THE USE OF RADIO FREQUENCY IDENTIFICATION IN THE SUPPLY CHAIN OF FAST MOVING CONSUMER GOODS IN SOUTH AFRICA

By

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DECLARATION

This research has not been previously accepted for any degree and is not being currently submitted in candidature for any degree

Signed:.....

Date:.....7/4/2006.....

STATEMENT

EXECUTIVE SUMMARY

Organizations have indicated that RFID technology will revolutionise the supply chain in South Africa. There are, however, a number of challenges and issues, including the relatively high costs of the technology and the lack of mature standards, that need to be overcome before this reality is achieved.

Research has confirmed that selected organizations understand that there are number of key benefits to be gained from implementing RFID technology. The collaboration between the supply chain partners has been identified as the requirement for the achievement of these benefits.

Manufacturers are lagging behind their counterparts, with the research suggesting that they are reluctant to adopt the technology. Retailers and logistics suppliers have been identified as the main beneficiaries of implementing RFID technology. Retailers are expected to follow the American approach with mandates being issued to manufacturers to drive the adoption of RFID technology.

RFID technology is to be implemented in the medium-to-long term with none of the respondents currently using the technology.

ACKNOWLEDGEMENTS

Thank you to Hollie, whose editorial review and assistance with this work was invaluable.

Thank you to Margi, for continually motivating me to complete this dissertation; finally I can reply to your question, it is complete.

Finally, thank you to all the respondents, who took the time to complete the questionnaire.

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"……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, CEO Pick 'n Pay as attributed to him at the
The Smart Card Society of Southern Africa Conference, 2003

PART ONE

CHAPTER 1 - INTRODUCTION

1.) Introduction

The management of the movement of goods through the supply chain is a difficult and challenging task. The coordination of physical goods, transportation, human intervention, and the necessary administration is a complex activity. These factors combined with the demand of retailers for shorter leads times for goods from suppliers and increasing volume of goods have made this task even more complicated. (Editor, 2003)

The use of technology in the management of the supply chain has evolved slower than the corresponding growth in volumes of goods, thereby presenting a challenge to the entire industry. This challenge has created the need to develop an adequate solution to alleviate this growing problem. The advent of the use of Radio Frequency Identification (RFID) technology to track and coordinate goods throughout the supply chain is presented as a possible solution.

The dynamic business environment demands that supply chain partners identify innovative solutions to improve supply chain performance. The consideration and adoption of RFID technology as a potential solution has been slow. This is, as a result, of various factors, notably, the sophistication of the technology itself and the relevantly significant costs to be incurred to develop a workable solution. (Editor, 2004e)

There have, however been a number of salient developments in RFID technology over the past few years. The world's largest retailer, Wal-Mart, has issued a mandate to its top 100 suppliers to implement the technology effective from 1 January 2005. (Chen, 2004) This initiative has acted as a catalyst for other role players to realize the benefits of adopting the technology.

RFID is a revolutionary technology capable of changing an entire industry. Goods can move throughout the supply chain and proactively communicate information to different

supply chain systems without human intervention. This is perceived as the critical element of RFID technology.

The implementation of RFID technology is gradually gaining momentum. Globally, the retailer, the end-part of the supply chain, is driving this adoption. Currently, in South Africa there appears to be very little momentum from the partners in the supply chain for the adoption and implementation of a RFID solution.

The use of technology in South Africa tends to follow the trends of the United States of America (USA) and Europe, which are often described as being at the "bleeding edge" of technological change – a somewhat cynical reference to the enormous costs of research and development. (O'Connor, 2005)

This paper studies this rapidly evolving technology. It discusses the different approaches adopted by the major international players as well as the applications and developments in the technology. Primarily, these developments are discussed in a South African context. All the respondents to the research survey are South African organizations.

1.1) Scope

The dissertation undertakes a study of selected supply chain partners in South Africa and endeavours to understand their current approaches. Their long-term strategies towards RFID will be explored. Further discussion points will include:

- A review of the RFID technology;
- An outline of the challenges facing supply chain partners;
- The attitude of South African supply chain partners on the potential benefits of RFID; and
- Whether Supply Chain partners have given consideration to the use of the technology

The examination of the role of RFID in the supply chain in South Africa attempts to understand the progress the various partners have made in their understanding of the technology.

An effort is made to analyse the progress that the industry is making towards finding better solutions to Supply Chain challenges through the efficient use of RFID technology. Another area of analysis focuses on determining the level of understanding of the partners of the benefits of using the technology. Consideration is made on the timeframe for implementation of the technology and those who are responsible for driving this implementation.

1.2) Research Objectives

South African-based supply chain partners are, by and large, aware of the significant benefits of RFID and have sufficient interest in the adoption and use of RFID. This study will explore the level of awareness and consider those factors that each partner considers pertinent to their businesses.

Furthermore, it will consider whether there is capacity for the adoption of the technology. By undertaking this dissertation, it is submitted that it would be possible for industry players to be able to benchmark their current strategies against other players in the South African market.

1.2.1) Hypothesis

- There is significant awareness and interest in the potential benefits of RFID Technology amongst Supply Chain partners in South Africa

1.2.2) Corollaries

- To date, there have been no significant developments in the implementation of RFID technology amongst Supply Chain partners in South Africa.

- It is submitted that the timeframe for the implementation of RFID in South Africa is medium- to long-term
- Retailers are likely to be the drivers of the implementation of RFID technology as opposed to the other supply chain partners.
- The most important benefit of RFID technology is the increased "visibility" of inventory throughout the supply chain

1.3) Limitations of the Research

This study focuses on only the major players in South Africa, namely those partners with significant turnover and the resources to consider implementing RFID technology. The implementation and deployment of the technology is considered as being expensive and difficult. Consequently, a number of smaller partners were not selected for review because of their potential lack of resources.

There is, however, a risk that, notwithstanding their size and resource base, smaller partners excluded from the research sample might nevertheless, be committed to using RFID technology to enable their existing infrastructure. Moreover, they may be looking to gain "first mover" advantage and thereby achieve a sustainable competitive advantage over the larger entities in the short to medium-term.

1.4) Structure of the Dissertation

Part one of this dissertation comprises Chapter 1 - *Introduction* and Chapter 2, the *Literature Survey*. Part one presents an overview of the subject matter and includes a review of the existing literature dealing with the subject of RFID technology and its application in a global context.

Part two of this dissertation comprises Chapter 3 - *Research Methodology*, Chapter 4 – *Data Analysis* and Chapter 5 – *Conclusion*. The analysis of the research data is followed by the conclusions and recommendations for future research.

CHAPTER 2 – LITERATURE SURVEY

2.1) Introduction

This section explores the literature and discussion that has developed around RFID. It outlines the various RFID technologies and identifies the different supply chain partners. Furthermore, it discusses the potential impact of RFID on the supply chain and considers certain issues relating to the implementation and deployment of this technology.

Most of the survey of literature is drawn from current topical journals, which are constantly debating and discussing RFID technology. There is a strong bias on the source of the literature, with most of the references quoted below from the USA and Europe. The innovators and implementers of RFID technology are mainly United States-based, hence it follows that most reference points are from these sources.

RFID technology is regarded as an "enabler" (Editor, 2004e) and is predicted to have the potential to change industries, thereby shifting the paradigm around the distribution of goods through the supply chain. It is, therefore, important to understand the perception and the current attitude towards the technology in a South African context.

Furthermore, knowledge of the relevant issues and potential benefits will enable the different parties to understand the concerns and challenges of their peers. A better understanding of these challenges will, in turn allow for improved coordination of the implementation of the technology between the different parties.

The key role players in the traditional supply chain include the retailers, the third party logistics suppliers (hereinafter, referred to also as "3PL"), and the manufacturers of fast moving consumer goods (abbreviated, for ease of reference, in this text as "FMCG"). The implementation of RFID technology facilitates the flow of goods between these partners. (Intermec, 2004)

The information pertaining to these goods is better shared between the partners as a result. (Rangarajan et al. 2005) By reviewing, what has been discussed and documented by industry experts, and comparing those views with the thoughts of South African industry leaders, a balanced insight can be gained into RFID technology. (See Chapter 4)

2.2 RFID Technology

RFID technology consists of a number of components. These include both hardware and software. Briefly, the components comprise a tag, a tag reader, middleware software, and the Internet. Simply stated, the technology entails a linking-up of the above technology to create an RFID system. An integrated system is a major achievement involving considerable cost and effort.

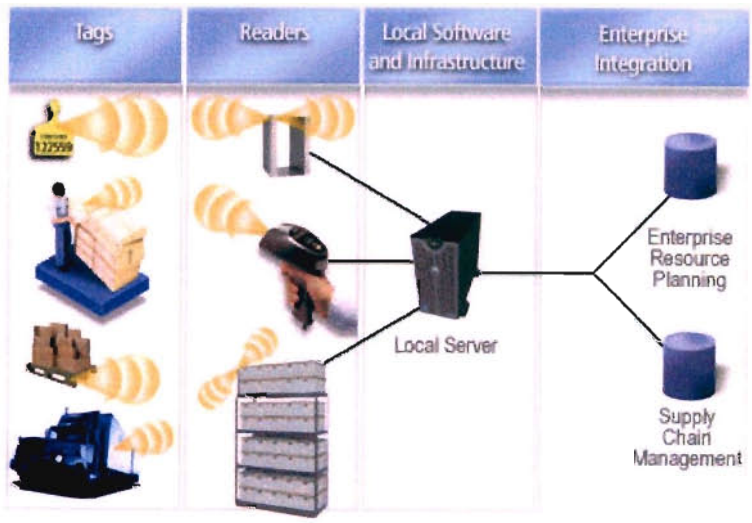

Figure 1: RFID Technology Model

(Source: http://www1.webmethods.com/images/solutions/webMethods_RFID_121703.jpg)

Each of the respective components (Editor, 2001 and Intermec, 2004) are described below.

2.2.1) Tags (Transponders)

The tag is a radio frequency transmitter that has a built-in microprocessor. The microprocessor is programmable and is capable of being updated frequently from an external source. Tags have the capacity to store data as well as receive and transmit data to other devices wirelessly. The data that is stored on the tag is dynamic. The size of tags ranges from a pinhead to a brick. (Intermec, 2004)

Tags are either active, in that they have their own power source, which allow them to transmit over a longer range, or passive, in that they receive power from tag readers and are limited in their broadcast range. Given their capabilities, active tags are more expensive than passive tags. Tags can be "write once" or "multiple write," depending on the particular application. (Editor, 2001)

Tags are able to transmit over a range of different frequencies, accordingly if a product moves internationally and the frequency of the reader changes from one country to another country, the tag has the functionality to perform this. Tags can operate in extreme conditions such as low temperatures. (Intermec, 2004 and Editor, 2001)

The cost of the tag is dependent on its storage capacity and life expectancy. The cost of a tag is also partly dependent on the volume purchased. The growth in the implementation of RFID technology, together with a commensurate increase in the number of tags used will drive the cost of individual tags down. Despite the lower anticipated costs, tags will nevertheless continue to be the greatest single unit cost item for manufacturers making use of RFID technology. (Intermec, 2004)

Each individual item has a tag attached, which essentially contains the data relating to the product. Tags are affixed to the carton or pallet on which the goods are transported.

2.2.2) Tag Readers

Goods moving through the supply chain are constantly broadcasting their data via the tags to the world. This data is read by the tag reader, which collects the data from the tags. It is capable of performing thousands of "reads" per second. This capability allows for multiple data from multiple sources to be received simultaneously. Sophisticated "anti-collision" software manages the reading process. (Editor, 2001)

Tag readers have the capacity to read wide range of frequencies. This ensures that frequencies broadcast from multiple tags are not excluded. Typically, these tag readers are located at the entry/exit points to a building to track and monitor the movement of goods. They may also be located at the different production stations to track the movement of goods through a production line. (Intermec, 2004)

2.2.3) Middleware software

RFID technologies such as the tag reader and tags are not in themselves a standalone solution. These pieces of equipment feed the data about the goods to a software system called middleware. Middleware programmes the tags. Middleware acts as a buffer between the tag readers and the Enterprise Resource Planning (ERP) system. Data is controlled and manipulated into the correct format. Once in the correct format, this data can be captured into the organization's ERP system. This information is then available to the other supply chain partners. Essentially, it allows for the seamless connection between the hardware, tags and readers and the software, the ERP system. (Evans, 2004b)

2.2.4) Applications Software

This software receives the data from the reader and integrates it with the existing system, via middleware, typically an ERP system. Other supply chain partners, via the internet using the EPCglobal network, can access the data. (Refer to section 2.7 below)

2.3) Supply Chain Partners' Challenges

The partners in a typical supply chain are as follows:

- The Suppliers/Manufacturers produce goods for distribution to the consumers.
- The Logistic suppliers (3PL) provide distribution services, from the manufacturers to the retailers.
- The Retailers are the final partner in the supply chain. They are responsible for the delivery of the goods to the consumer.

The "supply chain" is a term used to describe the flow of goods and services from manufacturers to retailers and, thereafter, to consumers; it applies to the flow of information to enable the "rapid replenishment" of depleted inventories.

All supply chain partners are continually facing increasing competitive pressures and there is a constant requirement to improve profitability and efficiency. The need to reduce costs and to enhance customer service level through efficient supply chain management is significant.

Continued growing volumes are making this a difficult assignment because the changes in technology to manage this growth are not keeping pace. The next change in technology anticipated is the widespread acceptance of RFID technology.

The "active" management of inventory levels presents an opportunity to reduce costs. Overcoming this challenge is considered as the single most important lever to control costs. (Editor, 2004a) The ability to manage stock levels throughout the supply chain using RFID technology presents an opportunity.

Other challenges include the current low service levels that exist throughout the supply chain. There is, in simple business terms, a constant need to get the "right product at the right level, at the right store to the right customer, at the right time" There are

inefficiencies that exist between the partners that lead to high logistical and transportation costs.

Outdated and non-integrated technologies represent another challenge. These technologies cause the continual duplication of tasks and functions. Innovation developed by one partner is not, in the opinion of Shutzberg (2004), dispersed throughout the industry. The knowledge is retained by one partner and not shared with the other partners. This is, to the detriment of the other partners. The industry requires a cooperative approach for the benefit of all partners.

FMCG Manufactures are attempting to reduce work-in-progress and safety stock levels. (Foltz et al. 2004)The challenges are to increase the certainty in demand planning and improve product "visibility."

3PL are looking to increase asset "visibility" and distribution efficiency. The challenges are outlined below: (Foltz et al. 2004)

- In-transit inventory status (internally / externally)
- Recover misplaced inventory
- Remove inventory obsolescence
- Improve the cross-docking and other distribution processes
- Improve asset utilization

The challenges that retailers face include the following: (Foltz et al. 2004)

- Reduced inventory shrinkage
- Improved buying experience for customers
- Reduce missed sales opportunity and stock out situations
- Eliminate returns fraud
- Reduce inventory write-off
- Enhance loss and theft protection
- Move beyond assumed receipt for inventory

- Recover misplaced inventory in stock room
- Eliminate manual counting of stock
- Reduce staff time and costs associated with product recalls
- Maintain stocked shelves
- Recover inventory misplaced on store floor
- Ensure that the right goods are stocked
- Improve customer checkout experience
- Maintain product quality

The successful integration and deployment of RFID is dependent on the ability to manage the complexity of business and technology considerations.

The potential of RFID is to offer multiple levels of benefits. The tracking of inventory is done in "real-time" so that everything that is done is faster, better and cheaper. (Symbol, 2005)

Optimizing, the Supply Chain will allow for the incorporation of customer specific logistics information to lower costs.

RFID offers enhanced business opportunities and enables new capabilities and services. (Utilize RFID information to drive the portal and to share information with retailers regarding product functionality). (Kirkpatrick, 2004)

If the business case for RFID technology cannot standalone, (The return on investment does not justify the project) then the reasons to implement have to be strategic. They must be supported on a strategic level. Realizing the business value proposition of RFID technology requires integrating technology, economics, and other factors in a systematic framework that ensures delivery of enterprise value. (Highjump, 2004)

Currently organizations cannot justify a fully integrated RFID solution. The preferred solution is to adopt the "slap and ship" model.

2.4) The Technologies used in the Supply Chain

The most significant technologies used in the supply chain are scanning technologies. These include barcode images and barcode readers. Barcode images are printed on the physical goods' packaging and barcode readers are utilized to scan the barcode and to gather information about the product.

In order to work correctly the scanner and barcode must be aligned directly with one another. Direct line-of-sight of the item is required for scanning by the reader. Achieving this entails that humans must be involved. The technology cannot operate without human intervention, a factor that drives up costs and inefficiencies.

Scanning goods is difficult to achieve when it is necessary to scan large volumes of goods in warehouses. Another drawback of this technology is inability to store more than the basic information on an item.

Despite theses shortcomings barcodes are widely accepted and have been used since the early 1970's. Furthermore, barcode technologies are easy to use. Consumers are familiar with them. The technology has well-established standards that have been agreed upon globally. Most problem areas have been resolved and the technology is "mature."

Both RFID and scanning technologies provide rapid and reliable item identification and tracking capabilities. RFID is not about to replace barcodes. The two technologies are not mutually exclusive. The choice is not between RFID and barcodes, but rather where to use each technology to achieve the highest level of benefit to the organization. (Intermec, 2005a)

2.4.1) Barcodes vs. RFID

As stated above, RFID technology will not replace barcodes, as they are both auto-identification technologies, designed to create efficiency in the supply chain. Bar codes will continue to be used widely until RFID tags costs are affordable, and all users consider the tags sufficiently reliable. Barcodes are a tried and tested solution and are

reliable, whereas currently, RFID tags are not always reliable. In the opinion of the Douglas (2005), barcodes will exist indefinitely to backup RFID.

2.4.2) RFID Models

Two models are available to be implemented as potential RFID solutions. (Shutzberg, 2004) They are respectively the "slap and ship" solution and the "full integration" solution. Both solutions can fit most organizations' strategic plans. Typically, the "Slap and Ship" model precedes the integrated model.

It is essential that the two systems are integrated together to ensure that information can be collected, collated, and disseminated to provide EPC data throughout the supply chain.

2.4.2.1) The "Slap and Ship" Model

This solution involves the use of tags on case-lots and pallets rather than onto the individual goods. Tags are attached to the outside and larger quantities can be tracked by using one tag only as opposed to having a tag attached to each unit of product (Shutzberg, 2004). The case-lots and pallets are tracked and limited benefits of RFID can be realized.

Wal-Mart has encouraged their suppliers not to simply use the "slap and ship" model but rather to leverage the benefits of RFID through an integrated approach.

The feeling, however, amongst US suppliers is that the "Slap and Ship" model will continue to be used until a significant proportion of the goods produced will require RFID and further investment is justified. Until that point is reached, most companies cannot justify the investment on the basis that the anticipated return does not exceed the costs involved.

2.4.2.2) The Integrated Model

An integrated model makes use of all the components RFID technology from tag readers to middleware, to complete integration with the existing ERP system within the organization (Shutzberg, 2004). All business processes in the supply chain are managed using RFID technology.

The number and volume of goods to be shipped would be the main consideration when electing the integrated model. The larger the number of volume of goods the more difficult it is to adapt the integrated model to the organization's business. Another important consideration is the association that the organization has with its supply chain partners. A good cooperative relationship facilitates the adoption of the integrated model. The immaturity of RFID technology restricts manufacturers from electing the integrated model.

To justify the large investments required to achieve in achieving an integrated model, companies should to be aware of the potential costs and delays associated with RFID technology and its integration with existing systems.

2.5) Problems with the Current Supply Chain Model

It is important to understand the problems organizations face in the supply chain environment. If one considers the following facts as quoted by Accenture (Editor, 2003), one can gain a better understanding of the problems that RFID technology is capable of solving.

The supply chain is not effective and is regarded as inefficient. Therefore giving rise to the analogy that there is always room for improvement. There is currently a 20% wastage factor on all goods moving through the supply chain due to spoilage. This is because of an inefficient global supply chain.

Another major problem of the supply chain is that approximately 75% of the final cost of the product is the cost of "getting the product to the customer." These costs could be reduced significantly if the inefficiencies are eliminated. (Editor, 2003)

High levels of stockouts, currently assessed globally at 6% of sales arise from inefficient supply chains. Other problems include inefficient transport planning. Fifty percent of trucks are partly or totally empty on returning from making deliveries. (Editor, 2003)

Most businesses rely on paper-based business processes to co-ordinate the movement of goods. This leads to latency and the increased risk of inaccurate information due to human involvement.

People-intensive practices including paperwork and the use of barcode scanners to locate and keep track of inventory creates inefficiency. This results in a lack of trust that the inventory is in the same location as previously reported.

The handover points for the transfer of inventory ownership are a manual, time consuming, and inefficient reconciliation process. The matching of the inventory to the customer order is not only time-consuming, but also impractical. The view of the inventory is not accurate, as the incorrect information has been recorded. This may result in financial loss.

The human role and intervention in the foregoing processes is adjudged as inefficient. The business processes that require humans to initiate or terminate processes should be automated.

The above problems are restricting organizations from realizing their maximum potential. This may result in an organization losing the competitive advantage held in the market. By overcoming these problems, an inefficient organization may propel itself to a more competitive level.

2.6) The Flow of Goods through the Supply Chain using RFID Technology

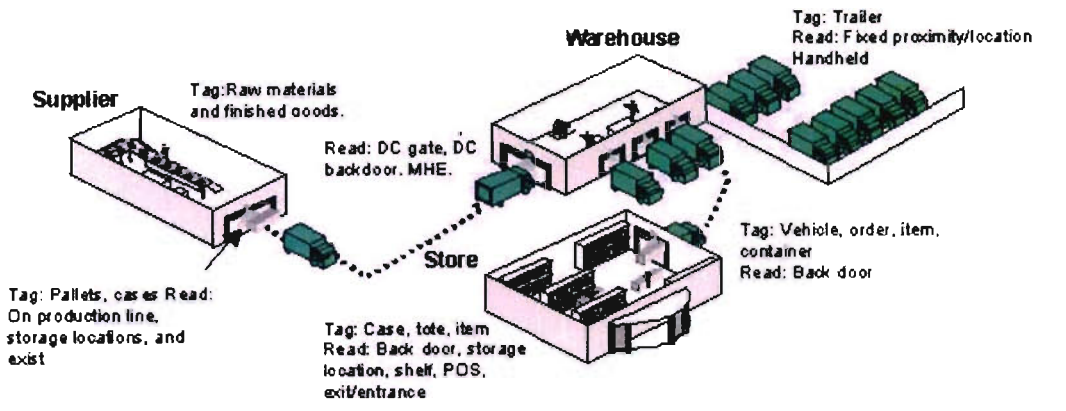

Figure 2: Flow of goods through the supply chain

(Source: IBM Business Consulting Services Analysis, Auto-ID centre in Intermec, 2004)

For successful implementation of RFID technology, it is necessary to understand the Supply Chain and the partners. Refer to the diagram above. Goods move from one partner to another. It is important that the data pertaining to those goods flow with the goods in "real-time." (Symbol, 2005)

The movement of goods starts with the manufacturer and one needs to ponder the benefits and challenges that the manufacturer encounters. The manufacturer, as the first partner in the supply chain would attach tags to the goods produced.

The tags would match the agreed upon standards that the other Supply Chain partners have adopted. The attachment of the tag is a difficulty task. Evolving technology, however, is making this activity easier to achieve.

The tag is attached to the goods and the data pertaining to the goods is stored on the tag. This information would include:

- Date of manufacture
- Type of product
- Pricing

- Special instructions
- Other relevant details that will help the future user of the item

Goods are the case packed and loaded onto pallets for shipping. Both cases and pallets are tagged to ensure that bulk shipments can be tracked and traced. The tags on the pallets and cases are encoded with the detail as above. The manufacturer then sends an advance shipping notice (ASN) detailing the nature of the goods shipped to the 3PL. This is done electronically allowing the logistics company to anticipate the delivery.

Goods are loaded and shipped either directly to the retailer or to a 3PL. In this scenario, it is assumed that all the goods are shipped via a 3PL. The goods are offloaded and are automatically received via the tag readers, which are located at the receiving dock.

The readers "talk" to the tags and they can automatically update stock levels on the organization's system. At the same time, a confirmation is generated confirming the goods were received at the 3PL. The date and time are recorded. This confirmation is sent automatically to the manufacturer.

When the goods are "put-away," the 3PL can automatically determine the exact location of the goods by scanning the warehouse. This makes the inventory fully "visible" not only to the 3PL but also to the manufacturer and the retailer.

The retailer places an order for delivery. The 3PL then determines which goods to ship to the retailer based on first expiry first out (FEFO) requirements and the current stock levels. When goods are picked and dispatched to the retailer, the manufacturer is automatically advised of the sale. The manufacturing plan can be subsequently updated. Again, an ASN will be sent to the retailer confirming the dispatch of the goods so that the retailer is aware of the pending delivery.

The retailer on receiving the goods can automatically confirm the delivery via the tag readers located in the receiving area. Goods are packed into a back store and not directly onto the shelves. Again, the inventory is more "visible" as the exact location of stock

can be identified easily. Once shelves are re-packed, the merchandisers can quickly determine where the stock is.

In an experiment, Metro AG linked RFID tags to shelves, which determined when shelves needed to be re-stocked without human intervention (Intermec, 2005b). This was achieved through RFID tags on goods and the maximum and minimum quantities where preset. As stock was removed from the shelf, the shelf automatically "counted" the stock and when it reached the pre-determined minimum, an instruction was issued to re-stock the shelf.

2.7) The EPCglobal Network

The EPCglobal network is a standard developed by EPCglobal Inc. (Editor, 2004b) that will make goods "visible" throughout the world via the Internet. Currently goods are classified according to the Universal Product Code (UPC). GS1, the organization that designs and develops global standards for use in business, is developing a new standard to replace the UPC. This standard is termed the Electronic Product Code (EPC). The EPC will be used on all goods that flow through the supply chain. It will become the international standard for tracking goods.

The proposed system will require that all goods be allocated a unique EPC. The EPC will then be associated with a unique item. The code will then be stored in a central database by the GS1. When goods are tagged using RFID technologies and tracked through the supply chain all the partners will essentially be "seeing" the same information linked via the internet and the EPCglobal network.

This information will be available via the internet in a secure manner. Any authorized person using an EPC can determine at any stage the exact location of a consignment of goods are in the supply chain. This feature is currently available via courier companies but they are using scanning technologies as opposed to RFID to achieve this.

2.8) RFID and the Value Chain Model

The Value Chain model developed by Michael E. Porter (Value Based Management, 2005) looks at the overall business in terms of a series of value-generating activities through the supply chain. These activities can be further broken down into primary and support activities that facilitate the value-generating activities. Please refer to diagram below

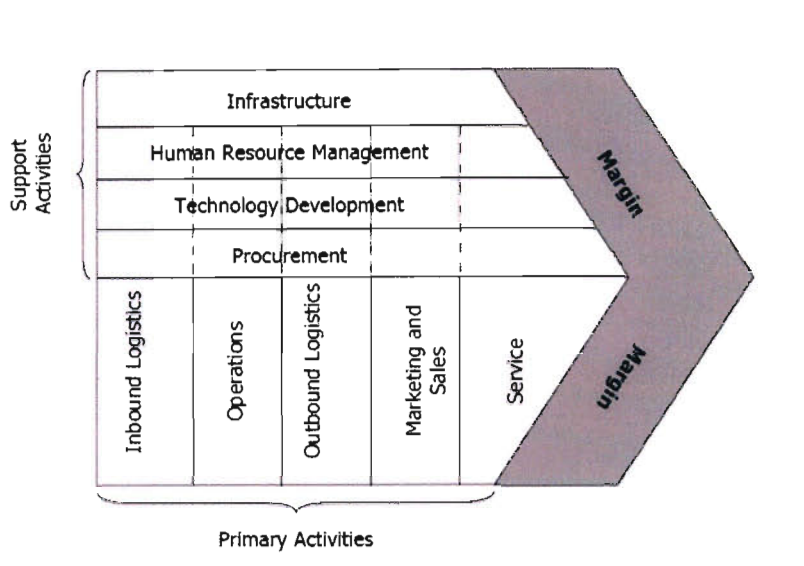

Figure 4: Michael E. Porter's Value Chain Model

(Source: www.themanager.org/pdf/valuechain.pdf)

These activities, together with the potential RFID impact in each case are analysed for the respective supply chain partners in the table below.

Organization Type	Primary Activities	RFID Impact
FMCG Manufacturer	Inbound logistics – The receiving and warehousing of raw materials and distribution to manufacturing. Operations – Process of transforming	Removal of human intervention and increased "visibility" of goods throughout the production

	the raw materials into finished goods and services.	stage
3PL	Outbound logistics – The warehousing and distribution of finished goods	The accurate monitoring of stock levels to ensure stock outs are kept to a minimum. In addition FEFO principles can be monitored
Retailer	Marketing – Identification of customer needs and generation of sales Sales Service – Support of customers and goods after the sales has taken place	Ensures that the "right product is in the right place at the right time" through the seamless integration of the supply chain from manufacturer to consumer

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Organization Type	**Support Activities**	**RFID Impact**
Applicable to all types as above	Infrastructure of the firm – Organizational structure / Control systems, company culture etc	Electronic communication and integration of all processes – Important
	Human Resource Development – Employee recruiting, hiring, training, development and compensation	Use of new technologies requires extensive training in the new systems
	Technology development – Technologies to support value – creating activities	The removal of human intervention and the elimination of repetitive task. The elimination of the risks of errors.
	Procurement – Purchasing inputs such as materials, supplies and equipment	Automatically controls the level of raw material stock and can automatically generate orders for replenishment.

As outlined above, the support activities are essential for the primary activities in terms of the movement of goods. By ensuring the costs throughout the value chain are reduced and are lower than those of their competitors, firms can achieve a competitive advantage through product differentiation. It is, essentially envisaged that RFID technology will be an enabler to achieve the objectives of the value chain model.

2.9) RFID Challenges and Issues

The overwhelming theme from all the research conducted to date is that the limiting major factor to the introduction of RFID technology is its high costs. This factor together with the lack of tangible benefits makes the decision to adopt the technology very difficult.

The lack of acceptable global standards is a major hindrance to the adoption of RFID technology.

Organizations do not want to be the first to implement the technology in the event that the standards changes subsequent to their decision.

2.9.1) Technology

It is important that tags are 100% reliable to ensure that all goods are scanned. Currently, the quality of tags is not consistent. Reliability must be guaranteed first before a reliable solution is achieved. The volume of goods produced is a problem, in that tags cannot be applied to goods quickly during manufacture.

Minor issues requiring resolution include, tag frequency collisions problems, tag readers currently not capable of reading different types of tags and other technology issues. (Highjump, 2004)

The technology is changing rapidly. It is necessary to stay constantly informed about ongoing developments in the industry.

2.9.2) Costs

The cost of the technology is the biggest issue for the supply chain partners. (Shutzberg, 2004) Firstly, tags are expensive to purchase because of the low volume required. Secondly, the tags need to be affixed to individual goods, cases, and pallet thus adding significantly to the cost to the overall finished product. (Editor, 2004e) Developments in this area of technology are regarded as the key to the future growth of RFID technology. (Shutzberg, 2004)

This problem will be solved by the anticipated increase in volumes of tags produced and utilised. RFID technology, however, must be adopted on a large scale to enable tag manufacturers to achieve economies of scale and to reduce the price of tags.

Early adopters of RFID technology would appear to have underestimated the costs thereof. An additional problem, it would seem, has been the high level of obsolescence of the technology because of the rate of its development. Technology costs may be expected to decrease as the deployment of RFID becomes more widespread.

Early initiators will also have to bear the costs of first-time mistakes as well as the lack of industry best practice. There is a shortage of specialist skills to assist with the implementation of RFID technology. In the opinion of many writers, (Pitman, 2005) existing consultants have had insufficient experience to develop these skills.

Although the cost of the tag will be borne initially by the manufacturer, this cost will be passed onto the final consumer via an increased selling price.

An entry-level tag reader currently costs in the region of R 6000. The price for better models of tag readers can increase upwards of R 30000. The scope and application of intended usage determines the tag readers required and hence the price.

Typically, entry-level middleware software costs approximately R 150,000. Additional costs incurred include additional hardware and the consulting costs to build an integrated solution.

This is where the success of RFID will lie. It is relatively easy to tag and read goods as they flow through the supply chain. Making this information "visible" to all the partners is critical.

The mandate from the Retailers to implement RFID is a major driver of the adoption of the technology. Without the push from the biggest company in the world, Wal-Mart, the technology would languish and take years to be considered as a solution.

2.9.3) Standards

The lack of standards is another challenge that is affecting RFID implementations. How does an organization adopt a particular strategy with the type of tag, the type of reader, and data type when the technology is still in a state of uncertainty? Wal-Mart has selected a particular standard that will probably become the de facto standard in the industry. This results from the influence of the organization over its supply chain partners.

2.9.4) Resistance to Change

Resistance to change is another challenge to innovators. The existing scanning technologies including bar coding have been entrenched over the past 20-30 years. The entire industry is familiar with a solution that works. It is deemed not a necessity to change and evolve to a technology that has not been proven.

One method of overcoming this resistance to change is to introduce RFID to work in conjunction with scanning technologies. This will allow new technology to be given the opportunity to gain acceptance amongst the different players.

Existing scanning technology solutions currently add value and represent a significant investment. The consideration to make another significant investment and retooling the existing infrastructure will make the adoption of RFID technology very difficult. Furthermore, why consider change when existing solutions are working.

2.9.5) Collaboration in the Supply Chain

Based on the literature survey, manufacturers struggle to understand RFID technology and future role it will play. The successful integration of RFID technology is contingent on each of the partners understanding and adopting the technology. It is pointless if a manufacturer adopts the RFID technology if the 3PL and the retailer do not also adopt the technology.

If the retailer mandates the manufacturer to tag all the goods supplied they will have to work together with the 3PL to develop a solution. A coordinated effort will be required, as organizations cannot work alone.

Another issue is businesses need to continue with day-to-day operations and cannot stop and implement new systems. The RFID solution must to be integrated into existing solutions with minimal disruption. Organizations need to have the availability of networks to cope with the new data generated by the new system.

There is widespread industry uncertainty around RFID technology. Organizations are unsure of RFID and how it can benefit the organization.

2.9.6) Skills Shortage

Currently there is a lack of industry skills manage the implementation issue. RFID deployment is a complex activity and requires skilled staff to implement. There are insufficient qualified and experienced consultants to drive and coordinate the project. This is as consequence of the paucity of new RFID projects. This, however, is expected to change with the adoption of the technology.

Relatively few players globally have successfully integrated a full RFID solution using internal staff and consultants. This suggests to the writer that there is an inadequate pool of skills in this field and that one challenges will be for industry to develop the skills that will make RFID implementation easier.

2.10) The Benefits of RFID

Research indicated that early RFID adopters could expect the Supply Chain costs to decrease between 3% and 5%, and revenues to increase between 2 and 7% (AMR Research in Intermec, 2004). The main reason for this benefit is the increased "visibility" of the goods throughout the supply chain.

The technology is able to provide error-free, wireless data transmission that is maintenance and power free. No line-of-site of the goods is required.

Further benefits include the capability to alter stored data and capture workflow process information. The tags and system can operate and work effectively in harsh environments that include excessive dirt, moisture, dust, and temperature. (Editor, 2004c)

In 2005 Retailers in both the USA and Europe went "live" with RFID systems. According to a study conducted by the NRF Foundation and Bearingpoint of 300 leading retailers surveyed, 35% indicated that they would implement RFID to some degree in 2005. This represents a 100% increase over the previous year. The first to implement will achieve competitive advantages over those that delay their implementations. (Burnell, 2005)

Other identifiable benefits include (Foltz, 2004), reduced pipeline inventory, which will lead to reduced operating costs, and improved customer service.

Potential benefits from within the organization must be identified. These include internal operating efficiencies and an increased "visibility" of inventory. Achieving the

abovementioned scenario as well as the potential benefits will take years to achieve. Detailed planning on an organization-wide basis is required to achieve this objective.

2.11) The Business Value of RFID

RFID will improve data collection through automation across the supply chain. This will change the competitive landscape of packaging, manufacturing, logistics and retailing aspects of the entire FMCG industry. (Symbol, 2004) Data will be collected across the supply chain at different locations. A pool of historical data will be created and be readily accessible:

The better quality the available data, the better the business decisions made. Sharing data between partners will lead to increased collaboration between partners and drive down costs.

A recommendation outlined by (O'Connor, 2005) suggests that partners must "get into the game." Business must investigate and understand the challenges of the technology. RFID is costly and complicated but it will be a transforming agent throughout the supply chain. There is an ongoing need to develop several strategies to prepare for RFID.

It is important to remember that prior to adopting any technology there are a number of factors to consider. (Blossom, 2005b) These include:

- There is a unique set of challenges for every company;
- It is necessary to create several iterations before an acceptable plan can be deployed; and
- The technology must be experienced to be completely understood

The RFID application must integrate with the business processes to solve problems as well as generate benefits.

The first strategy a manufacturer would have to develop would have to comply with the mandates issued by the retailers. Complying with these mandates would be the primary focus. Organizations could then develop a strategy that would look at achieving internal operating efficiencies and competitive differentiation. (Shutzberg, 2004)

2.11.1) RFID for Internal Operating Efficiency (Closed Loop Systems)

"Closed loop systems" are easier to implement and avoid issues with industry standards, synchronization of data over the internet and difficulties in developing collaborative processes. RFID technology is used internally to improve their own processes by tagging goods that are manufactured. (Shutzberg, 2004) This is to ensure quality as well as track the progress of goods through the manufacturing process. The "closed loop" system does not extend beyond the "factory gate."

2.11.2) RFID for Competitive Differentiation (Supply Chain Collaboration)

The fusion of RFID with product and service offerings allows retailers to achieve competitive differentiation. This is collaboration between packaging and display suppliers, the FMCG manufacturers and retailer to deploy smart shelves and create intelligent displays. (Shutzberg, 2004) These benefits will only be available after the RFID implementation has been completed successfully.

2.12) Business Justification for RFID

The benefits include increased revenue, reduced operating costs, improved product safety, quality control and many other non-tangible benefits. (Bearingpoint, 2005) These benefits will only be realized in the longer term as there is currently no viable business case for RFID technology at this stage. (Editor, 2005a) It is necessary the research and development monitor developments in RFID industry and feedback to management.

2.12.1) Adopting a "Wait and See" Approach

A company without a clear business strategy for RFID will experience market share erosion. The sales force will not be in a position to publicize the company's mandate for RFID in discussions with customers. (Intermec,2005a)

Waiting reduces the time to understand and work the issues and challenges that RFID presents. When the time comes to implement RFID as required by customers the organization will be lagging behind.

Waiting will reduce the time available to deploy RFID. When the solution is finally installed, it will be done in a hurry and under pressure. This will result in a less than an optimal solution implemented.

A prudent step for an organization would be to spend a small amount of money on RFID technology to understand the issues. The technology is undoubtedly going to be used in the future throughout the supply chain. A more significant investment in the technology should be deferred until the benefits are fully understood and there is a strategic fit with the organization's strategic objectives.

2.13) FMCG Manufacturers' Perspectives on RFID Mandates

The benefits of RFID will accrue to the retailer. Most of the costs will be borne by the manufacturer. They have to apply the tag to their individual goods. This activity is regarded as a difficult and expensive task. (Editor, 2004e)

The retailer's responsibility is selling of goods to the consumer. The costs of the tags will be passed onto the consumer. If the RFID implementation is a success and the benefits of RFID are realized, costs will be driven down and revenues will be increased because of higher sales. These benefits can be passed onto the consumer in the form of lower selling costs.

The benefits, difficult to quantify in the short term will outweigh the costs in the medium to long-term. Coordination of partners is a requirement and an understanding of all the supply chain partners' roles and responsibilities need to be outlined.

The adoption of RFID technologies as a solution requires a long-term strategy with milestones along the way to ensure that the organization is making progress. It is necessary to set targets to be in the early majority of innovation adopters.

The approach to RFID adopted by the USA has the retailer driving the implementation. The retailers have drafted mandates. These mandates outline the retailers' requirements from their suppliers. Typically, in order to continue to be a supplier, suppliers need to implement RFID according to the mandate requirements as outlined by the retailers by a certain deadline. (Blossom, 2005a)

The approach that FMCG manufacturers have taken is to focus on core product lines only. (Shutzberg, 2004) Most suppliers are developing their own mandate compliance strategy. The terms of the mandate compliance strategy are negotiated and agreed upon with the retailers. This would outline those goods can be reliably and cost effectively tagged.

The larger manufacturers are dealing with similar issues. They have to invest significant amounts of money to comply with the retailers' RFID mandates. There is no interest in the use of RFID for competitive advantage. The focus is only on the tagging of cases and pallets using the "Slap and Ship" model.

The resolution of issues between manufacturers and retailers will take many months. Once the issues for the supply of core product lines are resolved, then those suppliers who supply non-core goods to the retailers will be required to comply.

2.14) RFID - A Real World Application

The Chief Information Officer (CIO), Linda Dillman of Wal-Mart has outlined that the adoption of RFID is the organization's top priority. (Kharif, 2005) The mandate that was issued to suppliers (Top 100 suppliers had to meet the requirements of Wal-Mart's RFID mandate by 1 Jan 2005 and the next 200 have until 1 Jan 2006) was not an attempt to improve inventory "visibility" but rather an attempt to further cement its No.1 position in the retailing world.

The reasons for the adoption of the technology are strategic. (Evans, 2004c) The "first mover" principle is what Wal-Mart is attempting to achieve. RFID technology is regarded by Douglas (2005) as a disruptive technology and the early adopters of the technology have a better chance of success in the end.

The mandate calls for manufacturers to tag their goods for delivery to Wal-Mart at no extra cost to Wal-Mart. Manufacturers who comply with the mandate will be in a position to supply other retailers who request that the goods be tagged.

2.15) Conclusion

The literature survey outlined that RFID is a very immature and developing technology. Globally, the adoption of the technology by supply chain partners is measured. Partners are reluctant to commit to RFID projects because of high costs, a lack of defined standards, and a shortage of skills.

The literature survey suggests that RFID technology is at present a very immature, albeit a developing technology. The numerous challenges that supply chain partners are facing were highlighted and discussed in detail. Overcoming these challenges might lead to improved profitability. These include the inefficiencies that exist in the entire supply chain.

Overcoming these challenges can be achieved with RFID technology. Organizations, however, need to understand what the technology can attain and what impact the technology will have on the organization.

PART TWO

CHAPTER 3 - RESEARCH METHODOLOGY

3.1) Introduction

The key purpose of this study is to establish whether the use of RFID technology in the supply chain by the main supply chain partners as identified above is prevalent in the South African economy and to understand what the perceived benefits of the technology are.

Furthermore, attempts are made to ascertain what the constraining factors are of adopting an industry changing technology. The nature of the supply chain presupposes that each partner will interact which each other to achieve commercial success. The relationship between partners is fundamental to attaining and maintaining the ongoing success.

To undertake this study, it was necessary to obtain the opinion of the leading players in the supply chain management sector in South African. The retailer, the third party logistics (3PL) supplier, and the FMCG manufacturer, all the necessary partners of the traditional supply chain were included.

The type of questions asked in the questionnaire looked specifically to identify the progress that these players had concerning with RFID and the challenges with the technology.

The use of RFID technology is potential benefit to all partners (Chappell et al. 2002). It is, therefore, important that the partners agree on the benefits of RFID technology and means to achieve these benefits.

3.2) Research Method Selection

The study lends itself to the use of descriptive statistics, which entails the use of the measures of central tendency (mean), dispersion (standard deviation), frequency, histograms, and ratio analysis.

In addition, cross tabulations were generated to establish if any meaningful relationships exist between the different variables.

Organizations were selected from the start of the supply chain, namely the FMCG manufacturer were selected, along with the logistics suppliers, the companies responsible for transporting the goods from manufacturer to retailer. The final selection of organizations came from the retail sector, being representative of the final link in the supply chain.

3.3) Sampling Design

Non-probability sampling was used. Given the size of the South African economy, large companies were selected based on their turnover. Turnover was used as an indicator of the organization's size; because these companies were likely to have the resources necessary to investigate and implement RFID technology.

Other factors that affected the type of sample selected included the consolidated nature of the FMCG industry, characterized by a limited number of large retailers. This limitation also applies to the logistics suppliers.

General, IT, and logistics managers were targeted and surveyed from the selected organization because of their presumed knowledge of RFID technology, coupled with their understanding of the relevant issues pertaining to IT, supply chain management and logistics. In each case, the most important partners in the supply chain were identified and those ancillary to the supply chain were excluded.

Twelve people from the retailers were surveyed, whilst eight people from the logistics suppliers were asked to complete the questionnaire. The final ten people surveyed were from the retail sector.

Accordingly, there are no statistical techniques for measuring the random sampling error of a non-probability sample such as this. The use of inferential statistics to extrapolate the results to a larger population is not possible.

3.3.1) Selection of the Sample

A cross-section of potential candidates was identified from the Johannesburg Stock Exchange (JSE) share page in a local newspaper. The categories identified included retailers, Third Party Logistics (3PL) suppliers and the FMCG manufacturers. Initial contact was made via email to the respective companys' information pages on the internet. Once contact was established, the contact details of the IT department and the relevant personnel were requested and obtained.

Those companies that did not have a web page or were not available on the Internet were contacted telephonically. Once the complete contact database was established, the questionnaires were forwarded electronically to the selected companies, under cover of a request that, once completed, they be returned electronically.

According to Cooper et al. (2003), the validity of a sample depends on:

- Accuracy – Degree to which bias is absent from the sample. Sufficient elements are required in the sample to allow it to be free from pre-determining the type of sample required
- Precision – Precision of estimate. No sample fully reflects its population in all respects. There will always be a sampling error and a standard error of estimate. The smaller the error, the higher the precision of the sample
- Reliability – How reliable are the results and can the same results be achieved by using the same instrument with the same selected sample?

3.4) Data Collection

For the purposes of data collection, a questionnaire was designed and sent to the selected companies. **Appendix I** contains a copy of the questionnaire. All responses with the exception of one were completed electronically. One interview was conducted with the questionnaire forming the basis for the interview.

3.5) Research Objectives

The study of the RFID in the supply chain in South Africa attempts to ascertain the extent of the understanding of the technology and the opinions of the different partners within the supply chain. Apart from determining the level of understanding of the RFID technology, other factors affecting the technology as well as what benefits were foreseen by the significant players in the supply chain will be considered

For ease of reference, the research objectives introduced in chapter 1 are re-produced as follows. The study has set out to test the following hypothesis and corollaries.

3.5.1) Hypothesis

- There is significant awareness and interest in the potential benefits of RFID technology amongst supply chain partners in South Africa

3.5.2) Corollaries

- To date, there have been no significant developments in the implementation of RFID technology amongst supply chain partners in South Africa.

- It is submitted that the timeframe for the implementation of RFID in South Africa is medium to long - term

- Retailers are likely to be the drivers of the implementation of RFID technology as opposed to the other supply chain partners.

- The most important benefit of RFID technology is the increased "visibility" of inventory throughout the supply chain

3.6) Instrument

The questionnaire was designed and based on the issues that were identified through the literature survey phase of the project.

3.6.1) Structure of the Instrument

Twenty questions were posed to the respondents. The questions were designed to understand in each case whether RFID was important to the organization and if so over what timeframe the respondent would consider using the technology to gain the perceived benefit.

Other questions attempted to understand what the respondents considered to be the benefits of using the technology. In addition, other specific questions sought to establish if there is any relationship between the various factors.

The basic information and types of questions were addressed as follows:

Administrative – This dealt with the name of the respondent, the name and address of the company, relevant email addresses as well as the position held by the respondent within the organization. This type of data is ordinal and administrative in nature in that it identifies the respondent.

Classification questions were used to develop groups. Questions 1 and 2 established the industry of the respondent its turnover of the organization to give an indication of size. The type of data is ordinal. Additional questions regarding the profile of the respondent

and the organization were posed in questions 3, 4 and 5. This allowed for groups of respondents to be classified together in attempt to identify any meaningful trends.

Questions 6 and 7 made use of the Likert scale to collect the ordinal data about rating a particular problem that could be solved using the RFID technology as well as the benefits associated with the technology.

Questions 8 and 9 attempted to establish whether the respondents were considering using the technology, and if so, over what timeframe.

Question 10 is a specific question requesting the nature of the implementation of RFID.

Question 11 related to the organizations' future prospects and proposed solutions

Question 12 dealt with the constraining factors that have, in the opinion and/or experience of respondents, inhibited the ongoing and rapid installation of the technology.

Question 13 – Who is responsible for driving the implementation of the technology?

Question 14 – This generic question attempts to establish what the thinking is regarding the technology.

3.6.2) User Friendliness

Given the time constraints of most respondents, the time taken to complete the questionnaire was kept to a minimum. Ideally, respondents should have completed the questionnaire within 15 minutes. The most time taken was on the administrative section. The nature of questionnaire was kept to a high level and purposely framed in easily understandable vocabulary. The terms used were not overly technical and allowed the respondents to understand fully what each question was attempting to establish.

The inclusion of a scale from 1-10 for selected questions allowed respondents a relatively wide range to express their thoughts, thereby enabling a more accurate rating.

3.6.3) Bias Control

The sample was selected randomly with a total of 65 questionnaires distributed. The initial response was slow and respondents were prompted with further follow-up correspondence and telephonic reminders.

3.7) Limitations of the Research

As previously stated, the focus of the research was on the major organizations in the South African business arena. It must be acknowledged that they are possibly slower to react to technology changes than smaller organisations. This factor could, therefore, detract from the effectiveness of the research.

Conversely, smaller organizations, despite not having the financial resources to harness RFID could nevertheless be in a position to respond relatively quickly and be more willing to adopt the new technology, if only in a bid to gain a competitive advantage over their larger counterparts. Their exclusion from the sample may constitute a limitation on the scope of the research.

In the case of the retailers surveyed, those selected are representative of the entire sector, as they are responsible for retailing almost ninety nine percent of goods in South Africa.

A number of large FMCG companies, however, were excluded from the sample due to their technology strategies being set by foreign holding companies. The local decision-making capabilities of the management of these companies was felt to be not relevant and would possible have had no weighting in the sample. These companies were not considered despite having the necessary resources to adopt the technology.

CHAPTER 4 – DATA ANALYSIS

4.1) Introduction

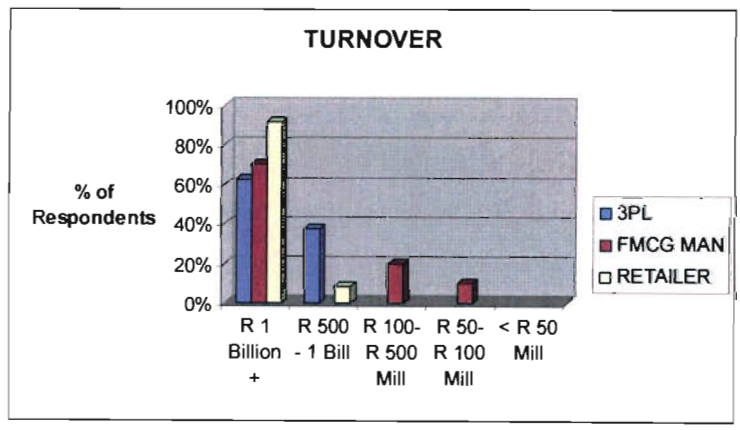
The results of this survey are based on the views of the different supply chain partners. These views are influenced by the information that they have read about foreign organization and their experiences with RFID.

If a respondent, reads favourable comment on RFID technology, then their responses would indicated this. The opposite applies to negative comments. It is important to understand that RFID is a new and immature technology in South Africa.

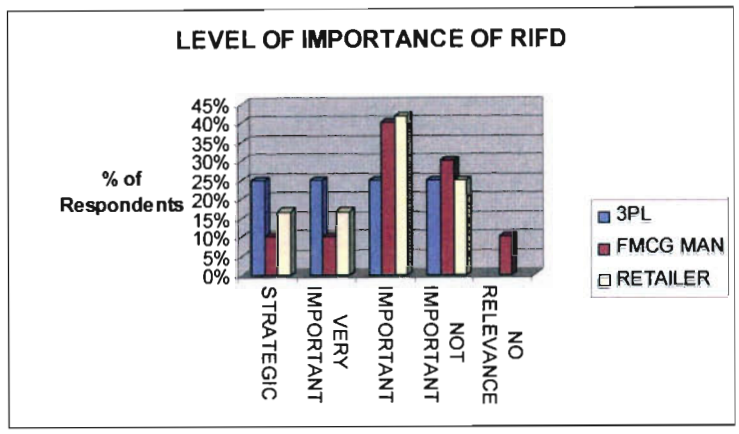
The strategic level that the technology has permeated to is a further point to ponder. A high strategic level allows for a better and more accurate response because it would reflect the seriousness of the respondent in terms of the adoption of the technology within a particular organization. A lower level understanding of the technology would show that respondents are not fully aware of the potential benefits.

4.2) Analysis and Discussion

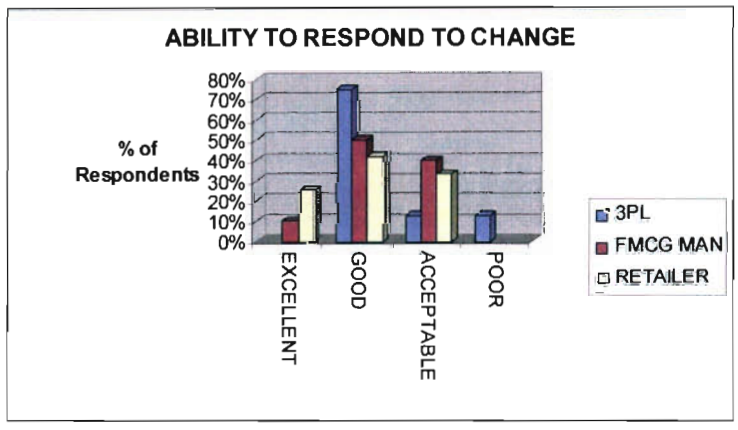
4.2.1) Demographic Information



The graph above indicates that the research targeted organizations with a large turnover. A majority of the respondents emanated from organizations with annual turnovers in excess of R 500 million.



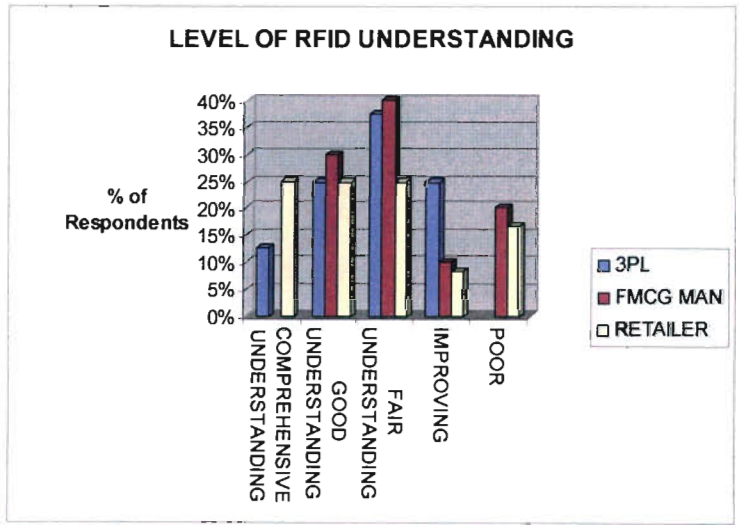
The responses for the level of importance of RFID were distributed equally amongst the supply chain partners. The 3PL respondents identified RFID as extremely important with 25% of the respondents indicating that the technology is strategic. Selected FMCG manufacturers did not regard the technology as important.



Organizations were evaluated in terms of the ability to respond to change. Change not because of RFID, but change within the organization. The results were spread between good and acceptable. This confirms that most organizations were not resistance to change and would be open to change the way they carried out processes.

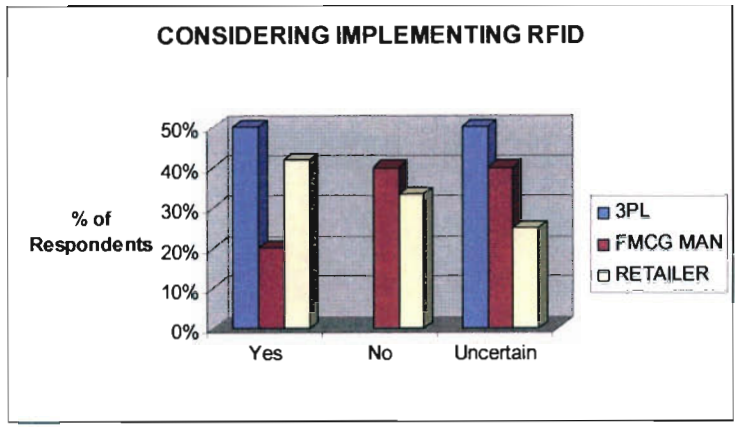
4.2.2) Hypothesis Result

All 30 respondents indicated an awareness and understanding (see below) of RFID technology. The results vary from poor to a comprehensive understanding of RFID technology. There were also awareness indicators. These include the responses to the potential benefits questions outlined in the questionnaire. The deduction drawn from these results is that the hypothesis is true that the supply chain partners are aware and interested in the potential benefits of RFID technology. It is, however, not possible to conclude that significant awareness exists without further detailed research and statistical analysis.



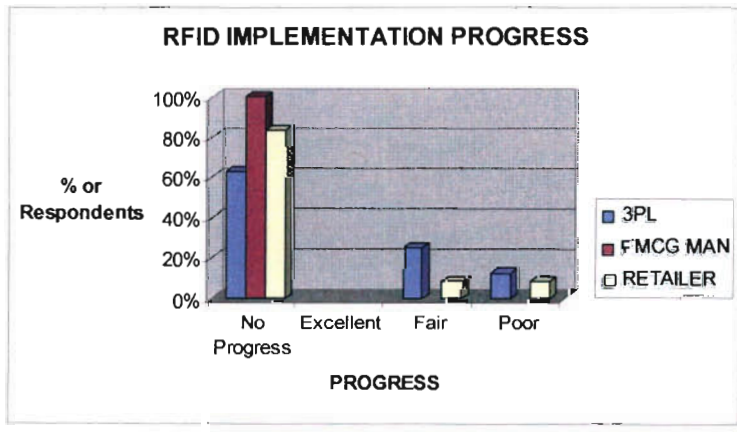
4.2.3) Corollaries

The results indicate that a number of respondents were considering implementing the technology. (See below). The majority of respondents are uncertain regarding the direction that they are going to take with RFID.

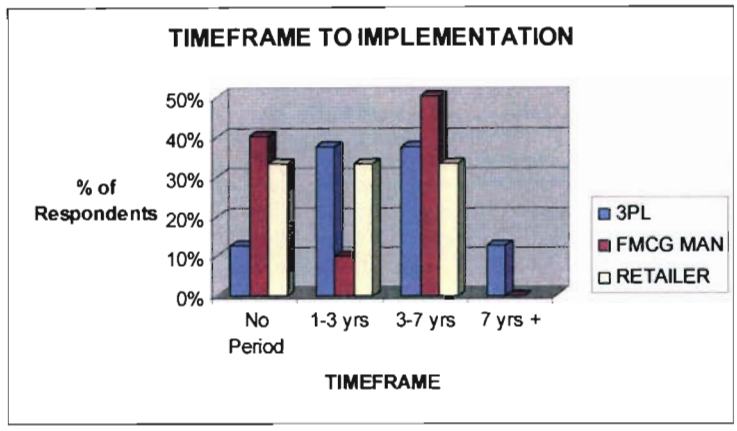


Only one respondent indicated that they were using RFID technology and a number indicated that they were making reasonable progress in the RFID implementation. The majority of respondents indicated that they were no progress in implementing RFID.

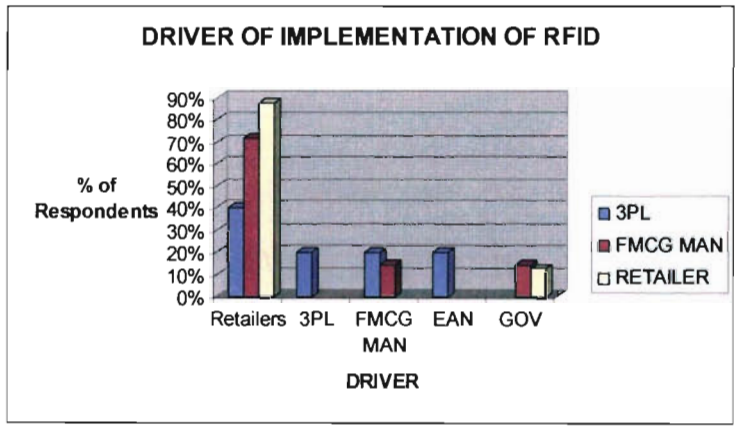
It can be concluded that there are no significant developments in the implementation of RFID. This supports the literature point of view that there is a slow adoption of RFID technology.



If the decision were taken to implement RFID technology, then most organization would only consider the implementation to take place in the medium- to- long-term.



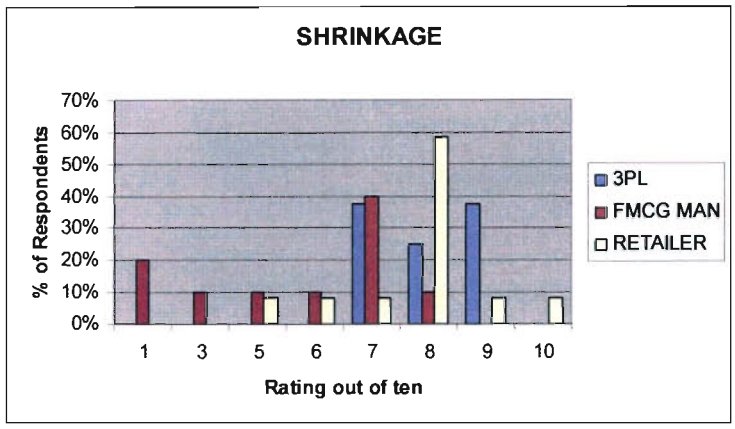
The results below confirm that none of the partners would be responsible solely for driving the implementation of RFID. The responses show that it would require a coordinated effort between all the partners. In reality, however, is may require mandates from the retailers to initiate RFID implementation.



It is difficult to single out one factor as the most important benefit of using RFID technology. The most important benefits are organizational and industry specific. Certain benefits may be considered important to one partner and irrelevant to another.

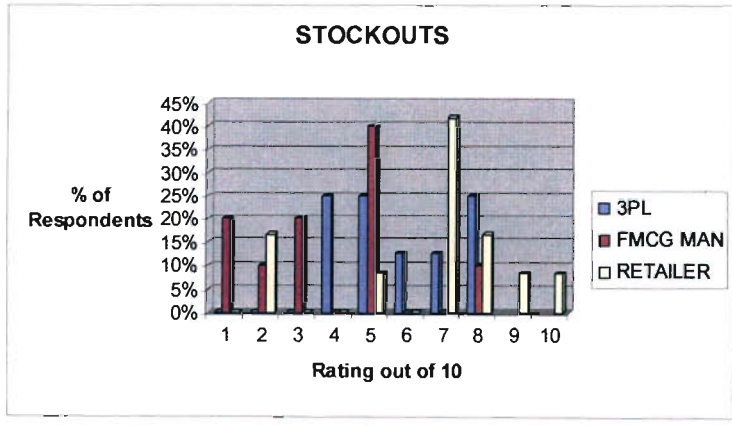
4.3) The Respondents' Perception of the Technology and what they Perceive as being Important / Value that the Technology can Provide

4.3.1) Shrinkage Reduction



Respondents generated an overall rating of seven out of a possible ten. This indicates that RFID could help to reduce shrinkage. The 3PL were undecided in their response and rated the benefit between seven and nine out of ten. FMCG manufacturers rated in this factor in the region of seven out of ten. This indicates that there is potential to reduce shrinkage through using the technology. Fifty eight percent of retailers rated the technology an eight indicating that the technology could help eliminate shrinkage.

4.3.2) Stockout Elimination

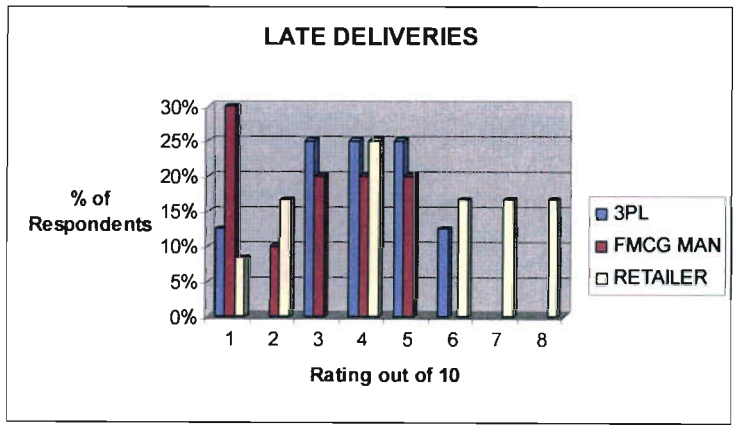


Respondents scored an overall rating of five out of ten. This demonstrates that respondents are not convinced of the potential of RFID to prevent or reduce stockouts.

The 3PL ratings fluctuated from four to seven out of ten. This shows that they do not have a problem with stockouts and the technology would not help. FMCG manufacturers suggest that RFID technology could not help in any way. Their scores were below five out of ten.

The results suggest that 3PL would be responsible for helping to prevent stockouts. Retailers, who would lose money in the event of stockouts, suggest that the technology would benefit them by rating the benefit from seven up to ten out of ten.

4.3.3) Late Deliveries



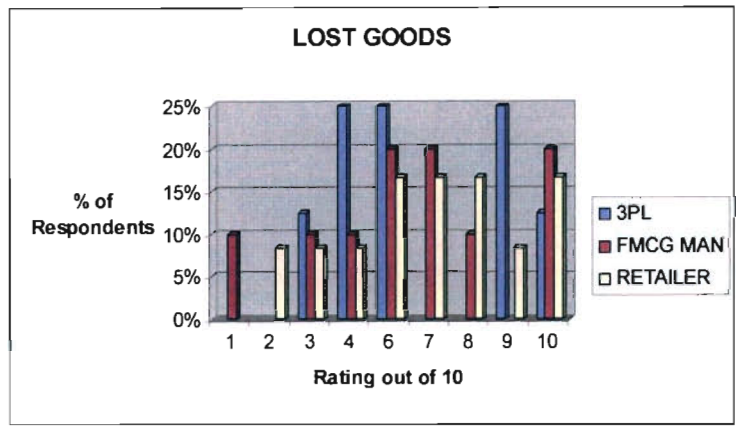
Respondents recorded an overall rating of four out of ten. This indicated that respondents were not convinced of the potential benefit of RFID to reduce late deliveries. 3PL rated late deliveries as not important with the ratings of between four and six out of ten. FMCG manufacturers gave this benefit a low rating of between one and five out of ten

Retailers varied in their responses. Fifty percent rate this benefit between six and eight and the other half between one and four out of ten. This factor would require further

analysis to understand the type of retailer (convenience etc) and the type of rating they give this benefit.

Most of the respondents gave this benefit a very low rating. This factor is not a problem in the supply chain in South Africa. The use of RFID technology would no solve this problem.

4.3.4) Lost Goods

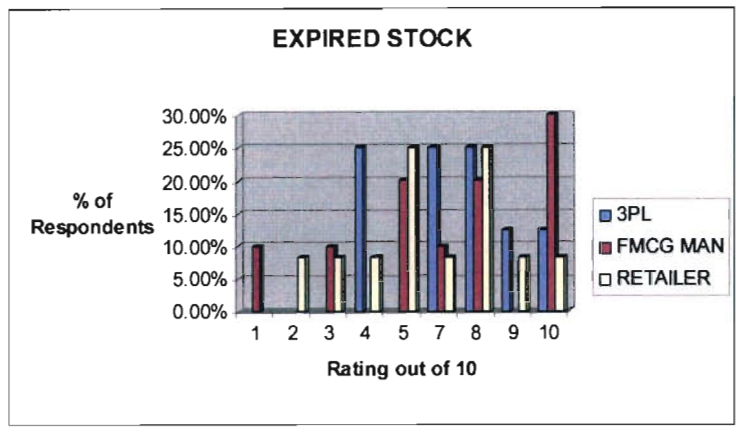


Respondents recorded an overall rating of six out of ten. This indicates that they were convinced of the potential of RFID technology to reduce lost goods. 3PL ratings vary from six to ten for 62% of the respondents.

The response of 3PL suggests that they would benefit by using RFID technology. FMCG manufacturers' responses vary from one to ten of ten. This suggests that the nature of the goods manufactured determine whether there is a problem that be solving for manufacturers.

Some respondents indicated major problems with goods being lost. Retailers indicate strongly that they would benefit by using RFID technology. Scores ranged from six to ten out of ten.

4.3.5) Expired Stock

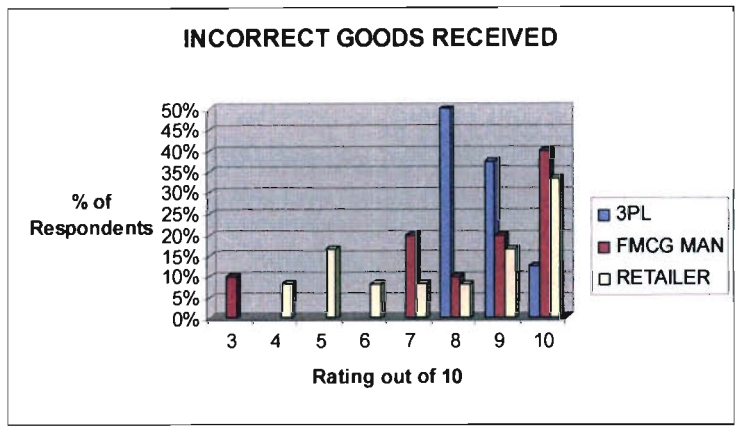


Respondents recorded an overall rating of eight out of ten. This indicates that they are convinced of the potential of RFID technology to reduce expired stock. This response is dependent on the nature of the goods moved through the supply chain.

Some industries including the furniture and durable goods generally do not have expiry dates. This factor would not be important to manufacturers of these types of goods. 3PL also rated this as important. They are responsible for delivery on time of goods that will expire. FMCG manufacturers suggest it is important that expired goods be monitored. Retailers are indifferent with scores varying from three to ten out of ten.

This indicates that retailers are often not responsible for expired stock. This cost is the responsibility of the manufacturer. High-end retailers, however, need to ensure that stock has not expired in their store or else they could lose sales if their business model dictates fresh foods for sale.

4.3.6) Incorrect Goods Received

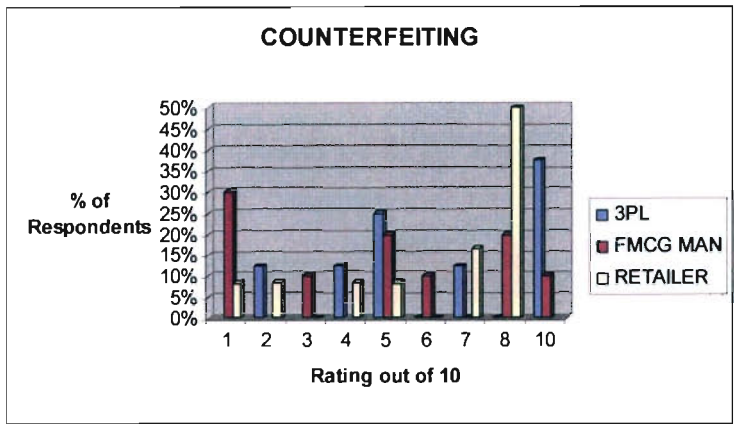


Respondents recorded an overall rating of nine out of ten. This indicates the potential of RFID technology to reduce the quantity of incorrect goods received and shipped.

3PL responded with scores of between eight and ten indicating that this is a problem area that the technology could very easily solve. Given that their business is, the movement of goods from one party to another would also suggest that it is critical for profitability that the correct goods are moved.

FMCG manufacturers indicate this is a problem area. Their ratings range from seven to ten of ten. Retailers suggest that it is a problem but do not feel as strong about this as the other two partners. This could be because of the retailer being partly responsible for creating the problem. The potential of this benefit could warrant further investigation.

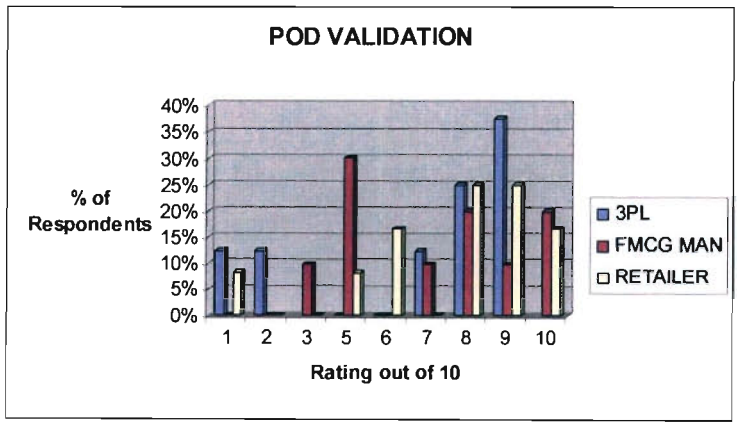
4.3.7) Counterfeiting



Respondents recorded an overall rating of seven out of ten. This indicates that they are convinced that RFID will with reducing the counterfeiting of goods. 3PL respondents suggest that the technology can help with ratings from seven to ten of out ten.

Only 40% of FMCG respondents feel that the technology can help. Retailers suggest that it can help.

4.3.8) Proof of Delivery (POD) Validation

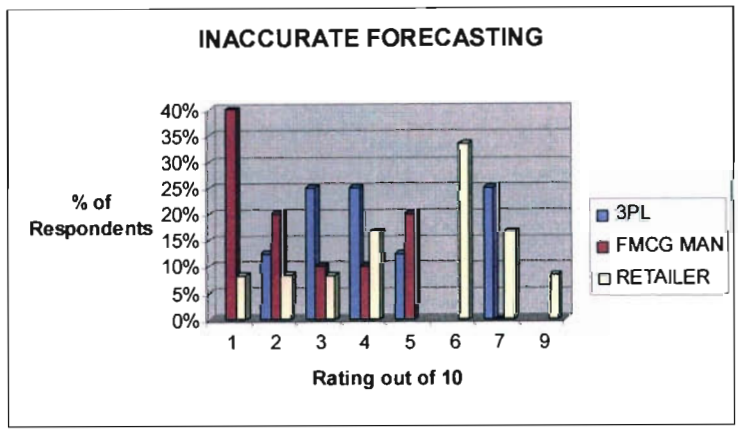


Respondents recorded an overall rating of seven out of ten. This indicates that they are convinced of the potential of RFID technology to help with validating PODs. 3PL ranges from ratings of one and two to eight and nine out of ten suggesting that to some parties the POD validation is a not a problem and to others the problem is serious.

Sixty percent of FMCG manufacturers believe POD validation can be enhanced be using RFID technology. Retailers' responses vary from one to ten out of ten.

Given the reputation of retailers to use incomplete PODs as an excuse to delay payments, it would suggest that in certain cases the technology could work to their detriment and to the benefit of the other parties.

4.3.9) Inaccurate Forecasting



Respondents have varying responses from one to ten out of ten. This suggests that forecasting is a problem for some organizations. 3PL do not rate forecasting as benefiting from using RFID. The same applies to FMCG manufacturers as respondents do not feel strongly about the technology being able to help with factor.

Retailers rated the ability to forecast accurately important. This may due to the different types of goods sold and the type of store from which the goods are sold.

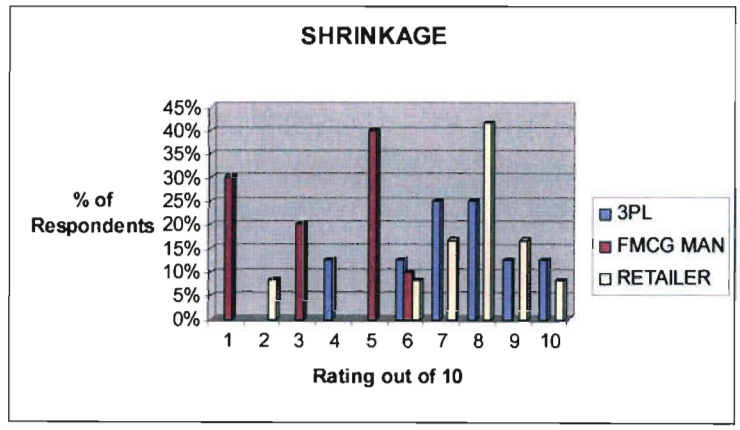
Any technology that reduces the role of human beings can help eliminate errors and streamline operations. The overall perception from all respondents is that the technology can help and assist businesses in making their operations more efficient and eliminating waste and inefficiencies that are prevalent in the supply chain.

4.4) **Respondents' Ratings of RFID Technology benefits in terms of the Perception of the Technology and what they consider important / value that the Technology can provide to the Respondents' Organization**

Although this question is similar to the first question it attempts to match the overall perspective of RFID technology being the responses in question 1 and the potential benefits that the respondents will feel are applicable to their organization in question 2.

The discussion attempts to ensure that perceived benefits by respondents are aligned with the benefits that the respondent can foresee being applicable to their type of organization.

4.4.1) Shrinkage Reduction



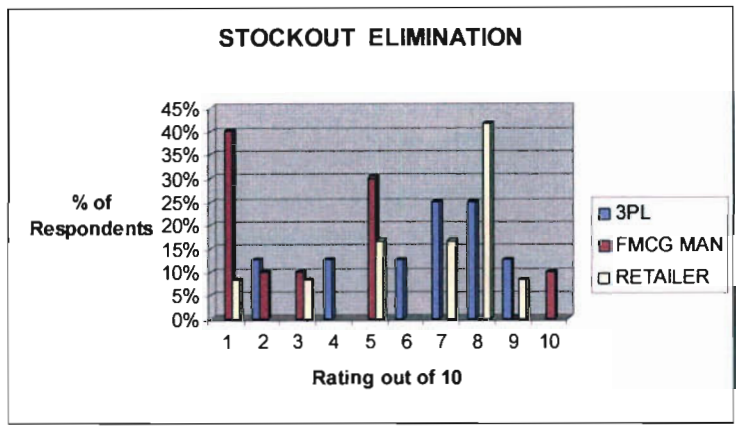
The overall response was mixed with 53% of the respondents rating RFID as being able to help their organization with the reduction of shrinkage. This indicates that organizations have a significant problem with shrinkage but they feel that the RFID cannot add any value by helping to reduce shrinkage.

Considering the general response to this question from above indicates that the perception is the technology can help with 60% of respondents indicating this. However when applied to their organization this drops to 50%. Eighty seven percent of 3PL

indicate above six out of ten that they can benefit from the technology to reduce shrinkage.

FMCG manufacturers generally felt that RFID would not help them. The responses were below five out of ten. They are at the beginning of the supply chain and possibly have limited human involvement with the goods after manufacture. The shrinkage problem appears to become a bigger problem to the other parties who are further down the supply chain.

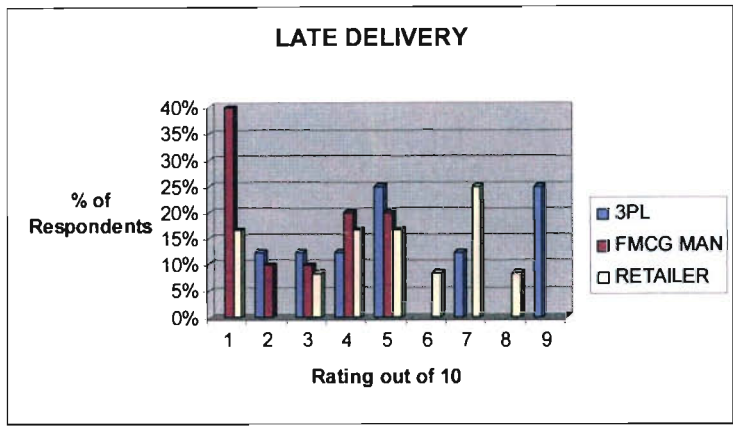
4.4.2) Stockout Elimination



Again the responses were mixed with 50% indicating that some organizations perceived the technology as being able to assist in eliminating stock outs. This begs the question, is it those organizations that are not managing the process correctly that will benefit or is the process difficult to manage due to the volumes?

Accordingly, 3PL partners whose function it is to manage logistics suggest that the technology will assist them in reducing stockout situations. FMCG manufacturers appear not to have problems with stockouts. This would suggest that being at the start of the supply chain has benefits in terms of control over the movement of goods. Retailers also offer mixed responses with 50% suggesting a range of six to ten out of ten. Surprisingly, this rating is low given the high cost of stock outs for retailers.

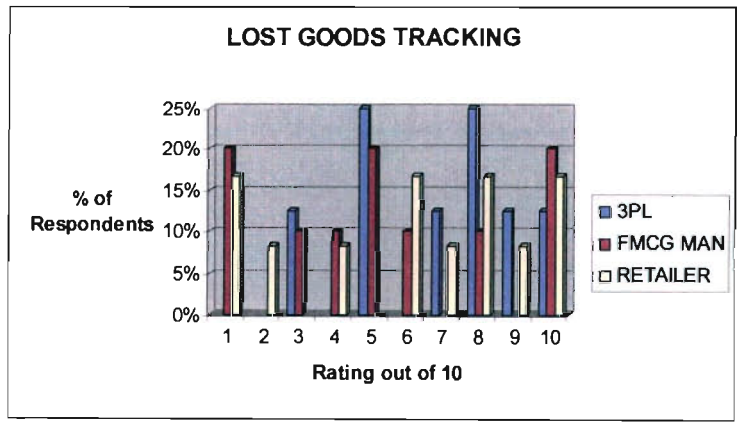
4.4.3) Late Deliveries Elimination



The results for the question mirror the responses in part one above. RFID technology has a number of benefits. The responses are mixed in terms of the importance of these benefits. A number of 3PLs indicate that the technology may be beneficial with responses at nine out of ten outlining that the technology is helping to ensure that late deliveries are eliminated.

FMCG manufacturers do not indicate that there will be significant benefits of the technology. Retailers present a mixed set of results.

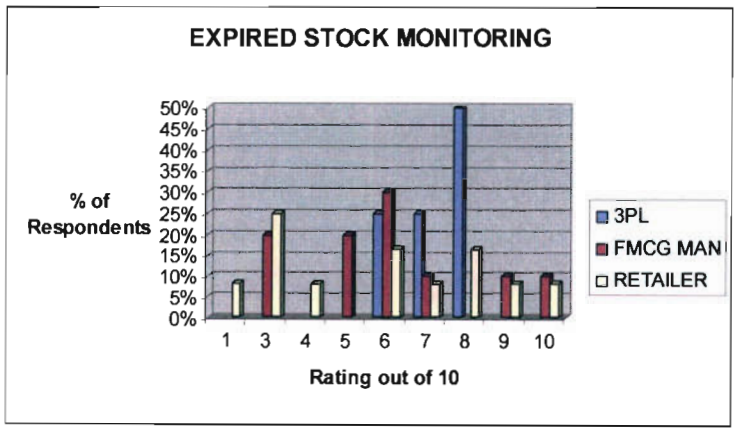
4.4.4) Lost Goods Tracking



There is a similar pattern for this question. Some respondents suggest a strong benefit in terms of using the technology to track lost goods. Again how many of the goods are being lost and is it a problem that warrants making a significant investment to eliminate.

Some 3PLs suggest significant benefits of using the technology. It mirrors the nature of their business. It would also appear important to some retailers to track goods. The response does not indicate whether these are goods coming into the organization or whether it attempts to locate goods already purchased by an organization. This would suggest that possible retailers has a lot of stock available on a system but when attempts are made to locate it, it is not possible to find the item to sell it to a customer.

4.4.5) Expired Stock Monitoring



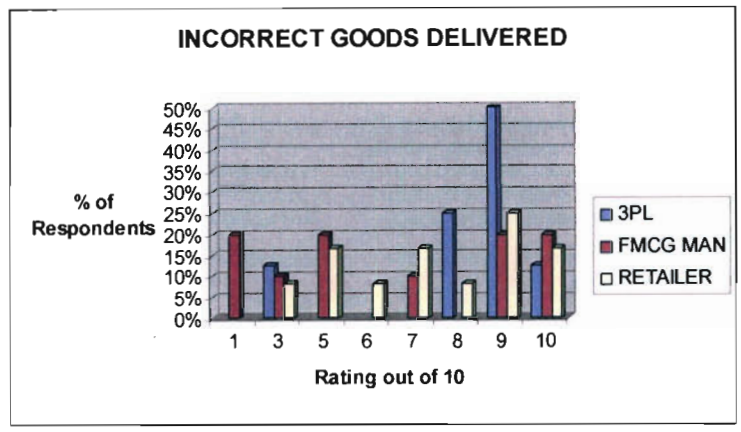
It is an important requirement in the Food and Drug industry that the expiry dates on stock goods are monitored and managed. Therefore, depending on the type of the business, this would determine how important it is to monitor expired stock. In the furniture industry, as an example, RFID has no relevance.

Retailers identified RFID technology as being important in being able to monitor expired stock. 3PL suggest that RFID technology will help them rotate their stock and help eliminate the expired stock.

FMCG manufacturers are indifferent because they often determine the expiry date on the goods that they manufacture and once they have shipped the goods they have no control over these goods. However, with successful branded goods it is imperative that no expired stock reaches the customer.

Retailers indicated a strong benefit because of the losses involved in allowing stock to expire. There is also the possibility of customers losing faith if the stock that is available for purchase is already expired.

4.4.6) Incorrect Goods Received



The processing of invoices and credit notes for goods received that were not ordered is a huge waste of money and time. The removal or reduction of the problem would allow for significant savings to all parties involved in the supply chain.

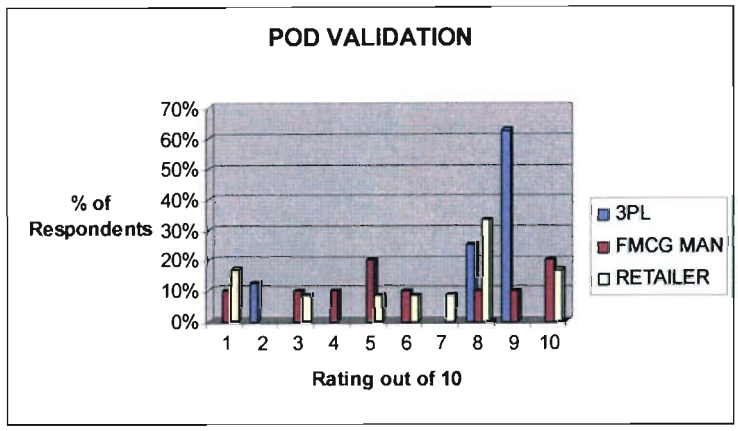
Eighty seven percent of 3PL respondent cite RFID strongly (six-ten out of ten) as being able to eliminate or reduce this problem. This indicates that this is a significant problem in their business.

FMCG manufacturer respondents are indifferent. This indicates that this problem would not be solved by using RFID. Possibly, they do not have a problem with incorrect goods being delivered. There are some FMCG manufacturers, who indicate that they do have problems and that RFID can help solve this problem. It would be necessary to look at

the type of business that this FMCG manufacturer is involved in. If the organization is the manufacturer of an essential drug, whose raw materials are critical it might be essential that the correct goods be received as per the order.

Retailers who sell thousands of different goods suggest strongly that RFID will help them to solve this problem.

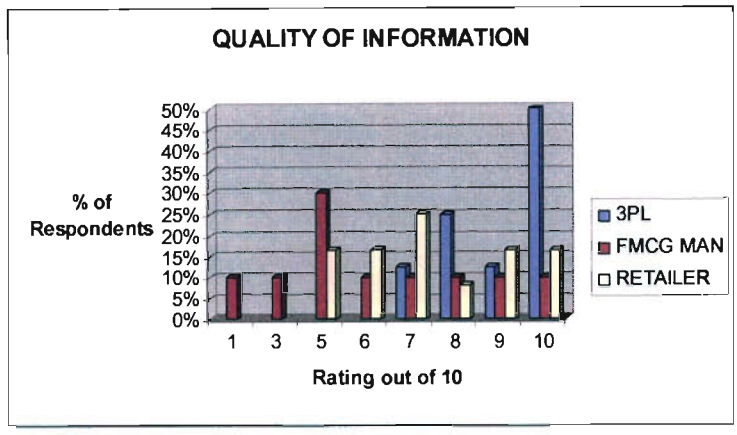
4.4.7) POD Validation



Accurately determining who received goods is important to ensuring that payment is made on goods supplied. Being able to confirm delivery on time using RFID is considered beneficial. 3PL suggests strongly that RFID will help. FMCG respondents offer a wide range of responses and this could be determined by the type of business and if they are currently experiencing problems with POD Validation.

Retailers offer mixed responses. A simple explanation could be that they are indifferent and that POD validation made simple would suggest that they would have to pay all invoices on time and that there would be no scope for queries on invoices. This response is dependent on the retailers' attitude towards their suppliers.

4.4.8) Quality of Information

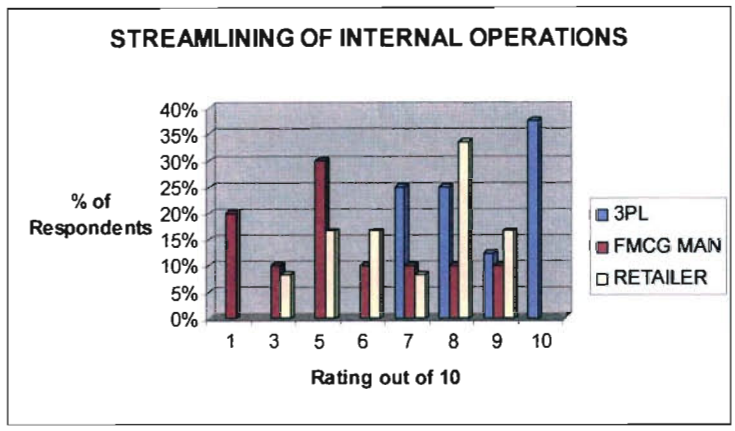


The better the information available, the better the decision made. Surprisingly one third of the respondents did not think that RFID would improve the quality of information that they had available. This response depends on the individual respondents.

Two thirds of respondents felt that they could benefit by using RFID to get better information. The 3PL respondents rated 100% above seven out of ten rating. Their business type dictates that information is relevant and of key importance

For FMCG manufacturers the responses were mixed. This is concerning in that, any technology that can improve decision making, should be considered beneficial rather that being rated as not important. Retailers indicated a rating that suggests that they could use technology that would improve decision-making.

4.4.9) Streamlining of Internal Operations

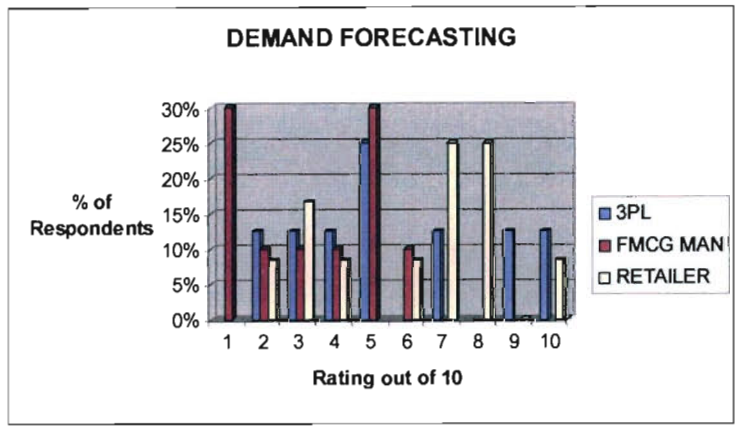


RFID technology would not only improve external operations, those interactions with third parties, but would be beneficial internally, allowing for the smoother flow of goods from one location to another. 3PL suggests a measurable benefit in using RFID technology for the tracking and monitoring goods within the organization.

FMCG manufacturers do not see the benefits of the technology in terms of their internal operations.

Retailers offer mixed responses in that some indicate a positive response in terms of the benefit internally. Some respondents are indifferent. Possible they are unsure as to how the technology can assist internally.

4.4.10) Demand Forecasting

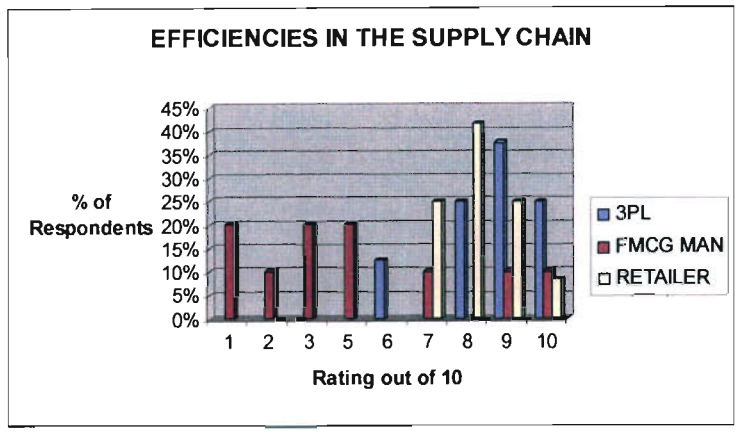


By being able to predict or anticipate the demand accurately from customers is fundamental to ensuring profitability and efficiencies throughout the supply chain. Responses suggest otherwise from both 3PL and the FMCG manufacturer as their relationship is more interactive that the retailer.

The standard days of stock measure is used as the gauge for demand. It is not able to prevent stockouts. Retailers who are linked directly to the consumer and final customer indicate a moderate response to being able to improve the forecast of customer demand.

This suggests that depending on your position in the supply chain determines what benefits of RFID technology are important to your organization.

4.4.11) Efficiencies in the Supply Chain

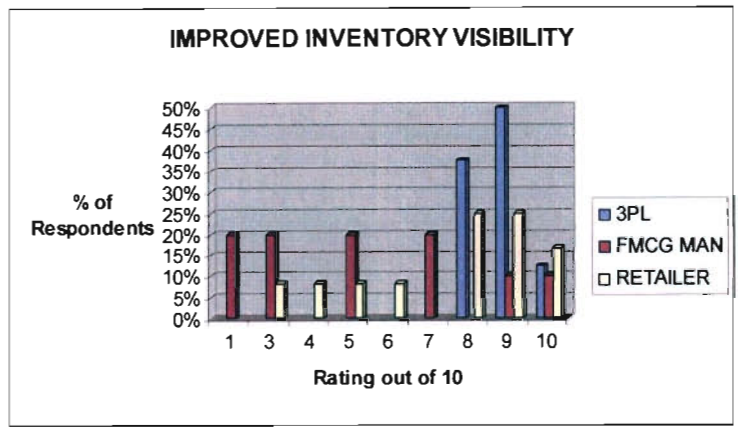


The smooth flow of goods from the manufacturer to the consumer via the 3PL and retailer with minimum effort, time, and money is the perfect world. Achieving this would represent huge savings as discussed in the literature survey. To achieve this reality would require a strategic drive and coordination amongst all the players.

Seventy five percent of all respondents confirm a benefit of using RFID in achieving efficiencies. 3PL and retailers are the strong respondents. These parties are closer to the final consumer and it as this point that additional costs are added. Reducing these costs through efficient supply chain management using RFID will deliver a better-priced product to the customer.

Surprisingly the FMCG manufacturers do not believe the technology can deliver benefits. This is due to their position at the start of the supply chain. Do FMCG manufacturers care what happens further down the supply chain with their goods? They would if the technology would make the final price on goods cheaper and drive up demand.

4.4.12) Improved Inventory Visibility



Being able to view or track stock at any stage from manufacturer to shelf is important. Goods that are imported and exported can be quickly located and delivery times can be established. Being able to locate lost goods is important for ensuring continued sales.

Seventy percent of respondents indicate a benefit rating of six to ten out of ten of RFID being able to improve inventory visibility.

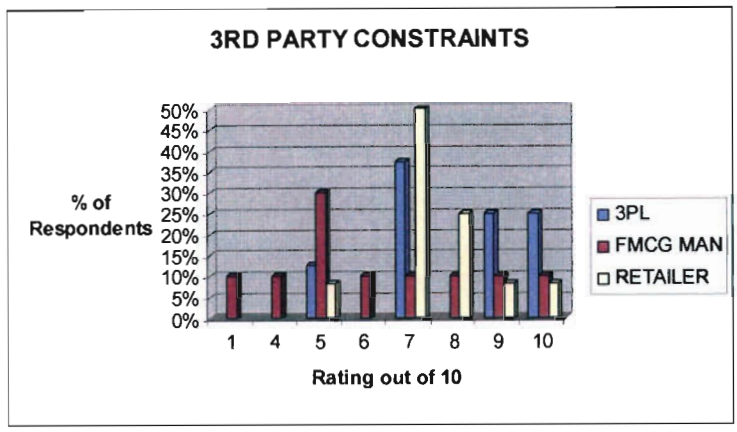
The FMCG manufacturers do not foresee the benefits with 60% giving a rating of less than six out of ten. Possible there is no concern about being able to see stock and at what stage their raw materials or finished goods are. 3PL and Retailers indicated strongly that being able to "view" stock as being a strong advantage.

Clearly, the 3PL organizations stand to benefit the most by implementing RFID technology. The biggest problem that they have is that they are dependent on the FMCG manufacturer upstream to tag all the goods and are dependent downstream for the retailer to implement a system to capture the product.

Until the other parties make a significant move to implement the technology the 3PL are unable to gain any benefits from RFID.

4.5) The Factors that Respondents Consider Relevant to Constraining the Implementation of RFID in South Africa

4.5.1) 3rd Party Constraints



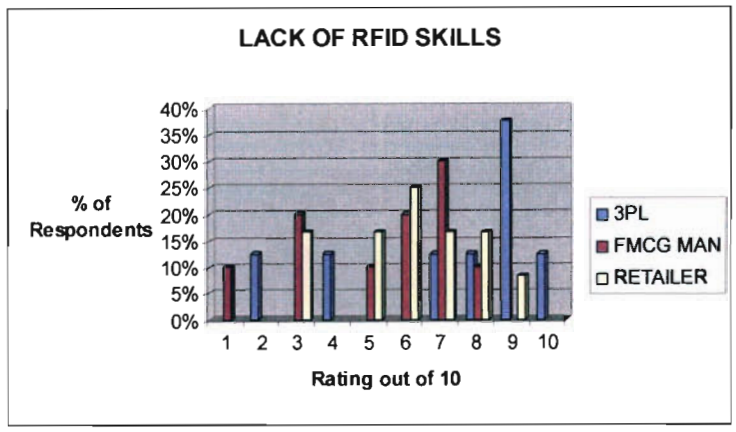
Factors that are beyond the control of the respondent are the cause of the delay. The nature of RFID means that the organization can implement the technology within the organization for internal efficiency gains but the true benefit would come from using the technology in conjunction with other partners.

An organization may be willing to adopt the technology but cannot because of third party constraints as discussed above.

Seventy percent of respondents indicated a rating of seven or more out of ten for third parties being responsible for limiting the deployment of the technology. Eighty seven percent of 3PLs indicated this was a major factor. FMCG manufacturer's responses are indifferent in that they ranged from low to high.

Retailers suggest it is third parties, which are responsible for the delay. These results would suggest that both 3PL and retailers see FMCG manufacturers as being the factor for delaying the adoption of RFID. This factor would require further research to confirm if this is the case.

4.5.2) Lack of RFID Support / Knowledge in South Africa



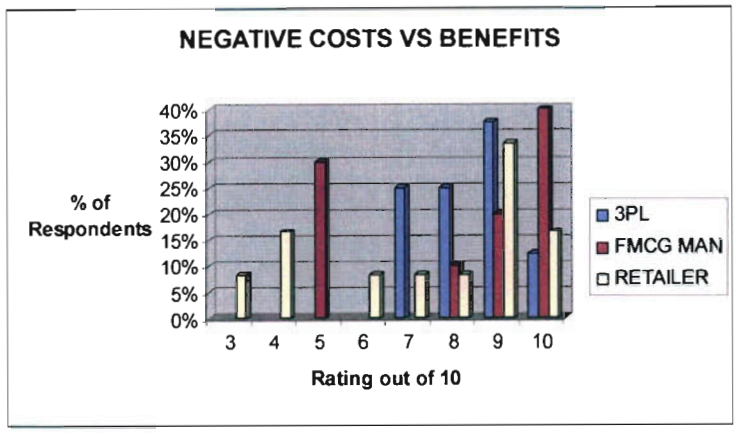
Organizations are reluctant to tread a path alone. With the availability of support and knowledge about the technology, organizations would be more willing to pursue the implementation of RFID.

Respondents indicated that that there is a limited knowledge base in South Africa to support organizations with the implementation. This could be a function of the immature technology as well as the scarcity of this type of project in South Africa.

Organizations are reluctant to be the "first mover" without the pre-requisite support. Retailers offer a mixed response to this being a major factor with the respondents indicating a rating of between five and eight out of ten. 3PL also only offer a mixed response.

FMCG manufacturers suggest that this might be one of the reasons they do not see the true benefits of the technology and possibly, it would suggest that they are unfamiliar with the potential benefits and would require further justification.

4.5.3) Negative Costs vs. Benefit Analysis

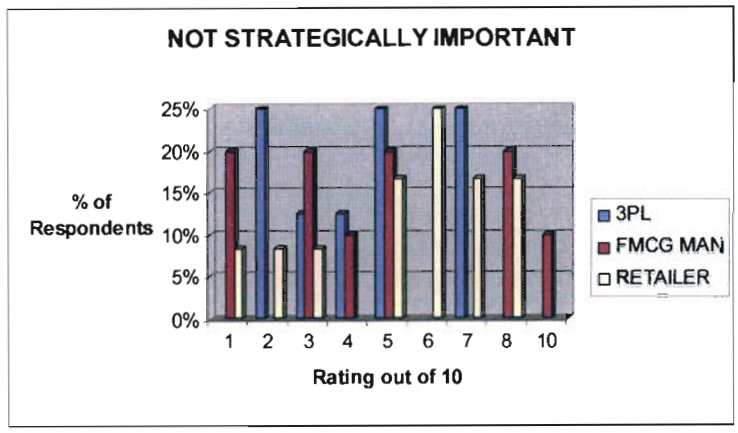


To justify any project is needs to add value to the business. Given the current high costs of RFID, the benefits are still not outweighing the costs. Projects will negative benefit analysis cannot be implemented. Cost vs. benefits analysis must be only one of the types of analysis carried out. Organizations should consider other factors when considering the option to implement the technology.

Seventy five percent of 3PLs feel that this is a constraining factor (with all respondents giving a rating of seven or more out of ten). Seventy percent of FMCG manufacturer respondents give a rating of seven out of ten or more.

Strangely, 30% of respondents did not deem this a major factor in their decision not to implement. Retailers offer a mixed response in that the feeling is that the costs still outweigh the benefits but a small number of respondents suggest that possible that this is not the case.

4.5.4) Not Strategically Important



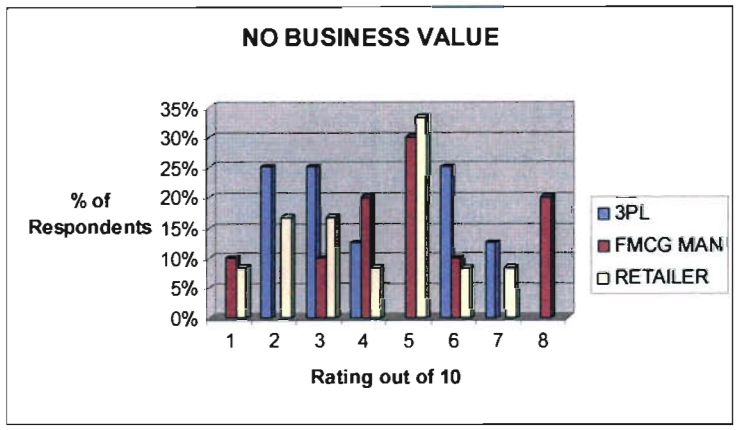
Organizations feel that this technology is not important in the medium to long-term and suggest that the technology is not being adopted and driven by senior management.

3PL suggest that this is not really a constraining reason. As per the comments early in this paper, RFID is most probably more strategically important to this organization type. Seventy five percent of all the respondents indicate that this is not a major constraining factor.

Surprisingly the FMCG manufacturer's responses indicate a mixed set of results. Eight percent of respondents suggest that the technology is not strategically important.

Seventy five percent of the retailers feel the opposite. This poises an interesting conundrum as both 3PL and Retailers feel that it is strategically important to their business but the FMCG manufacturers do not. Given that the FMCG sell most of their goods through the retailer, one wonders who will eventually be forced to adopt the technology.

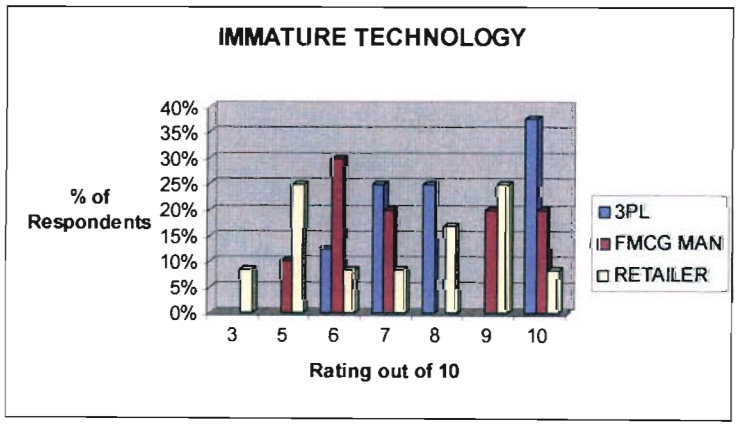
4.5.5) No business Value



Organizations do not feel that there is any value in implementing RFID. They might adopt the "wait and see" approach and let the technology stabilise.

The results are similar to the above. The 3PL (62.5%) suggestion that RFID has no business value is not a constraining factor. The retailers also suggest a similar response. (60%) The FMCG manufacturers surprise with 60% of the respondents suggesting that there is no business value as the reason for not considering the technology.

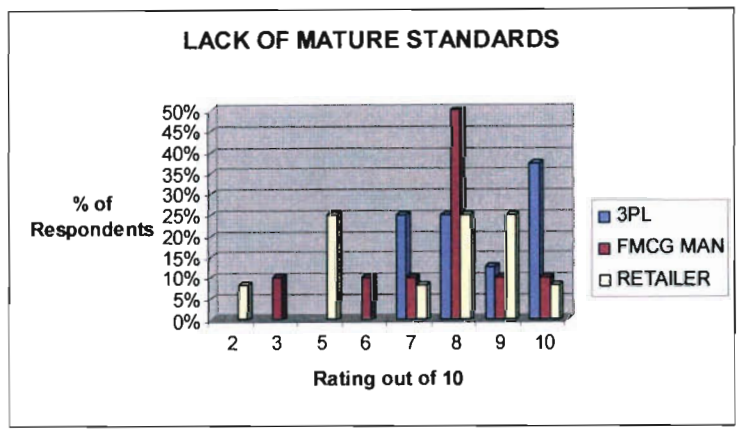
4.5.6) Immature / Evolving Technology



Maturing technology means that that it is gaining acceptance and is being widely adopted. Making a large capital investment into new/immature technology could be problematic if the technology evolves in another direction.

Eight three percent of retailers suggest (a rating in excess of seven out of ten) that a lack of immature technology is definitely one of the major factors restricting their decision to proceed with implementing the technology. Eight seven percent of 3PL rate this factor highly. FMCG manufacturers (60%) are lacking in their thinking concerning this technology. This would suggest why they have adopted a "wait and see" approach to the technology and as it evolves they will adapt accordingly.

4.5.7) Lack of mature standards

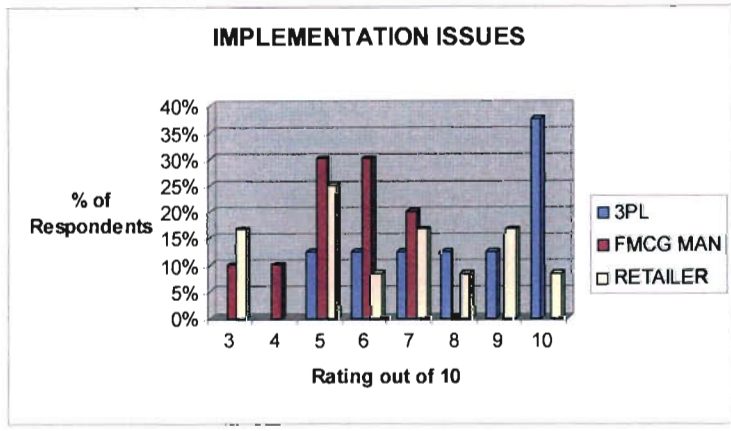


The results are similar to the above. The two factors go hand-in-hand. Standards drive technology. A change in standards will make any investment made in technology redundant. RFID technology is dependant on the ability of one organization's technology being able to 'talk' to another. "First mover" status may result in costly changes because the standards followed may change later. This one factor is restricting organizations.

One hundred percent of the 3PL rate this factor seven or more out of ten. FMCG manufacturers offer a mixed set of responses. They are aware that the technology is still evolving and that the standards have not yet been finalized.

The retailers do not appear to be that concerned about the lack of mature standards in that they offer also a mixed set of responses. Some suggest this as a major constraining factor others do not feel that strong about it. Their responses may reflect those that Wal-Mart followed in that they will develop the standards according to the benefits.

4.5.8) Implementation issues



If the decision is made to proceed with the implementation of RFID, technology there is the issue of coordinating the implementation.

3PL respondents where concerned with implementation issues. This would suggest that they would have the biggest problem having to coordinate between the FMCG manufacturer and the retailer. Retailers offered mixed responses.

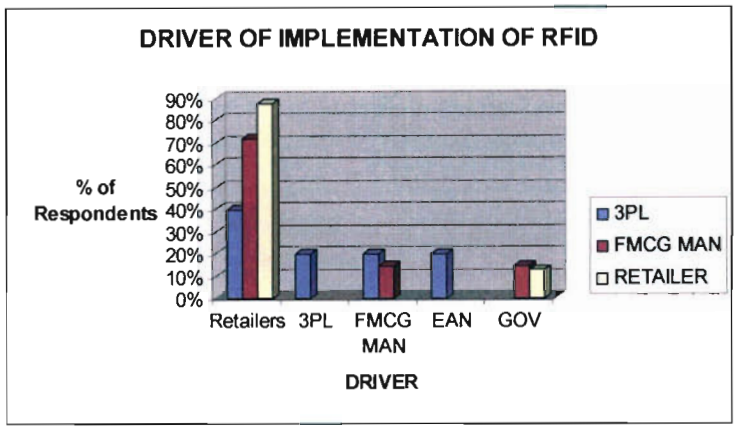
FMCG do not feel that implementation issues constraining their plans to implement the technology. If we consider the earlier factors, one can understand that they are not at the correct stage of planning to consider the implementation of the technology.

The interesting point regarding the constraining factors is that the three types of respondents are at different stages with their planning for RFID. The major factor contributing to the successful adoption of RFID technology is to ensure that all parties are at the same stage and are working together to achieve a working solution.

The adoption of the technology requires an integrated plan amongst all players but it does require one of the parties to drive the adoption process.

4.6) Who do you Think will be the Driver of the Implementation of RFID?

The responses to this question indicate the need for a coordinated effort in that one supply chain partner would not solely be responsible for implementing the technology.



The South African business environment is dominated by large retailing groups. A decision by one of them to adapt the technology will force the other competitors to adopt immediately. It would have a significant impact on all the partners "upstream" who would have to react and adapt to meet the initiative of the retailer.

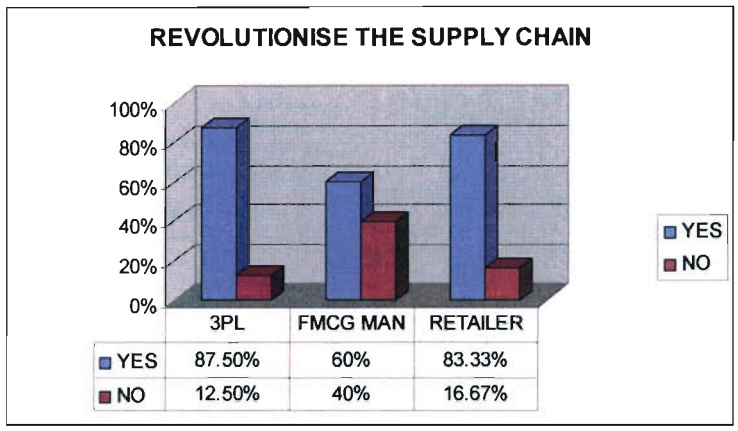
The majority of the respondents suggest that retailers should be responsible for driving the project. The scenario in the US has Wal-Mart mandating manufacturers to supply goods that comply with their requirements.

Being at the end of the chain allows them to make these demands. 3PL cannot realistically be responsible for driving the adoption of the technology in that they serve two masters. FMCG manufacturers realistically cannot drive the adoption because there are so many FMCG manufacturers. There are limited retailers who purchase goods from

FMCG manufacturers. It would be the FMCG manufacturer's customer, the retailer, who is responsible for the drive to implement the technology.

The cost of implementation might be significant in the short term but there are studies (See above) that have valued the savings that the technology can be achieved.

4.7) Revolutionary Technology



A simple yes or no answer was requested. It is interesting to note that the 3PL response was the highest. Eight seven percent of these respondents suggesting it would be. The FMCG manufacturers are not convinced. They suggest a sixty-forty split. Eighty three percent of retailers suggest that the technology would be revolutionary.

CHAPTER 5 – CONCLUSION AND RECOMMENDATIONS

5.1) Recommendations for future research

Future research could focus on a study that reviews the same sample after the elapse of a pre-determined timeframe. The results of this study could be contrasted with the results obtained in the new study. This would allow the author to obtain an insight into the progress South African organization have made in implementing RFID technology.

Another area of possible research could be to consider a specific factor that was identified in this study as being relevant to South African organizations. An in-depth study of this particular benefit could then be undertaken.

Other possible areas of future research could include those technologies allied to RFID technology and the role that these technologies could play in a South African context.

The results of this study could be measured against the responses from a similar study conducted in another developing country. This would allow South African organizations to benchmark their progress with RFID technology with other developing countries.

This study specifically removed smaller organizations in terms of turnover from the selected sample. Additional research could focus on these organizations and determine whether they are using RFID technology.

Research using the case study method could review the implementation and use of RFID technology in a South African organization. This would provide greater insight into organization-specific problems and opportunities.

5.2) Conclusion

RFID is a remarkable technology that has the ability to revolutionize the entire supply chain. It is a sophisticated technology that requires large amounts of capital, both monetary and intellectually, to be integrated successfully into any organization. Opportunities exist for any organization to embrace the benefits of RFID technology and recreate their entire business model.

The challenges and issues of RFID technology from numerous literature sources have been reviewed and analysed. A study of the supply chain partners in South Africa was undertaken and respondents to the questionnaire have indicated their differing levels of understanding and the requirements for a solution to the ongoing supply chain challenges. They suggested that RFID technology could offer a unique solution to the different industry challenges.

The South African business environment is dynamic and open to change. Businesses embrace foreign solutions and incorporate them as best practice into their organizations. RFID technology will be implemented as a solution to overcome the supply chain challenges, once the costs are manageable, the standards matured and the technology fully understood by all supply chain partners.

Critical to the success of RFID is the continued collaboration between the FMCG manufacturer, the 3PL, and the retailer. Their relationship is interdependent and should be the cornerstone of the successful integration of RFID into their businesses.

As outlined throughout this paper there are decisions that need to be made and challenges to be overcome in the industry. This is imperative to move RFID technology implementation forward.

The responses from all the South African supply chain partners were positive. They understand that the technology will play an integral part in the movement of goods from one party to another. The only question that requires answering is, when will this be a reality?

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APPENDIX I – QUESTIONNAIRE

NAME _____

COMPANY NAME _____

COMPANY ADDRESS _____

EMAIL ADDRESS _____

POSITION _____

NATURE OF BUSINESS

- RETAILER ☐
- 3RD PARTY LOGISTICS ☐
- FMCG MANUFACTURER ☐

TURNOVER

- R 1 Billion + ☐
- R 500 Million - R 1 Billion ☐
- R 100 Million - R 500 Million ☐
- R 50 Million - R 100 Million ☐
- < R 50 Million ☐

1 INDICATE THE LEVEL OF IMPORTANCE OF RFID BASED TECHNOLOGY TO YOUR ORGANIZATION

- STRATEGIC ☐
- VERY IMPORTANT ☐
- IMPORTANT ☐
- NOT IMPORTANT ☐
- NO RELEVANCE ☐

2 RATE YOUR ORGANIZATION'S CURRENT LEVEL OF RFID KNOWLEDGE

- COMPREHENSIVE UNDERSTANDING ☐
- GOOD UNDERSTANDING ☐
- FAIR UNDERSTANDING ☐
- IMPROVING ☐
- POOR ☐

3 YOUR COMPANY'S ABILITY TO RESPOND TO INDUSTRY CHANGES

- EXCELLENT
- GOOD
- ACCEPTABLE
- POOR

4 HOW EFFECTIVELY DO YOU THINK THAT RFID TECHNOLOGY CAN SOLVE THE FOLLOWING PROBLEM AREAS
(1 - Low Rating / 10 - High Rating)

- SHRINKAGE
- STOCKOUTS
- LATE DELIVERIES
- LOST GOODS
- EXPIRED STOCK
- INCORRECT GOODS RECEIVED
- COUNTERFEITING
- POD VALIDATION
- INACCURATE FORECASTING

1	2	3	4	5	6	7	8	9	10

5 PLEASE RATE THE FOLLOWING RFID BENEFITS ITO YOUR COMPANY'S REQUIREMENTS
(1 - Low Rating / 10 - High Rating)

- SHRINKAGE REDUCTION
- STOCKOUT ELIMINATION
- LATE DELIVERIES ELIMINATION
- LOST GOODS TRACKING
- EXPIRED STOCK MONITORING
- INCORRECT GOODS RECEIVED
- POD VALIDATION
- QUALITY OF INFORMATION
- STREAMLINING OF INTERNAL OPERATIONS
- DEMAND FORECASTING
- EFFICIENCIES IN THE SUPPLY CHAIN
- IMPROVED INVENTORY VISIBILITY

1	2	3	4	5	6	7	8	9	10

6 WOULD YOU, OR ARE YOU, CONSIDERING IMPLEMENTING RFID

- YES
- NO

		UNCERTAIN AT THIS STAGE / INVESTIGATING	☐
7	IF SO, TIMEFRAME TO IMPLEMENTATION	SHORT TERM (1-3 YEARS) MEDIUM TERM (3-7 YEARS) LONG TERM (7 YEARS +)	☐ ☐ ☐
8	IF YOU ARE BUSY IMPLEMENTING RFID PROGRAMME PLEASE RATE YOUR PROGRESS	EXCELLENT GOOD FAIR POOR / DIFFICULTIES EXPERIENCED	☐ ☐ ☐ ☐
9	THE COMPANY'S PROPOSED SOLUTION TO TRACKING GOODS THROUGHOUT THE SUPPLY CHAIN IS: (Please select one only)	AUTO-ID SOLUTION RFID SOLUTION SLAP AND SHIP SOLUTION INTEGRATE RFID WITH SCANNING SOLUTION BARCODING SOLUTION EXISTING SOLUTION	☐ ☐ ☐ ☐ ☐ ☐
10	RATE THE CONSTRAINING FACTORS TO THE DEPLOYMENT OF RFID (1 - Low Rating / 10 - High Rating)	3rd PARTY CONSTRAINTS LACK OF RFID/SUPPORT KNOWLEDGE IN SA NEGATIVE COSTS VS BENEFITS ANALYSIS NOT STRATEGICALLY IMPORTANT NO BUSINESS VALUE IMMATURE / EVOLVING TECHNOLOGY LACK OF MATURE STANDARDS IMPLEMENTATION ISSUES	1 2 3 4 5 6 7 8 9 10
11	WHO WOULD YOU EXPECT TO BE THE DRIVER OF RFID IMPLEMENTATION IN SOUTH AFRICA	RETAILERS 3PL MANUFACTURERS	☐ ☐ ☐

	INDEPENDENT ORGANIZATION (EAN)	☐
	GOVERNMENT	☐
	NONE OF THE ABOVE	☐
12 DO YOU FEEL THAT RFID WILL REVOLUTIONISE THE SUPPLY CHAIN IN SOUTH AFRICA	YES	☐
	NO	☐
13 WOULD YOU LIKE TO RECEIVE A COPY OF THIS DISSERTATION?	YES	☐
	NO	☐

ANY OTHER RELEVANT COMMENTS

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Please note that all responses will be treated with the utmost confidentiality and under no circumstances will individual responses be disclosed

Thank you for taking the time to complete this questionnaire. Your assistance in this regard is most appreciated