used in the clothing manufacturing process wherein clothing patterns are automatically placed and printed instead of the process being done manually. Regarding this technology, participants were asked the following question:

Participants were asked, *“does your company make use of Printed Pattern Marker Technology and would you say it benefits the operations of the company?”*

All participants who opted to answer this question felt that printed and digital markers did not have as much scope, as the patterns used for in this company were fairly straightforward as compared to a clothing manufacturer as it was primarily a linen supplier. The company does not make use of such technology, but the participants felt that it would undoubtedly be beneficial for fashion and clothing manufacturers which they supply.

4.6. Part B Data Presentation

4.6.1. Demographics of participants

4.6.1.1. Gender

Whilst not much credence is given to gender for the purpose of the study, it is mentioned to understand the demographics of the participants.

Gender	Number of participants	Percentage of total participants
Male	12	71%
Female	5	29%

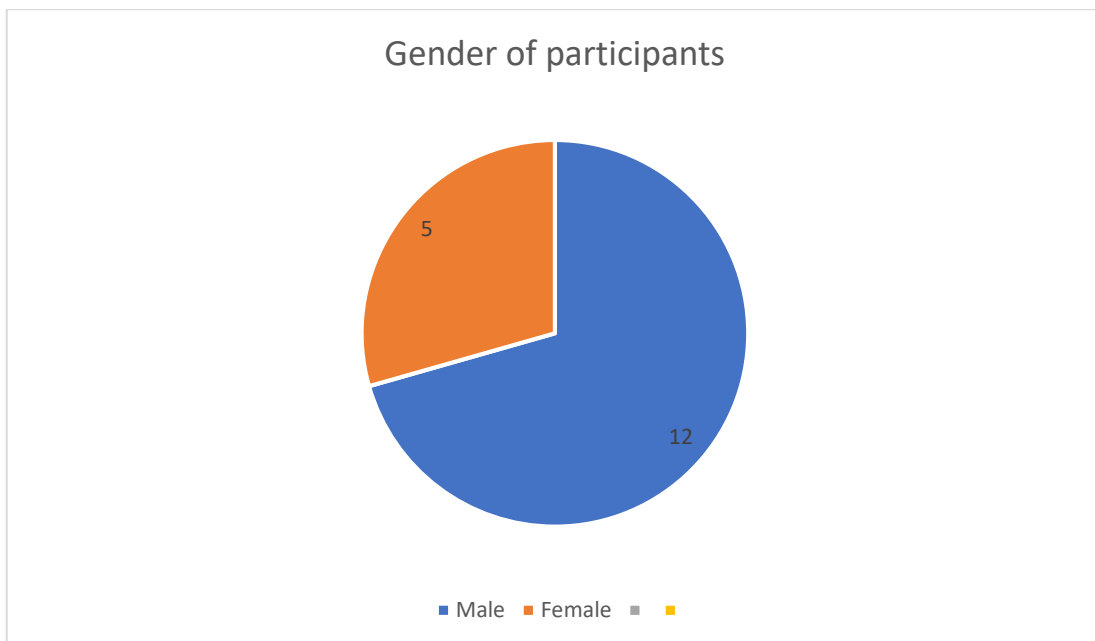


Figure 4.6: Gender of participants: Part B

Source: Created by researcher post-primary research.

4.6.1.2. Experience in sector

Due to judgemental sampling being used to find relevant industry experts, to fulfil the criteria for being regarded as an industry expert, participants were required to have at least two years of experience in management positions at industry-leading companies. The companies selected were Mr Price, Truworths Group, Kingsgate Group and the

Edcon Group. The 17 participants who agreed to participate had a cumulative experience of 222 years, with an average of 13 years. The following table and chart depict the level of experience of the participants.

Table 4.3: Participant experience: Part B

Timeframe	Number of participants	Percentage of total participants
Less than one year	0	0%
More than one year but less than five years	3	18%
More than five years	14	82%

Source: Developed by researcher

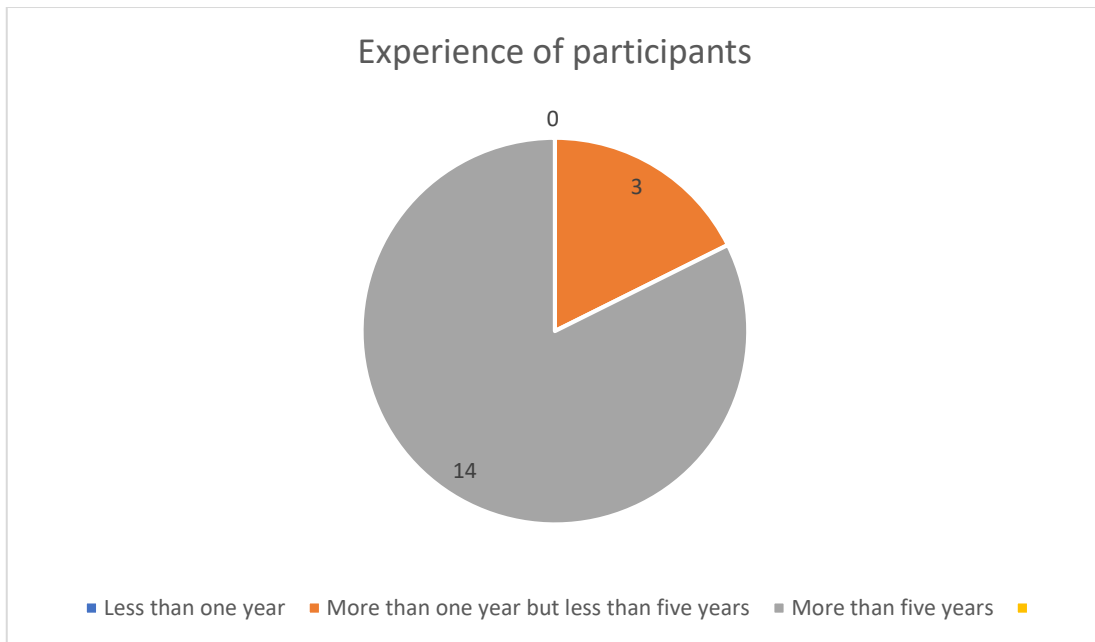


Figure 4.7: Participant experience: Part B

Source: Developed by researcher

4.6.2. The response rate of sampled participants

As stated in Chapter Three, the entire population of management personnel was selected based on their roles in the company. The population size (and the sample size) of personnel who met this description was 20. Of the 13 participants selected, some refused to participate. Their refusal was accepted as participation is totally voluntary, as stipulated previously.

The table and chart below show the number of participants who participated in comparison to those who did not.

Table 4.4: Participant participation: Part B

Participation status	Number of participants	Percentage of total participants
Participated	17	85%
Did not participate	3	15%

Source: Developed by researcher

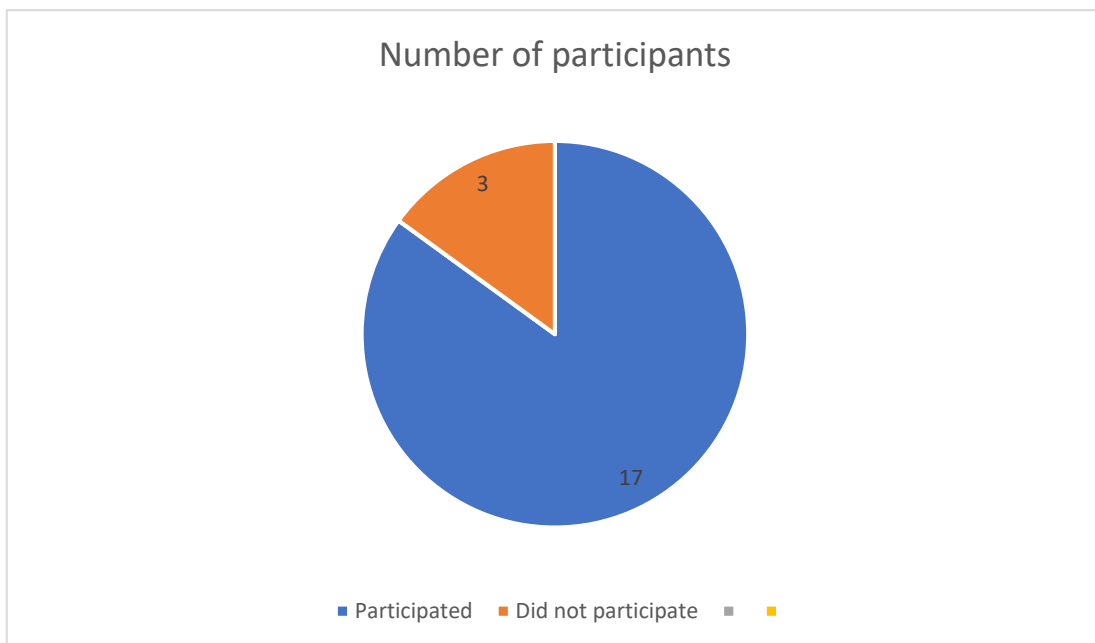


Figure 4.8: Participant participation: Part B

Source: Developed by researcher

4.6.3 Part B – Interviews with Industry Experts

As clarified in chapter three, an interview guide was drawn up and this is attached as Appendix B. This interview guide was used in addition to themes found in Part A of the primary research to guide the questioning of participants in order paint a picture of the case study, from which participants could advise on the generalisability of the case study.

Participants were given open-ended questions. Questions were adapted according to each participant's roles in the industry and their exposure to the types of technology, with. For example, some participants had no idea if RFID systems were implemented in the retail sector, so they were not pressed about how much they felt it helped the company.

For Part B of the study, expert opinion was sought from educated and experienced personnel from the textile industry. Participants for this portion of the study were interviewed with open-ended questions and given an opportunity to give their opinions on the state of the industry and the prevalent themes at Company A, with the aim of understanding whether Company A was alone in its experiences or if results from Part A were generalisable to the industry. The following is a presentation of the results of these interviews.

Permission was granted by all the individual participants to use a recording device during the interviews. Participants were advised that recordings would not be disclosed unnecessarily and that no reference would be made to them when mentioning their responses. The interviews took between fifteen and one hundred minutes each. All the interviews were conducted either face-to-face, with the interviewer meeting the participant, or via video calling medium such as WhatsApp and Skype.

Before the data is presented and analysed, it is imperative to note that some "experts" stressed that no information which would divulge their respective company's secrets and competitive advantages to rivals should be released. To alleviate their concerns,

they were offered the opportunity to look at the interview schedule to see if there were any questions they did not want to be asked and they were promised anonymity before provision of access to the company. Participants who still did not feel comfortable undertaking the study were given the option to back out at will and ensured that participation is entirely voluntary.

Additionally, it is essential to mention that participants were ensured that their responses would not be tied to them and that this was an external research activity. They were further assured that their responses would not be shown to their co-workers or employers. Thus, responses which are mentioned below have had names redacted.

With these promises and the University's ethical standards in mind, the common themes found in the interviews of industry experts are explained below and depicted in Figure 4.9.

Thematic Map: Part B of Primary Research

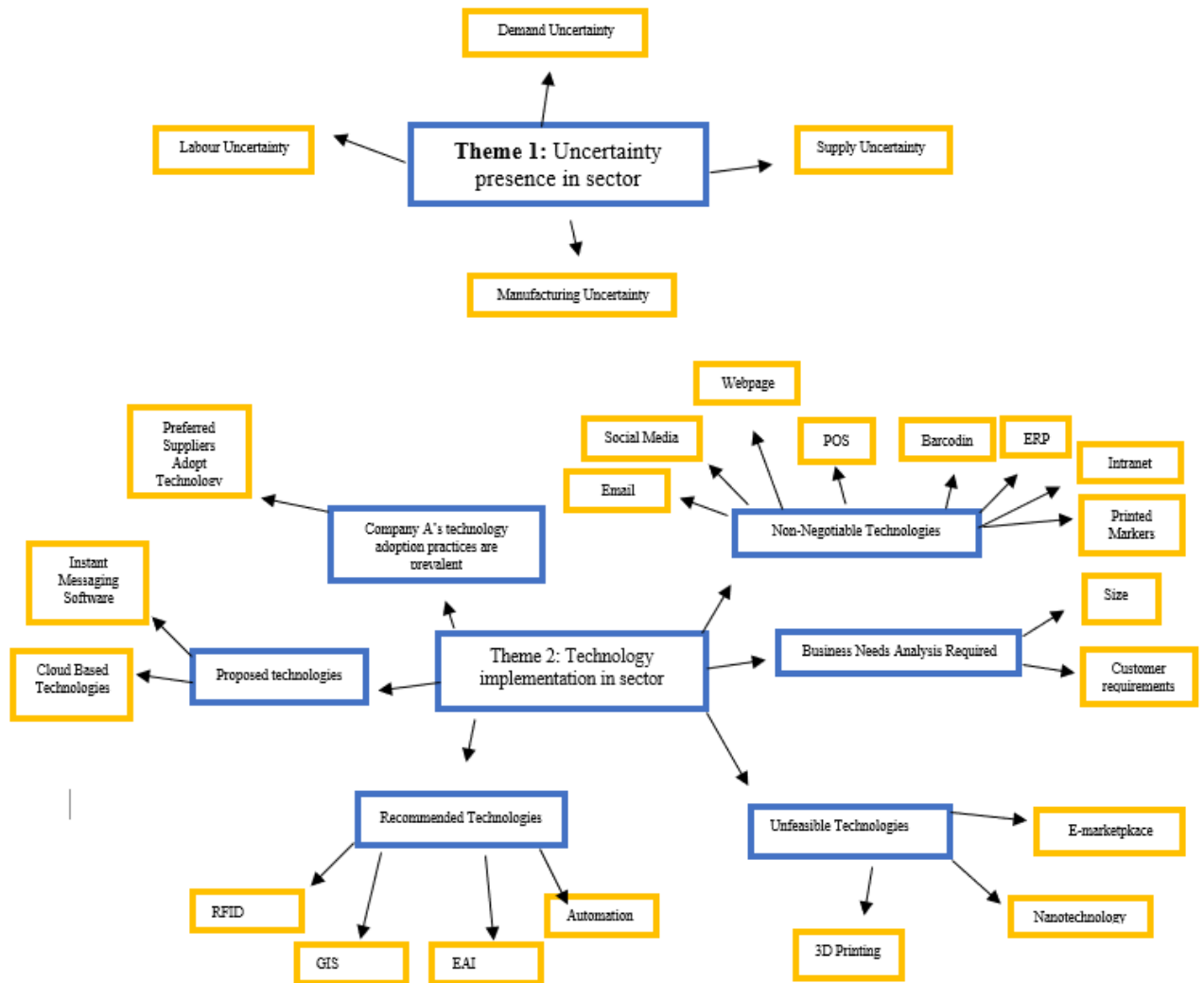


Figure 4.9: Thematic Map - Part B of Primary Research

Source: Developed by Researcher

4.7. Analysis of Data: Part B Theme 1 - Uncertainty presence in the sector

As described in the review of previous literature, several sources of uncertainty are present in clothing and textile supply chains. These range from labour uncertainty, demand uncertainty, supply uncertainty, manufacturing uncertainty and distribution uncertainty. Participants were posed with these sources of uncertainty and asked if they felt they were common industry-wide or were limited to the case.

Thereafter, participants were asked if they felt that technology could benefit the sector. Whilst most participants agreed that it was imperative that technology is used in improving the sector, a couple of other factors were brought up. A significant concern lied in the fact that more importance should be paid to the impact which government assistance could have on the sector, with one participant stating that “ *no amount of technology can help if you do not have financial help from the government*”, and another stating that, “ *manufacturing businesses are given minimum wages to pay by the government, but the companies they supply are not forced to pay them minimum service fees.*”

On the amount of uncertainty which management personnel in the sector faced, one participant even noted that it would be impossible to list all uncertainties because, “*such is the nature of uncertainty that as time goes it’s different.*”

4.7.1. Subtheme 1: Labour uncertainty is prevalent along industry supply chains

In alignment with the literature review and the opinions of participants in Part A of the primary research, industry experts in Part B of the primary research felt that labour uncertainty was prevalent in the sector and linked it to supply uncertainty. Many participants cited the fact that labour issues higher up on the supply chain typically disrupted the supply of goods and services along supply chains and in turn, the predictability of stock availability and expected deliveries.

4.7.2. Subtheme 2: Demand uncertainty is prevalent in the sector

In alignment with the literature review and the opinions of participants in Part A, participants in Part B said that a major form of uncertainty is indeed demand uncertainty.

One participant spoke of the changes in consumer preferences with new shopping seasons prevailing in recent years such as Black Friday. He said, “*a big issue in the last couple of years is Black Friday, which many people underestimated. When companies have good Black Friday sales figures, what they failed to realise is that*

people who usually do their Christmas shopping in December are now spending in November whilst companies are still preparing forecasts on historical data and trying to meet December targets. Many companies underestimated Black Friday because it was so new in South Africa.”

One participant noted that for local suppliers, demand uncertainty is not just limited to the end-user, citing that the decisions of retailers affect their demand. He said, *“especially when you consider that most local companies actually import. They actually get their stuff made cheaper in countries like China, Bangladesh etcetera. This obviously leads to a lack of investment in local industries. To be honest, the local textile industry is tied up because of that.”*

One participant however, noted that retailers like Edcon had made significant attempts to ensure they prefer local suppliers to those overseas when possible, with almost 60% of outsourced manufacturing, which was previously done overseas being intentionally reshored, in an effort to stimulate the local economy.

However, he too noted that countries such as China, Bangladesh and India make products at, *“quite a reasonable rate,”* in comparison to local manufacturers, thus making reshoring of supply costly for retailers.

4.7.3. Subtheme 3: Supply uncertainty is prevalent in the sector

In alignment with the literature review and the opinions of participants in Part A, participants in Part B said that a major form of uncertainty is indeed supply uncertainty. Many participants felt that it was common for suppliers to make false promises and overestimate their capabilities.

However, most participants noted that large retailers seldom used such suppliers, with planners and buyers using technology to rate suppliers on an on-going basis in tandem with their subjective opinions when selecting suppliers for projects.

4.7.4. Subtheme 4: Manufacturing uncertainty affects companies negatively

In alignment with the literature review and the opinions of participants in Part A, participants in Part B said that a major form of uncertainty is indeed manufacturing uncertainty.

One said, *“every year uncertainty is different. For example, in this past year the biggest uncertainty we faced in the December period was loadshedding, which had a big impact on production. You can’t get goods into the store in time for Christmas, with goods arriving at stores at the end of December, leaving you either cancelling orders or keeping stock for the next year.”*

Another participant said, *“you have risks everywhere and obviously it's much more heightened here, because of the climate. In terms of your demand side, we have a very wide range of customers. In South Africa, the markets are really wide and very open.”*

4.8. Analysis of Data: Part B, Theme 2: Technology’s role in rectifying sectoral uncertainty

Participants were asked their opinions on the use of technology to manage uncertainty in the sector. The participants were then presented with types of technology which were identified in the secondary research and asked them about the prevalence and importance of these technologies in enhancing efficiency and effectiveness in local clothing and textile supply chains. Most felt that it did indeed provide advantages to businesses, with many citing their use of technology allowing them to work from home if required. There were several subthemes which unfolded during the interviews which will be discussed below.

4.8.1. Subtheme 1: Company A’s technology adoption practices are prevalent

When presented with themes of the research conducted at Company A, all participants felt that the technologies implemented by the company aligned with best practice. It is important to remember that, in the interest of preserving Company A’s anonymity, it

was not referred to by name when discussing it with participants in Part B of the primary research.

Below is the discussion of the prevalence of technologies which the company implemented and the views of industry experts on the level of generalisability.

Email:

As per Part A of the primary research, Company A was found to have implemented email technology adoption several years ago and is very reliant on it as a communication tool. All the participants felt that email technology was prevalent in the industry. However, two noted that the use of technologies such as ERP which allowed communications to be managed better meant that email technology was becoming less prevalent than it once was, with one referring to it as an “*archaic*” technology.

Barcoding:

As per Part A of the primary research, Company A has recently implemented barcoding technology at the instruction of one of its wholesale customers. In the review of past literature, the researcher explained the benefits which the technology could bring to the company, sentiments shared by participants at Company A. When posed with these themes, participants in Part B felt that Company A was aligned with successful companies in the sector.

Web-Page Advertising:

According to participants, most successful retailers engaged in online web-page activities and had operational online stores. Many participants cited that Mr Price was a benchmark for online stores, noting the company’s early adoption of the technology meant that their online store’s usability and accessibility was “world class.”

Social Media:

Another technology used by Company A, social media is a commonly used technology for retailers to reach consumers and get feedback from them, with one company using, “*Facebook, Instagram and anything you could think of*”, for advertising purposes.

ERP Systems:

As per the review of existing literature, ERP refers to a system whereby a company manages and integrates vital aspects and departments of business within a singular software. Themes of results of Part A relating to this technology were presented verbally to participants, who were then asked about the benefits of this type of technology and its prevalence in the sector. All participants felt that successful companies used ERP or similar technologies to assist management activities.

Point of Sale (POS)

As per the review of existing literature, point of sale includes the use of cash registers, computers, tablet computers and the software used on these devices to record and disseminate sales data into company databases. Themes of results of Part A relating to this technology were presented verbally to participants, who were then asked about the benefits of this type of technology and its prevalence in the sector. One participant said, “we definitely have a Point of Sale and you definitely need a Point of Sale, especially to manage things like stock flow and monies.”

4.8.2. Subtheme 2: Some technologies are non-negotiable in supply chain contexts

Certain technologies were deemed by industry experts as non-negotiable. This is to say; they felt that companies not using these technologies would struggle to succeed and, in many cases, were avoided in favour of companies embracing these technologies.

4.8.2.1. Email

As per the previous literature, email refers to the transmission of messages over networks such as the internet (Arnold, 2011). Themes of results of Part A relating to this technology were presented verbally to participants, who were then asked about the benefits of this type of technology and its prevalence in the sector. Most participants felt that email was a valuable communication tool.

One participant at a leading company in the industry emphasised this when she said, *“email is very, very, very, very helpful. We do deals using emails every day.”* She added that alternatives to email such as WhatsApp groups were vital to communication.

Another participant said, *“listen, you are never going to fully move away from email. Even if you are using so called, “smart”, systems, such as systems used to track your suppliers, when you raise an order, an email is sent to a supplier and the system is such that I can track when someone opens that email. I will know when they opened it and who opened it. I don’t think that you’ll ever move from emails, I think that it’s more about investing in this smart technology.”*

He further went on to explain this, *“smart technology”*, referred to software which allowed a user to integrate systems like ERP and email.

One participant, however, whilst agreeing that using email is vital, disagreed with the sentiments of participants at Company A, who firmly believed that email was the number one technology on the list. This participant said, *“I would disagree with that, because technology evolves so fast. In my experience, whilst email is used a lot to communicate with suppliers abroad, there are so many other ways of communication as well. It often happens that you miss an email. There are other ways of communication such as Skype and Microsoft Teams which we are currently used. As compared to these, email is quite outdated in terms of communication.”*

Another participant agreed with this sentiment, calling referring to the use of emails as, *“archaic.”* Apart from these two participants, all other participants cited the use of email as imperative to a company’s success.

4.8.2.2. Barcoding

As per the review of existing literature, barcoding technology refers to a form of automatic identification, which entails the use of physical numbers or patterns to label,

identify and track objects. Themes of results of Part A relating to this technology were presented verbally to participants, who were then asked about the benefits of this type of technology and its prevalence in the sector.

Most participants found the technology to be a non-negotiable amongst successful retailers and their supply chains. One participant added that a barcode is a, *“one of the most important things,”* for tracking an item.

Another participant excitedly said, *“whew! Okay barcoding, that’s absolutely important and the reason for that is that your barcoding really sets the tone for the rest of your supply. It gives you so much of information. You know, everything about the garment the year it was manufactured, the fabrication, the colouration, everything. I’m actually surprised that a company which supplies major companies just started implementing barcode printing and scanning, because it helps with controlling supply and you know what stock you have.”*

One participant cited that the technology was used with every successful company he had come across. He started off with a commonly used South African expression when asked about the importance of barcoding, saying, *“Sho! That’s a key principle in terms of managing stock, because remember, from the time you order your stock, to the supplier at the onset, how much how the stock is coming in. Once you see that you want to have more certainty of products from the supplier that are received, and it is almost as realistic and as real-time as possible is key.”*

Explaining the supply chain-wide implications of the technology, he further said, *“It’s not just about the receiving, it’s managing the product throughout its lifecycle. So if I know for instance, the first thing is to start moving in bulk, that means whether it’s in cartons or whatever you’re actually receiving, but then the individual barcodes on the items themselves, once you actually now scan it into your store, scan it out either through a sale to a customer because that’s also not helping you to almost instantaneously have a realistic stock on hand and you know how many t-shirts you’ve sold, how many were ordered as backup stock, what’s coming in the pipeline and what’s sitting in your distribution centre.”*

Another participant said, *“our percentages of discrepancies are maybe like 1% or 2% of our hits off all of the batches. And these are in big retailers that have been using barcodes. A CMT business I know which uses manual counting, there are always overcounts and undercounts. So, what happens is it goes through like counting processes before it leaves. And the second and third counts often have mismatches from the first one and I'm sure their percentage of mismatches is definitely more now than when actually using a barcode system.”*

Another participant mentioned the importance of barcoding to the companies he worked at previously, saying, *“that's one of the most important things to have on an item, because a barcode is a tracking system for you. It tracks how much stock is in your warehouse, it tracks how much stock loss you have. It allows you to know where an item is and what happened to it. So, I would say that's actually one of the most important things to have. We have a big warehouse opposite our Head Office and most definitely make use of barcoding in our warehouse to track items.”*

On the benefits to retailers in the sector, one participant said, *“let me give you an example. Say you have a sale and you have a lot of customers and you don't have a scanner. You will end up with long lines and customers getting dismayed and leaving the store.”*

One participant cited the speed at which barcoding allows goods to move through the supply chain as a major benefit for the technology. He said, *“companies like Mr Price when they receive something to the DC. That is, it's almost impossible to do all that type of stuff without barcode. Because those boxes are they barcoded and they scan and they're going through so fast and to be able to count that through at the same rate, you're going to be losing time, ridiculously,”* citing a *“definite necessity for it,”* for larger companies and their suppliers.

4.8.2.3. Printed marker technology

As per the review of existing literature, printed marker technology refers to a form of automation commonly used in the clothing manufacturing process wherein patterns are laid out digitally and printed by a computer instead of manually. Themes of results of Part A relating to this technology were presented verbally to Part B participants, who were then asked about the benefits of this type of technology and its prevalence in the sector.

Most industry experts interviewed in Part B felt that this technology is widely used in the sector, particularly by clothing manufacturers. This aligns with the opinions of several participants at Company A who said that clothing manufacturers may use this technology.

When asked about the importance of such technology, most participants felt that the technology was beneficial. One said that it would allow for *“100 per cent accuracy,”* when cutting garments.

Another participant said that such technology is widely used by clothing companies, *“to make sure you're using the fabric to the best possible unit, no wastage and things like that.”*

Another participant cited that the technology was ubiquitous with most of his suppliers using it. He said, *“most of the CMT's that I use would use a paper marker. I have one CMT that I currently use for a lot smaller runs that do still manual markers.”*

4.8.2.4. Enterprises Resource Planning (ERP)

As per the review of existing literature, ERP technology is a system whereby a company manages and integrates vital aspects and departments of business within a singular software. Themes of results of Part A relating to this technology were presented verbally to participants, who were then asked about the benefits of this type of technology and its prevalence in the sector

One participant spoke positively about this technology's use when he said, *“ let me put it this way, having information at your fingertips when you require, you can never*

put a value to that no one can say that there is any manual method that can give you the information as quickly as you require it. Only these systems can give it to you. When you don't have these systems in place, you won't realise the value of having the information when you need it for making decisions. The only time one can know the value of such accessible information is when they have it."

Another participant, who had worked previously for Edcon and The Truworths Group spoke of the customer service improvements brought about by ERP and similar technologies. He said, *"I think it is very important."* On the benefit of the provision of real-time information added that at companies like Truworths, a user could *"view stock levels, especially at a store level, for example, if you're at the Pavilion store and are looking for an item on the system, you could see if it was available at the Gateway store."*

An exception was made by some participants who said that tiny companies may be able to manage their things manually and in a traditional manner. However, for any company growing or hoping to grow, all participants felt that the adoption of this technology was imperative.

As per the review of existing literature, an intranet is a local connection between multiple computers at one location which is typically used by computing devices to share information and instructions internally. Most participants felt that for larger companies, these were commonly used and very beneficial. Through the interviews, it became evident to the researcher that the benefits of intranets and ERP systems were closely correlated, as noted in the review of previous literature.

One participant who worked at two major retailers noted that it is important to use technology to its full potential, citing that one of the companies he worked at previously, used its ERP system to full capacity and was able to use it to create visibility and flexibility. He further noted that another leading company had what he termed as the, *"Rolls Royce"*, of ERP systems, but that improper use of the technology meant that it was only used to 5% of its capability, disadvantaging the business. Such phenomenon was also seen at Company A.

4.8.2.5. Extranet

As per the review of existing literature, extranets are intranets which grant partial access to external users, allowing businesses and stakeholders such as management and alternative branches to exchange information securely on the internet. Particularly citing the impacts of Covid-19, many participants said that it would be impossible to continue working from home during the nationwide lockdown.

The benefits of contemporary extranets are evidently closely linked to cloud-based ERP software.

4.8.2.6. Demand Planning Software

As per the review of existing literature, demand planning software is computerised software which allows organisations to conduct demand planning activities. The company did not use such technology, as it was in the infancy in its retail activities.

Most participants felt that such systems were commonly used amongst retailers in the industry, noting that such software was a necessity for companies in customer-facing positions along the supply chain. Participants felt that such software allowed wholesale customers like Mr Price and Jet to provide forecasts and projections early enough to allow the company to source materials and plan.

4.8.2.7. Social Media

Another technology used by Company A, social media is a commonly used technology for retailers to reach consumers and get feedback from them.

One participant said, “in the first year at my previous company, we weren’t seeing any sort of numbers and we brought a marketing person in who spent a lot on social media such as Facebook and Instagram amongst other marketing efforts and in the next year sales doubled. It could be a coincidence, but I feel that all forms of marketing aren’t given enough attention and play an important role.”

He further went on to say, *“it depends on your customer, because if your customer is a younger person, Instagram, Twitter and Facebook may be very advantageous.”*

Regarding the importance of social media for feedback in the modern marketplace one participant said, “*one small complaint on social media can be made into a mountain.*”

4.8.2.8. Web-page advertising:

When asked about advertising and online stores, all participants noted such technology as beneficial and imperative to success. One participant noted that for some leading retailers, their online departments sell more than any individual brick-and-mortar store.

Another participant from a leading retailer said, “I would estimate that about one tenth of our turnover is just from online sales.” She further stated that using “Google pop-up ads,” is an effective way to drive consumers to a company’s online store.

4.8.3. Subtheme 3: Business needs analyses is required before choosing technologies

A vital subtheme which was found regarding technology implementation was that there is no rigid formula for companies to follow. Whilst all participants agreed that every company should look to improve its eSCM implementation, several stated that flexibility is required when deciding what technologies to use, as some technologies would be more suitable to some companies than others.

The suitability of technologies to a company was said by participants to depend on two main variables. These are the size of the company and the requirements of its customers.

4.8.3.1. The size of a company

The size of a company determined the ability of it to successfully implement technologies, with the scale of output dictating whether a technology would be feasible to implement at the company.

One participant referred to barcoding and RFID as technologies which could be used by large companies and their suppliers, citing that it wouldn’t be necessary for smaller

companies dealing with small volumes of output and could still manage their stocks manually.

When he mentioned the benefits of barcoding, he said, *“maybe in smaller companies, like CMTS and all the rest, it's pretty manual to then have to physically barcode so for them, unless you're dealing with the likes of Mr. Price or a big retailer, you don't won't have to barcode because it's already manual or handwritten, on your box stickers, for example how many smalls medium larges or how many size twelves [are in the box].”* He further said, *“it depends on the type of company you are in.”*

Similar opinions existed around ERP technology. Whilst all participants believed it could be beneficial to the communication and management of businesses in the sector, some cited that it may only provide benefit for larger companies.

Regarding ERP implementation, further went on to say, *“I think it depends on the size of the growth of the company. I think most companies are going to start off manual because they're not going to be handling for example a 1000 orders a day. They might have an order a week which they need to make sure that they get as good a control as they can and push through the system and it can be very manual and easy to maintain. But all of a sudden when you've got 10 orders coming through in a day and you've got to make sure that you're following up the next day on that follow up and you've got another 10 orders coming through, it suddenly overlaps and you've got a lot going on. Having these systems in place that are flagging any timelines that you might need in your career path. It's definitely a big help. Like I said in the beginning, it might take a little while to implement but, eventually a company will have to, depending on the growth.”*

One participant had a similar sentiment regarding RFID. He said, “if you're just a normal curio shop or whatever and you're selling 15 to 20 items a day, who cares if you barcode scan it, that's fine don't go for the outlay. If you're a company like Mr Price or Woolworths where at times you're just smashing things through the till, get it

done, because it is worth the outlay. The faster you can get people through the till, the better, because customers are looking for an experience nowadays.”

4.8.3.2. The requirements of a company’s customers

The requirements of the customers of an organisation is a significant variable noted by some participants when deciding whether a form of technology was required. One participant stressed that technology including ERP and barcoding was necessary for some companies, but less so for others. He said, “*it depends on A, the type of company you are in, and B the type of company that you supply and what they require.*”

4.8.4. Subtheme 4: Recommended uncommon technologies

Some technologies were not in use in a South African context according to the participants’ exposure but represented an opportunity for improvement of textile supply chains.

4.8.4.1. Radio Frequency Identification Device (RFID)

As per the review of existing literature, RFID technology refers to systems are a form of wireless communication which use radio frequencies to detect and identify such goods without the need of line-of-site contact (Mbhele, 2014). Themes of results of Part A relating to this technology were presented verbally to participants, who were then asked about the benefits of this type of technology and its prevalence in the sector

Whilst many participants had heard of the technology none had seen it in use locally. Several cited that they went to product viewings, with suppliers offering them the technology. However, none were certain if their companies would move forward with implementing it in the near future.

One participant said he attended a presentation at a potential supplier of RFID technology and referred to it as, “*mind-boggling,*” stating that the technology could be used to “*store as much information as you want on a garment at a store level,*” and that stock takes for an average store could take, “*just two minutes,*” allowing managers to take stock on a daily basis instead of a quarterly basis. This participant said, “*many*

of the big stores”, had considered using it, citing the fact that one is “*able to detect stock levels,*” on both storefront and warehouse levels.

Another participant stated that he had previously researched RFID, citing that it could be beneficial for larger companies which could afford to invest in high-speed internet lines, citing that this was necessary for “*real-time updates.*” This participant also stated that he was confident that Cape Union Mart and Truworths had trialled RFID technology. He stated that whilst it may not be scalable and widely implemented in the local clothing sector, he expected wider adoption to begin “*5 or 6 years’ time.*”

4.8.4.2. Automation

As per the review of past literature, automation technology the use of automatic equipment in manufacturing or other processes. Themes of results of Part A relating to this technology were presented verbally to participants, who were then asked about the benefits of this type of technology and its prevalence in the sector.

One participant stated that cutting processes were automated in the manufacture of footwear. “It is the same with shoe design is the footwear is all based on a machine. And then it still gets manually stitched together and put together by a human. Another participant cited the use of automatic laying and cutting machines in a factory he had been to in the Verulam area of Durban, citing that larger manufacturers may benefit from such automated processes.

Another participant also cited the use of automatic cutting tables, which were an upgrade on automated printed marker technology. This participant, from a leading industry organisation, noted that the organisation he worked at had been considering implementing such technology for a few years, noting that the operations manager, “*goes on about it every day.*”

He further noted that in the current economic climate meant that organisations needed to adapt manufacturing processes, saying, “*the economy is currently slow because people are not spending money, it is necessary to sell things at a lower price. The one way we found is the biggest savings is on automated cutting of fabric. Simply say my company gives a CMT supplier 100 metres of fabric and I request 50 garments. I trust*

the CMT and don't have the ability to monitor his cutting processes constantly. After a few days, the CMT supplier says that he could only make 40 garments from the fabric. It's impossible to say whether fabric was stolen, if the garments were laid properly or if they were cut incorrectly."

He further said, *"My opinion is that the system is very expensive, but it allows you to insource cutting activities and take control of the garment manufacturing process by having it done under your nose. This allows the company in this instance to automatically cut 50 garments and expect 50 garments back from the manufacturer whose job is now just to put the garment together. The system only requires a few people to use and reduces printing errors because you skip the process of printing markers out as well."*

Another participant cited an occasion on which he went to a clothing factory in Italy where he witnessed fully automated garment manufacturing processes, which required no labour at all to turn fabric into t-shirts.

Several participants cited the automation at Mr Price's distribution centre, referring to the levels of warehouse automation as being *"world class"*. One said, *"having a tour through the Mr Price DC, everything's automated. The truck will literally reverse and the guys will offload it manually put onto a conveyor and that will go in from there, everything will be automated, it will know exactly what scannable know exactly where it goes, which conveyor it goes to. It's got it it's what they call a panda system. So as it comes in, it scans it and it automates it to where it needs to go from there. So basically, the conveyors will shift it into the correct path that it needs to go."*

He further states for a company the size of Mr Price the speed brought about by automation is imperative, *"simply because of the number of cartons that flow through its distribution centre."*

However, it became evident that apart from Mr Price's distribution centre's automation and printing marker technology, which is discussed separately, automation was not commonly used in local clothing and textile supply chains.

4.8.4.3. Geographic Information System

As per the review of existing literature, a GIS is a computerised tool which is used for the capturing, storing, manipulating, analysing, managing, and visually presenting of geographical data, typically on a map. Some participants cited that similar technology was used to add to planners' intuition, allowing them to plan store-level stock allocations. However, some noted that a shift away from Excel spreadsheets was still required and that a graphical presentation of consumer demographics and demand patterns would make such allocations easier.

4.8.4.4. Enterprise Application Integration (EAI)

As per the review of existing literature, EAI is a cross-platform framework which allows different types of software in an enterprise to communicate efficiently. Regarding this technology, participants were unaware if it was commonly used. However, many saw the benefits of such systems, with many, even at leading companies citing that they felt that their current planning processes were not automated enough to allow them to focus on decision-making.

4.9.4.6. Electronic Data Interchange (EDI)

As per the review of existing literature, EDI technology refers to businesses electronically communicating information which was traditionally communicated manually, like purchase orders or invoices. For this form of technology, some participants noted that they were familiar with them, with several stating that EDI was integrated within the ERP systems which they were familiar with. However, not all participants could attest to the prevalence of EDI in the sector, with all agreeing that it theoretically would be beneficial to their processes.

4.9.4.7. Customer relationship management systems

As per the review of existing literature, customer relationship management technology refers to represent an approach to manage a company's interaction with current and potential customers through careful collating of their information.

All but one of the participants were uncertain if the technology was used locally, with that participant noting that the major retailer he was employed by used loyalty cards to track consumer preferences. Many participants noted that they were not in an ideal

position to comment on its prevalence, providing the reason that such software was more likely to be used by marketing managers. This provides possibility for future research, which is discussed in Section 5.5.

Some participants cited that they had come across such technology, with one participant citing that he saw it in practice at a Nike store in London and at a company he was previously employed at in the Middle East.

He said, *“I used to work for a company called Le Azur group in the stores, we had 28 stores in Saudi Arabia, but the head office was run out of Dubai. We had a system where they could track customers based on their gender and preferences. You could even send a message to customers based on where they were in the store it was. It was amazing. It was really, really incredible.”*

He further said, *“I also know that Nike in London I once visited, and depending on where you were in the store, you'd get a direct message that appeal to you personally, for example they would work out your preferences and say, “he likes basketball and would send a customer a message related to the basketball section when he is in that part of the store.””*

4.9.4.8. Supplier relationship management systems

As per the review of existing literature, supplier relationship management systems refer to software designed to allow the strategic planning and centralised control of relationships between a company and its suppliers. Some participants noted the use of such technology to manage suppliers, with others relying on their intuition to manage supplier relationships. However, the prevalence of the software was not fully ascertainable, with participants speaking from their own perspectives.

One participant said the technology was used to “rate suppliers” based on quality, lead-time, capacity, order fulfilment and flexibility, noting that this allowed her to select suppliers better when sudden orders came through or technically difficult items were required.

4.8.5. Subtheme 5: Technologies suggested by experts

It was evident in Part B of the primary research that traditional Electronic Data Interchange has been substituted with Cloud-based EDI, due to the relative ease of implementation and the cost-savings of having on-site infrastructure installed. Many participants at leading companies such as the Mr Price Group and Edcon were able to continue their activities seamlessly from home during the Covid-19 lockdowns. The same was said of cloud-based ERP technology when asked of the benefits of extranets.

The in-depth and adaptable nature of the interviews allowed the researcher to query on the possibility of working from home permanently with one participant who was interviewed during the national Covid-19 lockdown. One participant said that working from would undoubtedly be a possibility in the future because it was evident that a lot of her activities could be done from home using such systems.

Many participants felt that the inclusion of communication software such as WhatsApp, Viber and IMO are greatly beneficial. Citing the speed with which these applications operate and the accessibility they present, this form of technology is seen by many industry experts as one which replaces email in specific situations, for example when quick feedback is required, deeming the use of email and ERP systems excessive in certain, urgent circumstances.

4.8.6. Subtheme 6: Some technologies aren't feasible in a South African context.

Despite their theoretical benefits, some technologies were seen by industry experts as surplus to requirements in a South African context. Primarily due to the additional costs incurred through their implementation, investment in these technologies was not seen to provide any significant benefit to companies in the sector. These technologies will be discussed below.

4.8.6.1. Nanotechnology

As per the review of existing literature, nanotechnology refers to technology which uses the instilling of minute particles onto fabric, allowing manufacturers to change the relationship between textiles and their environment. Themes of results of Part A

relating to this technology were presented verbally to participants, who were then asked about the benefits of this type of technology and its prevalence in the sector

Whilst nanotechnology was cited to potentially benefit companies in allowing them to differentiate their products, industry experts felt that there were differing levels of nanotechnology. The use of the technology in enhancing textiles would undoubtedly make companies competitively stronger, but implementing nanotechnology in terms of computing, wearables and body sensors seemed out of the scope of the average South African's spending power.

4.8.6.2. 3D Printing Technology

As per the review of existing literature, 3D printing technology refers to is the process of manufacturing three dimensional solid objects from digital files. Themes of results of Part A relating to this technology were presented verbally to participants, who were then asked about the benefits of this type of technology and its prevalence in the sector

3D printing technology was deemed by industry experts as something which could be of potential in the future, but most failed to see how it could be applied to scale and mass-production in a local context, thus deeming it a technology that would not have a marked impact on the sector currently.

4.8.6.3. E-marketplace

As per the review of existing literature, an e-marketplace refers to an electronic commerce system where third parties supply products and services with transactions being processed by the marketplace operators. Themes of results of Part A relating to this technology were presented verbally to participants, who were then asked about the benefits of this type of technology and its prevalence in the sector

Despite Company A's participants claiming to use such systems, industry experts mostly felt that this technology would not be useful in a South African Clothing and Textiles usage. Responses encircled the concept of brand image and what using an e-marketplace would say about a company.

Participants felt that this form of technology may bring about exposure to a business. Responses on this alluded to the fact that new and small businesses could use such formats for these sales.

One participant said that Gumtree, for example, may be beneficial for smaller businesses targeting lower income consumers. He said, *“I think it comes down to your brand perspective. I think it would be fine for a company that is maybe in the centre of town which serves the lower LSM. Customers just want to know that they can come in and buy factory goods.”* He goes on to further mention some brands which he felt would be able to use such systems, calling them factory outlets

However, many participants felt that this was not a suitable way to sell new clothing for companies looking to build their reputations, with participants citing that customers, *“trust companies with websites more than ones they find on Gumtree”*.

However, one participant alluded to the fact that because e-marketplaces come in so many forms, some, such as Takealot Marketplace, may actually be beneficial for companies to list their products on. This will be listed as a future research opportunity in Section 5.6.

4.9. Conclusion

This fourth chapter covered the presentation and analysis of the interviews of the management of Company A. Chapter Four served as the data analysis chapter of this study. It commenced by revisiting the research objectives and questions of the study to guide the rest of the chapter. Thereafter, Part A of the primary research was presented, which was the interviews of management personnel at Company A.

Within the presentation of Part A, the organisational structure of Company A was revisited to show how the selected participants fitted into the company structure before the justification of selecting the company was revisited and the answers to each question were presented and analysed.

This was then followed by the presentation and analysis of the response from Part B of the primary research which involved interviewing 17 industry experts in an effort to understand the generalisability of the case study and further provide usable

information on which of the identified eSCM tap be suitably applied in the national textile sector. This was lastly followed by a brief analysis of the primary research's results in terms of the research questions and objectives.

The next chapter, chapter five, aims to conclude the dissertation. It does to by providing a summary of the study's main findings. Each research objective is considered individually, revisiting both the study of existing literature and the results of the primary research with the purpose of drawing conclusions and providing recommendations.

Chapter 5: Conclusions and Recommendations

5.1. Introduction

Chapter One was an introduction to the study. This was followed by a review of past literature in Chapter Two and an outline of the selected research methodology in Chapter Three. Chapters Four covered the presentation of the data analysis of the two parts of the primary research. This chapter will discuss the findings from the study, the significant findings, future research opportunities and the recommendations of the study.

5.2. Correlating research activities with the Research Objectives and Questions

This section contemplates on the main research objectives and questions of this research study, which were proposed in Chapter One. These objectives and questions shaped the research activities, and it is imperative to stipulate how these objectives have been met in the study.

The table below is an illustrates these research questions and objectives of the research study in perspective of the chapters of the research in which they have been covered.

Table: 5.1: Correlation between Research Objectives and Research Questions and their coverage within study

Number	Research Objective	Research Question	Chapter
1	To identify uncertainties prevalent in the South African textile industry	What are the uncertainties prevalent in the South African textile industry?	Two
2	To investigate the use of electronic supply chain management technologies to	How can electronic supply chain management activities	Two, Four

	lessen the detriments of these uncertainties	lessen the detriments of these uncertainties?	
3	To study the current situation of companies using eSCM in order to understand their successes as well as barriers to implementation	What is the current state of companies which are currently implementing eSCM activities?	Four

Source: Compiled by researcher

The following section is an explanation of the above table, elucidating on how these research objectives were met in the study.

5.3. Discussion of achievement of research objectives

5.3.1. The achievement of Objective One:

As stated in Section 1.5, the first research objective was:

“To identify uncertainties prevalent in the South African textile industry.”

This objective was fulfilled in Chapter Two, the review of previous literature. Common causes of uncertainty included the uncertainty of supply, which included the uncertainty of labour, electricity related-uncertainty and trust-related uncertainty. Operators in the sector also faced uncertainty on the demand-side, with customers becoming more value conscious and often opting to purchase imported products and with fashion trends being more short-lived than ever before through the impact of “fast fashion.”

These forms of uncertainty were further delved into in the primary research, with participants both at Company A and industry experts agreeing that uncertainty was prevalent, as noted in Chapter Four.

5.3.2. The achievement of Objective Two:

As stated in Section 1.5, the second research objective was:

“To investigate the use of electronic supply chain management technologies to lessen the detriments of these uncertainties.”

Tackling this research objective began with understanding what eSCM means. Thereafter several technologies which fall under this branch of supply chain management were discussed along with their ability to reduce uncertainty and ensure efficiency in Chapter Two.

Confirmation of the uses of such technology was gained through the primary research activities, with participants posed with questions on the actual, realistic benefits of such technologies to the industry.

5.3.3. The achievement of Objective Three:

As stated in Section 1.5, the third research objective was:

“To study the current situation of companies using eSCM in order to understand their successes as well as barriers to implementation.”

Whilst the research of existing literature provided a framework for this, with secondary research showing that companies had implemented technologies such as ERP and RFID, the primary research of this research activity tackled the actual benefits of such technologies to a selected company.

This provided an overview of how the company actually benefitted from eSCM adoption and further explored how prevalent these technologies were along with a realistic assessment of which technologies had potential in a South African context, with Company A using technologies such as email, ERP, POS and barcoding, and industry experts agreeing on their effectiveness in the sector.

Part B of the primary research showed generalisability of Company A’s technology adoption practices. Furthermore, it provided evidence that successful companies either engaged in eSCM adoption or specifically chose to deal with companies which implemented eSCM.

5.4. Findings of the study

5.4.1.1. Findings based on research objective one:

“To identify uncertainties prevalent in the South African textile industry.”

In the secondary research found in Chapter Two, the researcher found that there are numerous uncertainties present in the national textile industry. These primarily include the uncertainty of supply which includes uncertainty related to miscommunication, loadshedding and strike uncertainty. Furthermore, prevailing uncertainty includes the uncertainty of demand which occurs in the form of fashion-related uncertainty and the threats of new entrants on market share.

5.4.1.2. Findings based on research objective two:

“To investigate the use of electronic supply chain management technologies to lessen the detriments of these uncertainties.”

It was found that eSCM technologies including email, ERP, social media, automation, RFID, barcoding, demand planning software and the inclusion of extranets proved useful for operators in the sector in mitigating the effects of uncertainty.

5.3.1.3. Findings based on research objective three:

“To study the current situation of companies using eSCM in order to understand their successes as well as barriers to implementation.”

A key finding for this research objective was that individual businesses need to conduct a needs analysis before selecting technologies to implement. This aligns with theories presented by (Muller, 2011) and (Payne, 2016) who suggest that technologies such as ERP and barcoding require upfront capital investment and the suggestion of (Engness, 2019) that a technology needs analysis is required to ensure sound investment.

Nonetheless, participants from major industry retailers noted that technologies such as ERP, barcoding, social media, extranet, demand planning software and certain forms of automation were non-negotiable at either the retail level or amongst supply chain

partners. This sentiment confirms the assertions of (Heizer, Render and Munson, 2017), (Johnson, n.d.), (Stokes, 2018) and other researchers referred to in the secondary research on the importance of these technologies. Many participants noted that in instances where products were similar suppliers with technologies including ERP and barcoding capabilities were preferred to those who did not.

Companies such as Mr Price which implement such technologies as social media and web-page advertising for customer-facing communication evidently thrive in a saturated marketplace.

Similar evidence was found for the success of companies correlating with CRM and SRM adoption, with participants noting that CRM technologies allowed leading retailers to target consumers with specific products and SRM systems allowing them to consistently source from suppliers which provided the best flexibility, reliability and quality. This evidence aligns with the assertions of (Binns, 2019), (Holland, 2019), (Stevenson and Spring, 2007) and (Schuh et al., 2014) on the importance of CRM and SRM systems.

5.5. Recommendations for operators in the sector

5.5.1. Recommendations pertaining to Research Objective One:

As stated in Chapter One, the first research objective was, “to identify uncertainties prevalent in the South African textile industry.” This was done through secondary research, with existing studies being analysed in Chapter Two and furthermore in the primary research, with the case study of Company A and the seeking of expert opinions. Several sources of uncertainty, as discussed below, need to be looked at by operators in the sector.

Operators in the national clothing and textile industry should take cognisance of the presence of uncertainty within it. An understanding of the internal and external environments is necessary for business success. Additionally, as per the primary research conducted in Company A, a concurrent knowledge of the business and its

supply chain are imperative to maintaining flexibility and ensuring customer satisfaction, as cited by participants who said that companies like Mr Price held suppliers to stringent delivery times.

A failure to understand uncertainty reduces organisational competitiveness and allows the possibility of failure. The acknowledgement of uncertainty provides a reflective view on data consumed and allows for rational decision making (Robson, 2018). Failure to acknowledge uncertainty also results in stakeholders losing trust in decision-making, even if decisions turn out to be correct (Howe et al., 2019).

Amongst the uncertainties which operators should take cognisance of are the following:

- The uncertainty of supply which relates to uncertainty of energy and labour-related issues.
- The uncertainty of demand, which relates to fashion trends which change at an unprecedented rate and uncertainty related to new entrants into the local retail marketplace.

5.5.2. Recommendations pertaining to Research Objective Two:

As stated on Chapter Two, the second Research Objective is, “to investigate the use of electronic supply chain management technologies to lessen the detriments of these uncertainties.” This was done through secondary research, with existing studies being analysed in Chapter Two and furthermore in the primary research, with the case study of Company A and the seeking of expert opinions. Several sources of uncertainty, as discussed below, need to be looked at by operators in the sector.

Thus far, the review of previous literature has highlighted uncertainties which operators in the sector face and technologies which could improve a company’s management of these uncertainties. The primary research targeted all three objectives by looking at the uncertainties faced at Company A and the industry and how technology application has enabled the management of uncertainty.

An understanding of the technologies present for companies to take advantage of is imperative for the success of clothing and textile supply chains. An understanding of SCM and eSCM and the potential to improve uncertainty management, as evidenced in the ways in which it helped numerous companies worldwide and in numerous sectors, provides opportunities for the sector.

It is evident from both the primary and secondary research activities that Company A should continue embracing technology adoption whilst continuously adjusting its adoption to match its requirements.

5.5.3. Recommendations pertaining to Research Objective Three:

Thus far, the review of previous literature has highlighted uncertainties which operators in the sector face and technologies which could improve a company's management of these uncertainties. The primary research targeted all three objectives by looking at the uncertainties faced at Company A and the industry and how technology application has enabled the management of uncertainty.

As stated in Chapter One, the third and final Research Objective is, "To study the current situation of companies using eSCM in order to understand their successes as well as barriers to implementation." This was done through the primary research, with the case study of Company A in Part A and the seeking of expert opinions on the generalisability of the case study in Part B. Recommendations based on this objective are highlighted below.

It is evident from Part A of the primary research that the adoption of eSCM led to an improved management and a reduction of uncertainty at the company, with improved communication and the reduction of errors assisting the management process. Thus, small to medium operators in the South African clothing and textile sector should follow the example of Company A in implementing eSCM and embracing the potential of technology.

This recommendation is further evidenced by industry experts interviewed in Part B of the study who strongly felt that technology is a vital means of managing and

reducing uncertainty. This aligns with sentiments of previous literature, as discussed in Chapter Two.

Of the technologies studied in this research project, email, ERP, POS and barcoding systems, social media, web-page advertising and demand planning software are imperative to the success of SMME's in the sector, in alignment with the Literature Review in Chapter Two.

That being said, cognisance needs to be given to the types of technology being implemented and the associated costs. From Part B of primary research study, it became clear that whilst some technologies such as ERP, automation and RFID undoubtedly improve communication and reduce uncertainty, a needs analysis is required before implementing any technology. Companies may not benefit significantly from expenditures on such software.

It is, however, evident that adaptability and flexibility are imperative in decision-making. Biases are easily made when looking at new technologies, with some people who too keen to implement them suffering from confirmation bias (Lazenby, 2018). Conversely there exists those who are either afraid of or unwilling to adapt to changes, resulting in them refusing to give implementation a chance (Lazenby, 2018). This was evident in both parts of the primary research.

To avoid the phenomenon of overzealousness, strategic thinking should be applied when implementing information technology and adopting eSCM. Inclusion of eSCM objectives within the development of the strategic, long-term goals of the business allows realistic thinking on behalf of management and allows for the selection of appropriate technologies (Lazenby, 2018). Additionally, the primary research shows that careful analysis of business needs is required before choosing a form of technology.

To avoid apathy, under usage and refusal to implementation, adequate communication, motivation and importantly training is required on how to implement technology and

the benefits of it (Lazenby, 2018). This may be aligned with the training conducted by I-Sync solutions with employees at Company A.

5.6. Recommendations for Future Research

5.6.1. Future Research Opportunities

The following research opportunities present themselves:

- Further research should be done on the scope of nanotechnology. Most participants at Company A had not been exposed to the technology and saw its implementation locally as a promising but unachievable pipedream.
- Research on the statistical benefits of technology implementation should be researched. A lack of trust means many companies, including Company A, are not willing to share such figures.
- Research on the benefits of applying augmented reality into the retail-space of clothing supply chains may be worth taking a look at. Although this technology has been highlighted to a slight degree in the review of past literature, this was at the advice of one of the participants in Part B of the primary research.
- Further research on the impacts of the Internet of Things, which includes maintenance reporting software, in clothing and textile value chains.
- In-depth research on the impact of a shift away from traditional EDI to cloud-based EDI, which was cited by the participants in Part B as a cost-effective way of EDI implementation.
- Research is required to understand the impact of different types of e-marketplaces on operators in the sector. As suggested in Part B of the primary research, there are some e-marketplaces which may be beneficial to clothing and textile companies, such as Takealot, whilst others such as Gumtree may be less beneficial due to the type of e-marketplace it is.
- Future research is required on the suggestion of one industry expert on the implementation of supply chain-wide price flooring. Whilst it is understood that consumers are price-sensitive, this participant referred to the fact that manufacturers are at a disadvantage because they had minimum labour wage rates as dictated by the government which dictated their costing, but faced large retailers who did not factor their costings adequately when negotiating deals.

- Studies in other industries on the impacts of eSCM, including the mining and furniture manufacturing industries may prove insightful for those sectors.
- With some of the technologies discussed such as EDI, participants were either unaware of their existence or unfamiliar with it in practice, so the richness of information sought about these technologies was not as great as with others. In such cases, researchers with greater funding may be able to interview a greater number of participants and may be able to target personnel who are familiar with such technology more efficiently.
- A pertinent cause of uncertainty brought up by many participants was loadshedding. Research into software which links ERP and production planning systems with loadshedding schedule software may prove fruitful for this and other industries.

5.6.2. Recommendations based on research methodology

- For this research study, personnel were selected who primarily had IT, supply chain-related, purchasing and planning backgrounds. Some eSCM concepts, for example CRM software, was said by participants to resonate more with the responsibilities of marketing teams. Organisation-wide research, which focuses on all forms of management may provide a broader insight into the use of such technologies.
- It became evident in the study that time-constraints would hinder the ability for participants to fully understand all eSCM terminology relating to technologies presented to them, despite being given a glossary. To rectify this, efforts were made to explain the technologies to participants during interviews which was time-consuming. A peer of the researcher has recommended that future researchers on the topic may choose to supplement the glossary with a visual or audio aid. Alternatively, the researcher could explain technologies in a group setting before questioning takes place, but only if it were possible to get all participants together at the same time.

5.7. Contribution of the Research Study

This research study contributes to the implementation of eSCM practices in the South African textile industry. There was specific importance placed on how these practices and the technologies that they bring may have on the industry amidst uncertainty, with focus on Company A's development since the implementation of eSCM began. Focus was placed on how well this eSCM adoption allowed Company A to be managed better whilst looking at the way it has nullified uncertainty. Although it was not within the objectives of the study, the importance of collaboration and its benefits were found, with many noting it to be the difference between success and failure. Through the analysis of past literature and the interviews of industry experts from leading companies, the research study was able to contribute to highlighting which technologies Company A, operators in the sector and operators in other sectors in the South African manufacturing landscape should focus on as discussed within the recommendations in Section 5.4.

5.8. Limitations of the Study

- There is limited previous research on the national textile industry regarding both SCM and eSCM.
- There is no publicly available database of all operators in the sector available, hindering the possibility of a quantitative study of the sector without much capital input.
- As is with most self-reported research, the full honesty and validity of responses are not guaranteed.
- Due to union-employer disputes and the saturation of the market, companies are hesitant to partake in activities which they feel may probe into their operations.
- As the population of companies and workers within them are too large, and there is a hesitancy to participate from companies, a case study research methodology was selected. This method, while giving useful qualitative information for the reasons behind uncertainty, cannot create a sample which

guarantees a comprehensive depiction of the textile industry. This limitation is, however, accommodated for through the use of qualitative research techniques.

- Due to the timeframe of the study beginning before the Covid-19 pandemic, getting responses on uncertainty management and primary research regarding the industry's perspective of the virus was difficult. This certainly provides a basis for future research.
- The withdrawal of participation of some participants. In Part B, of the 20 participants who were approached, three declined thereafter. However, according to (Latham, 2013), a sample size of between 15 and 20 is adequate for qualitative studies, so it is felt that the study did not lose significant validity due to these refusals.

5.9. Concluding Remarks

This study can be classified as both descriptive and exploratory as per their descriptions in Chapter Three, which outlined the research methodology. Through the literature research, it was established that uncertainties were faced by business in general, and this was especially true in the national clothing and textile industry. It was also established that technology implementation in the form of eSCM could facilitate uncertainty reduction and management.

This was further evidenced in both parts of the primary research, which involved interviews at Company A at the company's headquarters and thereafter interviews with industry experts either in-person or via video or voice calls. Certain technologies were seen by participants in both parts of the primary research as being imperative to a company's survival in an uncertain marketplace. Others, as presented in Chapter Four and discussed in Chapter Five, don't play a role in the sector for the foreseeable future.

Companies looking to follow the example of Company A would do so to their own benefit, as the management at the company and the industry experts noted that the technologies used at the company were of vital importance to large or growing companies. The company, however, as suggested in Chapter Four, can also stand to

grow further. The reliance of employees on email may not be detrimental, but the hesitancy to use technologies such as ERP systems must be addressed, with training into the reasons for the implementation of such systems being added to training in how it is used.

Chapter Five presented the conclusions of the study and recommendations, highlighting the decisions the researcher feels that operators in the sector should consider. The chapter discussed the conclusions of what eSCM facets may be beneficial in the sector whilst concluding on the generalisability of eSCM tools which have helped Company A.

The chapter also looked at the coverage of Research Objectives within both primary and secondary research undertaken. The objectives of the study are well covered with each objective having its set of conclusions and recommendations.

In this study, the researcher sought to understand the influence of technology in the context of electronic supply chain management on the effectiveness and efficiency of the national clothing and textile industry. Of the objectives of the study, this chapter highlighted the final objective. However, due to financial constraints of the researcher and a perceived lack of trust in the sector, an opening still exists for further quantitative research which may be required for individual cases and to improve generalisability.

Regarding Company A, based on the discussions of primary research in Chapter Four and the recommendations in Section 5.5, ongoing implementation of eSCM activities is required, with an emphasis on training being required as well. Concerning the industry as a whole, it is evident that operators embracing eSCM are better placed to tackle the uncertainties of the contemporary business environment and all operators are advised to implement eSCM depending on their organisation's specific needs.

The next section presents the list of academic references followed by the appendices containing a survey template used, informed consent forms which were given to participants, the ethical clearance certificate and a copy of gatekeeper's letter at Company A.

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Appendix A: Interview Guide for Part A

Interviews at Company A

Date: _____

Name (to be kept confidential): _____

Gender: _____

History (time at company/in industry/level of management/ roles):

Now we will discuss the types of uncertainty uncovered in the literature research and how it affects your company directly.

Question 1: Labour Uncertainty

Labour uncertainty has been prevalent in the industry, with labour strikes, wage uncertainty and downtime affecting many companies in the industry.

- 1.1. Does strike activity downtime affect the predictability of operations?
- 1.2. How does labour wage uncertainty affect your company?
- 1.3. Would you say that wage opinion differences with unions affects motivation and performance?
- 1.4. Can technology benefit morale?
- 1.5. Can technology reduce dependency on labour?

Question 2: Demand uncertainty

Demand uncertainty is prevalent in the industry, with seasonality of items and imports affecting demand.

- 2.1. How does demand uncertainty affect your company?
- 2.2. How does demand price uncertainty affect your company?
- 2.3. Do you feel that technology has a role in rectifying demand uncertainty? If so, how would you suggest it does so?

Question 3: Supply uncertainty.

- 3.1. How does supply uncertainty affect your company?
- 3.2. How does supply price uncertainty affect your company?
- 3.3. Do you feel that technology has a role in rectifying supply uncertainty? If so, how would you suggest it does so?

Question 4: Manufacturing uncertainty.

- 4.1. How does manufacturing uncertainty affect your company?
- 4.2. Does technology implementation play a role in rectifying this form of uncertainty at the company?

Question 5: Distribution Uncertainty

- 5.1. How does distribution uncertainty affect your company?
- 5.2. Does technology implementation play a role in rectifying this form of uncertainty at the company?

Question 6: Electronic Supply Chain Management

Now we will discuss technology factors which may benefit clothing companies, their uses and benefits to your organisation’s work.

Does your company make use of:

6.1. Enterprise Application Integration (EAI)	If yes, does its implementation help in A. Supply side communication B. Demand side communication C. Elimination of waste D. Efficiency E. Agility
6.2. Extranet such as SAP	
6.3. Electronic Data Interchange (EDI)	
6.4. In-house system/intranet	
6.5. Enterprises Resource Planning (ERP)	
6.6. E-mail (E- fulfillment, E-Procurement)	
6.7. Barcoding	
6.8. Radio Frequency Identification Device (RFID)	
6.9. Customer relationship management systems	

6.10. Supplier relationship management systems	F. Time saving G. Internal collaboration H. External collaboration I. Error removing J. Reduced dependency on labour for non-value adding activities
6.11. Point-of-Sale (POS)	
6.12. E-marketplace	
6.13. Demand Planning Software	
6.14. Automation	
6.15. GIS	
6.16. 3D Technology	
6.17. Nanotechnology	
6.18. Printed Pattern Marker Technology	
6.19. Maintenance report update systems	

7. Barriers to entry

7.1. Is the implementation of technology accepted amongst management members in the company?

7.2. If not, why so?

8. What other technology applications have been implemented to your company's supply chain and operations which benefit it through the reduction of uncertainty and how do they do so?

Appendix B: Interview guide for Part B

Interviews with industry experts.

Date: _____

Name: _____

Basic history:

Instruction to Researcher:

Please use this guide flexibly, considering the results from Part A of primary research. Please also keep names confidential where promised.

Question 1: Uncertainty

Labour uncertainty, demand uncertainty, supply uncertainty, manufacturing uncertainty and distribution uncertainty. These are the types of uncertainty discovered through secondary research. Company A shows evidence of (this will be filled in once Part A interviews are complete).

- 1.1. Which of these sources of uncertainty would you say are limited to the company and which would you say are present throughout the industry?
- 1.2. Secondary research shows that many companies would still benefit from additional e-SCM implementation. What are your thoughts on this?
- 1.3. Are there any other sources of uncertainty which are not highlighted in the study?

Question 2: Electronic Supply Chain Management

From secondary research, the following e-SCM activities have shown benefit to operations worldwide. Some have been implemented by the company and some haven't. Which of these have direct benefit to the industry and can directly aid the reduction of uncertainty for companies in it?

- 2.1. Enterprise Application Integration (EAI)
- 2.2. Extranet such as SAP
- 2.3. Electronic Data Interchange (EDI)

- 2.4. In-house system/intranet
- 2.5. Integrated Electronic Supply Chain Management (e-SCM)
- 2.6. Enterprises Resource Planning (ERP)
- 2.7. Electronic marketing featuring social media, display advertising, search engine marketing, content marketing, E-mail (E- fulfilment, E-Procurement)
- 2.8. Social Media Marketing
- 2.9. Barcoding
- 2.10. Radio Frequency Identification Device (RFID)
- 2.11. B2C e-commerce (Customer relationship management systems)
- 2.12. E-Business Collaboration (Supplier relationship management systems)
- 2.13. Point-of-Sale (POS)
- 2.14. E-marketplace
- 2.15. Demand Planning Software
- 2.16. Automation
- 2.17. GIS
- 2.18. 3D Technology
- 2.19. Nanotechnology
- 2.20. Printed marker technology
- 2.21. Maintenance report update systems

- 3.1. Could you provide examples of instances which you've found these to be beneficial at industry leaders like your current company? (This question is to be asked for each of the bullet-points)?
- 3.2. What other e-SCM activities could you recommend which may also bring about positive change in the industry?

Appendix C: Informed Consent Information Sheet

Information Sheet and Consent to Participate in Research

Date: 1 January 2019

Greetings,

My name is Muhammad Hassan Adam and I am from the School of Management, IT & Governance at the University of KwaZulu-Natal, Westville Campus. My mobile number is 082 487 1234 and my email address is muh.adam@gmail.com. My supervisor Jayrusha Ramasamy-Gurayah can be contacted at guayahj@ukzn.ac.za.

You are being invited to consider participating in a study that involves research which evaluated the ability for electronic supply chain management to benefit the national textile industry. The aim and purpose of this research is to find a means through technology and supply chain management to bring back this industry to its former heights. The study is expected to include approximately 30 people. It will involve the following procedures. First I will be interviewing members of "Company A", an upcoming business in the sector to determine the benefits which technology has in eliminating uncertainty from its supply chain processes. Thereafter, Part B of the study involves interviewing industry experts to determine whether the findings at "Company A" are the norm in the industry as well as to find ways for companies in the sector to improve their current activities. The duration of your participation if you choose to participate and remain in the study is expected to be approximately 15 minutes.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number _____). In the event of any problems or concerns/questions you may contact the researcher at (provide contact details) or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban 4000 KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 • Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Your participation in the study is voluntary and by participating, you are granting the researcher permission to use your responses. You may refuse to participate or withdraw from the study at any time with no negative consequence. There will be no monetary gain from participating in the study. Your anonymity will be maintained by the researcher and the School of Management, I.T. & Governance and your responses will not be used for any purposes outside of this study.

All data, both electronic and hard copy, will be securely stored during the study and archived for 5 years. After this time, all data will be destroyed. If you have any questions or concerns about participating in the study, please contact me or my research supervisor at the numbers listed above.



Muhammad Hassan Adam

Appendix D: Informed Consent

CONSENT TO PARTICIPATE

I _____ have been informed about the study entitled The Use of Electronic Supply Chain Management in Overcoming Uncertainty Constraints in The South African Textile Industry by Muhammad Hassan Adam(Student number 210526175).

I understand the purpose and procedures of the study.

I have been given an opportunity to ask questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to.

I have been informed about any available compensation or medical treatment if injury occurs to me as a result of study-related procedures.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at muh.adam@gmail.com or at 082 487 1234.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Additional consent, where applicable

I hereby provide consent to:

Audio-record my interview (Please underline your choice) YES / NO

Signature of Participant

Date

Signature of Witness
(Where applicable)

Date

Signature of Translator
(Where applicable)

Date

Appendix E: Ethical clearance approval



08 November 2018

Mr Muhammad Hassan Adam (210526175)
School of Management, IT & Governance
Westville Campus

Dear Mr Adam,

Protocol reference number: HSS/1745/018M

Project title: The use of Electronic Supply Chain Management in overcoming uncertainty constraints in the South African Textile Industry

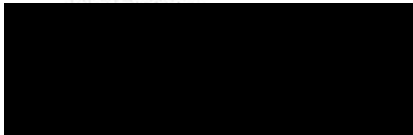
Approval Notification – Expedited Application

In response to your application received on 28 September 2018, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.



pp Professor Shenuka Singh (Chair)

/ms

Cc Supervisor: Ms Jayrasha Ramasamy-Gurayah
cc Academic Leader Research: Professor Isabel Martins
cc School Administrator: Ms Angela Pearce

Humanities & Social Sciences Research Ethics Committee
Professor Shenuka Singh (Chair) / Dr Shamilla Naidoo (Deputy Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Telephone: +27 (0) 31 260 3587/8350/4557 Facsimile: +27 (0) 31 260 4609 Email: simban@ukzn.ac.za / jnvdarm@ukzn.ac.za / msbunp@ukzn.ac.za
Website: www.ukzn.ac.za



Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

Appendix F: Gatekeeper's permission to conduct the study at Company A



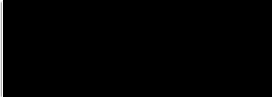
rica
Tel: +27 31 

To: Muhammad Hassan Adam

Dear Muhammad Hassan Adam, UKZN Student Number 210526175. This letter hereby approves the use of our premises for research which you requested toward your Master of Commerce (Supply Chain Management) at the School of Management, IT & Governance at UKZN's Westville Campus for your research titled "Use of electronic supply chain management in overcoming uncertainty constraints: South African textile industry". We kindly reiterate the our desire for anonymity for our company and staff members.

Approval of conducting research within the company for the purposes of your study is hereby granted.

Regards



Director



Appendix G: List of participants included in Part A of this study

Function	PARTICIPANT	EXPERIENCE	DATE
Production Coordination	Participant A	4 years	20 December 2018
Game planning	Participant B	4 months	20 December 2018
Planning	Participant C	8 years	20 December 2018
Assistant Manager	Participant D	16 years	20 December 2018
Planner	Participant E	1 year	20 December 2018
Planner	Participant F	5 years	20 December 2018
Planner	Participant G	12 years	20 December 2018
Planner	Participant H	1 year	20 December 2018
Assistant Manager/ IT Head	Participant I	18 years	2 January 2019
Head of Sourcing	Participant J	20 years	Withdrew (personal reasons)
Head of Operations	Participant K	40 years	Withdrew (personal reasons)
CEO	Participant L	30 years	(personal reasons)
Quality Control Manager	Participant M	15 years	Withdrew (personal reasons)

Appendix H: List of participants included in Part B of this study

Name and role at industry leader	PARTICIPANT	Experience in Sector	DATE
Jason – Production Manager – OHTWO	Participant 1	13 years	31 January 2019
Kingsgate Group – Executive Fatima	Participant 2	10 years	3 April 2020
Fashion World – Manager - MH Kadwa	Participant 3	10 years	9 April 2020
MRP - Buyer - Marcel	Participant 4	13 years	10 April 2020
Truworthis – Manager - Hafsa Sabjee	Participant 5	4 years	2 April 2020
Edcon - VM / Store Design Management – Anonymous	Participant 6	10 years	6 April 2020
MRP Mandla - OPS, IT Manager - Mandla Cwele	Participant 7	7 years	7 April 2020
Operations Manager Truworthis Amina	Participant 8	18 years	10 April 2020
Store Manager: Polo/ Truworthis/ Edgars. Zak Farjan	Participant 9	15 years	10 April 2020
Marco Breschi	Participant 10	34 years	1 April 2020
Materials Manager: Puma/ Woolworths Ricardo Scheepers.	Participant 11	7 years	4 April 2020

Management @ Bata/ Gelvenor: Derek Yengabaram	Participant 12	26 years	4 April 2020
Sourcing Manager: Kyle Mr Price	Participant 13	11 years	21 April 2020
M Arshad Wahid: CMT Owner MAW Trading	Participant 14	25 years	1 March 2020
Elaine Govinden	Participant 15	4 years	1 May 2020
Anonymous: Buyer at Edcon	Participant 16	11 years	15 March 2020
Anita Botha: Manager	Participant 17	4 years	6 March 2020
Anonymous	Participant 18	WITHDREW	
Anonymous	Participant 19	WITHDREW	
Anonymous	Participant 20	WITHDREW	

Appendix I: Glossary provided to participants

Please use this glossary to help you understand any of the technologies which you may not have previously been accustomed to.

- E-SCM: Electronic supply chain management is the use of technology to enhance supply chain management capabilities.
- Enterprise Application Integration (EAI): This is a framework which allows different types of software in an enterprise to communicate.
- Extranets such as SAP, which are intranets which are partially accessed by external users, allowing businesses to exchange information securely on the internet.
- Electronic Data Interchange (EDI) is the concept of businesses electronically communication information which was traditionally communicated manually, like purchase orders or invoices.
- In-house system or intranet is a local connection between multiple computers at one location.
- Enterprises Resource Planning (ERP) software usage, is a process whereby a company manages and integrates important facets of business with one software. SAP ERP and Sage ERP are commonly found ERP software options in South Africa.
- Barcoding, the most common form of automatic identification is the use of physical numbers to label and track items.
- Radio Frequency Identification Device (RFID) is similar to barcoding except that it relies on radio frequencies and not physical contact to find and track items.
- B2C refers to Business-to-Consumer
- E-marketing refers to online marketing activities.
- E-marketplace refers to a type of e-commerce where third parties provide products and services with transactions being processed by marketplace operators, such as Bid Or Buy.
- Automation refers to the use pf automatic equipment in manufacturing or other processes in the workplace.
- Social media marketing refers to the use of social media such as Twitter and Instagram to reach out to and receive feedback from customers and suppliers
- Display marketing refers to the use of online banners and other visual advertising

Appendix J: Turnitin Originality Report

MH Adam Dissertation

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