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Radio Frequency Identification Technology Adoption: South African Retailers' Perspective

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For the degree of Masters of Commerce (by coursework)

Submitted in 50% fulfillment of the Degree

Supervisor: Professor Judy Backhouse
28 February 2013

Declaration

I declare that this research report is my own unaided work, except to the extent indicated in the text, acknowledgements and reference matter. It is being submitted for the 50% research component of a Masters in Information Systems (by Research and Coursework) degree.

This research has not been submitted before for any other degree or examination in this or any other institution.

……

Bernard Oppong Sarpong

28 February 2013

Dedication

This research report is dedicated to my son, Afriyie Boateng Sarpong, who is the joy of my life.

Acknowledgements

I am thankful for the encouragement, support and guidance of my supervisor, Professor Judy Backhouse, who has continuously provided me with constructive and insightful feedback on my work throughout this project. Without you this research would not have been possible.

I wish to give all praises and thanks to the almighty God for his abundant blessings and for bringing me this far. Thank you for your amazing love Daddy.

Special thanks also go to the following people:

- My wife, Lufuno and my son, Afriyie for their unflinching support until the end.
- To my parents, Kofi Sarpong and Elizabeth Sarpong for sacrificing so much to put me where I am today.
- All the participants and friends who contributed to this research.

Abstract

In recent years, Radio Frequency Identification (RFID) Technology has transformed from being unknown to mainstream applications that help facilitate the managing of manufactured goods and materials. Its information storage capacity as well as its ability to transfer information through contactless means without line-of-sight translates to significant advantages to deliver various benefits for retailers and their clients in the retail settings. However, up until now RFID technology has gained very little momentum and the status of adoption particularly of retail organisations in South Africa is unknown. To fill this research gap, an exploratory study that draws on the Technology-Organisation-Environment (TOE) framework was employed to provide a deeper understanding of South African retailers' perceptions of RFID adoption. Five interviewees representing their respective organisations participated in the study. The findings suggested that the adoption level is very low and only one organisation from the sample used had done a pilot project. The results also indicated that cost, standardisation and government support influenced the adoption of the technology. Complexity and technology competence were not considered to have any influence in the adoption of the technology. Competitive pressure was not deemed influential if the technology was not embedded in the whole supply chain, a somewhat surprising result. There were no anticipated impacts on the employees if this technology was implemented. Methodological and practical implications are also discussed.

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Chapter 1 - Introduction

The importance of innovation as a competitive driver for organisations is one of the key research areas in the Information Systems (IS) field (Battezzati, Miragliotta and Perego, 2006). Technological innovation is widely acknowledged to be an influential catalyst of business transformation and economic growth (Keating, Coltman, Fosso-Wamba and Baker, 2010). The evolution and continuous development of Information Technologies (IT) in business processes have created opportunities to augment the effectiveness, speed and accuracy in which data can be captured, retrieved and consumed (Curtin, Kauffman and Riggins, 2007). Business organisations are currently faced with the challenges of global competition as well as more diversifying requirements from their customers and consequently prompting changes to business environments (Bhattacherjee, 1998). As a result, many organisations are increasingly turning to emerging IT such as Radio Frequency Identification (RFID) as a means of coping with such rapid changes sweeping their environment.

" ..... *RFID is going to change our lives, but if I think of the efficiencies and the productivity that can be gained out of this thing, knowledge that can be gained out of it, not only from a business perspective, but from a consumer perspective as well, I think it's going to be nothing short*.... *(sic) but absolutely awesome, absolutely awesome but the responsibility rests fair and square on our shoulders as to how we take this technology forward and how we embrace it .... "*

Keynote address by Sean Summers, Former CEO Pick 'n Pay as attributed to him at the Smart Card Society of Southern Africa Conference, 2003.

A number of large manufacturing, retailing, health care, and other organizations have some ongoing project(s) related to RFID systems. For instance the development of RFID service in facilitating superior efficiency in aircraft operations between Boeing and Fujitsu from the first quarter of 2012 and Walmart's implementation of item-level apparel tagging in 2010 (Zhou and Piramuthu, 2011). Further developments include CHEP's (a pallet and container pooling services company) implementation of RFID at its facilities across Europe to track returnable goods for the automotive industry in 2008 (Wessel, 2008) and Mark and Spencer's partnership with Avery Dennison to expand their use of the technology to track and control all clothing and home wares commencing in 2013 and ending in 2014 (RFID Journal,2013). The above mentioned indicate a strong thrust from some of the major organisations making use of RFID technologies in their day to day operations (Zhou and Piramuthu, 2011). Recent forecasts on the overall market value of RFID indicate a positive trend for the immediate anticipated

future. According to ABI Research (RFID World, 2012), it is anticipated that US$70.5 billion will be derived from sales between 2012 and 2017 on RFID readers, transponders, software and services. TechNavio (2012) forecasts the Global RFID market to grow at a CAGR of 19.4% over 2011-2015 time periods. These forecasts are based on the Americas, Europe, and the Asia-Pacific regions. Gu (2011) predicts a more than double RFID market growth in China from 2009 to 2014 (from US$ 1.1 billion to US$ 2.4 billion).

Given the above predictions and the amount of money being spent on the technology, it appears like the potential economic impact of RFID is very large and will be very dominant in the years to come. It therefore makes sense for a study to be conducted into its adoption from the perspective of an organisation as opposed to investigating whether clients of an organisation would accept the technology since it (the technology) is believed to be in its nascent stages particularly in the third world countries such as South Africa (Brown and Russell, 2007).

This study is important in South Africa because it would increase the understanding of the RFID adoption status of the retail sector in the country. The research will also shed some light on some of the factors inhibiting adoption in the retail sector so that organisations in South Africa seeking to adopt and implement the technology can take these factors into consideration during the planning stages. Since large retail operations pose huge difficulties to the retail companies, this technology if implemented correctly, could help retail organisations in South Africa to forecast, order and replenish properly while staying competitive globally.

This study is restricted to the South African retail sector. The retail sector is identified as one of the sectors with the greatest opportunities to use RFID (Bhattacharya, Chu and Mullen, 2007). Further, the retail industry is one of the most aggressive supporters of the technology (Bhattacharya et al., 2007).

1.2. What is RFID?

RFID refers to technologies and systems that use radio waves (wireless) to transmit and uniquely identify objects (Finkenzeller, 2003; Piramuthu, 2007). A basic RFID system typically consists of a number of components: tags, antennas, readers, middleware and host application software. The idea of introducing RFID technology in the supply chain and other fields might appear new but the technology has been around for quite some time now. It was first used by the British in World War-II to identify friend or foe (Want, 2006).

The tags come in different forms and can be as small as a grain of rice (Attaran, 2007). The tag holds the electronic product code (EPC) used in the product identification exercises. Information stored on the tag is transferred through suitable radio frequencies to the reader. The antenna is predominantly made of a coil of wire. This is used to transmit and receive information that permits the tag to exchange data with a reader (Kim and Garrison, 2010). RFID readers can either be stationary or hand held. They have the ability to read wide range of frequencies. The reader is one of the key components of the entire RFID solution. The reader is capable of automatically recognising and distinguishing all the Radio Frequency tags within its reading range. This feature allows the reader to simultaneously process all the data and provide for efficient material handling, sorting of inventory and packaging (Finkenzeller, 2003). The RFID middleware is at the core of any RFID implementation (Castro and Fosso Wamba, 2007). The RFID middleware is a software platform configured to assist with data exchange from a reader or multiple readers to host application software hooked to the middleware. Some of the host application software can be warehouse management systems, enterprise resource planning systems and many more as displayed in figure1. The middleware is configured to process RFID functions and relay and present them to business applications in a way that can be processed further by host applications (Sandip, 2005). A host application is usually the retail management or inventory control software that is already in use by an organisation and not necessarily RFID specific endeavour. This component receives the data sent from the middleware. As RFID application is likely to generate a high volume of data about objects and other things, some of the existing legacy systems might have to be updated to cope with the demands of the RFID application.

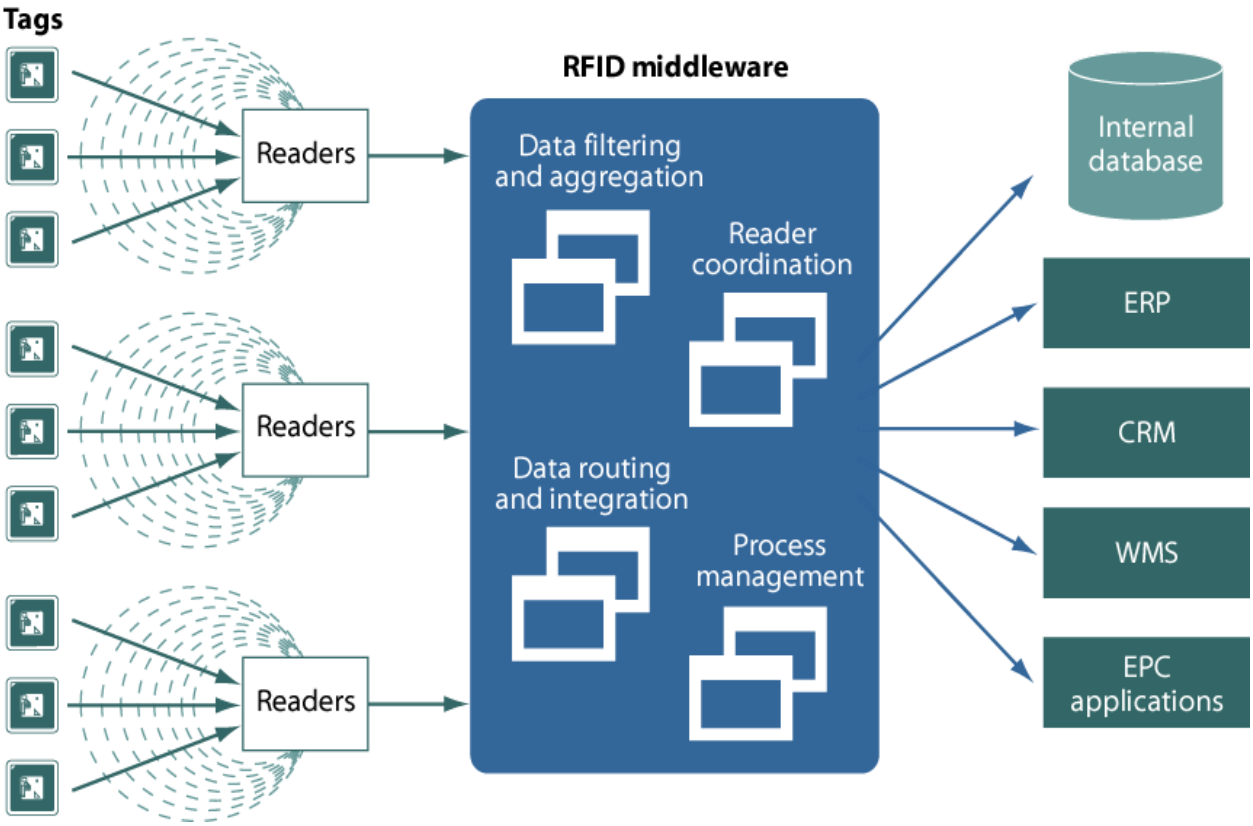

Figure 1: Fundamental functioning of RFID. Source: Forrester Research (2004)

Two categories of RFID tags exist; a remotely powered passive tag and a self powered active tag (Upfold and Liu, 2010). Passive tags are the most deployed to date and have no battery to power the microchip. The passive tag's chip is stimulated by electromagnetic waves from its reader, thereby, giving the chip power to transmit (Kelly and Erickson, 2005). The passive tags are cheaper to manufacture compared to the active tags. By contrast, an active tag has its own battery which powers the chip and is as a result more expensive. The power supply makes it possible for the chip to have a stronger signal to transmit stored information and broadcast over longer ranges. Evidently, since active tags are self powered, they are constantly transmitting even in the absence of a reader.

1.3. Why RFID Research?

RFID technology has been gaining popularity in recent years, not only from a research perspective but also from corporate practice. Unlike earlier barcode technology, RFID enables identification from a distance (Finkenzeller, 2003; Want, 2006). RFID technology is identified to become the key technology for the retail sector and logistic operations, as well as customer orientation (Muller-Seitz, Dautzenberg, Creusen and Stromereder, 2009). RFID tags enable items to have their own unique identification unlike other identification technologies (Ahamed, 2009). RFID enables a tagged object or entity to metamorphose into a mobile, intelligent and communicating element of the organisation's entire IS framework (Curtin et al., 2007). Moreover, Curtin et al., (2007) accentuate that RFID systems are a new instance of Inter Organisational System (IOS) that goes beyond the boundaries of the organisation resulting in new opportunities to revolutionise real-time optimisation for the supply chain.

A scenario as to how retailers could use the technology is that, when an item or a product enters a store, it is scanned by portal readers that update the stock inventory which is stored in a secure computer database (Deal, 2004; Sangani, 2004). When these items are sold, the computer at the register indicates that the items are no longer in inventory and the computer contacts the database at the central warehouse with the updated information (Deal, 2004; Sangani, 2004). The warehouse team then selects which items need to be replenished at the store and have them shipped immediately (Deal, 2004; Sangani, 2004). This provides speed and efficiency in inventory management at the shops with minimal manual effort. Given the capabilities of the technology, it is therefore not surprising that there have been numerous studies with regards to RFID in the retail sector (Thiesse, 2007; Wang, Wang, and Yang, 2010; Muller-Seitz et al., 2009, Deal, 2004; Sangani, 2004; Brown and Russell, 2007).

Most of the existing research on RFID has been conducted using quantitative research methodology (Muller-Seitz et al., 2009; Want, 2006; Juels, 2006; Upfold and Liu, 2010; Piramuthu, 2007). For this reason, this study aims to add to the RFID literature by using a qualitative methodology supported by the TOE framework to provide insight into the RFID adoption status of South African retail organisations. According to White, Johnson and Wilson (2008), little is known about the current adoption status of RFID technology in the supply chain sector in the world. This study will help investigate the adoption status of retail supply chain organisations in South Africa. The study will also help determine how factors such as cost, complexity, technology competence, competitive pressure and government support influence the retail organisations in South Africa to adopt RFID technology. Further, it will be

investigated whether the implementation of this technology could have any impact on the number of employees required in an organisation for the day to day operations.

1.4. Problem Statement

The barcode technology that triggered a revolution in identification systems many years ago has been found to be inadequate in an increasing number of cases (Ahamed, 2009). Although this technology is cheap and affordable, the low storage capacity and the fact that it cannot be reprogrammed and reused make it a big concern for manufacturers and retailers alike (Gunther and Spiekermann, 2005). The barcode technology also appears to provide little flexibility to suit the diversifying requirements of customers (Ahamed, 2009). For example, barcode technology cannot identify objects either at rest or in motion and requires an object to be brought very close to the bar code scanner before it can identify it (Ahamed, 2009). This has prompted manufacturers, retailers and decision makers to look at automation technologies such as RFID technology. The likes of Walmart, Tesco, Gillette and other retail companies have already adopted and implemented the technology (Roh, Kunnathur and Tarafdar, 2009) so as to capitalize on the benefits the technology promises.

Even with extensive writings on adoption and how innovations are diffused, the adoption of new and emerging technologies such as RFID with unique characteristics, is still not very comprehensible (Sharma, Thomas and Konsynski, 2008). Moreover, the majority of IS literature on RFID originates from Europe and the United States with very little emanating from developing countries such as South Africa. Since the majority of RFID pilot projects and implementations are established in developed or industrialized countries, it is not startling that most studies on RFID adoption examine cases in developed countries. However, this only increases the gap in the literature with regards to developing countries (Wang, Li, Zhang, Li, 2010, Brown and Russell, 2007). This research study seeks to close this knowledge gap by gaining a deeper understanding of South African retailers' perceptions guided by the TOE framework regarding these five research questions;

1. What is the RFID adoption status of retail organisations in South Africa?
2. How are costs, complexity and technology competence influencing the adoption of RFID technology by South African retail companies?
3. What impacts are anticipated on labour?
4. How is competitive pressure influencing the adoption of RFID in South African retail companies?

5. How could government support influence the adoption of the technology in South Africa?

1.5. Research Questions

This section presents the research problems to be investigated for the proposed study.

1.5.1 Research Question One

RFID and its adoption is a global concern, as retailers and their partners in the global supply chain are not sure whether to adopt or play the wait-and-see approach (Upfold and Liu, 2010). According to Kelly and Erickson (2005), most of the earlier literature on RFID was fuelled by companies such as Walmart and the United States Department of Defence which had a vested interest in the technology. However, having realised the capabilities of the technology, its prospects of helping to bring about competitive advantage due to its integrative nature as well as the uncompromising behaviour of bar code technology, RFID and its adoption has subsequently been highlighted as one of the key issues facing CIOs globally (Brown and Russell, 2007).

The motivation to adopt and implement a technology can be broadly categorised under two umbrellas in organisational theory. There is the "rationalistic strategic" option which places emphasis on promoting efficiency and organisational performance. The other option is from an institutional perspective with emphasis on maintaining legitimacy (Sharma et al., 2008). Understanding the justification invoked in adoption decisions may prove valuable in explaining many shallow implementations which fail to yield the desired benefits and lead to unexpected IT diffusion patterns (Sharma et al., 2008).

The RFID adoption status in industrialised countries like USA and Europe is at the stage of mandate compliance from larger retailers (Bhattacharya et al., 2007). The smaller retailers who were not thinking of adopting the technology are now influenced by the mandates issued by the giant retailers (such as Walmart, Gillette and Proctor and Gamble) because of increasing competition among businesses (Bhattacharya et al., 2007). With regards to tagging in the retail industry, generally, it is moving from pallet level to the case level. Item level tagging (when an RFID tag is used to identify a single item) is what most companies implementing RFID are aiming for, and once again, Walmart has led the way in this area (Panizza, Lindmark and Rotter, 2010).

A study by Brown and Russell in 2005 indicated that many retailers in South Africa had not yet adopted RFID or even conducted pilot studies, but intended to do so in future.

As several years have now elapsed *since their study, I propose research question one:*

What is the RFID adoption status of retail organisations in South Africa?

1.5.2 Research Question Two

1.5.2.1 Cost

The cost associated with an innovation may influence a company's decision to adopt it or not. Some of the costs associated with RFID are tag costs, the cost of applying the tag to products and the cost of purchasing and installing readers. Others are "systems integration costs, the cost of training and re-organisation, and the cost of implementing application solutions" (Brown and Russell, 2007). Most organisations would prefer the benefits of any new innovation to surpass the cost of adopting it (Premkumar and Roberts, 1999). If the cost is prohibitive, organisations can choose to delay adoption and implementation with the hope that someday the costs will decline. An interesting aspect regarding cost that is not always appreciated is the way in which the cost of tagging the product is divided among the supply chain partners. Sharing the tagging cost from manufacturer to the retailer without making a single party incur all the cost is an option as everyone is likely to benefit from the RFID tags if implemented correctly. Gaukler (2011) believes that the issue of cost sharing is crucial because the high cost of RFID tags can be an impediment to widespread adoption of item-level RFID. Therefore, cost may influence the adoption of the technology.

Research question two 'A' is proposed:

How are costs of the technology influencing the adoption of RFID in South African retail companies?

1.5.2.2 Complexity

Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use (Wang et al., 2010). Compared to bar code technology, RFID is more sophisticated to implement and requires a certain level of complexity to achieve success. Complexity of an innovation can function as an inhibitor for successful implementation and because of this reason, it is usually negatively associated with adoption (Premkumar and Roberts, 1999). An explanation for the impact of complexity is based on the IS innovation paradigm (Swanson 1994). Swanson (1994) classified innovations into three classes: Type I innovations are aimed towards technical innovations, associated with technical tasks (for

example, CASE); Type II innovations make use of IS to support business administration (for example, payroll system); and Type III innovations are required to be integrated with the core of business where the whole business can be potentially influenced. As per this classification, RFID in supply chain can be considered as Type III innovation that aims to spawn more efficient and effective business processes and improved decision making. Therefore, the difficulty in adopting RFID is higher than other innovations and perceived complexity is likely to be of more importance for RFID adoption (Wu and Subramaniam, 2011). Hence, complexity may influence the adoption of the technology.

Research question two 'B' is proposed:

How is complexity of the technology influencing the adoption of RFID in South African retail companies?

1.5.2.3 Technology Competence

Technology competence, also known as technological readiness, relates to IT infrastructure and IT professionals (Wang et al., 2010). IT infrastructure refers to installed network technologies and enterprise systems, which provide a platform on which the RFID applications can be built (Wang et al., 2010). RFID technology is relatively new and successfully implementing this technology will require new skills and adaptation of existing information systems. IT employees as well as infrastructure will have to be developed to cope with the demands of the new technology. As there are shortages of IT skills in South Africa, more will have to be done to train employees to successfully implement the technology. Relationships involving the provision of RFID technology and services can be complicated if organisations do not approach them with caution. It is possible for a vendor to take advantage of the adopting organisation through inappropriate parallel use (Curtin et al., 2007). Therefore, technology competence may influence the adoption of the technology.

Research question two 'C' is proposed:

How is technology competence influencing the adoption of RFID in South African retail companies?

1.5.3 Research Question Three

RFID will, without a doubt, necessitate new business processes for the retailer seeking to adopt and implement the technology. Korteweg (2007) states that changes to business processes and organisational structures are required in order to optimize the use of RFID technology. RFID, by its very nature, touches a wide variety of areas of the organisation (Korteweg, 2007). For companies to fully

reap the benefits of RFID, they must involve multiple functions which include the supplier functions and processes as well (Brown and Russell, 2007).

Research into EDI usage has revealed that incorporating EDI with process redesign results in much more benefits than implementing EDI alone (Curtin et al., 2007). In the same way, RFID will require significant process redesign at almost all places in the value chain where the technology is applied (Curtin et al., 2007).

Mostly, work systems and process redesign eventually impact the individual workers that are involved (Wu and Subramaniam, 2011). Understanding how workers and others in society will be impacted is crucial to ensure the successful adoption and appropriate use of RFID. Humans will no longer be needed to do repetitive item level scans of warehouse and retail shelf inventory, and in their place will be RFID readers that will permit similar information to be collected without much effort. One expects the composition and size of workforce of retailers implementing the technology to be severely impacted (Wu and Subramaniam, 2011). The concern is that any business process changes that could involve retrenching of employees could be problematic especially in South Africa where unemployment is very high. Such a move could incur the wrath of Trade Unions representing the workers and might impede the adoption of the system if not handled with care. Therefore, change in business processes as a result of RFID may influence the adoption of the technology.

Thus research question three is proposed:

What impacts are anticipated on labour?

1.5.4 Research Question Four

History teaches that the acceptance of technological innovation within the business sector can take quite some time (Keating et al., 2010). However, each time, there appears to be a primary driver that shifts the perception of the business value of technologies, especially the ones that could provide good returns on business investment (Keating et al., 2010). For instance, the establishment of the internet has its origins in the late 1960s and 1970s, and did not attain broad acceptance until the late 1990s. The principal catalyst for extensive adoption came with a transformation in the business perceptions of value emanating from the introduction of fast, reliable, and low-cost Hypertext Markup Language applications (Keating et al., 2010). The competitive pressure of organisations and the rivalry among competitors, drive companies to design new services and technologies to keep or increase their enterprise competitiveness (Quetti, Pigni and Clerici, 2012).

Larger retailers are often very aware of what their competitors are doing. In 2003 Walmart instructed their top 100 suppliers to have RFID implemented by 2005 or otherwise face a fine. Other retailers, businesses and governmental entities quickly followed suit to catch up. Target, Albertsons, Carrefour, Metro AG, Mark and Spencer and Tesco were some of the retail giants that decided to also look into the technology and caused a ripple effect for their suppliers (Attaran, 2007). Many of the retail giants did not want Walmart to use the technology to gain competitive advantage over them. With Walmart having decided to start trading in South Africa, their presence could trigger a positive influence for the local competitors to adopt the technology.

Therefore research question four is proposed:

How is competitive pressure influencing the adoption of RFID in South African retail companies?

1.5.5 Research Question Five

Government support is one of the factors that has emerged as a determinant of RFID adoption especially in the literature from developing countries. For instance Hossain and Quaddus (2009) cited insufficient government concern and support as one of the factors impeding the adoption of RFID technology in Bangladesh. Wang, Li, Zhang and Li (2010) identified government support as one of the significant drivers for RFID adoption in China. The Taiwanese government and the Chinese government seem to be promoting the adoption of RFID (Tsai, Lee and Wu, 2010; Zhou and Piramuthu, 2011) in their countries unlike places like the USA and Europe where companies are at the fore front of promoting the adoption and implementation of the technology. As a developing country, government support is an important factor for new technology adoption to happen successfully (Hossain and Quaddus, 2009). The government can assist in promoting the technology in terms of how companies can use it and make money out of it instead of just seeing it as a cost. The government could also support by providing incentives and tax-deductions to increase the RFID adoption rate and integration for companies willing to adopt the technology. According to Hossain and Quaddus (2011), RFID adoption needs to be examined from government and organizational perspectives because it involves many national policies and requires modification of organizational structures and operations.

Therefore research question five is proposed:

How will government support influence the adoption of RFID technology in South Africa?

1.6. Importance of the Study

According to Bidgoli (2006), over five billion bar codes are scanned each day around the world. This signifies the importance of bar code technology in the supply chain domain. With the RFID technology developing to replace/complement the bar code technology, it is important to know the role the technology is likely to play in the retail sector and the plans for its adoption particularly in South Africa.

Since South African retailers want to compete globally and not lose out to their global competitors, this study could assist in establishing the degree to which South African retailers have considered the adoption of RFID technology. Successful adoption and implementation of the technology could assist in accelerating operational efficiency, better inventory control, inter-organisational movement of materials and information collection in the retail environment in South Africa. This research will also help determine how internal and external factors of the organisation motivate the eventual decision to adopt RFID in the South African retail sector taking into account the benefits and the risks associated with the technology. This research will also assist in establishing whether competitive pressure could influence retailers to step up their adoption campaign of the technology. Further, the study could help investigate the impact this technology might have on employees in the retail space. Giving the recent instability in the labour domain in South Africa, it will be important to know exactly what would happen to employees if the technology is adopted and implemented in the retail sector. Moreover, the study will also illuminate how government's support could influence the adoption of the technology. Additionally, this study could also help establish the likelihood of widespread adoption of not only RFID but potentially other ubiquitous technologies to be implemented in the future in South Africa.

1.7. Objectives of the Study

By and large, the South African supply chain partners are aware of the considerable benefits of RFID and have sufficient interest in the adoption and the use of the technology as per Brown and Russell's study (2005). Since the technology is in its nascent stages particularly in the third world countries such as South Africa, it is only fitting that we determine the plans to its adoption in the retail sector where adoption of the technology has been found to be among the greatest.

The wider objectives of this research are as follows:

- To understand the level of adoption considered by retail organizations in South Africa regarding RFID technology

- To understand the impact of costs, complexity and technology competence with regards to the adoption of RFID technology in the retail organisations in South Africa
- To understand the impacts anticipated on employees in the retail space in South Africa
- To understand how competitive pressure would influence local retail competitors to consider the RFID technology
- To understand how government support would influence the adoption of RFID technology in South Africa.

1.8. Research Approach

This study is exploratory in nature and employs qualitative methodology with the intention to look for patterns and to gain familiarity with the five questions posed in this study. This is also done to identify areas for a more thorough study at a later stage (Hussey and Hussey, 1997). Semi-structured interviews were used to gain a richer understanding of the respondents' view on the designed questions for the research. The unit of analysis is the retail organisations that have (1) implemented, (2) completed a pilot study and are planning to implement, (3) completed a pilot study and are not willing to implement or (4) are considering implementing RFID technology in the future. The study sample is limited to retail organisations listed on the Johannesburg Stock Exchange (JSE). The respondents are senior executives responsible for making IT investment decisions in their organisations. The Technology-Organisation-Environment (TOE) framework developed by Tornatzky and Fleischer (1990) is used in the interpretation of the findings.

1.9. Structure of the Research Study

Figure 3 below illustrates the research report structure.

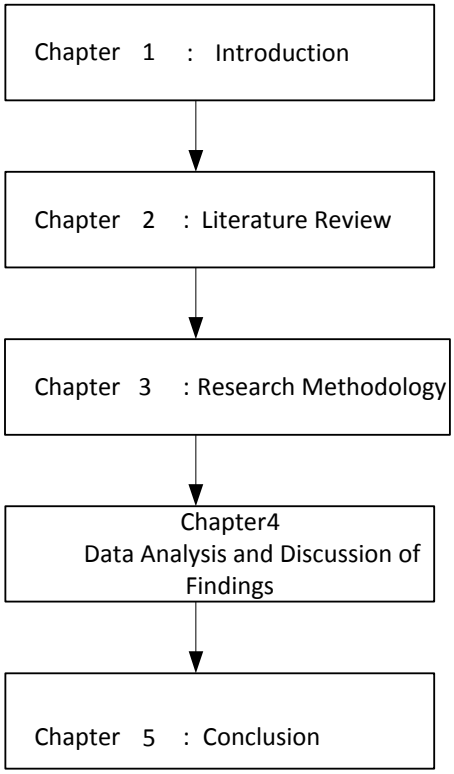

Figure 3: Overall Structure of the Research Study

Chapter 1 – Introduction

This chapter has presented the reader with a broad introduction to RFID technology and explained clearly the research problem that needs to be discussed. It will also explain the aim and importance of the research as well as the contribution this research study will add to the base of knowledge particularly from a South African context. It will also state some of the RFID implementations taking place around the world.

Chapter 2 –Literature Review

This section will initially look at Technology Organisation and Environment framework guiding the research. Thereafter, the literature review of the benefits as well as the challenges to retailers looking to implement the technology will be presented. A review of literature relating to RFID adoption will be followed and will assist in revealing the important factors that could be relevant in South Africa.

Chapter 3 – Research Methodology

The detailed research methodology that was used to address the research questions will be addressed in this chapter. The research methodology chapter will also justify the chosen research methodology that has been adopted for this study. Further, the methodological approach that will be used to sample and collect the data will be covered. Additionally, the data analysis method used to analyse the data will be detailed. Furthermore, the validity and reliability issues associated with the research being undertaken are discussed. Lastly, the ethical considerations that need to be considered for this research will be clearly stated.

Chapter 4 – Data Analysis and Discussion of findings

This chapter will provide a detailed account of the findings resulting from the data collection process. The data was analysed and categorised according to the research questions posed in chapter one of the study. Suitable qualitative techniques made up of five steps were used to analyse the research data. The five steps are immersion, abstraction, synthesis and theme development, Refining the Themes and Sub Themes and drawing conclusions. Important results will then be highlighted and drawn to the readers' attention.

Chapter 5 – Conclusion

The conclusions drawn from the undertaken research based on the research findings will be presented in this chapter. This chapter will also summarize the research report and provide an overall perspective in the sequence of the research questions posed, suggest future research directions and highlight the contributions of this research. The limitations of the study will also be discussed in this chapter.

1.10. Conclusion

This chapter presented the background to the study, problem statement, importance of the study, research contributions and the structure of the research report. The RFID technology was explained and the different types were also mentioned along with some of the frequency ranges currently available. The five research questions the study seeks to answer based on the South African retailers' perspective were also mentioned along with the theory. The next chapter reviews and summarises prior literature behind the theoretical framework of the study.

Chapter 2 – Literature Review

2.1. Introduction

Chapter one sets the scope of the study and sheds light on what the research study seeks to accomplish. This chapter reviews the current literature with respect to RFID and its adoption and the gaps identified in the literature. Most of the papers used in this study were acquired from ScienceDirect, EBSCO Host, IEEE Explore, JSTOR, Springer Link, Taylor & Francis, Web of Science, Association of Computing Machinery (ACM), Google and Google Scholar Electronic databases. Others were also obtained from the WITS library. The majority of the searches were limited to published papers with a time span of 10 years (between 2002 and 2012). However, some papers that were published more than 10 years ago have been made use of in this paper as they were found to be relevant to this study.

Initially, search strings such as *"Radio Frequency Identification Adoption", "RFID adoption in South Africa"* and "RFID and Privacy" were used to search in ScienceDirect and Google databases and these searches returned multiple hits. Sometimes when a search is done on a particular database with a search string, it brings out interesting papers that were initially not considered. On some occasions papers could not be retrieved from the databases in which the searches were done. Multiple searches in other databases needed to be done to yield the desired results. In some cases the WITS library was consulted to find the required papers.

2.2. Theoretical Framework

2.2.1 Rationale to Technology Organisation Environment (TOE) Framework

Literature on technology adoption is largely dominated by studies that have the individual as their unit of analysis (Brown and Russell, 2007). For this reason, the Technology Acceptance Model (TAM) among other theories has been widely employed by many scholars. TAM is an adaptation of the theory of reasoned action and mostly geared towards modelling user acceptance of information technology (Davis, 1989). A number of studies have confirmed the illustrative power of TAM in relation to various types of IT (avis, 1989; Venkatesh, 2000; Muller-Seitz et al., 2009). However, TAM is mostly used for studies that require individual adoption and is not fully appropriate for organisational adoption as key organisational and environmental factors are not taken into consideration (Brown and Russell, 2007). Hence, it was considered inappropriate for this study.

Diffusion of Innovation (DOI) theory is another theory that is widely used in technology adoption at the organisational level. Whilst the DOI may be considered suitable for the current study due to the complexity of the technology for the retail supply chain applications, it only focuses on the technological aspect of the system adoption and does not fully cover the organisational and environmental aspects of the system. Therefore, it was considered unsuitable for this study. According to Chau and Tam (1997), the decision to adopt a technology should take into account the appropriate context of variables conforming to the specific features of the innovation. Brown and Russell (2007) accentuate that RFID adoptions in retail supply chain activities are driven by its technological factors, organisational factors, and environmental factors. The Technology, Organisation and Environment (TOE) framework presents the contextual viewpoint more appropriate to analyse innovations pertaining to organisational adoption (Wu and Subramaniam, 2011). Hence, the TOE framework has been identified as an appropriate framework to apply in this study.

The TOE framework has been used extensively in studying RFID and other technologies. For example, Li, Wang, Zhang and Chu (2010) examined the influences of technological, organisational and environmental factors on the acceptance of RFID in China using the TOE framework. Furthermore, Wang et al. (2010) applied the TOE framework to investigate the determinants affecting RFID adoption in the manufacturing industry in Taiwan. Also, Al-hashedi, Arshad, Mohamed and Baharudin (2012) explored the factors affecting RFID adoption intention in Hajj organisations with the TOE framework. Regarding technologies other than RFID, Oliveira and Martins (2010) applied the TOE framework to analyse the pattern of e-business adoption by firms across European Union (EU) members. Additionally, Kuan and Chau (2001) extend the understanding of Electronic Data Interchange (EDI) in small businesses by identifying factors that distinguish adopter firms from non-adopter firms with the TOE framework. The TOE framework therefore provides a relatively complete view to study RFID adoption related issues and will be suitable for this study.

Table 1 below provides a summary of some studies that used TOE framework.

No.	Author	Innovation Studied	What Research is About
1	Kuan and Chau (2001)	EDI	Extends the understanding of EDI in small businesses by identifying factors that distinguish adopter firms from non adopter firms
2	Shahawai and Idrus (2010)	Enterprise Resource Planning (ERP)	Discusses factors affecting ERP system adoption in Malaysian SMEs.
3	Wen, Zailani, and Fernando (2009)	RFID	studies the determinant factors of the RFID adoption by manufacturing companies in China
4	Li, Wang, Zhang, and Chu (2010)	RFID	investigates the influences of technological, organisational and environmental factors on the acceptance of RFID in China
5	Brown and Russell (2007)	RFID	Conducts an exploratory investigation into RFID adoption in South African retail organisations, and to identify factors that have an impact on the adoption status
6	Al-hashedi, Arshad, Mohamed and Baharudin (2012)	RFID	Explored the factors affecting RFID adoption intention in Hajj organisations
7	Wang, Wang and Yang (2010)	RFID	Studies the determinants affecting RFID adoption in the manufacturing industry in Taiwan
8	Oliveira and Martins (2010)	E-Commerce	analyses the pattern of e-business adoption by firms across European Union (EU) members
9	Zhu and Kraemer	E-Commerce	develops an integrative research model for assessing the diffusion and consequence of e-business at the firm level

Table 1: Some studies based on TOE Framework

2.2.2 The Origins of the TOE Framework

The TOE framework was developed by Tornatzky and Fleischer in 1990. The TOE framework is widely used in the study of IT and gives a constructive analytical outline that can be used to investigate the adoption and assimilation of various types of IT innovation (Oliveira and Martins, 2008). The TOE framework as pointed out by Tornatzky and Fleischer (1990) is influenced by three elements related to the firm's context: technological context, organisational context and environmental context.

The technological context pertains to the external and the internal technologies related to the organisation. This comprises existing technologies, current practises and equipment internal to the firm in addition to the emerging technologies relevant to the organisation (Oliveira and Martins, 2008). Many characteristics of the technology can influence its adoption (Wang et al., 2010) and in this study, cost and complexity will fall under this umbrella.

The organisational context depicts the characteristics of an organisation. Firm size, scope, complexity of managerial structure and the quality of its human resources are some of the common characteristics of the organisational context (Tornatzky and Fleischer, 1990). In this study, technology competence and business process changes or creation will fall under this category. Organisation characteristics can also hamper or ease the adoption and implementation of technological innovations (Brown and Russell, 2007).

The platform on which an organisation performs its business is referred to as the environmental context (Tornatzky and Fleischer, 1990). This includes the industry and dealings with business partners, competitors, and government (Tornatzky and Fleischer, 1990). They are external factors to an organisation that can offer opportunities and constraints for technological innovations. Walmart's influence as a competitive pressure and government support will belong to this category in this study.

Figure 4 below introduces the TOE framework by Tornatzky and Fleischer, 1990.

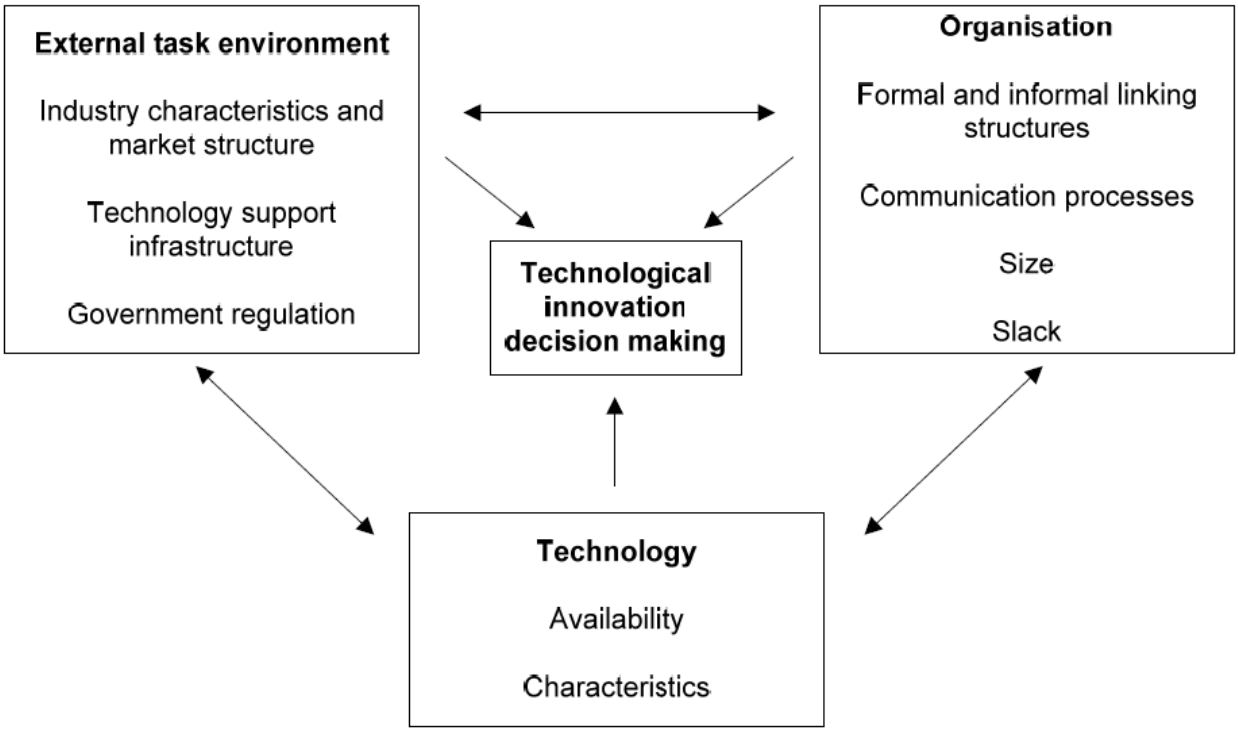

Figure 4: Technology, Organisation and Environment Framework (Tornatzky and Fleischer, 1990)

2.2.3 Limitations of the TOE Framework

The TOE framework as with any other framework is not without its shortcomings. Awa and Ukoha (2012) state that some constructs in the adoption predictors are assumed to be more applicable to large organisations where there is surety of continuity in the business. The above understanding is very consistent to this study as the interviewees were all from fairly large organisations listed on the JSE (with one exception) that are deemed to have the resources necessary to implement the technology. In spite of this limitation about the TOE framework, it has been extensively used to successfully determine how an organisation adopts and implements technological innovations and therefore, can be employed for the purposes of this study.

2.3 Literature on RFID Technology

The literature on RFID technology states that it displays exceptional sensing capabilities which differentiate it from other existing technologies such as the Barcode and Electronic Data Interchange (EDI) (Brown and Russell, 2007). It is believed that RFID will become the principal technology for tracking products and managing inventory (Roh et al., 2009). RFID technology has the capability to be an organisation-wide technology with inter-organisational implications just the same way as the Internet

and networked Personal Computers (Roh et al., 2009). The subsequent sections discuss the benefits of the technology in the retail sector, the challenges of the technology, the adoption and the research problems.

2.3.1 Benefits of RFID Technology to the Retail Sector

Although RFID technology should not be considered a cure for imperfect business practices, if implemented correctly, it can assist to radically lessen business overheads (Upfold and Liu, 2010). The desire to cut cost has resulted in looking into the RFID technology by retailers and their supply chain partners who seek to reduce cost in their operations (Attaran, 2007). One source of saving cost is through theft reduction (Wyld, Jones and Totten, 2005). Roh et al. (2009) point out that the total losses the USA retail industry incurred as a result of shoplifting and employee theft in 2005 was in the region of US$ 30 billion. Efficient tracking and quick authenticity check via RFID can reduce such shrinkage and also provide more value to retailers and their trading partners by increasing the collaboration among them (Bhattacharya et al., 2007). Effectively utilising the data generated from an RFID system can help to improve inventory visibility, which in turn can lead to lower stock levels and tighter and integrated supply chain (Luckett, 2004).

RFID could assist retailers in rendering benefits to customers. RFID can speed up the process for clients giving them the satisfaction of shorter queues and quicker checkout times (Bhattacharya et al., 2007). Roh et al. (2009) found that it takes 1 minute and 40 seconds to scan 1000 items through RFID scanners and 33 minutes (20 times as long) using bar-code technology. Retail goods that will be tagged with RFID can greatly simplify consumers' frustration of having to return unwanted items bought without having to provide a receipt (Juels, 2006). Additionally, tagging retail goods can assist in tracking perishable food items to trace disease outbreak and also provide more efficient means to recall defective products (Thiesse, 2007). Further, RFID has the potential to reduce the number of counterfeit goods (Juels, 2006).

RFID can help deliver business process benefits to retailers. RFID has the potential to improve efficiency and decrease errors in manual work (Attaran, 2007). RFID improves the rate and quality of data being collected and can assist retailers to improve their accuracy in managing inventory, improve efficiency of store operation and invoke shorter retail cycle of designing, manufacturing and stocking the latest products (Wen et al., 2009). RFID can facilitate the exchange of necessary information in real time and can assist in fostering good communication among supply chain members (Tsai and Tang, 2012).

2.3.2 RFID Challenges

Unfortunately, as with most emerging technologies, RFID has its limitations too. While companies stand to gain from the use of the technology, a number of authors have expressed concern about the security of the technology that could serve as an impediment to its broader adoption. According to Piramuthu (2007), most existing RFID implementations are not secure and are therefore vulnerable to leak private consumer information stored on the RFID tag. Juels (2006) states that RFID tags broadcast fixed serial numbers to nearby readers and as a result, facilitate "clandestine physical tracking" of consumers. These issues have led to debate from some researchers such as Juels (2006) and Spiekermann and Ziekow (2005) proposing solutions which are all aimed at preventing the uncontrolled reading of transponders as well as the manipulation of information saved in them. Some of the proposed solutions include the use of jammer transmitters or the so-called ''blocker tags'' (blocks RFID readers), distance-based access control, and bug-safe anti-collision protocols (Juels, 2006; Spiekermann and Ziekow, 2005; and Piramuthu, 2007). Another widespread privacy enhancing technology mechanism is the kill command in transponders that can be implemented in shops to destroy the tags before consumers leave the premises (Juels, 2006). It appears like the concern of privacy is not a key issue since the technology is currently used at the pallet and case levels. The literature from developing countries (such as Hossain and Quaddus, 2009; Brown and Russell, 2007; Wang et al. 2010) does not really mention privacy and security as a concern when compared to that from Europe and the United States of America (USA). This could mean that retailers in the developing countries are more concerned about the initial plans to have the technology adopted instead of looking into how the technology will impact clients at the retail level.

The adoption and implementation of RFID will require retailers and suppliers to carry out strategic evaluation of business processes and see where they can use the technology to derive the most benefit (Wu, Nystrom, Lin and Yu, 2006). Many companies currently rely heavily on manual processes or bar code scanning to track goods (Forcinio, 2006). With these companies, moving from the known to the unfamiliar technology could pose a huge challenge especially when it requires process changes (Forcinio, 2006).

Merely adopting and implementing the technology will not give any benefits if not managed properly. In order to reap the benefits of the technology, there needs to be infrastructure in place to help track activities and even the storage of information generated from the RFID system (Wu et al., 2006). Infrastructure will have to be built which might require huge capital investment in the technology. As no

comprehensive RFID infrastructure exists as yet, especially in the developing countries, it could even be tricky to calculate the true returns based on limited benefit information from pilot projects from other established countries (Wu et al., 2006).

Lack of worldwide standards has been one of the restricting factors mentioned by a number of authors. Consistent with the above, Koh, Kim and Kim (2006) assert that the lack of clarity on the standards make it risky to implement the technology. However, Chavada and Kokatnur (2009) are of the view that efforts are being made to have a generalised agreed protocols in place with regards to the type of tags to be used, the frequency and read rate of tags.

It is estimated that terabytes of data will be generated by the RFID technology daily. Companies will have to do more to store and protect the data from adversaries who will want to use these data for devious purposes (Tsai and Tang, 2012). Retailers will also have to use RFID in more resourceful ways to take advantage of the enormous marketing data that will be generated by this technology (Wu and Subramaniam, 2011)

Bhattacharya et al. (2007) mention employee reluctance to change as one of the issues that could hinder the development of the technology. This point could be relevant in the developing countries where the use of the technology could put some employees out of work.

2.3.3 Adoption

Quite a number of studies have focused on different aspects of RFID adoption. For instance, Hossain and Prybutok (2008) investigate the factors that affect consumer acceptance of RFID technology in the USA. Their study revealed that convenience, culture, and security are significant in predicting the intention for consumers to use RFID technology. Muller-Seitz et al. (2009) explored customer acceptance of RFID technology at a German electronic retail corporation. It was found in this study that perceived usefulness, protection of data privacy and security have an impact on customer acceptance of RFID technology.

Interestingly, Hossain and Prybutok (2008) found privacy of customer data not to have any impact on consumer acceptance unlike Muller-Seitz et al. (2009). It also appears that few papers have been published on user acceptance of RFID in developing countries. This could be due to the fact that many organisations in developing countries could be more concerned about its acquisition rather than how it could impact consumers.

The study by Muller-Seitz et al. (2009) and Hossain and Prybutok (2008) were done at the consumer level and hence are less relevant to this study.

Wu and Subramaniam (2011) drew on the DOI theory and TOE framework to investigate the factors affecting RFID adoption in supply chains using survey data collected worldwide about different stakeholders in supply chains, such as manufacturers, transporters, wholesalers, and retailers. It was found that trading partner readiness, trading partner power, top management support, technology maturity, and complexity are the predictors of RFID adoption. Among them, trading partner readiness, trading partner power, top management support, and technology maturity are the facilitators for RFID adoption but complexity is an inhibitor to RFID adoption.

Alqahtani and Fosso-Wamba (2012) used DOI theory to assess the influence of a set of determinants on the intention of Saudi Arabian retail firms to adopt RFID technology. They found that technology competence, social issues (such as privacy, security etc) and competitive pressure were found to be significant determinants of RFID adoption by Saudi Arabian retailers. Some of their (Alqahtani and Fosso Wamba, 2012) findings were very inconsistent with what has already been established by other authors. For example, they found relative advantage and top management support not to be significant drivers of RFID adoption in Saudi Arabia. This is inconsistent with what Brown and Russell (2007) found in South Africa, Wang et al. (2010) found in Taiwan, Wu and Subramaniam (2011) found using data collected worldwide.

Kim and Garrison (2010) investigated some of the driving forces behind the evaluation of RFID and its subsequent influence on the adoption and integration of RFID among 278 South Korean retailers. They found that organisational needs (Ubiquity, Performance Gaps, and Job Relevance), perceived factors (Benefits and Cost Savings), and organisational readiness (Financial Resources and Technological Knowledge) are the key factors determining RFID Evaluation of retailers in South Korea.

Schmitt, Thiesse and Fleisch (2007) came up with five important factors that influence RFID adoption and diffusion in the automotive industry at the time the research was conducted in 2007. Schmitt et al., (2007) recommended that the RFID adoption and diffusion was still in its infant stage and for that reason, basic technological issues had to be tackled first. Therefore, they accentuated that the organisational and environmental factors were of less significance than technological factors at that moment. This finding is in contrast to what Li et al., (2010) found in their study of the influences of

technological, organizational and environmental factors on the acceptance of RFID in China. They concluded that technological factors were not significant for RFID acceptance in China but only organisational and environmental factors were significant.

Wang et al., (2010) conducted a study into RFID adoption in 133 manufacturing companies in Taiwan. They made use of the TOE framework and identified nine variables (relative advantage, compatibility, complexity, top management support, firm size, technology competence, information intensity, competitive pressure, and trading partner pressure) affecting RFID adoption in the manufacturing industry. Brown and Russell (2007) performed an exploratory inquiry using six selected retailers to identify the factors that influence RFID adoption in South African retail organisations in 2005. Their study made use of both quantitative and qualitative data based on the selected six retailers. Their findings supported the applicability of the TOE framework in the RFID adoption research. They established that relative advantage, compatibility, complexity, cost, top management attitude, IT expertise, organisational size, organisational readiness, competitive pressure and change agents affect RFID adoption intention. The results from Wang et al., (2010) appear to be consistent with Brown and Russell's (2007) study even though they were conducted in two different countries with different cultures.

More often than not, innovations in technology have led to changing business dynamics, requiring careful attention from adopters and implementers (Roh et al., 2009). Consistent with the above, researchers have paid significant attention to factors that influence the organisational adoption of RFID (Upfold and Liu, 2010; Wang et al., 2010; Brown and Russell, 2007; Chau and Tam, 1997).

Table 2 below depicts the adoption factors considered in this study along with the other authors who have also considered these variables in their study.

The section goes onto justify the choice of factors addressed in this study.

No	Study	Country	Author	Technology factors	Organisational Factors	Environmental Factors
1	Understanding and predicting radio frequency identification (rfid) adoption in supply chains	worldwide	Wu and Subramaniam, 2011	Complexity	business process changes, technology competence	
2	The adoption and continued usage intention of RFID: an integrated framework	Australia	Hossain and Quaddus, 2011	Cost, Complexity		
3	Factors affecting RFId adoption in a vertical supply chain: the case of the silk industry in Italy	Italy	Quetti, Pigni and Clerici, 2012	Cost, Complexity		Competitive Pressure
4	An Adoption-Diffusion Model for RFID Applications in Bangladesh	Bangladesh	Hossain and Quaddus, 2009			government support
5	An Exploratory Study on RFID Adoption in China	China	Wang, Li, Zhang and Li, 2010	Cost		competitive pressure, government support
6	Radio frequency identification technology: An exploratory study on adoption in the South African retail sector	South Africa	Brown and Russell, 2007	Cost, Complexity	business process changes, technology competence	government support,Competitive Pressure,
7	RFID Adoption Intention in Hajj Organizations	Saudi Arabia	Al-hashedi, Arshad, Mohamed and Baharudin (2012)	Complexity		government support
8	Understanding the determinants of RFID adoption in the manufacturing industry	Taiwan	Wang, Wang and Yang (2010)	Complexity	technology competence	competitive pressure
9	Impact of external environmental factors on RFID adoption in Australian livestock industry: An exploratory study	Australia	Hossain and Quaddus, 2010			competitive pressure, government support
10	Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors	Europe	Zhu, Kraemer and Xu, 2003		technology competence	competitive pressure
11	Firms Patterns of e-Business Adoption: Evidence for the European Union-27	Europe	Oliveira and Martins, 2010		technology competence	competitive pressure
12	Classification of RFID adoption: An expected benefits approach		Roh, Kunnathur, and Tarafdar, 2009		business process creation	
13	Making the 'most' out of RFID technology: a research agenda for the study of the adoption, usage and impact of RFID	United States of America	Curtin, Kauffman and Riggins, 2007		business process creation	
14	RFID Implementation in Retail Industry: Current Status, Issues, and Challenges		Bhattacharya, Chu and Mullen, 2007	Cost, Complexity	business process creation	

Table 2: Adoption factors considered in the current study

Given the large number of potentially relevant adoption variables and the time constraints, it is prudent that concentration be given to some of the major factors that have been used extensively by a number of scholars in determining various IT adoptions. Evidently, cost, complexity, technology competence, government support, competitive pressure and business process changes have been identified as some

of the major variables that determine the technologies that are adopted in practice. This study seeks to close the gap in IT literature on RFID adoption between the established economies and that of developing countries such as South Africa.

Cost was chosen as a factor to be considered in this research because it has been identified by many authors from both developing as well as developed countries to impact technology adoption (Hossain and Quaddus, 2011; Bhattacharya et al.,2007; Quetti, Pigni and Clerici, 2012 and Brown and Russell, 2007). Cost can potentially affect how the technology would be adopted in South Africa and other developing countries. Organisations from South Africa might not be able to launch a full scale adoption of the technology if the cost associated with the technology is high.

Compared to bar code technology, RFID is more complicated to implement in terms of integrating with multiple technology platforms and other legacy systems which a lot of organisations from the developing countries could be relying on for their day to day running of their businesses. Complexity is an important factor to look at in this research as high levels can incite and raise doubts as to the successes and benefits of an emerging technology such as RFID and delay or at worse thwart its adoption in South Africa (Brown and Russell, 2007).

Successful adoption of the RFID technology will require good infrastructure and competent IT personnel. This is an important factor to consider because according to FASSET (2012), there are shortages of IT skills in South Africa. Further, the infrastructure in the country is not as developed as that of the industrialised countries. The shortage of skills and lack of infrastructure in the developing countries make this factor an important one to investigate in South Africa.

Government support as a factor is significant as it has emerged in a number of works arising from developing countries such as Taiwan, Bangladesh and China as an important factor for technology adoption (Hossain and Quaddus, 2010; Wang et al., 2010). As South Africa is also a developing country, it will be essential to know how the support from the government might help play a role in influencing the adoption of emerging technologies such as RFID.

The nature of competition in the South African retail market has changed as there are big global players such as Walmart coming in to compete for market share with the hope of strengthening their global presence. Walmart is one of the retail companies known to be a force behind RFID implementation especially in the retail sector. Having entered the South African market, research needs to be conducted

to ascertain if the local retail players will step up their pursuit of the technology as Walmart being one of the competitors in the retail space might at some point use it to gain competitive advantage.

The implementation of RFID has the potential to bring about new business processes that can impact employees. This factor is considered in this study because any business process changes that would require the laying off of workers in South Africa could meet a stiff opposition from the Unions and even the government as unemployment in the country is very high. Adopters of this technology will have to tread with caution in the developing countries where unemployment is high. This therefore makes it relevant for it to be investigated in this study.

Figure 5 displays the adoption variables as per the TOE framework considered for the study.

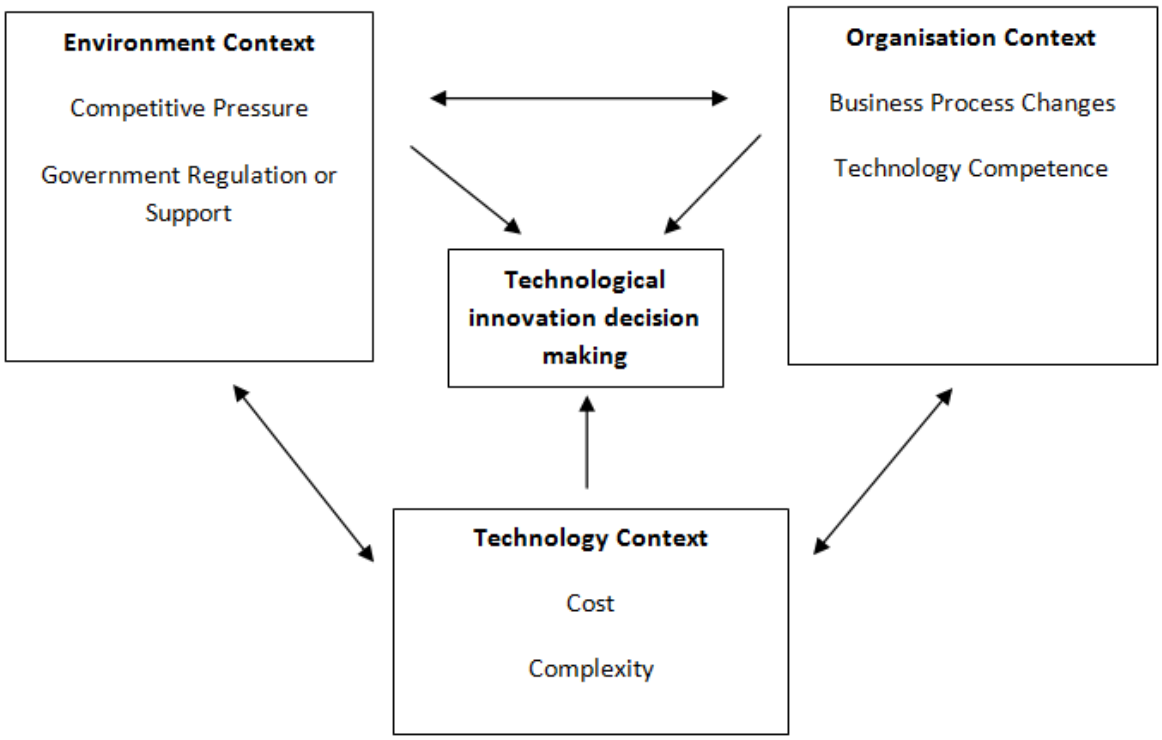

Figure 5: Refined Technology, Organisation and Environment Framework. Source: Adapted from Tornatzky and Fleischer (1990)

2.4 Conclusion

RFID is gradually gaining popularity as retailers around the world seek to adopt and implement it for their activities. This section commenced by looking at the theoretical framework guiding the research study. TOE was chosen as the appropriate framework to be used for this study as it was suitable in helping to achieve the intended purposes of the research. Thereafter, the literature review of the benefits as well as the challenges to retailers looking to implement the technology was presented. A review of literature relating to RFID adoption followed and revealed the important factors that could be relevant in South Africa. Evidence from the review indicated that cost, complexity, technology competence, government support, competitive pressure and business process changes were important for retailers considering adopting RFID in South Africa and as a result needed to be investigated.

The next chapter will detail the research methodology employed for this study.

Chapter 3: Research Methodology

3.1. Introduction

The previous chapter discussed the literature review and identified the lack of literature from developing countries such as South Africa which has made it necessary for this study to embrace an exploratory research approach. The previous chapter also introduced the conceptual framework guiding this research and stated the research questions to be addressed in this study.

This chapter establishes the research methodology that will be used to conduct the study, validate the proposed framework and answer the research questions posed in chapter 2. This chapter also justifies the qualitative approach that allows for in-depth exploration and detailed responses from the one-to-one interviews

Firstly, the research paradigm underpinning this research is introduced. Secondly, the methodological approach that was used to sample and collect the data is covered. Thirdly, the data analysis method used to analyse the data is detailed. Fourthly, the validity and reliability issues associated with the type of research being undertaken are discussed. Lastly, the ethical considerations that might arise from this type of research are clearly stated.

3.2. Research Questions

This study aims to provide a deeper understanding of South African retailers' perceptions of RFID adoption. To facilitate this research process, the following five questions were asked:

1. What is the RFID adoption status of retail organisations in South Africa?
2. How are costs, complexity and technology competence influencing the adoption of RFID by South African retail companies?
3. What impacts are anticipated on labour?
4. How is competitive pressure influencing the adoption of RFID in South African retail companies?
5. How will government support influence the adoption of the technology in South Africa?

3.3. Research Methodology

This study will be making use of qualitative research methods to investigate the adoption of RFID from the viewpoint of South African retailers. A qualitative approach is necessary, given the preliminary nature of the study, and the limited prior work on the topic. Since RFID technology is at an early stage of adoption, it is difficult to gather data by using a survey questionnaire for an empirical study in a quantitative approach. Because few companies are using the technology, respondents are likely to be unfamiliar with RFID and there is not a large population of implementations to research. By and large, a qualitative approach is better suited to answer the research questions of the study through in-depth interviews (Creswell, 1998). Qualitative methods have been productively employed where there is a need to describe and explain the phenomenon under study and have been used for examining organisational adoption of various information technologies (Roh et al., 2009).

Strauss and Corbin (1990) describe qualitative research broadly to embrace any type of research that generates findings not arrived at by means of statistical modus operandi or other means of quantification but, instead, the kind of research that produces findings resulting from real-world environments where the “phenomenon of interest unfold naturally” (Patton, 2002). Consistent with the above, Creswell (1994) also accentuates that qualitative research is a free-form methodology used to gather non-statistical feedback and opinions deeply entrenched in people's motivations and perceptions, often from small samples. The above understanding is core to this study as it seeks to explore and understand the motivations of companies acquiring new technologies like RFID from the viewpoint of the respondents who are also part of the decision making body in their respective companies.

Legard, Keegan and Ward (2003) suggest that qualitative research has both advantages and disadvantages. On a positive side, it helps provide a rich contextual perspective on issues where a standard questionnaire may not be able to assist in extracting the details required. Further, it helps to capture what is happening without being judgmental and allows people to expresses their feelings and experiences from their own point of view (Legard et al., 2003). However, findings from qualitative research may not be generalised owing to the limited number of participants involved and the purposive nature of the sample.

This study is considered exploratory in nature owing to the lack of literature emanating from developing countries such as South Africa and as a result of the nature of questions that emerged from the

reviewing of the literature. According to Hussey and Hussey (1997) exploratory research is conducted when there are very few or no earlier studies which can be referred to for information. The goal of such study is to look for patterns, ideas or hypotheses rather than testing or confirming a particular hypothesis. The focus for such studies is on gaining insights and familiarity with the subject area for more thorough analysis at a later stage (Hussey and Hussey, 1997).

Yin (1994) expresses research design as the preparation of a working plan or blueprint aimed at consistently assembling, organising and integrating data to solve the research problem at hand. Research designs are aimed at collecting and analysing of data (Bryman and Bell, 2003) and also clarifying any assumptions and consequences, and understanding the limitations of the study.

Analysis of the research approaches indicated that a qualitative research design may take a variety of forms, the most common of which are; ethnography, phenomenology, case study, content analysis and grounded theory (Leedy and Ormrod, 2010). This study will be making use of phenomenological research design. This design approach is substantiated by the following logic:

- The principal catalyst of the research was to understand the motivations and perceptions of South African retail companies about the adoption of RFID technology and to describe their motivations and perceptions in great detail.
- The research was focused on the motivations and perceptions of the retail companies and does not propose any factors or attempts to measure anything.

3.4. Sampling

Marshall (1996) asserts that the process of sampling in qualitative studies is one of the principal areas of confusion. This according to Marshall (1996) is mainly as a result of researchers misunderstanding what a qualitative approach seeks to address as compared to a quantitative approach. Understanding clearly what a qualitative approach aims to address could help rectify this situation for the right sampling techniques to be employed (Marshall, 1996).

A non-probability sampling strategy was employed for the purposes of this study. Participants were selected because of their accessibility (convenience sampling) and because of their likelihood of knowing about the technology and the company's intentions (judgement sampling or purposive

sampling). Further, snowball sampling was also used to get respondents if the senior managers could refer other senior managers who were knowledgeable about the topic under discussion.

The study sample was retail organisations listed on the JSE. Retail companies listed on the JSE and headquartered in Gauteng were identified and copied onto a spreadsheet to make a target interview list. The organisations head quartered in Gauteng were targeted for convenience. The email addresses and phone numbers were then sourced and confirmed from their respective websites and contacted for participation in the interview.

In phenomenological study, a typical sample size can vary from 5 to 25 individuals (Creswell, 1998), all of whom have an idea of the phenomenon being studied. Ten participants representing the diverse retail supply chain market were anticipated to be involved in the interview process. However, in the end, five participants were successfully secured for this study. This gave a diverse spread but was also manageable in terms of interviewing and subsequent data analysis. The participants who were involved in the interview process included IT senior managers and senior managers who are knowledgeable about the RFID technology and are aware of their organisations' position on RFID.

3.5 Methodological Approach

3.5.1 Source and Method of Data Collection

There are various techniques employed for data collection in qualitative research. Some of the techniques used are interviews, observations and secondary documentation, which includes memos, electronic mails, annual reports, financial statements, newspaper articles and websites (Bhattacherjee, 2012). For the purposes of this study, interviews and documents were used to gather the data needed to help answer the research questions stated.

Interviews can produce a great deal of valuable information and the researcher can ask questions related to issues such as biographical information, beliefs, feelings, motives, claimed present and past behaviours, standards for behaviour and conscious reasons for actions or feelings (Leedy and Ormrod, 2001). Qualitative research interviews are hardly ever highly structured and generally only a few central questions or themes form the pivot of interaction (Burger, 2003). Bernard (1988) cautions that when asking participants about past experiences the information revealed may not always be accurate because of the imperfection of human memory. Another downside to interviews is that it can be time consuming.

One of the challenges for the study was having access to the participants. As the participants were senior IT managers in their respective companies, getting appointments with such people can be challenging (Hussey and Hussey, 1997). There was also a challenge of finding senior IT managers who are knowledgeable about the RFID technology and can participate in the study.

The process that was used to secure participants to be interviewed for the study involved identifying, emailing and consequently phoning the head offices of retail organizations listed on the JSE and headquartered in Gauteng. A total number of 23 email addresses belonging to the targeted companies were sourced from their respective websites. The researcher was not able to retrieve email addresses for five companies and had to resort to phoning the head offices and asked about the relevant people to be involved in the research. Of the 23 emails sent out to the individual companies in request of their top IT executives or senior managers to participate in the study, only three responses were received. After two weeks, the researcher followed up with a telephone call on the companies that had not responded. During the telephonic conversation with some of the companies, five declined to be part of the study. Some pointed out that they could not contribute to the research since their companies had not yet made any plans to implement RFID. Others also indicated that they were not knowledgeable about the technology and could not provide the information needed. A total of nine voice messages were left for CIO or senior IT managers belonging to nine different companies but did not yield any fruitful responses. For some of the companies, their targeted participants were busy. Some of these CIOs or senior IT managers were either in meetings or were not available when their secretaries and assistants were called for the appointments. The researcher managed to get four participants from the JSE listed companies. Seeing that four participants were not enough for the study, the researcher went outside of the JSE listed retailers to get more participants for the study. An additional participant was obtained who had even conducted a pilot project for RFID technology. This brought the number of participants of the study to five.

The descriptions of the five participants' organisations while upholding their anonymity along with their pseudonyms are depicted in table 3 below.

Organisation Identifier	Company Description
X1	❖ Listed on the JSE ❖ This organisation is focused on the FMCG market. ❖ Provides branded consumer products with brand portfolio that includes more than 53 brands, with 33 owned brands and more than 20 international brands under license
X2	❖ Listed on the JSE ❖ Focuses on sourcing, distributing, wholesaling and retailing general and specialised building materials through a number of stores
X3	❖ Listed on the JSE ❖ Sources, develops and distributes unique, quality products in the house wares, exercise and fitness, health, DIY, automotive, education toys and personal comfort categories.
X4	❖ Not Listed on the JSE ❖ It is the leading clothing, footwear and textiles retailer in South Africa with a market share of the South African clothing and footwear market nearly twice that of their nearest competitor
X5	❖ Listed on the JSE ❖ Provides portfolio of branded and generic medicines and has a strong presence in over-the-counter brands. It is one of South Africa's largest suppliers of hospital and critical-care products and supplies established brand name consumables and equipment to medical, research and servicing pathology laboratories

Table 3: Descriptions of Organisations Used in the Study

The top IT executives or senior managers were selected as the researcher believes they could shed optimal light on activities related to the adoption of RFID in their respective companies. Upon identifying the relevant participants, appointments were made with them for the interviews.

A meeting room in the offices of the participants was booked for the interview as it was convenient and easier for them without having to travel. Some of the interviews were also conducted at a mutually agreed upon time and place with the participants. The interviews with the participants were scheduled for 30 minutes to 1 hour.

All the interviews were face-to-face. The process for all the interviews followed the same pattern. Setting the scene initially, the researcher took the time in explaining what the research was about as well as the aim and the role the interviews played in the whole study. Subsequent to that, the participants were asked if the interview could be recorded, and were given a consent form for their acknowledgement and signature. All participants agreed to have the interview being recorded and subsequently signed the consent form. If there were no questions from the participants or anything to be clarified, the researcher then proceeded with the interview questions and elicited the information from the participants' responses to the questions. The interview was open ended and this allowed the participants to reveal their underlying concepts and statements about the status of adoption of RFID technology in their companies. The researcher also took notes while the interview was being undertaken to help bring into memory questions that needed following up as well as todescribe some of the background factors that were absent from the recording like facial expressions, gestures, tone of voice and general body language (Henning, Van Ransburg and Smit, 2004). In the course of answering the interview questions, any participant that needed time to think or to break for some time was permitted. As the interview continued, the researcher also tried to summarise some of the conversation from the notes that had been made to try to assist the participant to have a full picture of what had been discussed. At this time, concepts that were not clear from both parties (interviewer and the participant) were explained and clarified. The researcher also kept a constant eye on the recorder during the process to ensure it was functioning properly. Towards the end of the interview, the researcher started rounding off by enquiring if there was anything the participants still wanted to add to the conversation. If they had anything more to add, they were allowed to do so without any coercion. After that, the participants were thanked for taking their time out of their busy schedules to participate in the interview.

After the interview process, the transcription of the conversation was done by the researcher on the same day when the conversation was still very fresh in memory.

3.5.2 Interview Schedule

An interview schedule (Appendix A) was designed containing all the research questions that were used to extract the required information from the respondents. This schedule was employed to serve as the foundation for conducting the face to face interviews. This allowed the researcher and the participant to have full discussions and ensured that all the interview questions were covered and any further probing done to add quality to the research. The use of this interview schedule functioned as a guide to structure the interview process and help ensure that the same themes were explored with all participants making the interview more systematic and comprehensive (Silverman, 2000).

Research Question one from the interview schedule seeks to answer the adoption status of retail companies in South Africa. Question two is focused on how cost, complexity and technology competence affects or can affect RFID adoption in South Africa. Question three examines how RFID technology could impact labour in South Africa when adoption fully happens. Question four investigates how competitive pressure brought about by the likes of Walmart in the South African retail sector can influence companies to adopt the technology. Question five looks at how government support could help harness the adoption of RFID technology.

The interview schedule was also used to help maintain the interview purposes by minimising digression into trivial conversations.

3.6 Data Analysis Method

The data analysis strategy involved the systematic application of logical techniques to illustrate and describe, summarise and compare data at hand (Strauss, 1987). Yin (2003) refers to data analysis as that which involves "examining, categorizing, tabulating, testing or otherwise recombining both qualitative and quantitative evidence" to address the initial propositions of a research study. Analysis commences when the first data is collected and the analysis then guides decisions related to further data collection (Burger, 2003). The analytical process steps for this study were iterative as is the case for most analysis of qualitative studies (Kotlarsky and Oshri, 2005). Common themes were identified in participants' descriptions of their perceptions and motivations of the companies they represent with regards to RFID technology adoption.

After the interviews were transcribed, the following steps were followed to analyse the data as suggested by Thorne, Kirkham and MacDonald-Emes (1997) and Ajjawi and Higgs (2007):

Step One: Immersion

This step involves organising the data set into texts, doing iterative reading of texts and preliminary interpretation of texts to facilitate coding. Qualitative data might be in different forms such as video recordings, audio recordings, focus groups or handwritten field notes. Nearly all qualitative research studies include some degree of transcription (Lacey and Luff, 2007). Since the data collected for this study was mainly audio recordings, it needed to be transcribed to texts to assist in preliminary coding of the data. The audio recordings were translated verbatim to text by the researcher except for the exclusion of names and other identifiable materials. This assisted in preparing it for easy reading of texts leading to the initial interpretation of the data. After transcription, the data were organised into more meaningful sections. For example, all the interviews were labelled with a number and field notes were also broken up into sections by context. All the interviewees were given "code numbers" in order to desist from the use of real names. Paragraphs were also labelled clearly with a number in order to facilitate linking back any unit of text used to its original context.

Thorne et al. (1997) suggest that researchers continually read and immerse themselves into the data before coding, classifying or attempting to link the data. This immersion helps in comprehending the overall sense of each data collected and may be guided by questions such as "what is happening here?" and "what am I learning about this?". The researcher read and re-read all the written texts (Interview transcripts and field notes) for each and every participant to become very acquainted with the data set. The audio recordings were also listened to repeatedly to ensure that all ideas were successfully captured and matched against any field notes written to gain a good impression of the data. Summaries were also done at this stage before the formal analysis began.

Step Two: Abstraction

This step was iterative and a lengthy process which began during data collection. It involved determining ideas expressed by participants in their own words or phrases. These ideas identified were categorised and linked back to the research questions of the study. This was done for one participant and consequently used to code for the remaining participants, with a constant process of inspection for appropriateness and completeness. No new codes emerged from examining transcripts of other participants. The researcher's understanding of the participants' ideas was checked with the participants by rephrasing ideas raised in previous sentences or phrases to ensure that there is clarity of those ideas by the researcher and the participants during the interviews. This made it easier in assisting the

researcher by providing a richer and deeper understanding of the participants' perceptions and motivations about the phenomena.

This step also included the generation of ideas based on the researcher's theoretical and personal knowledge. Here all the ideas were assembled into meaningful units to illuminate the various significant aspects of the phenomena as it is perceived. The understanding and the analysis of every interview transcript was utilised to form a picture of that participant's data in entirety, which then enlightened the understanding of each transcript such that a richer, deeper understanding of the phenomena evolved. The researcher also used this data to understand each participant's view and to look for any connection between the participants. Thus, at the end of this step, all significant text materials were grouped under each relevant idea in order to answer the research questions.

Step Three: Synthesis and theme development

This step involved the drawing together of themes and sub themes from the results of steps one and two of the analysis. The results from the previous two steps were grouped together under the concepts identified by the theoretical framework underpinning the study. The sub themes were further elaborated and their relationships illuminated by reading and re-reading all the transcribed data. This step required the researcher to continuously move back and forth between the literature, the research data and the earlier analysis (step one and two). Where two or more sub themes seemed to be explaining or meaning the same thing, they were merged and managed as a single category under a major theme. The data was reduced and sifted by the researcher to detail what was really occurring. From this process the interpretation of the research phenomenon of understanding the South African retailers' perceptions of RFID adoption reasoning evolved. This detailed analysis of the data assisted in discovering meaning that the participants attributed to ideas or concepts.

Step Four: Refine Themes and Sub Themes Identified

Step four of the data analysis involved improving and refining the sub themes identified to ensure that all the patterns were checked and re-checked at this stage. One of the important things done in this step is exploring the relationships between themes and sub themes to establish that they do really deserve to be categorised under one umbrella. If it made sense to remove a sub theme off a major theme that would be done, but was not necessary in this study. Also as new insights emerged, the themes were then refined to include the new ideas discovered. This gave rise to the development of meaningful

themes and sub themes which were then critiqued by the researcher and the supervisor with a final review of the literature for key developments that could impact on or increase our understanding of the phenomena.

Step Five: Draw conclusion

This step involved making the conclusion based on the findings of the analysis done in steps one to four and reporting the final interpretation of the research findings. In the subsequent chapter (chapter 4), the results and the findings will be discussed.

Figure 6 below displays the steps used in the data analysis strategy.

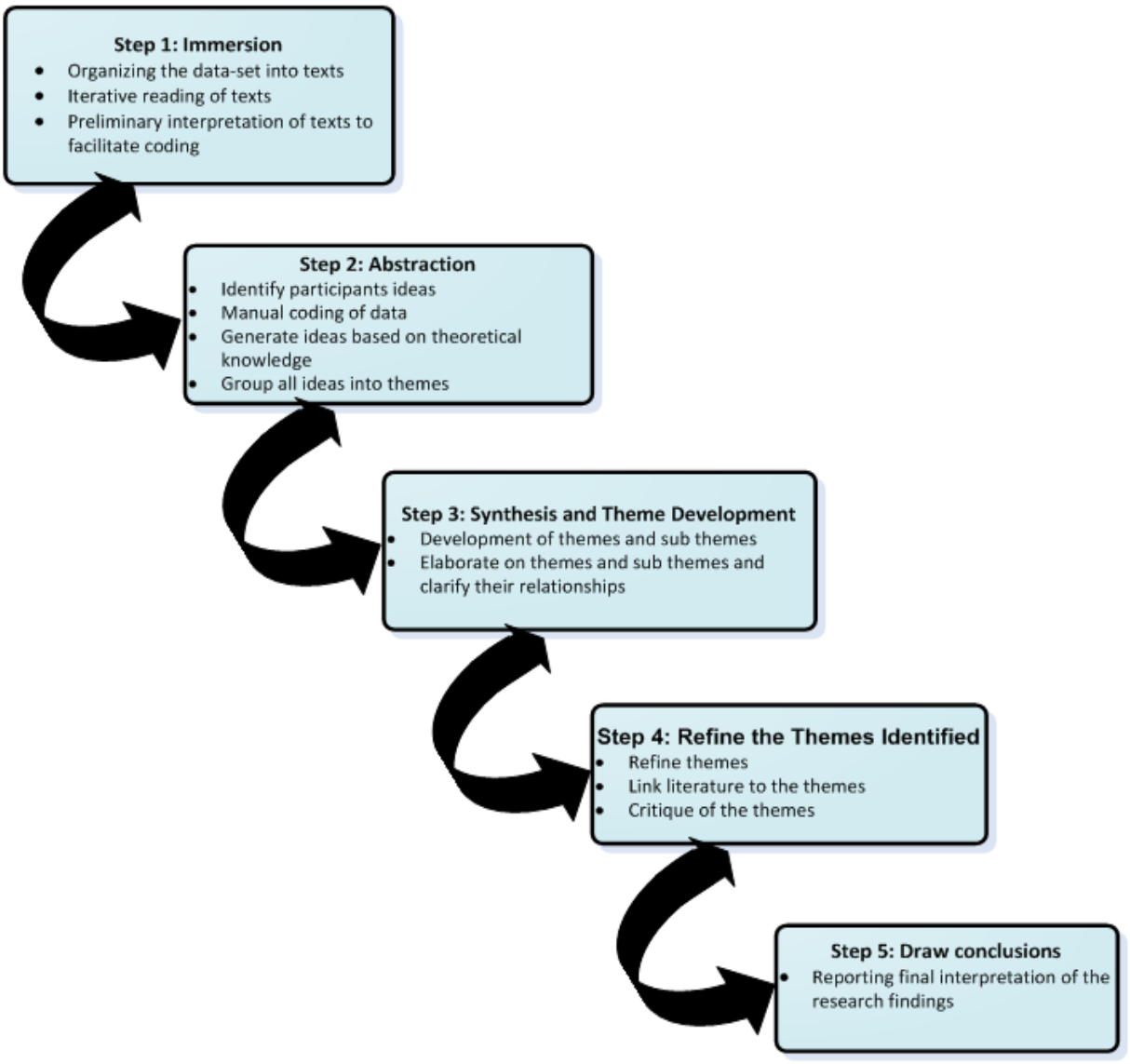

Figure 6: Data analysis strategy. Adapted from Ajjawi and Higgs, 2007

Some of the major themes that were explored came from the TOE framework and includes the impact of cost, complexity and technology competence on RFID adoption, support from the government, competitive pressure and the impact of RFID on labour in South Africa. Another major theme also arose from the research questions highlighting the adoption status of retail organisations in South Africa. The other sub themes under their respective major themes are listed in table 4 below.

Cost	Complexity	Technology Competence	Impact on Employees	Competitive Pressure	Government Support
technology is expensive to implement	technology will not be too complex to implement	some skills available but not all the skills to implement RFID	number of employees will stay the same	competition can spark the adoption process	uncertain as to the role of government
technology is seen as additional cost	business process needs to change	skills to be supplemented	no changes at all in the number of employees	don't want to implement and push extra costs on consumers	government to put in place standards
cost of tags expensive	might be a bit complex for early adopters	outsourcing	no reduction in compensation benefits	lagging behind competitors	supply chain network needs to communicate
cost of acquisition	no integration challenges expected	training	Likely process changes	organisations want to see some gains from others who have adopted before they will be convinced to follow	government to assist a standardisation body
cost of scanners		do not see shortage of skills as a hindrance	roles and responsibilities likely to change	supply chain partners implementing the technology is key	
cost of training		infrastructure available		competitors implementing the technology first are not considered to be threats	
the cost of pilot study is high					
errors could be costly					
financial loss					
affect replenishment					
stock count will not be accurate					
impact on health of consumers					
reputational damages					

Table 4: Resultant Themes

3.7 Validity and Reliability

To increase reliability in this study, a tape recorder was used as the primary tool to capture all the details resulting from the interviews. The collected data from the interviews were transcribed and checked and re-checked for verbatim transcription of interviews and thereby raising the validity of the data collection. Respondents were not asked questions in a manner that influenced them in a way which endorsed a particular response (Mehra, 2002). Further, the researcher refrained from focusing on particular viewpoints when observing respondents as this endangers the impartiality of the study. Also field notes were kept and all conversations recorded to minimise the researcher's subjectivity in the analysis of the data.

The data collection was done personally by the researcher and ensured that respondents were really listened to and their views recorded accurately. The researcher believes that RFID technology will be a good technology for retailers in South Africa to adopt as it promises advantages that go beyond barcode technology and could stimulate economic growth if properly implemented. However, the researcher is of the opinion that South Africa is not yet ready for a full blown RFID implementation as this could have some impact on labour which could worsen our already high unemployment rate. Also, not all companies can take advantage of the enormous amount of rich data generated by the technology. Despite the researcher's bias towards the above statement, more was done with the interviews and the analysis of the data to ensure validity.

Regular consultations were also held with the researcher's supervisor as a critical reader to discuss the results to improve validity. The researcher ensured that respondents who were knowledgeable about RFID technology and knew their organisations' position on the technology were sourced.

"Triangulation is a validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study" (Creswell and Miller, 2000). The researcher employed a systematic process of sorting through the data to uncover common themes or categories by excluding overlapping areas. The researcher also provided corroborating evidence collected through the interviews using the tape recorder, written notes and documents from pilot projects conducted to locate major and minor categories. These assisted to increase the validity and reliability of the study.

3.8 Ethical considerations

Participants were initially emailed with the information sheet (Appendix B) explaining what the research was about and also to seek their consent for participation. The researcher's number and email address were made available should participants want to ask any questions about the research project or confirm their participation. After two weeks, the participants who did not respond were called telephonically to see if they would want to take part in the study. Participants who showed interest were asked to read and understand their rights before signing the consent form to be interviewed for the study.

Participants were informed that any information given would be confidential. Confidentiality was achieved by making certain of participants' anonymity and not including their names or their affiliated companies in the research report. Further, during data collection pseudonyms were introduced to avoid using real names of participants and companies they represent. Information given for the purposes of the study will not be used for any other purpose.

The research data will be kept as per the regulations of the University of Witwatersrand. After that, all data used in the study and in the researcher's possession will be destroyed.

The participants for this study were empowered, educated people who were likely to understand what this research was about and could make contribution to this study. By partaking in this study, their (participants) jobs were not in any way threatened.

3.9 Conclusion

This chapter commenced with a summary of the research questions and then explained the research paradigm employed. It highlighted the sampling, source and method of data collection and interview schedule. It detailed the data analysis strategy that was used to analyse the data. Validity and reliability as well as ethical considerations were also discussed in this chapter.

The next chapter discusses how the research data collected will be analysed using the data analysis method depicted in chapter 3.

Chapter 4: Presentation and Discussion of Results

4.1. Introduction

The previous chapter discussed the research methodology adopted in this study. In particular, it highlighted the strategy for analysing the research data collected. In this chapter, conclusions will be drawn from the data analysis and the findings will then be discussed portraying the perceptions of participants about the phenomena studied.

4.2. Discussion of Results and Findings

This section presents and discusses the results after the data was analysed.

4.2.1 Research Question One: RFID Adoption Level

The adoption level of RFID was analysed by asking participants if their companies had implemented the technology. None of the organisations interviewed had as yet implemented the technology. A Statement like "*RFID has not been adopted in our business" (interview_X1 Paragraph (P) 2 line 4)* demonstrates this. Another participant pointed out that they "*haven't really gone into the adoption of the technology" (interview_X2 P 1 line 1)* portraying the low adoption of the technology in the retail supply chain sector in South Africa. All the participants indicated that none of their competitors have set the ball rolling as yet on this technology. Even though organisations appeared very interested in the technology, there was no evidence of any immediate plans in place to adopt the technology as compared to some of their retail counterparts in the USA and Europe. For example, Walmart became one of the drivers of the technology in the retail space in the USA and have currently implemented it whereas in Europe, Tesco from United Kingdom and Metro in Germany have made good progress in the implementation of the technology.

One organisation had conducted a pilot project in one of their futuristic stores for almost a year but ended the project before they could formally bring the project to a successful end. This participant also indicated that one of their competitors had also completed a pilot project on RFID. Documents from the pilot project were sourced to help with analysing the research data and drawing up conclusions. Two organisations had not formally discussed the technology and had resulted in investing in other technologies such as blue tooth and robotics that they felt were going to give them the edge that they require. However, the data indicated that these two organisations knew about RFID to the extent that they even had some of their members on RFID conferences and also were aware of the prices of tags (passive and active) before opting to invest in other technologies. The other two organisations had

formally discussed the technology and were at the information gathering stage to see what other competitors were doing. It was not clear as to what their next step was going to be since there were no strategies in place to move forward. The following statements highlight this point "*there is no formal strategy yet" (interview_X5 P2 Line 2)* and "*there are no plans to implement this technology yet" (interview_X3 P1 Line 1 -2)*.

The level of adoption of RFID technology by retail supply chains in South Africa differs from one organisation to another. The one thing these organisations have in common is being at the level where RFID is not considered and implemented. Of those interviewed, only one out of the five had conducted a pilot. This does not appear to demonstrate any commitment on the part of the organisations to implement the technology at the moment. This however does not mean that they are not interested in the technology and don't want to implement it. They seem interested in the technology but, it appears there are some constraints preventing them from having a successful implementation of the system. Some of the main constraints identified include cost (at several levels) and standards which will pave the way for integration across the retail supply chain. It can therefore be concluded that the adoption level of South African retail supply chain is very low based on the sample considered.

4.2.2 Research Question Two 'A': Cost

The cost associated with RFID technology was probed by asking participants two main questions. The first one focused on whether the cost of RFID is prohibitive for organisations in implementing the technology. The second one asked participants how costly errors in an RFID-based work system could be.

Whenever cost was mentioned, there appeared to be some uneasiness in the faces of the participants signifying their discomfort with the current cost associated with the technology. All participants stated the cost of the technology as one of the reasons for not adopting it.

Some of the organisations are of the view that they have already heavily invested in technologies for scanning and tracking so the cost of RFID technology will be an additional cost. This is evident in what one participant said,

> "*... we have a barcode scanning along the production lines to scan so your RFID tag is an additional cost which would not benefit us inside our network because we have got the infrastructure and the systems in place that track products from one side to another" (interview_X1 P5 line 1)*.

Another participant also indicated that

"*we have facilities for scanning and tracking so to implement RFID, the cost of the tags must come down otherwise it would only be an additional cost that would not just make sense for our business" (Interview_X5 P1 line 11-12)*.

The above statements give the impression that companies who have massively invested in other technologies might find it difficult to adopt RFID technology unless the cost of the technology becomes reasonable for their businesses and they find a good reason to implement it.

The cost of acquiring the technology emerged as one of the impediments to the adoption of the technology. One participant had this to say "*I think its the start up cost firstly, I mean to get everything kick started is very costly at this stage" (interview_X4 P6 Line 1)*. Another participant noted that "*acquiring the technology is also costly" (interview_X2 P2 Line 4)*. Even though the cost of tags is declining, it was recognised as one of the factors closely monitored by retailers since item level tagging is currently too costly for all supply chain partners. The following statements highlight this point,

"*I know the RFID tags (passive tags) were almost R2 each at that stage when we did the pilot and that was last year"* and again "*compared to the tickets we use at the moment, R2 is heavy because the current price of the ticket we use is around 70c a ticket" (interview_X4 P6 lines 1 and 6)*.

Another participant emphatically mentioned that "... *the cost of the tags and the scanners are a bit steep at the moment" (interview_X3 P1 Line 1-2).*

The data shed light on the cost of implementation and how it is affecting the adoption of the technology. It was stated by one participant that

"*the biggest cost is with the implementation of the technology, in terms of the impact with the current business processes, the synergy between RFID and current technologies and processes, and also training staff on how to use the technology and compliance" (interview_X2 P2 lines 1-3)*.

Another noted that

"*The implementation of RFID is a big investment and the priority for such a project is lower than other projects. So in terms of the expenses, they will rather be spent on things that are going to give you an edge in the retail environment and RFID does not really give you an edge that you have not already got" (interview_X1 P6 lines 7-10)*.

The other participant also revealed that *"... just to do one pilot store, the cost alone for that was about a million Rand just to get that store and kick it started with all the required stuff with all the software" (interview_X4 P1 lines 11-13)*. These statements go to show that the retail supply chain partners perceive the cost of implementation to be expensive to implement not only in monetary terms but also in terms of their business processes as well as the up skilling of employees to use the technology in their environment. The data also indicated that some retailers appear not to implement the technology because they view RFID as not giving them any particular advantage that they have not already got over their competitors.

It also became apparent in the data collected that organisations selling or producing high end goods and getting high profit margins on products are more likely to adopt the technology than organisations selling not so expensive goods with lower profit margins on products. One participant stated emphatically that

> "*We are selling boxes of biscuits and things like that where cost contained and everything is key because we are competing against competitors increasingly bringing products from China so we are always looking to reduce the cost everywhere we can and tags are the last thing we want to put on products" (interview_X1 P3 Line 5 -6)*.

Another indicated that

> "*No one cares if you put tags on a bag of chips or not, but for expensive goods like some of our products, it might be worthwhile to put tags on them since you will be able to recover your money easily" (interview_X3 P2 Lines 2-3)*.

Another pointed out that

> "*It's fairly expensive currently and not cheap enough for our products. We are going to use RFID per product, per pack size, per palette size. So to put an RFID tag on each and every product and every pack would be costly due to the margins we are making out of our products" (interview_X5 P1 Lines 4-6)*.

The above statements confirm that if an organisation's profit margin on products is low, they are more likely to play the wait and see game until the prices of tags and other equipments become affordable for their business. Further, organisations selling expensive products could find the means to implement it and get the customers to accept the increase more easily than the others selling low priced goods.

It was generally agreed that errors in an RFID-based work system could be very costly. Wrongly tagging products could lead to financial loss and affect how organisations replenish stock. One participant stated that:

> "*If you tag a garment with the wrong item serial number, you basically through your whole system going to think you sold a red shirt when in the meantime you actually sold a blue one. So accuracy is very important to ensure that when you tag your garments, the right information is attached to the tag that goes with the garments. This is because it actually influences in the end, your replenishments. So if you think you are selling the red t-shirt but actually selling the blue shirt because you've got the wrong ticket on, it's actually going to mess you up because you are going to replenish red when in the meantime you are running out of blue. So accuracy around having the right ticket on the right garment is key because the whole system runs around the items. So if you have the wrong tag on the item, you won't know that you are selling the wrong stuff, so its very important to make sure its accurate with the system" (interview_X3 P10 Lines 1-10)*.

Another indicated that by making mistakes in an RFID-based system, "*Stock count will not be accurate and could also lead to customers not paying the right amount at the point of sale. This could also have reputational damages for our organisation and all that" (interview_X3 P2 Lines 1-2).*

There could also be an impact on health of consumers and reputational damages depending on the environment an organisation operates. This is what one participant had to say

> "*in our environment, it's not only about cost, it's also about the impact, for instance if we put wrong tag on wrong product, a consumer or pharmacy can get a wrong product, if a pharmacist is not wide awake, they can issue a wrong product to a customer. So it is more about the impact on the user in terms of using wrong product than anything else. ... It might be dangerous if you get a wrong product for your condition" (interview_X5 P4 Lines 4-10)*.

It appears like working with RFID technology requires accuracy like any other system out there. The consequences of making mistakes in tagging the wrong item could have a devastating effect on organisations.

The data emerging from these interviews confirm my suspicions and confirms what the literature said, that cost is a major factor that negatively influences the adoption of RFID technology.

4.2.3 Research Question Two 'B': Complexity

The exploration of complexity associated with RFID implementation was done by asking participants to compare RFID to a recent technology they have implemented and indicate how complex they perceive RFID to be. They were also asked how complex they perceived RFID in integrating it with other existing applications.

In terms of the complexity of RFID compared to other systems implemented in these organisations, most participants (four out of five interviewed) indicated that the technology would not be too complex to implement. A statement like

> "*I don't think it would be that complex, because currently we use a lot of bar code scanning and 2D scanning, lots of scanning and technology in our warehouses, factories to track products based on the label on the product. So to us using scanning technology to read RFID tags, it won't be that difficult, and all our factories are wireless enabled" (interview_X5 P5 Line 3-7)* confirms this point.

Another participant who had conducted the pilot study had this to say about the pilot project and the complexity of RFID,

> "*in the beginning I thought it was very complex but once we got into it, it was actually no different from any other system. But your business needs to have a mindset change. They need to understand that this technology works a bit different so once you get that understanding it's not that different from any other process" (interview_X4 P11 Line 1-3).*

The above statement highlights the need for process changes in a company that wants to embark on RFID adoption. It appears that the changes in business processes to be implemented are where the complexity might lie and not the actual technology. It is also interesting to note that organisations are not sure of how complex these changes would be since some of these complexities in business processes could arise when implementation commences. As most of these organisations have not even conducted pilot projects, it makes it harder for them to estimate the exact magnitude of changes to be made in their organisations for the technology implementation.

Regarding the integration of RFID to other existing applications or systems, most of the participants (three out of five interviewed) stated that it would not be complex to integrate RFID to their existing applications. It was stated by one participant that "... *based on the software I saw, probably not too complex, but you going to have to do development so you have to understand how the interface from the device (scanner)*

interfaces into the system" (interview_X4 P12 Lines 1-3). This is what another participant had to say on the same statement,

> "*I don't see a problem with integrating RFID with our existing systems, because our systems are oracle, it's like SAP, and our readers have already been designed to take in RFID technology tags or information so there won't be a problem" (interview_X5 P5 Lines 13-15)*.

The above statements go to show that the organisations do not perceive RFID to be that complex to integrate into their existing applications although some technical developments will have to be done in interfacing the technology into the organisations' existing technology.

Although there were initial concerns about complexity, this study suggests that complexity will not hold back the implementation of RFID technology. This finding contradicts what the literature suggested and my own suspicions as well.

4.2.4 Research Question Two 'C': Technology Competence

Technology competence was partly investigated by asking participants if their organisations had the necessary skills to implement RFID. If they answered that they did not have the skills, they were then asked how they were going to source the skills needed to accomplish the task. Further, they were asked how these skills could block them from implementing the technology.

It emerged from the data that none of the organisations had all the skill set in-house to implement the RFID technology but were considering developing it. They all made mention of supplementing their skills base with outsourcing (through vendors and contractors) to get the needed skills to implement their IT projects. These vendors and contractors are then required to assist in training internal staff members to implement the technology within a given time period on their own. One participant elaborated on this saying

> "*we do have some skills that could help with the implementation but as this is a new technology in our country, we are going to have to outsource a big part of the implementation to companies with more knowledge and they will in turn help with training" (interview_X2 P8 Lines 1-3)*.

Another also noted that "*We do have some of the skills on board. We might have to train them a bit on the new technology, but I don't think it's something we would worry about so much" (interview_X5 P7 Lines 6-8).*

When asked as to how these skills could block their implementation of the technology, it was generally mentioned by all participants that they do not see the skills as a barrier in preventing them from adopting the technology. The data collected revealed that through the use of vendors and contractors, organisations are very confident that they would have the necessary skills to implement the technology without being an impediment to their entire process. One participant had this to say,

> "*I don't believe there will be any blockages for us because of the skills. If the skills are not available internally, they will be outsourced from companies who have the needed skills" (interview_X3 P6 Lines 4-5)*. Another noted that "*if we really want to go for RFID, we'll find the skills. We can get it from India or wherever because in India there's lots of expertise, skills in RFID" (interview_X5 P8 Lines 3-4).*

Another question was also used in assessing technology competence. This question concerns how organisations are prepared in terms of their IT infrastructure to host the technology. Most participants indicated that their infrastructure will not need a massive upgrade to successfully host the technology. The look on the faces of most participants was very cheerful when answering these questions, suggesting that they are quite comfortable with their current level of infrastructure. The following statements highlight this point

> "*our current infrastructure will be able to handle the new technology but we also need a good look to see where we need to upgrade and where we need to bring in new systems or software" (interview_X2 P9 Line 1-2)*
>
> and "*we don't have to invest massively from an IT point of view" (interview_X5 P9 Line 2)*.

Another participant also indicated that "*based on what I saw with our pilot project regarding the point of sale interface, I don't think it would have been a lot for us to upgrade" (interview_X4 P14 Line 2-3).*

It is interesting to note that organisations have the physical infrastructure in place but not the skills in their internal staff to implement the technology and have to possibly resort to using and relying on vendors and contractors to help them with the adoption.

It became apparent from the research data that technology competence will not influence the adoption of the technology. This finding contradicts what was suggested by the literature even though the organisations do not have all the skills internally to implement the technology successfully on their own. This finding is also inconsistent to my initial belief as I thought this factor was going to be a hindrance to adoption but the results indicated otherwise.

4.2.5 Research Question Three: Impact on Employees

This question was analysed by asking participants of the impact this technology was likely to have in the number of employees required. They were also asked how employee compensation could be altered due to the use of this technology.

The data revealed that there was not going to be much change in the number of employees required if the technology was implemented. Some participants indicated that there were not going to be any changes at all in the number of staff required if the technology came into effect. Statements such as "*you will still need the same number of people, it would probably make their lives easier with certain functions*" (interview_X4 P18 Lines 3-4) and "*the number of employees would stay the same, it wouldn't exactly spike*" (interview_X5 P16 Line 5) confirm this. Another indicated that the impact in the number of employees would depend on the organisation's system architecture. The participant went on and explained that

> "*If the system is very distributed, then you might see regional increases in staff. If it is centralised, then it will be a small increase in the number. In the manufacturing sector where the tags get put on the products, there is not going to be a lot of impact on production" (interview_X1 P18 Lines 1-4)*.

No participant made mention of any decrease in the number of staff if their organisations were to implement this technology. The lack of impact on staff has an advantage in terms of Unions not being a threat to the adoption of RFID.

Regarding the compensation changes that could be brought about by this technology, the data threw more light on the fact that there would not be any employee compensation structure changes if this technology is to be implemented. One participant stated that

> "*I would not see any reduction in compensation benefits, even in the future skills sets, they would have a way of achieving what they need to achieve, so it's a balance that we need to maintain. Obviously some policies might need to change in the way we remunerate and compensate employees and all those things. So there will be changes and alignment to our new processes" (interview_X2 P15 Lines 1-5)*.

Another also recounted saying "*I don't think the compensation would change it's just the processes that will change" (interview_X4 P19 Line 3)*. The above goes to show that business processes that could assist in the implementation of the technology could need changes but the employee compensation structures in organisations are likely to remain the same.

Since there is no impact in the reduction of the number of staff if the technology is implemented, it appears that the companies have no big incentive to move into adopting the technology.

Whilst there is no expected saving in staff costs for organisations, there could be savings in product loss due to theft, more efficient replenishment and many more that it appears they can enjoy from the technology. It is also evident from the data that it is likely there will be no opposition from the unions during adoption and implementation since the technology is not likely to impact the number of employees.

The data emerging from the study indicated that there will not be any impact on the employees or their remuneration if this technology is implemented. This means that Unions are not likely to hinder the implementation of the technology.

4.2.6 Research Question Four: Competitive Pressure

With this question, participants were asked as to how competitive pressure was going to influence their organisations to adopt RFID. Participants were also asked how their companies would react if their competitors adopted the technology.

The research data indicated that competition could help spark the adoption of RFID technology in the retail supply chain of South Africa. This push for adoption could be due to the fact that organisations might not want their competitors to implement and leave them behind. One participant had this to say

> "*I think competition would be a good thing to launch RFID in the retail sector because at the moment, a lot of companies are looking at ways of saving cost to make their products more competitive especially in recession environments instead of adding cost. This is because you don't want the consumer to pick up the price tag as a result of the new technology. The customer does not want to hear such things, he/she will opt to buy another product" (interview_X1 P16 Lines 5-10)*.

Another noted that

> "*I would think that pressure could be something to drive companies to adopt, especially if you are a big company and your competitors are already doing it. This is because if the technology ends up working well and there are efficiencies, the customers are going to switch to competitors" (interview_X2 P13 Line 2-5)*.

It appears that organisations are afraid to implement as it might force them to increase the prices of product to the advantage of other competitors who have not yet implemented the technology. If that happens, customers will be more likely to switch to competitors who have not yet implemented the technology and as a result have not increased prices of their products.

Moreover, it looks like organisations do not also want to lag far behind their competitors when implementing the technology as if it becomes successful for them (the rivals), their customers might switch to them. This makes it very interesting because it appears like organisations do not want to move too quickly in implementing the technology and they cannot also be too late to implement it behind their competitors.

When asked about how they will react if their competitors adopt and use RFID to gain competitive advantage over them, some stressed that the gain by competitors through the technology will determine whether they should also implement it or not. It was noted by a participant that

> "*it depends on the gains that the technology is bringing to the other company. We need to see some gains or pressure. So if it does bring gains or positives then the pressure will come and we might be forced to react" (interview_X2 P13 Lines 11-13)*.

Others were of the view that if the supply chain partners like the retailers and their competitors were implementing the technology, then they were also going to implement it. This is what a participant had to say

> "*If the competitor is doing it and the retailer can cope with it, we would be silly not to do it. It just makes handling, tracking, traceability, receiving, sending of goods so much easier. But there is no use doing it if it just stops at our door" (interview_X5 P15 Line 2-5)*.

The results from the data show that if an agreement can be reached between the suppliers and the retailers to embed the technology in the supply chain, then there could be a high possibility of adoption happening in that supply chain. It also appears that competitors implementing first do not seem to be regarded as threats as it was perceived the increase in costs might affect their sales until such time that they get some gains from the technology. This contradicts the notion of first mover advantage and consequently contradicts the literature on this view.

4.2.7 Research Question Five: Government Support

Government support was investigated by asking participants what government could do to encourage the adoption of the technology in the country including introducing policies such as tax cuts, incentives and more to help organisations to adopt the technology. There was a mixed response with regards to government's involvement in the adoption of the technology. Three out of five participants were uncertain as to the role government can play in helping organisations to adopt the technology. This was indicated in the following responses from participants

"*I am not sure as to the role of government in such a system. Because for them to be able to play a major role, they'd need to have a vested interest and be able to have stakeholder interest. In my opinion, I don't see how they fit in" (interview_X2 P10 Line 1-3)* and

"*government's role in the adoption of the technology is not very clear as I believe this technology will be mainly driven by private organisations because government is not geared towards writing technological hand books*" *(interview_X3 P7 Lines 2-4)* demonstrate this fact.

On the other hand, some participants were of the opinion that government could help set standards to ensure the smooth adoption of the technology. One participant had this to say *"The problem is that it's your supply chain network that needs to talk and that will probably be a standard that will have to be put in place by government" (interview_X1 P12 Lines 2-3).* Another noted that "*government can assist a standardisation body, for instance if there's a SA bureau of standards/ Council for Scientific and Industrial Research (CSIR)" (Interview_X5 P10 Line 3-5)*. The idea of standardisation appears very appealing but then one participant indicated that enforcing these standards could be difficult as only 52% of the retail market in South Africa is formal and the rest is all informal. It also became apparent from the data that the retail supply chain has a fragmented network which is currently a barrier to the supply chain partners in implementing the technology.

It looks like the government can get involved to help set standards for the technology that can assist the supply chain partners in reading the tags coming from the suppliers to the retail shops. The standardisation could also include the sharing of the cost of the tags since it is currently a very sensitive issue with the suppliers who do not want to bear all the cost of the tags since it has benefits for everyone in the supply chain network.

None of the participants was in favour of the government using policies such as tax cuts, incentives and more to motivate the organisations to adopt the technology. One participant says it best "*if there were tax cuts or any other gains, it could be appealing, but to us it's not that, we'd be doing it for ourselves since we can increase efficiencies, customer experience and many more" (interview_X2 P11 Lines 3-5)*

It is interesting that the retailers see a role for government perhaps, in setting standards yet in other industries such as medical claims processing, different companies have managed to get together to define standards for their industries. Therefore, government support can be very influential in the adoption of RFID and is also consistent to the literature and other findings especially from developing countries.

4.2.8 Other Findings

From the responses of participants and the data analysed, standards emerged and was cited by two of the participants as being one of the barriers to adoption. Organisations felt that the government's role could be helping bodies of knowledge in setting up standards that can guide the adoption of retail supply chains. This appears very important because if organisations implement different standards of the technology, it could be difficult for both suppliers and retailers to read the same tag and share similar systems. This could have the potential to deny them of all the benefits the technology promises. Additionally, organisations felt government should help enforce the policies around the standards that would be set and also control the informal retailers so that they do not benefit at the expense of the formal retailers who are paying the most tax in that sector. It appears that this is the role that organisations would like the government to fulfil and not so much of helping them in terms of acquiring the technology.

It appears that for organisations to realise the full value of the technology, they would require wide adoption among the retail trading partners. By this, the stronger organisations with larger financial resources at their disposal within the supply chain would have to encourage other smaller or weaker organisations in the same supply chain to motivate full adoption across the supply chain otherwise it would not yield the needed benefits for them if they go at it alone.

It also became apparent that retailers source their products from various places within the country, other African countries, Asia and other places. Some participants were concerned that they might not be able to tell their suppliers to put the tags on products. This could mean that the retailers have not yet

reached the stage where they can decide to command their suppliers to comply with the technology like Walmart and other powerful retailing giants have done.

One participant also made mention of the unwillingness to use the technology as one of the barriers in addition to what has been discussed already. It appears that this could be one of the key things for organisations as they prepare to adopt the technology in future.

4.3. Conclusion

This chapter presented the results and findings of this research from the data that was analysed. The researcher made use of five basic steps to analyse the data collected; immersion, abstraction, synthesis and theme development, refining the themes and sub themes and drawing conclusions. It was found that cost, government support and standards influenced the adoption of RFID technology. Competitive pressure was also found to be influential if trading partners could adopt similar standards of the technology within the same supply chain. Complexity and technology competence were found to be of no influence in the adoption of the technology.

The next chapter details the conclusions of the study, considers the limitations of the research and suggests potential areas for future research.

Chapter 5: Conclusion

5.1. Introduction

Chapter 4 summarised, analysed and presented the findings of the perceptions of South African retailers on the adoption of RFID technology. This chapter applies the TOE framework to the findings. The structure of this chapter is as follows: Firstly, it covers the main findings of this research study in relation to the literature review, and discusses the possible answers to the research questions considered in this study. Secondly, it presents the contributions of this research. Thirdly, it discusses the limitations of the study and also suggests the recommendations for future research endeavour. Finally, the overall conclusion to this research report is provided.

5.2. Main Findings

This study was exploratory in nature and did not seek to answer or confirm any particular hypothesis but looked for patterns and ideas to understand the phenomena under scrutiny. It focused on gaining a deeper understanding of South African retailers' perceptions about Radio Frequency Identification (RFID) technology adoption. By and large, it was aimed at understanding RFID adoption in the retail sector in South Africa coupled with some of the challenges faced by the retailers in adopting RFID technology in their organisations. Five participants across the retail supply chain were interviewed and the data collected were analysed with the support of the Technology, Organisation and Environment (TOE) framework governing this study. The TOE framework has been broadly employed in studying RFID and other technologies and was therefore deemed appropriate for this study. It provided three perspectives (Technology, Organisation and Environment) in which to understand the adoption of RFID technology.

The results indicated that no retailer in the sample considered had as yet implemented RFID technology except for the pilot by one organisation. This finding is in accordance with the findings from Brown and Russell (2007) in terms of implementation when they carried out their study in 2005. As several years have gone by, it was expected that by 2013, there would have been some progress made in this area but the data suggested otherwise. On the other hand, there was progress in that one organisation had conducted a pilot project and one interviewee knew of another organisation that had also piloted the technology. Brown and Russell (2007) found no evidence of any pilot study conducted by any organisation in 2005 so this gives the impression that organisations have begun to think about adopting

the technology although, they appear not to have any concrete plans in place for immediate implementation.

The rest of the discussions will be based on the different arms of the TOE framework pertaining to the research questions that were explored in the study.

The technological aspect of the framework addressed how cost and complexity influence the adoption of RFID technology in South Africa. It became apparent from the data that the cost of acquisition and implementation was one of the key barriers deterring the retail supply chain partners from adopting the technology. Organisations perceived that the start up costs and the costs of tags and scanners were too expensive for their businesses. It was noted from the research data that, implementation costs were believed to be one of the biggest costs. This included the impact on business processes, training of staff and the integration to existing technologies. These findings were consistent with what Wang et al., (2010) found with cost being one of the factors that was holding back the enterprise adoption of RFID technology in China. Perhaps organisations could also be afraid that investing heavily in the technology might reduce profits and, if that happens, they might not be able to keep their heads above water. Bottani and Rizzi (2008) accentuate that the implementation of RFID is still not profitable for organisations belonging to the following business categories; manufacturing, distributors, and retailers of the fast-moving consumer goods supply chain. This might help explain the hesitance on the part of the retail supply chain in South Africa, not implementing the technology until it makes enough sense for their businesses.

The results also indicated that errors in RFID such as putting the wrong tag on a product could be very costly which could lead to financial loss and affect how organisations replenish. It was further revealed that, depending on the environment one operates in, there could be impact on the health of consumers and reputational damages if errors are not avoided.

According to the participants, RFID technology will not be too complex to implement and also to integrate with existing applications. This finding is consistent with what Brown and Russell (2007) found in 2005; that organisations were confident of implementing the technology easily. However, this finding contradicts what Wu and Subramaniam (2011) found. They concluded that adopting RFID is more difficult than other innovations and the complexity of RFID significantly reduced the likelihood of RFID adoption. It was expected that RFID would be a complex technology to implement considering that it is

in its infancy the technology is not well-known by many organisations in South Africa. Yet, participants were confident that their organisations could implement the technology without any major setback.

From an organisational perspective, this study investigated technology competence and impact on employees. With regards to the technology competence, the outcome of the analysis showed that organisations do not have the needed skills internally to implement RFID and will have to resort to outsourcing to vendors and consultants to supplement the limited skills they already have in-house. The organisations believed that the vendors and the consultants would help with skill transfer. It was expected that the shortage of RFID skills internally and externally could affect the adoption of the technology since the technology is still in its early stages especially in South Africa. Nonetheless, participants believed that the lack of skills in their organisations would not be a hindrance for them to adopt the technology. This finding is inconsistent with Brown and Russell (2007) who found technology competence to affect RFID adoption in the South African retail sector. Research done by Wang et al., (2007) was in agreement with the researcher's finding in that they found technology competence not to influence RFID adoption in China.

The results from assessing the technology's impact on employees revealed the participants' opinion that, if the technology was implemented, there would be no undesirable consequences for employees. Most participants agreed that there could be a slight increase in the number of employees required. This finding contradicts some of the reasons cited by companies in Europe and US for adopting the technology. One of the main drivers for companies who have implemented RFID technology is the overall saving opportunities the technology offers, which includes the reduction of labour costs (Attaran, 2007). It is clear from the research data that the retail supply chain in South Africa does not see any reduction in labour costs from implementing the technology. This could be one of the reasons why they are not motivated enough to adopt the technology as they perceive the technology not to make any difference in the number of employees required to operate their businesses, even after implementation.

It also became apparent from the research data that employee compensation will not change but the business processes around roles and responsibilities could change to accommodate the demands of the technology.

The environmental perspective of the study looked into competitive pressure and government support to assist in understanding how they might influence the adoption of this technology.

The results from the investigation of competitive pressure suggested that it is likely to influence the rate of adoption of the technology if retail supply chain partners can adopt it and derive benefits from it. This could push other retail partners in that space to quicken their adoption and not get left behind. Quetti et al., (2012) are in agreement with this finding and emphasize that competitive pressure strongly influences companies belonging to the same supply chain to adopt RFID technology. At this point in time, there appeared to be little pressure from retail supply chain competitors. This could also help explain why organisations have not done pilot projects or made concrete plans to adopt the technology in the immediate future. They believe their competitors and their trading partners are not yet ready to implement and leave them behind.

There were mixed responses when it came to the matter of government support for the technology in the retail supply chain sector. Some organisations did not think it was necessary for the government to intervene while others believed that the government could help set standards to help alleviate any confusion when it comes to implementation. It appeared that the involvement of the government could only be in setting up policies with regards to the technology implementation and that is where their influence would end. These policies could drive the adoption not only in the retail space but for all organisations belonging to different business segments in the country. Hossain and Quaddus (2009) cited insufficient government concern and support as one of the reasons organisations were not adopting RFID in Bangladesh. Government support was also mentioned by Wang et al., (2010) to be one of the significant drivers for RFID adoption in China. The above shows that government support can be influential in the adoption of RFID technology.

Standards emerged strongly as one of the inhibitors of the technology indicating that it could be considered as a factor to be investigated in future research.

5.3. Additional Contributions of the Study

This section focuses on the contributions of the study of methodological and practical significance for academics and IT professionals.

5.3.1 Methodological and Theoretical Implications

This study has made a contribution to existing body of knowledge of RFID by using qualitative methods supported by the TOE framework to illuminate the understanding of RFID adoption that incorporated technological, organisational and external factors.

Further, this study supports the applicability of the TOE framework in assisting to understand various IT adoptions in the context of a developing country. Although this study did not yield any new factors that had not been identified before, it ensured that a rich explanation was given as to how the factors considered in the study influenced the adoption of RFID in the retail supply chain sector in South Africa.

This study adds to the literature emanating from developing countries with regards to RFID adoption and closes the gap in knowledge about RFID in developing countries.

5.3.2 Practical implications

One of the practical aspects of the research is that it has enhanced the understanding of RFID adoption in South Africa in the retail supply chain sector. From this, practitioners can be in a position to understand the adoption status of organisations in the retail supply chain in the country. Organisations can use this research in making decisions as to whether they should be making urgent plans or have medium to long term future plans for the technology. This is important especially now that we have companies doing pilot studies to assess the feasibility of the technology.

This research highlighted some of the main factors blocking RFID adoption in the retail supply chain sector in South Africa. This can assist retailers to know the challenges that they need to overcome when planning to adopt RFID in their businesses. As the cost of tags and other RFID related equipment is also declining, organisations could decide the best time to implement, when the cost of the technology makes sense for their businesses

RFID has been tipped to replace or complement barcode technology in the retail supply chain environment. Retailers can now see the likely role of government in assisting the setting of standards that could ensure consistency in the supply chain and possibly ignite the adoption of the technology among the retail partners who could be interested in implementing RFID in the supply chain in the future.

The South African retailers through this research can understand the usefulness of employing RFID in their businesses, assisting them with replenishing, product assortment, cost reductions through reduced stock theft, foster good communication with retail supply chain partners, ensure good customer shopping experience and many more that the technology has to offer. By this, they could also be staying relevant in the competition against global competitors and not lag behind.

RFID goes beyond the borders of a single organisation. The difference with RFID is that it requires a network as the benefits are not properly realised if only one company adopts the technology. The benefits fully emerge when several companies in the supply chain get involved. With this, the retailers could be enlightened to understand the importance of ensuring that their supply chain partners get on board to ensure full benefits across the entire supply chain. This could also trigger more partners to want to join once they see the benefits emerging from the technology.

5.4. Limitations of the Research

There were several limitations in this study. Firstly, the results emanating from this study only reflect South African perspectives; different cultural and environmental contexts could generate different results.

Secondly, the sample used in this study was not representative. Five retail organisations were involved due to limited time to complete an elaborated research report. Nonetheless, the study did make use of some of the largest retailers in the country who are listed on the JSE (with one exception) and headquartered in the Gauteng province. These organisations would typically be considered as technology leaders or early adopters in the retail sector due to their prominence and the resources available to them. There is, nevertheless, a possibility that, smaller organisations excluded from this research sample might be dedicated to using RFID to facilitate their existing operations.

Thirdly, due to the nature of a masters' study, the research data were coded and sub themes identified by the researcher and the results of the analysis then discussed with the supervisor. This process maintained the consistency in the method employed, however, it failed to give rise to multiple viewpoints from a larger group of people with varying expertise.

5.5. Future Research

Since this research was conducted using mainly organisations listed on the JSE and headquartered in Gauteng Province, a potential direction for future research could look into repeating this study for retail organisations in different Provinces or perhaps across the entire country.

Future research could focus on how the tag cost could be shared among the suppliers and the retailers as this was mentioned as a concern that might impede RFID adoption. The research might uncover the

frustrations of suppliers that can be dealt with by a governing body of RFID in South Africa to pave the way for successful adoption in future.

It is recommended that further research be undertaken to establish how the formal and informal retail markets might be controlled when standards are set by the government or any governing body in South Africa for RFIDs. Not ensuring uniformity across the supply chain could hold back the adoption of the technology.

Future research could also focus on the extent to which elements of the supply chain outside of South Africa might end up influencing adoption of RFID technology in the country. This is important because some organisations are getting products from many diverse places that might help ignite the use of RFID technology, if those companies decide to adopt and implement RFID.

Research could be conducted to ascertain whether bigger companies that are more powerful and command more of the supply chain are in a stronger position to implement RFIDs than others in the retail sector of South Africa.

It would be valuable for an investigation to be carried out to establish in what ways and to what level business processes are likely to change as a result of the adoption of this technology. This is important as the complexity of implementing the technology might lie in the business processes and not the actual technology.

5.6. Conclusion

The Technology, Organisation and Environment framework was used in an exploratory study to provide a deeper understanding of South African retailers' perceptions of RFID adoption. A sample of senior managers from five organisations headquartered in Gauteng Province contributed to the study. Four of these organisations were listed on the JSE and one was a non-listed company. The research data was sourced during open ended interviews with the participants guided by an interview schedule. All interviews happened at the premises of the participants.

The research set out to explore the adoption status of retail companies in South Africa. Cost, complexity, technology competence, competitive pressure and government support were also discussed to establish how they influenced RFID adoption. The study also investigated the technology's anticipated impact on labour.

One of the significant findings to emerge from the study is that the adoption level of retail organisations in South Africa is very low. The evidence of the study suggests that only one organisation out of five had done a pilot study.

Of the three umbrellas of the TOE framework considered, the environmental context factors had the most important influence on the adoption of RFID in the retail sector of South Africa. For instance, it was found that government could assist in terms of setting standards. Standards emerged as a critical part of adoption as it enables consistency across the supply chain. However, the mixed formal and informal nature of the retail market in South Africa makes it tricky for government or any governing body of RFID to enforce standards across the entire retail segment. Another arm of the environmental context was competitive pressure which brought out very interesting outcome. Contrary to expectations, organisations do not see implementing RFID technology first to have any competitive advantage, unless it is properly embedded in the whole supply chain and some gains have emerged from it. This finding contradicts the concept of first mover advantage in the literature.

The environmental factors were followed by technological factors in order of importance of influence. The evidence from the study suggested that, costs associated with acquisition and implementation of the technology served as a barrier preventing organisations from fully making commitment to implement RFID. Complexity was considered to have no influence on the adoption of the technology.

The results however, enhanced our understanding that complexity might lie in the business processes to be implemented and not the actual RFID technology.

The least influential factor on the adoption of the technology was organisational factors. Technology competence was not expected to influence the adoption of the technology. It is surprising to see that although organisations do not readily possess the skills to successfully operate the technology, they do not acknowledge it to be a hindrance to their adoption.

The expected impact of the technology on employees was twofold. On the one hand, organisations did not expect savings in staff costs and so savings was not motivating them to adopt. On the other hand, the fact that it is not likely to impact on who gets employed or their remuneration means there is less chance of opposition to the technology, especially from the Trade Unions, if and when it gets adopted.

In closing, it is likely that RFID could become the chosen supply chain technology in future retail systems. However, there appear to be challenges that need to be understood and resolved before it can be widely adopted and implemented by the retailers in South Africa.

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Appendix A: Interview Questions

Interview Questions for Research Question 1 (Level of RFID Adoption)

Question
What level of RFID adoption is this organisation at? Answer suggesting No Implementation Have you discussed RFID? Has there been any pilot study? What planning is in place? Answer suggesting Yes Implementation Is there any documentation regarding your implementation of the technology?

Interview Questions for Research Question 2

Interview Questions Related to Cost

Question
Is the cost of RFID prohibitive for your company to implement the technology? If Yes or No , Please Elaborate
How costly do you think errors in an RFID-based work system could be?

Interview Questions Related to Complexity

Question
Think of a recent technology that was introduced. Comparing this to RFID technology, do you think RFID will be complex to implement? Why or why not?
How complex do you think RFID will be to integrate with other existing applications?

Interview Questions Related to Technology Competence

Question
What skills will be required for this technology to be successful in your organisation? Do you have these skills? If No: Would you outsource or train employees to get these skills? How are these skills going to allow or block your organisation from successful adoption of the technology?
Is your IT infrastructure equipped to host the technology? Will there be a lot of upgrading required to get it ready for the technology?

Interview Questions for Research Question 3

Question
What could government do to encourage the adoption of the technology? Would policies such as tax cuts, incentives and more from the government encourage you to adopt the technology?
How will a strong awareness program by government influence your company to adopt RFID?

Interview Questions for Research Question 4

Question
Is competitive pressure going to influence your company to adopt RFID? What are your competitors doing?
How will your company react if its competitors adopt and use RFID to gain competitive advantage?

Interview Questions for Research Question 5

Question
Do you think this technology will have any impact in the number of employees required?
Do you think employee compensation may be altered due to the use of this technology?

Appendix B: Information sheet

Dear Sir / Madam

Details on the Researcher

I am a Masters in Commerce Information Systems student at the University of the Witswatersrand. One of the requirements of the degree is the completion of a research report. I would be very pleased if you would participate in an interview which forms part of the data collection of this research report.

Aim and objective of the study

This study makes use of qualitative methods to provide a deeper understanding of South African retailers' perceptions of Radio Frequency Identification (RFID) adoption.

Aims:

- To enhance understanding of RFID adoption in the retail sector in South Africa
- To assist in understanding the challenges faced by retailers in adopting RFID technology in their organisations.

Objectives:

- To understand the status of adoption considered by retail organizations in South Africa regarding RFID technology.
- To understand the extent to which costs, complexity and technology competence are going to influence the retail organizations in South Africa to adopt RFID technology.
- To understand how government support would influence the adoption of RFID technology in South Africa
- To understand the extent to which Walmart's decision to trade in South Africa is going to influence local retail competitors to consider the technology.
- To understand the impacts anticipated on employees in the retail space in South Africa

Additional notes.

All responses will be kept confidential. No information that could identify you will be included and no names or contact details will be in the research report. Upon completion of the study, all materials of the study will be kept in a secure location. The result of this study will be detailed in the research report.

If you choose to participate in the study please fill in your information on the form below and contact me. You can contact me telephonically on 073 533 6142 or via e-mail at Bernard.Sarpong@students.wits.ac.za

Your participation in this study will be greatly appreciated!

Kind regards,

Bernard Sarpong (Researcher).

Acknowledgement of Informed Consent

This form confirms that I have read and understood the Information Sheet for this study. Additionally, it confirms that I will take part in an interview, and the researcher may (with my permission), record the interview.

I consent to participating in this study entitled:

"Radio Frequency Identification Adoption: South African retailers' perceptions"

I understand that participation is voluntary and can also withdraw from this study at any time.

Signature of Respondent _____

Signature of Researcher _____

Appendix C: Interview Data

Interview Transcription for X1

Me: Introduction of RFID to the participant

P1

X2: In terms of where i come in, i work for field marketing shared services within the XXX company. Our role is to make sure that the product we produce land in the right place and also represent them properly on the shelves. Our shared services is the part that touches retail environment the most and i think that is why i was chosen to speak to you. I have been in the retail or FMCG marketing for about 12 years now. It has only been in a technical capacity but during that time have sat in RFID conferences for a little bit so have got a fair good insight in terms of the technology and all that so hopefully i can answer all your questions. Unfortunately, i do not have all the insight in terms of all the business unit.

Me: I am not interested in all the strategies of the other business units but with your level of knowledge, i think you are the best person to speak to. What i really wanted to know is whether any of your retail companies or associated companies have adopted the technology

P2

X2: Not really. I think the main or let see, i suppose the adoption for companies like us will be at the palette level tracking: to track palettes leaving the factory to the Distribution Centre (DC) or to the store so that the palettes get to the right store and at the right time and also for billing purposes of tracking mainly. So RFID has not been adopted in our business really. The adoption across manufacturers has not really been widespread and we are certainly not using it because our network (retail supply chain network) is so fragmented so we don't share systems with the retailers.

Me: so you don't share any system with the retailer?

P3

X2: No. So it will be fine tracking the palettes from our factories to our DCs and leaving the DC but there, the tracking stops. So for that part of the supply chain, the cost of the technology and implementation does not justify the benefits. It is also down to the product level as you know that the tags are a bit too expensive. I think that has been a long argument especially and in our products, we are selling boxes of biscuits and things like that where cost contained and everything is key because we are competing against competitors increasingly bringing products from China so they are always looking to reduce the cost everywhere we can and tags are the last thing we want to put on products.

Me: With that said, have your company discussed it in any way?

P4

X2: probably been discussed in part. Not that i am aware of. There are investments in other technologies that can save time and money like robotics rather than RFID

Me: Alternatives?

P5

X2: Yes. Also we have a barcode scanning along the production lines to scan so your RFID tag is an additional cost which would not benefit us inside our network because we have got the infrastructure and the systems in place that track products from one side to another. It is mainly when it leaves your production facility or your DC to other places that tracking really helps. I think in the US, Walmart has certainly made use of that model very well because the network is so collaborative, retailers are talking and your ordering systems, your EDI systems and things like that are much more closely linked so for them its a benefit but for us, there are no benefits. I think probably, most manufacturers have the discussions and park the technology so as to keep pace with everybody else. They are on committees and workgroups for keeping pace with everybody else but there is not much progress in terms of implementation.

Me: that is really insightful cos a research was done a couple of years ago and the results indicated that retailers were interested in using the technology

X2: of course retailers are interested

Me: i will like to ask more on the cost. How is the cost prohibitive for your company implementing the technology?

P6

X2: ok so, you have cost at several levels and let me explain something about the logistical difficulties. For instance a palette, we don't own the palette, so if you take the palette, the palette does not come back to you. What happens is that there is a company called CHEP and this company owns the palettes and not all retailers are on CHEP's palette system. If RFID is implemented, we will lose a lot of tags as in, a lot of tags will not come back to us and it will be a consumable rather than an investment. You need the infrastructure put into your DCs and factories to track. You need the system to be put in place. So the implementation of RFID is a big investment and the priority for such a project is lower than other projects. So in terms of the expenses, they will rather be spent on things that are going to give you an edge in the retail environment and RFID does not really give you an edge that you have not already got. May be if it was the case of getting your edge of your retail systems talking to the manufacturers, then it could work. In terms of the size of the cost, i cannot say, it could be millions of Rands. For us we have got about 4 or 5 DCs around the country, we have got equal number of manufacturing plants and if you think about the RFID requirements, you need to put a harness at every exit and control point and you need to wire it up to a system. The system needs training etc etc so it becomes quite expensive in that aspect. If you think about the value of our goods, its relatively low per palette compared to other goods like fridges and microwaves etc so the cost of the technology does not make sense for adoption. Also a

lot of food manufacturers face the same dilemma. If you talking about expensive products like fridges and electronics, then it makes sense because you have got expensive items. From that point, i think it makes it easier.

Me: very interesting. Supposing that your company decides to go for RFID technology, how do you see it to be similar or different to other technologies already implemented?

P7

X2: if my company is to put in a technology, i think the benefits of the company will be around reverse logistics. Reverse logistics is a pain because people receive products and they reject it because the products are wrong or the quantity is wrong or the types are missed or do not arrive on time. The reverse logistics of checking that could probably be useful because you could check the palette without having to manually do it. you just have to drive your pallets through and you will know what is on the palette, so from reverse logistics point of view, it will make a lot more sense. Also potentially short dated stocks ; stocks that are going to expire would be useful but that will mean that we will have to put tags on the products and that will add quite a bit of cost because, i think they were talking 50c or 20c a tag and just by adding 50c to a bag of chips does not make sense. But at palette and case level, it could make a difference.

ME: given your organisation's current infrastructure and skill set, do you think RFID will be complex to implement in your organisation?

P8

X2: Not really. My company has always worked with partners and i think most of the big organisations do that as well. So we will seek out partners that are specialist in implementing the technology

Me: that means outsourcing?

P9

X2: Yes. A lot of the outsourcing will be done i suppose at the physical level and at the reader level and the subsystems will obviously have to be built in and that will have to be consulted to have the modules in and the training around that so most of it will be outsourced in terms of speciality but the people managing that could be in house so the application and tags etc. The biggest problem is the support network, your bodies of knowledge like ECR, CCNGSA and i don't know what the body of knowledge of RFID is. ECR has been trying to establish norms in the industry for a very long time and they will have to get involved because everybody will have to agree on the sequencing of numbers and number formats and standards and things like that because none of those standards exist for retail as yet.

Me: so you think standards are one of the biggest issues for the technology?

P10

X2: it is one of the issues. Remember i talked about the supply chains? The supply chain needs standard governance beause if we send palettes to pick and pay and we are using our own coding sequence, they will not be able to read them or they will read them and not be able to sense out of it. so all of those standards are part of the problem as well. I think any company doing it now will be an early adopter and early adopters always pay a lot of money and they bleed.

Me: is your technological infrastructure at the level that can host the technology at the moment or is it going to need a lot of upgrading for it to cope?

P11

X2: i think there will have to be a small upgrade because you know, you look at ERP system with the current needs in mind so its all about user entry base and there have not been any thought put into it and suddenly, there is going to be a machine that puts in stock movements for you based on RFID tags so the frequency of RFID transactions are much more higher so we will have to upgrade our infrastructure like bandwidth, network etc

Me: If we are to say RFID has a lot of advantages to give to retail companies, what role do you think government can play to help retailers to adopt the technology

P12

X2: i think as i said, the bodies of knowledge, ECR, CCNGSA they would probably need backing by government. The problem is its your supply chain network that needs to talk and that will be probably be a standard that will have to be put in place by government. However, the enforcement of the standard will be difficult because how do you enforce it? especially if you look at our market and the demographics of the market, only about 52% of the market is formal retailing and the rest is not formal so the benefits of the technology disappears. If you are tracking down products, then you could have different advantages but surely, the government needs to control waht type of information is on the tag and when the tag is switched off. So the government will have to backup with legislation especially in the protection of privacy. This is because, you don't want to take products home off the shelves and ppl knowing what you have bought. But as to getting industries to talk, i don't know if they can have much benefits there (government and private companies). Certainly the protection of the information, there needs to be laws passed around it.

Me: so assuming that the legislation around the technology and everything is concluded, how can government motivate companies to go the RFID route?

P13

X1: i think it is an interesting question. If you think about government's role in business, they are there as gate keepers for framework and policies, the bodies of knowledge which are your user communities

are generally. So the government would not necessarily help somebody wanting to get into RFID but they would write a legislation that would not prevent people from sharing their knowledge like some monopoly thing. I suppose government will not want to invest in the technology to become expert otherwise we will have another TELKOM situation. So what they need to do is to help write rules about sharing information, infrastructure and certain frequency ranges and then your bodies of knowledge will then engage with user communities and the rest of the stuff.

Me: gave an example as to how the government is helping cattle farmers to invest in the tgechnolgy and is motivating more and more farmers to adopt the technology. Could a similar thing be applied in South Africa where the government can come in to help retailers to adopt the technology?

P14

X2: it depends on the government, let just say we have a problem with milk like Kenya had a problem with powdered milk imported from China, then the government can give directive that all milk products should have RFID attached so and it means this, that we the government will give a tax break or something like that. Once again, they are driving policy rather than implementation. This could be a tricky thing as well , because there could be a manufacturer who proiduces a small number of milk so in this case, forcing them to put RFID could put them out of business (potential job loss). They will need to think about how this will be done. Definitely, places like Australia is a much different environment to South Africa. The initiation of RFID could be good for example if governemtn is to put RFID on needles and stuff like that for the general population to preotect the population from abuse of system, then by all means, it is advantageous and makes perfect sense.

Me: in other words, government must have interest in the technology to sercve a specific purpose before they would come in to play a role?

P15

X2: correct. So what the government can do is to use business benefit to leverage on the infrastructure to benefit society but, it would not really matter if the government scans biscuits or not.

Me: how is competitive pressure going to force your company to adopt the technology? For example, we have Walmart who has just taken over MASSMART and they are well known for implementing the technology in the United States

P16

X2: I think it will force a lot of the manufacturers because WALmart would be our customer and the actual changes will happen at the manufacturing sector. The customer competition would drive a change in the business foe example, Walmart can say that they will not buy from anyone unless they have an RFID Palette. This could force us to get RFID palette because they are our customers and we will not want to lose them. Picknpay will also have to copy that model and so on. I think competition would be a good thing to kickstart RFID in the retail sector because at the moment a lot of companies are

looking at ways of saving cost to make their products more competitive especially in recession environments instead of adding cost. This is because you don't want the consumer to pick up the price tag as a result of the new technology. The customer does not want to hear such things, he/she will opt to buy another product. In this case the guy who does not have RFID will score cos he woiuld be able to make great operating profit. So if everybody has to put in RFID, everybody will be in the same boat and no other retailers could take advantage. Other than that, at the moment there is no need for RFID and we are not doing it. unless you are looking for internal operations efficiency and savibng money due to theft or missing stocks.

To give you an example, one company wanted to introduce biometrics applications inside the shops and in return, the other companies would buy the data generated from this system from the company implementing this technology. This data was going to tell the companies as to whether their staffs were checking in and out appropriately and many other benefits but this technology has not gone anywhere because no one wants to pay the extra money.

Certain products are specific to certain markets so by implementing the technology, if by any chance would result in higher prices for the consumer, then we will not do because we will lose business as the consumer will switch to other products.

Me: what about the number of employees required?

P 17

X2: RFID is pretty much an automative system so you would need small increment only at the system administration area but these resources are generally expensive so your labelling and the boxing like that gets automated. So the impact on staff would be a temporary one during initial adoption

Me: increase in the number of employees needed?

P18

X2: this could be due to the architecture of the system. If the system is very distributed, then you might see regional increases in staff. If it is centralised, then it will be a small increase in the number. In the manufacturing sector where the tags get put on the products, there is not going to be a lot of impact on production.

There could be impact on staff if business implements the technology and is not able to keep its head above water. In this case, some employees may be let go.

Alternatively, if RFID is a benefit, then we won't see any major shift in employee reduction

Interview Transcript for X2

Me: what level of RFID adoption is your organisation at currently?

P1

A: we haven't really gone into the adoption of the technology. I'd say that we are at the research stage, where we are trying to gather more information about the technology. So we haven't really implemented the technology.

Me: So by research phase, do you mean pilot study, that has been done?

X2: No, we are starting with reading around the technology and stuff.

Me: So do you have any specific documents that you are currently looking at?

X2: we have more documents on the groundwork done by our research department

Me: thank you very much.

In your opinion, what could be the cost implications for your company?

P2

X2: the biggest cost is with the implementation of the technology, in terms of the impact with the current business processes, the synergy between RFID and current technologies and processes, and also training staff on how to use the technology, compliance. Those are the cost implications we can foresee at this time, but I think others will crop in as it has been implemented. Also acquiring the technology is also costly.

Me: to re iterate, you mentioned acquisition and implementation being the main costs involved, as well as training. Am I correct?

X2: yes.

Me: is it training in itself or are you also talking about support? Support in the sense that if an employee has run into difficulty, there can be people who can come in and help give clarity to the employees so they don't do wrong things.

P4

X2: in terms of the training, obviously with any new technology, it has to be very well entrenched within the company. And once everyone is on board with that, it can be taken to the people. But obviously, we'll get the highest company to come and help us train the people onsite.

Me:

Talking about acquisition right now or what are you talking about?

X2: that is the training of the staff.

Me: are you talking about outsourcing? How will the training part be done?

P5

X2: the training part will be outsourced to a company that has the special skills because this is a new technology which is also quite new in our country as well. So we don't foresee a lot of people will have the knowledge, we'll outsource the training and probably also the after sales service. And any other issues we'll outsource that too until our own employees are up to par to be able to handle it on their own.

Me: think of a recent technology that was introduced in your company. Comparing that to RIFD, would you think that RFID will be complex to implement?

P6

X2: i think every technology is different in its own complexity. The issue with RFID is that its still in its infancy in the country. So what could be complex now might not be complex in 10 years time. So I'd say it would be a bit complex.

Me: so are you saying it might be a bit complex in the first few years?

X2: yes, initially it might be complex but if we do it now, and another company does it in 10 years time, the complexity might not be the same. Also because of the awareness that has to be done.

Me: so in other words, it will be complex for early adopters?

X2: yes, for the first movers.

Me: thank you. So how difficult do you perceive RFID to be in terms of integrating with the existing technology?

P7

X2: that is something we will try and figure out. We are not sure as to what changes would need to be made. But it would seem like it might not be too complex to integrate with the current technology that we have. But i cant say with much certainty.

Me: thank you very much. In terms of skills needed to implement the technology, do you think your company has the necessary skills required?

P8

X2: not at this moment. we do have some skills that could help with the implementation but as this is a new technology in our country, we are going to have to outsource a big part of the implementation to companies with more knowledge and they will in turn help with training. We will work together with the outsourcing company, but some of the work will be done in-house. Hopefully do a skills transfer once the work is completed.

Me: so will these skills have any impact in your company successfully implementing the technology because of the outsourcing you are going to do?

X2: i don't think there will be any blockages. If we don't have any skills they will be outsourced. So we can always get assistance and integrate with our own and see how it goes.

Me: is your IT infrastructure in a position to host he technology, will it need a massive upgrade to host this new technology?

P9

X2: our current infrastructure will be able to handle the new technology but we also need a good look to see where we need to upgrade and where we need to bring in new systems or software. But once we are done with the studies we will see what needs to be changed accordingly, but so far we see no major issues.

Me: what could government do to encourage the adoption of the technology?

P10

X2: am not sure as to the role of government in such a system. Because for them to be able to play a major role, they'd need to have a vested interest and be able to have stakeholder interest. From my point, i don't see how they fit in.

Me: for example, in Australia, the government is driving the adoption of RFID in the farming industry , since they are one of the biggest producers of beef around the world, the government has instituted this so the farmers could save money and minimise disease breakouts. Before then, When there are diseases, they tend to spread and affect their income which in turn affects the GDP. So the government is driving the technology and helping the farmers in identifying the livestock that are sick. Those are some of the advantages that could be found. In the retail sector, we could implement it and by so doing stimulate economic growth, and if the government sees an opportunity in that area, they might be in a position to advocate that retailers go that route as there could be efficiencies.

If there were policies that tax cuts or incentives from government could it help retailers to adopt the technology?

P11

X2: i guess its something that the government needs to think about as well because i think it's also an education issue as well. Once they are more knowledgeable about the technology then they can think about more ways to boost the adoption of the technology. But if there were tax cuts or any other gains, it could be appealing, but to us it's not that, we'd be doing it for ourselves since we can increase efficiencies, customer experience and many more.

Me: you mentioned education in the part of government, so if government were to run awareness programs, do you think that could help?

P12

X2: i think it starts with government themselves. If they see the need then they will drive the adoption. Otherwise it will be driven by private businesses, but currently I don't think they have fully understood the need. The awareness would come after they have grasped the magnitude of the technology and where they fit in as government. Then can really work together with businesses and investors.

Me: how is competitive pressure going to influence your company in adopting the technology?

P13

X2: in the business world you have to adapt else you get left behind and you die or slow down. You have to take cognisance of what is happening. I would think that pressure could be something to drive companies to adopt, especially if you are a big company where your competitors are already doing this. This is because if the technology ends up working well and there are efficiencies, the customers are going to switch to competitors.

Me: are you saying that you are aware of what your competitor are doing?

X2: of course, that's part of the game, you have to keep an ear on the ground, to know the trends, what competitors are doing.

Me: that's a very insightful one. In other words, in your opinion, how will your company react assuming that one of your competitors adopts RFID with a view of gaining competitive advantage?

X2: i think it depends on the gains that the technology is bringing to the other company. We need to see some gains or pressure. So if it does bring gains or positives then the pressure will come and we might be forced to re-act.

Me: in your opinion, what impact do you think this technology will have on the number of staff required. Once it is fully implemented, will there be any increase or decrease on number of staff.

P14

X2: i think it depends on the structure of the company and business processes. But as a company, we care about our environment and our employees. So I wouldn't say there will be job losses. But there will be efficiencies. So where there will be changes in skills sets we will have to find a way of redeploying those employees within other areas. But we can't say for sure where skills will be lost and where they will be needed more.

Me: will the technology help in altering employee compensation of any kind?

X2: i don't understand the question.

Me: as in now that efficiencies are being created in certain parts of processes, are employees going to be compensated for achieving the overall employee targets since the technology is going to help them do things more efficiently and faster.

P15

X2: we do have employee compensation policies in place. I would not see any reduction in compensation Meefits, even in the future skills sets, they would have a way of achieving what they need to achieve, so it's a balance that we need to maintain. Obviously some policies might need to change in

the way we remunerate and compensate employees and all those things. So there will be changes and alignment to our new processes.

Me: thank you that was insightful.

I appreciate your time. If you require a transcript of the recording I can send to you so you can preview.

X2: thank you, I wish you well in your research.

Interview Transcription for X3

P1

Me: has your company or its subsidiaries implemented RFID?

X3: No we have not yet implemented it because the cost of the tags and the scanners are a bit steep at the moment

Me: Have you at least discussed it in your company?

X3: Not really. I don't think we have discussed it but we do know about the technology but there are no plans to implement this technology yet.

P2

Me: i know you have mentioned cost but how is the cost prohibitive for your company in adopting the technology?

X3: it really plays a major role in adopting it. The cost of the transponders is very high and cannot be good for our business. No one cares if you put tags on a bag of chips or not, but for expensive goods like some of our products, it might be worthwhile to put tags on them since you will be able to recover your money easily. We have invested in blue tooth and it is working nicely for us at the moment. RFID could help in our warehouse but we are highly deterred by the price of transponders etc.

P3

Me: how are errors in an RFID based system? For example, you want to track boxes of cutlery and instead of putting their correct tag on, you place their tags on a box of tooth paste.

X3: Stock count will not be accurate and could also lead to customers not paying the right amount at the point of sale. This could also have reputational damage for our organisation and all that. We do not want to make such mistakes here as it carries a negative perception of our company. It is imperative that we get things right when implementing RFID otherwise, you may as well stick to your barcode and other technologies, laughed a bit here.

P4

Me: comparing RFID to some of the technologies your company has implemented already, how complex do you think RFID is compared to the systems implemented?

X3: RFID would not be too complex to implement. it could be a bit more than the ones already implemented as it touches various aspects of the organisation but i don't think it will be so complex in a way people have made it to be.

P5

Me: what about integrating it into existing applications? How do you think it could be?

X3: we need to understand the interface and how it will be developed and integrated. This is where your vendors and contractors can help to understand and also train people in the organisation for us to be successful.

P6

Me: do you have all the skills to implement the technology?

X3: I will say that we have got some of the skills but not all of it as we have not yet got to it.

Me: how could these skills block your organisation from implementing the technology?

X3: I don't believe there will be any blockages for us because of the skills. If the skills are not available internally, they will be outsourced from companies who have the needed skills

Me: How is your infrastructure prepared to host this technology?

X3: we may need a small upgrade and not a major one. We have already invested in IT infrastructure so I don't see us spending too much on this. In other words, we are more than 70% prepared for the technology but the problem is the cost and the standards in the country

P7

Me: that is very interesting. How can government help companies to adopt the technology?

X3: government's role in the adoption of the technology is not very clear as I believe this technology will be mainly driven by private organisations because government is not geared towards writing technological hand books.

P8

Me: if the government introduces tax cuts for companies wanting to implement, do you think that could help?

X3: tax cuts are always attractive and nice but one needs to do this for the right reasons. You cannot for tax cut reasons adopt such a system without ensuring that it would make a difference in your organisation. In my opinion, tax cuts will not make any difference.

P9

Me: thank you for your honest opinion. How is competitive pressure in this environment going to force your organisation to implement the technology? For instance, if Homemark is your competitor and is implementing the technology?

X3: competition is always a delicate issue. In this case we will wait till such time that more of the technology is known cos we cannot throw a lot of money at something that is not very well understood by us. We will wait and see how the early adopters do in this space and then we can respond. The tricky part is knowing when exactly to start implementing so that the company does not lag behind.

P10

Me: that was a very insightful response. What impact do you think this technology will have on changes in the number of employees required?

X3: We do not anticipate any changes in the number of employees required to do our day to day operations. We may need a few more employees to help the project but no job losses are expected to occur.

Me: meaning you are not going to have to face opposition from the Unions when you implement?

X3: Yes. Dealing with the Unions can be a hectic process so in this case, I do believe that they could even be on our side to implement the technology if it would help employees do a better job and not fire them.

P11

Me: ok cool. How do you think employee compensation would be altered due to the use of this technology? For example, before implementing the technology, it used to take employees 5 hours to take stock. Now when the technology is deployed, it could take them like 3 or less to do the stock taking. Do you think because the technology helps them to do their jobs faster, their compensations would change?

X3: I don't think their compensations would change. The thing is that we can always use them in other areas that they are needed. This could be good for the company if employees can do their jobs quickly and become available to other divisions that may need them. This could help employees to even learn things from other divisions and grow. So what could possibly change is their roles and responsibilities and not so much of their compensations.

Me: thank you very much for your time. These were all the questions I had for you.

Interview transcription for X4

Interview transcription for X4

P1

X4: I don't really know what you want to know but we have done a pilot project in one of our futuristic stores so i can talk to you about what we did there. We were told to stop the pilot project mainly because of bad communication.

They are very similar to our legit type of stores, i don't know if you know our legit type of stores, very fashionable. So we consulted with a company in America, i have forgotten their name. What they do is they keep on their floor one item, one colour and one size on the floor so as soon as that item gets sold, they want to be able to replenish immediately. So what they did is, we saw their presentation that they gave to hmmm errr, like a road show in America so we saw their presentation and what they did and we said we want to try that. So we said we want to do a pilot and see how the technology can work for us. From my organisation's perspective, from IT perspective we don't have a doubt that it can work for us but we wanted to see how its going to work for us. So just to do one pilot store, the cost alone for that was about a million Rand just to get that store and kick it started with all the required stuff with all the software

Me: that is quite a hefty sum hey

P2

X4: its quite a hefty sum and its quite a biggish store. We did not do all of the terminals, we picked bands and we only did the RFID on those bands. So we had to decide that certain products cannot be part of the pilot. So we used Denims which in our perspective are high risk items, so its items that get sold often but there is also a high value attached to it so if they get missing and we don't get them replenished quick enough, we lose out. So we decided on Denims for men and ladies and those were the only 2 departments that were tagged with the RFID tags. So the tags we bought, I think its from Avery. They supplied us with the printer. Now what was nice with the printer we had is while I tagged an item it encoded the barcode into the tag so we did not go for give us a serial number of up to a 1000 and we used it like that, we went for the blank tags that we actually decode as we scan it through the system. So which was very nice, I mean it was a string tag that we used so as I booked the stock into the system, i then created the tags and we then attached it and went into the area. So the s/w we had is a very nice s/w and we decided we were not going to do any development in our current store system to incorporate this data into there. We were running it as a standalone so stock were still coming into my area my receiving area in the normal store only when it was these nominated departments will it move to our area. We then booked the stock into the system to say how much stock I am receiving, we then tagged it and then it went into the stock room. So as soon as we tagged it, the system automatically puts it into the stock room. At the stock room door we had scanner so that when the stock moves out of the door, it actually picks up that it has gone to the shop floor. So the s/w we had we could create a picking list for the lack of a better word so we could create what we wanted to go to the shop floor. We create it on the same system then it goes thru the door and we had to validate it at that door that everything that we said was going to the floor is going to the floor and then it went and merchandise it on the floor. then what we did is when the staff had to sell the item for me on the front office that was the only thing the s/w company did for us they actually made an overlay for us where the guys could actually scan the tag on the scanner for the RFID and it fed the information into my point of sale so that the staff don't have to do two functions. So that is the only development we did for us at that time. So they basically iteratively flag the RFID tag over the scanner, it read it and that then booked it out of the s/w to say that has now been sold. We were able to do stock counts every morning and it took us about half an hour to count

Me: How long does it usually take to do the stock count?

P3

X4: well, normally our stock count happens over night. Hazard counts will probably take 3 to 4 hours just to count stock manually. I mean it took us half an hour to count 3500 odd items and all you do is you take the scanner and you wave it around the department walk until it stops beeping and then its counted and that info then flows into the s/w automatically. It was really exciting and I really enjoyed it and it got pulled so I must just have a look I know I have the presentation Ann used and I will just check what else I can give you.

Me: if there are documentations, please let me have them as they will be very useful

X4: Alright, I think I have got quite a lot of documentation. I don't see it here but i will look on my hard drive and send you an email. I have got your email.

Me: thanks.

X4: Anything else you want to know?

Me: all that you have spoken about is very excited. Does your company plan in future to implement this or what are they doing?

P4

X4: we are not planning to implementing it as such, what we did in the pilot was great I mean we could c d benefits especially around stock counts, the problem is , tagging in store and that is where the issue is. Where are we going to tag the product that will make sense? Because its very time consuming to tag in store. I mean I had extra staff complement of 2 allocated just to that project for the 2 months I was in the store and that is all the guys that were running the systems for me. So if we can find a better solution where the items come in tagged, we can then do development on our side that we actually don't need to do a dual process and actually once you are receiving it, it actually adds it onto your system automatically.

Me: so what about if your suppliers had tagged the products before it gets to your shop?

P5

X4: Yes, of all the case studies i have read, that is the big plus. Errrr, If you can get your suppliers or your source, if you can get tag at source, and it then goes for all of your systems that way, and that will already be a big plus. You must remember we are not just getting our stocks from South Africa, we get our stock from everywhere, its India and all the eastern side and so its very difficult. So if their systems are not catering for it, then you know its very difficult, so at this stage, NO. We can't do source and i think that is why i do think we have adopted it. hmmm, data integrity wise, i mean it really puts it out there. It gives you a much better visibility for the stores. I will have a look am sure iv e got a report pulled from the system. I was able to literally in seconds to see there were 5 items sold and we know had to be replenished.

Me: and that information is what people are looking for.

P6

X4: Yes the s/w itself is not a problem. I think its the start up cost firstly. I mean to get everything kick started is very costly at this stage. I know the tickets were R1.50 each at that stage when we did the pilot and that was last year. We bought the tickets R1.50 each.

Me: R1.50 each?

X4: yes. So that was what it was costing us at that stage. I don't know if the cost has come down, but that was what it was costing a year ago.

Me: R1.50 is quite heavy

X4: yeah compared to the tickets we use at the moment, R1.50 is heavy because the current price of the ticket we use is around 70c a ticket.

Me: so there is a big difference here.

P7

X4: quite a huge difference. I think that is probably the reason why we didn't go forward but like i said to you we didn't finish the project

We didn't get all the benefits out of it that we wanted. It was pulled and probably because of bad communication on XXX side. It was the CEO's decision. We weren't at the right stage anyway for it to be implemented.

Me: you've spoken about cost a lot but how is the cost prohibitive in terms of stopping retailers from implementing the technology.

P8

X4: Well if you don't have money, you won't be able to afford it. From the presentation, i think it was 22 terminals that we kicked it off with the scanner, the reader, hardware equipment is quite expensive. I will have a look at the quotes we were given, I will give you all of that. That will tell you already how much it's costing you per terminal. I don't see a smallish business taking up that cost. They probably don't have that cost.

Me: that will be key because if you don't have the financial muscle to pull this off then it won't be possible.

P9

X4: you must remember you have to have that upfront, and you only get the benefits as you grow into it. You are not going to get the benefits immediately as you need to get used to the technology. The ticket we had was great, and we had very good support from the American guys, they helped us with a lot of things. Because we had great relationship with the guys, they were really keen to help us. It was just as much benefit for them to get the project going. We had experience from the guys, I can't remember the name of the company, but they really do it from source cos they are in control of the factory. So they basically tag it as they manufacture their T shirts basically and it goes through their whole supply chain tagged. That's why it works for them. They are doing it from source up to the store.

If you can get hold of (xxx), it's too big i can see if i can zip it for you and send it. It's a very nice presentation of RFID. That was a very nice video we had a look at. Anything else ?

Me: since you've done this thing before, how costly do you think errors are say if you make a mistake in tagging or doing things you are not supposed to do

P10

X4: if you tag a garment with the wrong item serial number, you basically, through your whole system going to think you sold a red shirt when in the meantime you actually sold a blue one. So accuracy is very important to ensure that when you tag your garments, the right information is attached to the tag that goes with the garments. This is because it actually influences in the end, your replenishments. So if you think you are selling the red T shirt but actually selling the blue shirt because you've got the wrong ticket on, it's actually going to mess you up because you are going to replenish red when in the meantime you are running out of blue. So accuracy around having the right ticket on the right garment is key because the whole system runs around the items. So if you have the wrong tag on the item, you won't know that you are selling the wrong stuff, so its very important to make sure its accurate with the system. If you put the wrong information into a system, you are going to the wrong information out.

Me: so in terms of complexity, how is RFID compared to any technology you've adopted before.

P11

X4: in the beginning i thought it was very complex but once we got into it, it was actually no different from any other system. But your business needs to have a mindset change. They need to understand that this technology works a bit different so once you got that understanding it's not that different from any other process. It's just another process that you follow. I think it's not that complex if you put your mind around it and build your processes around RFID. But if you want to take your processes and keep them the same and you wanna force RFID on them, it won't work, you actually need to see how do I want RFID to work for me and what processes in the business need to change. You need to change it to adopt the RFID process otherwise you won't be able to make it. I don't think it's too complex but I think you need to make changes in your environment to support it otherwise it won't work for you.

Me: with regards to integrating it with other systems, how complex is it

P12

X4: You going to have to integrate it into your current systems, based on the software I saw, probably not too complex. But you going to have to do development, so you have to understand how the interface from the device (scanner) interfaces into the system. If you understand that, it's not an issue. The software i saw, that was developed the right RFID, by this guy who it was his business to have the software developed. That interface is very simple.

P13

Me: do you have the skills in-house to do implementation

X4: I'd say yes, our company does, because we outsource all our IT projects. So we have Accenture resources, so it'd be just for us to get RFID resource out of Accenture.

Me: supposing you didn't have the skills, but then you always outsource, so you'll always have the skills handy.

In terms of infrastructure, is it going to take a massive upgrade on our Organisation's part to get RFID working or you have the current infrastructure in place?

P14

X4: for our stores, we just went into a new point of sale system, which is a Microsoft/windows compatible and based on what i saw with our pilot project regarding the POS interface, I don't think it would have been a lot for us to upgrade, it'd probably just be an overlay, like they did for POS. So instead of us scanning a barcode, you just put a reader and inside that bar would've been the barcode anyway. So it's just linking the product from the reader.

Me: so in other words, you do have the facilities

X4: yes. so instead of having a scanner, we just replace it with a reader.

Me: so that means your company is really prepared

X4: we could be, but i don't think we are going to adopt

Me: i mean in terms of infrastructure

X4: yes i think so. We would've been able to do it

P15

Me: so you've done the pilot and you've seen what the technology can do, what can government to encourage retailers to adopt, if possible

X4: everything we got from local suppliers, i don't know if government can do anything

Me: supposing the government says there is a need for such a technology and they introduce some tax relief or something, would it encourage others to want to adopt the technology

X4: i don't think so. Everything we got we got locally anyway. The only we got was the software from overseas and they were saying 5000 pounds, and the only reason was that there was no one in SA that was an agent for them, so the rest we got locally although we could've gotten overseas

Me: so in other words, government cannot help?

X4: not that am aware of

P16

Me: you mentioned that Woolworths also did a pilot

X4: when we did the pilot, Woolworths was also doing a pilot on a department from the guys i think it's Avery... they were doing RFID pilot in CT. i'll have a look on the presentation, i think their names are there, they might be able to share some stuff with you. They loaned us the 2 printers and they themselves were doing a pilot in Woolworths in CT

P17

Me: so how is competitive pressure going to help retailers to adopt, supposing pick n pay /mr price goes and adopts technology, how can it affect retailers in the same space,

X4: the only thing it can influence the other retailers is that mr price will probably have their stuff on their shelves quicker than the other guys would but i don't think it would change their assortment, just their stock floor has the right stock at the right time. It won't change how they sort and how they decide to plan or things like that, it'll probably help them with replenishments a bit better, and i think thats one thing. We already have replenishments processes in place and i don't see that RFID would have made it better, it would have probably just support it better. So the planning tools are all in place. It would just help the store have better information at a certain point in time

Me: so even if Woolworths is to go implement, it's not going to worry other retailers?

X4: no i don't think so

Me: someone said RFID doesn't give you an edge that you didn't have already

X4: yes, i don't think it will, it will just support your processes but i don't think it will give you an edge

P18

Me: will this technology impact, supposing it was fully implemented, on the number of employees required

X4: no, you will still need the same number of people, it would probably make their lives easier with certain functions, but will not influence what they're are doing, it will just give them better information at store level and head office probably won't have any change

P19

Me: what about employee compensation, where employees used to do stuff manually & got paid for that & now everything is easier, would the compensation change

X4: no. I don't think the compensation would change it's just the processes that will change. Instead of using 2 hours to do accounts in the morning, it would probably take them half an hour and they'd be able to do other things as well

Me: this is pretty much all the information i wanted to know. And your knowledge about this issue is amazing.

X4: like i said it took us 6 months to get there

P20

Me: I will wait for the documents you have for me

X4: I will definitely look for all the documents. I know I've got it, I probably put them in an external drive. I will gather all the documents, the presentations we did to the business as to how we are going to

do the pilot. I know i've got some reporting that I pulled from the RFID software. We have case studies on here. It's really interesting technology that I can tell.

Me: thanks a lot for your time. I really appreciate you seeing me

X4: it's a pleasure. what I will do, I will send you all the stuff i've got and then if you've got any questions you can contact me

Me: thank you very much.

Interview transcription for X5

P1

Me: has your company implemented RFID

X5: no we have not

Me: why do you think it's not been implemented?

A: it's fairly expensive currently and not cheap enough for our products. We are going to use RFID per product, per pack size, per palette size. So to put an RFID tag on each and every product and every pack would be costly due to the margins we are making out of our products. And because there is no industry SA standard yet, we decided to wait for that. The proper standards and also the cost must come down. And we have to look at the various tax, the soft tax and hard tax, passive and active tax. It's not that we won't look into it in the future. As i said, at this moment, we can't see it being cost effective. Besides, we have facilities for scanning and tracking so to implement RFID, the cost of the tags must come down otherwise it would only be an additional cost that would not just make sense for our business.

P2

Me: has it been discussed at all in this organisation?

X5: yes, it has been discussed, but there is no formal strategy yet. At this stage I think we are at information gathering phase. To see what's going on in the market, to see what other companies are doing, especially in a pharmacy environment for proper tracking, ... very very important. If you want to go for RFID it must be able to conform to that, so we can be able to track ....

Me: cost that is the more reason why i thought your company being one of the giants in the pharma environment could be thinking of such.

X5: and if we do that it's be on our high end, high value products that you can only get with prescription and specialists products, that's normally where you'd start on the more sensitive products.

P3

Me: that makes sense. How is the cost since you've made mention of the cost. What are the cost implications for the organisation.

X5: we haven't worked out in detail per product but if you look at the standard cost of about 50 us cents for an active tag, if it's a passive tag it's a bit less, it equates to R3-R4, and on certain of our products it's too high a margin a cost to add on. And that will erode our margins. What we are currently looking at, not seriously, but we are looking at it, is palette tracking since in the industry it is a massive problem, cos what you do on palette use is you send stuff out on a palette, it goes out to wholesaler and retailer and you have to get the palette back. If it's a wooden palette sometimes it gets chopped up for wood, if it's a plastic palette, it gets used for whatever. So there is a thought process in the company that we should start adding RFID tag on palettes, cos that is a high cost item that you must get back. But if you want to start using that, your retailers, customers, everyone must be able to read your RFID so we can have proper traceability of where the palettes are.

Me: so what if you put it on the palette, implement the technology in-house, and the retailers that you are taking it to, are not on the same system as you are

X5: that's part of the problem. So from a retailer's organisation, there should be a standard in terms of RFID. You'd need everybody on the same system, and also they should be able to read the technology. There should be a track solution so you'd be able to track and know that the palette is at this store.

Me: if you want to implement, but the retailer doesn't want to

X5: then it doesn't make sense, it must be a joint effort between the suppliers and retailers. And industry bodies should be able to drive that, like the ECR or something like that.

Me: are there any RFID bodies of knowledge or like that in SA?

X5: I'm not sure, maybe there are

P4

Me: talking about the cost, how costly do you think errors in RFID could be. For e.g, you want to track Panado, instead of putting a tag on Panado, you put it on disprins. How costly do you think, the mistakes could be,

X5: in our environment, it's not only about cost, it's also about the impact, for instance if we put wrong tag on wrong product, a consumer or pharmacy can get a wrong product, if a pharmacist is not wide awake, they can issue a wrong product to a customer. So its more about the impact on the user in terms of using wrong product than anything else. It's a repetition, quality issue, on top of that It might be dangerous if you get a wrong product for your condition and could have lots of negative impact on your health. So you must first look on the consumer, what's the impact on health then your reputation to determine the size of the cost.

P5

Me: I'm sure you've already implemented some systems here in the company. How complex would you think RFID is compared to other systems you've already implemented

X5: I don't think it'd be that complex, cos currently we use a lot of bar code scanning and 2D scanning, lots of scanning and technology in our warehouses, factories to track products based on the label on the product. It's either a normal barcode or a 2D barcode so we have to scan on the technology in terms of

that. So to us using scanning technology to read RFID tags, it won't be that difficult, and all our factories are wireless enabled. So that's not an issue. We have the ability to be able to do that.

Me: that's quite comforting cos some people don't have all this infrastructure.

X5: yes, but we still have quite a lot to do. It's a different signal, a different environment. W know hat to look for,

P6

Me: so with regard to complexity, how difficult do you think RFID could be in integrating it to current systems?

X5: I don't see a problem with integrating RFID with our existing systems, because our systems are oracle, it's like SAP, and our readers have already been designed to take in RFID technology tags or information so there won't be a problem.

P7

Me: that is very interesting. What skills do you think would be required for RFID to be successfully implemented? And do you have these skills?

X5: I don't think you'd need a special skill, you'd need some technical skill expertise in terms of scanning, wireless, integrating. So you have some technical box on the hardware side and there's some programming stuff to do the interfaces to the various systems. We do have some of the skills on board. We might have to train them a bit on the new technology, but I don't think it's something we would worry about so much.

P8

Me: but supposing you don't have the skills, how are they going to block your company's decision to either adopt or wait

X5: if we really want to go for RFID, we'll find the skills. We can get it from India or wherever cos in India there's lots of expertise, skills in RFID. When i was in India i saw lots of Tags and what they were doing, so skills are available.

P9

Me: so is your IT infrastructure equipped to host the technology

X5: yes, we don't have to invest massively from an IT point of view. So we'd be able to do that.

P10

Me: so you guys are really prepared for this stuff. Another thing i wanted to ask is, how can government encourage the adoption of the technology?

X5: i think they can assist a standardisation body, for instance if there's a SA bureau of standards/ CSIR ,if they came out with an international standards in SA or set up a baseline or support the various training bodies like the ECR consumer council, they can play a role.

P11

Me: but do you think that if the government sees it to be important and introduces tax cuts for companies wanting to implement, do you think that could help

X5: i don't think it will help because they will stuff it up, you have to keep government out of it. You have to make sure there are bodies that have got a technology base like SABS/CSIR. They must actually drive it from there. They must just lay down the standards and then the companies must adopt. If you look at what the government tried to do with the whole ID system, card chip system, for the past 15 years, they can't get it right so they can't play a role.

P12

Me: so they must just help set the standards

X5: yes, they must allow the bodies like SABS / CSIR. They must trust them to come up with a bit of standards

P13

Me: so would companies be willing to adopt the technology if government is willing to introduce awareness programs and stuff like that

X5: yes and no. It will depend on how it will impact the company. So for instance, if you have to deliver to a state hospital a palette of products with RFID tags , and then yes, you don't have to do it , cos there's a commercial reason behind it. Everything is driven by quality health and safety commercial reasons, so if it's for these reasons, then we'd do it.

P14

Me: how is competitive pressure going to force your organisation to implement the technology? If one of your competitors makes a decision next month to implement, how will it impact your company

X5: i think what's going to drive it more is retailer behaviour. If our competitors are going to put it in and our customers, cos we all service the same retailers and the same pharmacies and same hospitals, if they are not really for it it's not going to make sense, so it's gonna be more of a customer driven exercise, so if they start putting it in. Walmart tried to do it in the states, they tried to force the suppliers, the suppliers kicked them out and said they don't have the money, technology in the first years but now they are better. But when they tried to enforce it there was a huge kickback. So it could be more of a consumer driven exercise than a competitor driven exercise. If we for instance we want to use it to manage our palettes, then it's something different because then it's an internal process. I don't think competitive behaviour will play that big a role here.

P15

Me: even if they decide to implement, is it still not going to have any impact?

X5: it depends, if the retailers are affected then we'd have to, then we'd have a reason to do it. If the competitor is doing it and the retailer can cope with it, we'd be silly not to do it. It just makes handling,

tracking, traceability, receiving, sending of goods so much easier. But there's no use doing it if it just stops at our door.

P16

Me: even in your situation, you share retailers, so if you'd have to do it, it'd mean that the customer also agreed to put it in, and if they put it in that's makes it easier for you guys to also put it in

X5:exactly

Me: in putting he technology, what do you think could be the impact on the number of employees required, would it be less or more

X5: the number of employees would stay the same, it wouldn't exactly spike, all of the technology would be applied by people or machines, cos a lot of the RFIDs you can put in normal labour that you attach to a product especially if its a passive one cos its a printed one on a label. i don't think there'll be a huge impact on labour, positive or negative.

P17

Me: Regarding employee compensation, there isn't gonna be any changes cos if things were done manually and now you just have to go around the room with a scanner or reader

X5: we are already scanning a lot of equipment, so we have hand held scanners that we scan bar codes, so where we'd use handheld scanner to scan RFID tag or scan bar codes

Me: so in that case the transformation is not gonna be that much of an issue?

X5: no its not gonna be an issue

P18

Me: I think that's just about all the questions i have. It's just interesting to see how people are really, cos I've been to places where people have done a pilot already and have decided not to go with it for now. Especially in the retail space, to see how people are preparing for this stuff.

X5: have you found anyone that is using it yet?

Me: No one. XXX and XXX have done a pilot. Those are the only ones.

X5: I think there was a bit of a hype about it when Walmart started, eight years ago or so. It sort of failed massively. I think in their space, certain suppliers are doing it, but if you are on a consumer end of the market, the price of the tag always plays a role. As soon as the cost comes down massively, the usage will increase.

Me: so the main barrier here is cost?

X5: yes, cost, standards and willingness to use technology.

Me: thank you very much for your time.