UNIVERSITY OF KWAZULU-NATAL

A critical analysis of the relationship between business information system technology and supply chain management with special reference to optimum efficiency within large enterprises in the food and drug retail sector in KwaZulu-Natal

By

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College of Law and Management Studies

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To Whom it may Concern

UNIVERSITY OF
KWAZULU-NATAL

31 July 2012

Dear Sirs

RE: MS CAROL AHERN / STUDENT NO. 200297939

This letter serves to confirm that it was agreed upon between Ms Carol Ahern (Researcher) and Mr Des Moodley (Head Office Manager: Pick 'n Pay) to ensure that, for the protection of Pick 'n Pay, the content of this research project be kept confidential for a 5 year period.

Yours sincerely

Professor Charles O'Neill
Supervisor

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DECLARATION OF OWN WORK

I, Carol Ahern, hereby declare that:

i) The research reported in this thesis, except where otherwise indicated, is my original research.

ii) This report has been compiled for the completion of a Masters of Commerce degree at the University of KwaZulu-Natal and has not been submitted for any degree or examination at any other university, for the purposes of attaining any other qualifications prior to this date.

iii) This thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.

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   a) Their words have been re-written but the general information attributed to them has been referenced.

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_____ _____

Ms Carol Anne Ahern **Date**

ACKNOWLEDGEMENTS

Firstly, I would like to thank my supervisors, Professor Charles O'Neill and Professor Brian McArthur, for their commitment and guidance throughout this research. Their dedication played a vital role in the completion of this thesis. Secondly, I would like to thank my family for all their patience and time sacrificed for the completion of this research.

ABSTRACT

The purpose of this research is to explore the relationship between supply chain management and business information system technology within the food and drug retail sector with special reference to optimum efficiency. Business information system technology leverages information and knowledge sharing throughout the supply chain which enables them to respond more effectively to an ever-changing and volatile marketplace. The relationship between supply chain management and business information system technology is multi-faceted and complex in nature, and consequently, has the ability to penetrate every element of an organisation's functionality. Furthermore, it has the ability to penetrate the functionality of an entire chain or network of suppliers and markets irrespective of their position around the globe.

Supply Chain management literature teaches that optimisation within functional areas is not as effective as cross-optimisation across functions and supply chain networks. As supply chains rely on business information technology for cross-optimisation, optimum efficiency will always be a moving target for as long as business technology and supply chain management continue to break through new ground.

In this research large food and drug supply chain networks and their business information system requirements, trends, influence, effect and constraints were reviewed, with special reference to creating optimum efficiency in their supply chain networks. This research was motivated by discussions with Pick 'n Pay's business information system's service provider and their desire to optimise Pick 'n Pay's supply chain network efficiency in a highly price-competitive environment, resulting in an in-depth case study being carried out on Pick 'n Pay (Pty) Ltd stores in KwaZulu-Natal. The review of literature suggests that cross-optimisation is only mutually beneficial within trust relationships that exhibit seamless flows of information throughout a supply chain. Data suggests that despite Pick 'n Pay's use of advanced business information system technology, Pick 'n Pay together with the food and drug retail stores in South Africa have a long way to go on this issue.

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GLOSSARY

Business intelligence	gathering the right information, at the right time, for the right people, to have a positive impact on business strategy, tactics or operations.
Breaking Bulk	Breaking bulk packaging down into smaller, manageable size packaging.
Data	is information in its raw material state. "Data is a meaningless point in space and time, without reference to either space or time". (Bellinger, 2004: Para 4).
Data mining	"extract patterns, trends, and rules from data warehouses to evaluate proposed business strategies, which in turn will improve competitiveness, increase profits and transform business processes" (Stair and Reynolds, 2008, p133).
End-user	is the ultimate consumer at the end of a supply chain.
Hard-copy	a paper printed document, a tangible form of output from a computer system.
Information	"Information is quite simply an understanding of the relationships between pieces of data, or between pieces of data and other information". (Bellinger, 2004: Para 5).
Information technology	is any computer-based tool that people use to work with information and support the information and

	information-processing needs of an organisation" (Haag et al, 2006, p7).
Integration	"Allows separate systems to communicate directly with each other" (Haag et al, 200, p523).
Intellectual Capital	a competitive advantage as organisations who receive accurate information timeously will be able to respond to changing market conditions.
Knowledge	The ability to understand patterns and their implications.
Soft-copy	computer system output that is displayed on a screen or monitor. (Benson and Standing, 2005, p39)
Strategic alignment	is a process of continuous adaption and change" (Tsinghua Science and Technology, June 2008, p355).
Systems	"a set of connected things or parts; an organised group of things" (The South African Pocket Oxford Dictionary, 1994, p670).
Time compression	how companies use time to deliver a sustainable fast response to customer needs, through business processes that are organised around a strategic time based focus" (Waters, 2007, p75).
Wisdom	The ability to understand principles that present "broader, more generalized rules and schemas for understanding a specific domain" (Stair and Reynolds, 2008, p11).

CHAPTER 1

INTRODUCTORY CHAPTER

1 INTRODUCTION

1.1 Introduction to the Study

Over the last 20 years, the business environment has been reformed by business information system technology and supply chain management. These systems have remodeled business methods and the competitive landscape by facilitating the seamless flow of information and goods that penetrate both organisational and geographical boundaries. Suppliers within supplier networks have stepped beyond organisational boundaries and integrated with one another to enjoy the economies of scale achieved within these networks. The global marketplace has become accessible and is a moving target as new business methods continue to emerge with new technologies. According to Levy and Weitz, "A critical factor in Wal-Mart's (the world's leading retailer) success is its information and supply chain management systems" (Levy and Weitz, 2009, p280).

The inception of supply chain management took place in the early 1990s. Since then it has become extremely important in helping organisations create efficiencies and competitive advantages (Haag, Baltzan and Phillips, 2006, p106). The idea of the integrated supply chain was born before this era; it only however became a reality once information technology advanced in such a fashion so as to leverage it. Today, "we are living in an era where information technology is a primary tool, knowledge is a strategic asset, and decision making and problem solving are paramount skills" (Haag *et al*, 2006, p126). Business information system technology leverages information and knowledge sharing throughout the supply chain, enabling a chain of suppliers to make swift decisions that are based on real-time information. This, in turn, speeds up their response to an ever-changing and volatile marketplace. The relationship between supply chain management and business information system technology is multi-faceted and complex in nature, and

consequently, has the ability to penetrate every element of an organisation's functionality, and furthermore, penetrate the functionality of an entire chain or network of suppliers. "Reinventing business operations to exploit information technology and facilitate supply chain collaboration means examining every facet of every job" (Bowersox, Closs and Drayer, 2005, online, para 8). The relationship between supply chain management and business information system technology has also provided a platform to facilitate strategic relationships between organisations and markets irrespective of their global position. The numerous benefits and growth resulting from their co-existent relationship within organisations have not gone unnoticed.

The purpose of this research is to explore the relationship between supply chain management and business information system technology within the food and drug retail sector with special reference to optimum efficiency. Recently, large enterprises within the food and drug retail sector have taken the use of supply chain management and business information system technology to new heights. Pick 'n Pay, one of South Africa's leading food and drug retailers, are making extensive use of technology driven supply chain management systems (Interview with Leanne Mounter - from Antinomy (Pty) Ltd, who are the primary BIS technology provider for Pick 'n Pay (Pty) Ltd). It is this competitive approach that this exploratory research study seeks to uncover and shed light on.

1.2 Statement of the Research Problem

What is the relationship between BIS Technology and SCM within large enterprises in the food and drug retail sector in KwaZulu-Natal. How can BIS be used to make SCM more efficient and effective within Pick 'n Pay Corporate stores in KwaZulu-Natal?

1.3 Objectives of the Research Study

The primary objectives of this research are to:

- Identify the business information system technology and supply chain management requirements and trends within the food and drug retail sector, both globally and within South Africa.
- Determine the influence that business information system technology and supply chain management have within the food and drug retail business environment, both globally and within South Africa.
- Determine the business information system technology and supply chain management requirements, trends and influence within Pick 'n Pay, KwaZulu-Natal.
- Establish and illustrate an overview of the Pick 'n Pay food and drug retail chain's current supply networks and information flows.
- Analyze the current effects business information system technology and supply chain management have on each other within Pick 'n Pay (Pty) Ltd, in the specific areas such as: forecasting, purchasing, transportation (both inbound and outbound), operations, distribution, just-in-time (JIT), quick response (QR), flexibility, total quality management (TQM), and customer relationship management (CRM).
- Determine and discuss the business information system and supply chain management challenges and constraints that inhibit performance in the sector and overall supply chain efficiency within Pick 'n Pay (Pty) Ltd, KwaZulu-Natal.
- Make recommendations for actions that can be taken in response to the findings.

1.4 Background and Purpose of the Study

Recent years have seen a significant shift in organisational structure and the way it is viewed. Organisations were traditionally structured around the various functions of a business which resulted in a vertical design, i.e. purchasing, finance, human resource management, operations management, marketing and distribution – forming what is commonly termed, functional silos. These silos had defined tasks within their own independent hierarchical structures which create barriers to supply chain integration. (Lambert, 2008, p5)

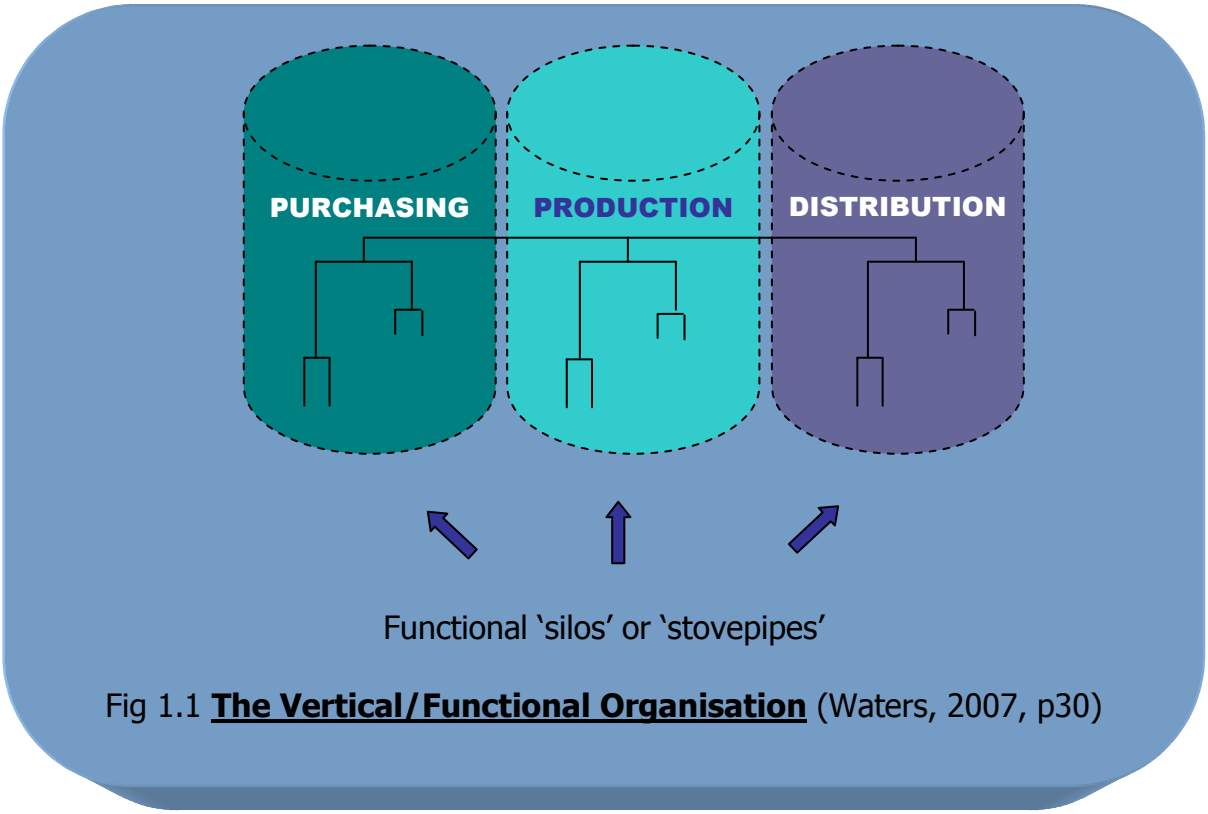


Fig 1.1 **The Vertical/Functional Organisation** (Waters, 2007, p30)

The figure above shows the round functional silos, working within their own independent hierarchical structures. Waters states that this functionally orientated business approach "was inwardly focused and concentrated primarily on the use of resources rather than on the creation of outputs" (Waters, 2007, p30). The focal point was to reduce costs through effective resource optimisation within each functional area. This approach resulted in cost savings, but left organisations very cumbersome in responding to changes in market demand.

"One of the major driving forces for change is the revolution that has taken place in information technology and systems enabling the supply chain linkage to become a reality" (Waters, 2007, p31). This 'supply chain linkage' established horizontal linkages that mirrored the seamless information and product flows from source to consumption. This linked horizontal processes within and beyond organisational boundaries in order to align organisations with market demand – thus having an output focus. The optimisation of cross-functional processes (also known as cross-optimisation) streamlined organisational efficiency far more effectively than optimisation within separate functional silos. The focal point moved to the creation of outputs, realising that their success and profits relied upon customer satisfaction.

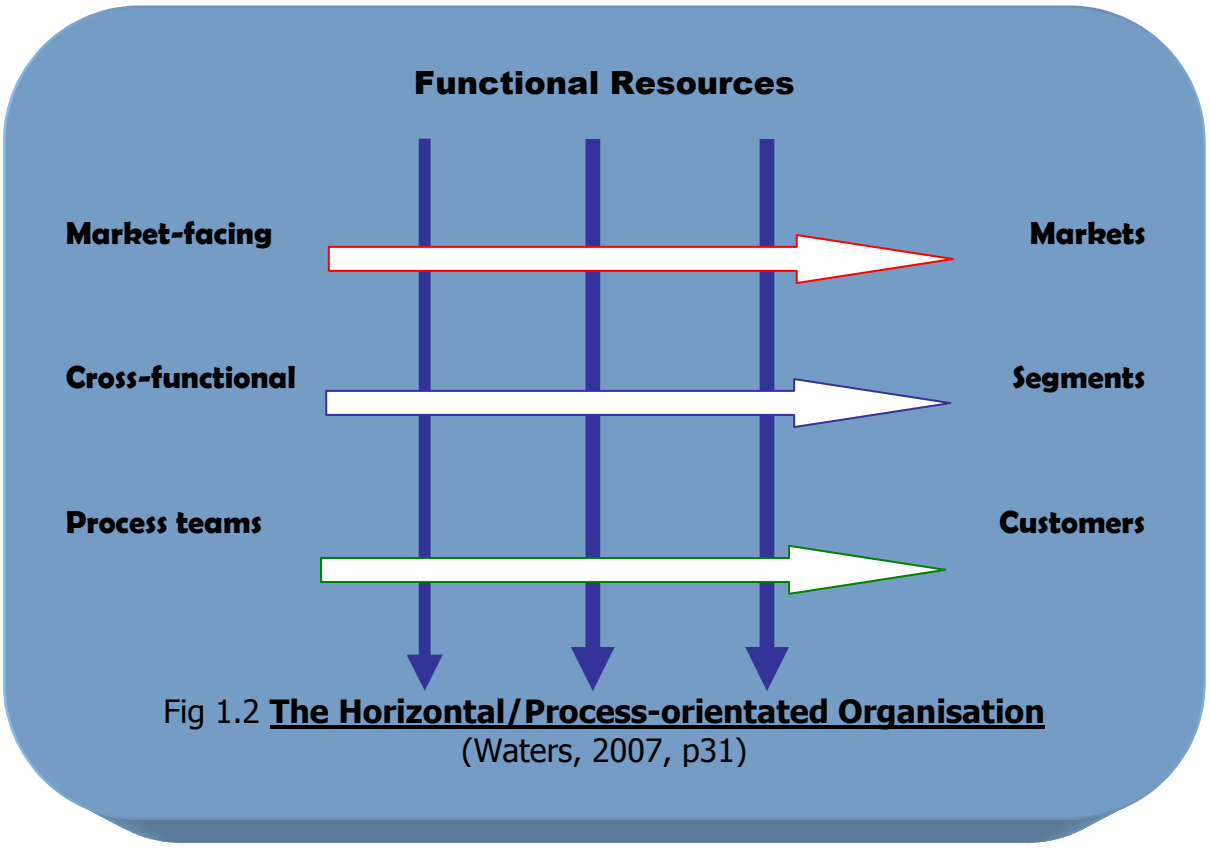


Fig 1.2 **The Horizontal/Process-orientated Organisation**
(Waters, 2007, p31)

This figure illustrates the horizontal linkages that mirror the seamless flow of information and products from source to consumption. The business information system technology that enabled the movement from vertical to horizontal organisational structures were EDI (Electronic Data Interchange), MRPII (Materials Resource Planning), DSS (Decision Support Systems) and ERP (Enterprise Resource Planning). These systems have enabled supply chains to become demand-driven through shared information and opened end-to-end pipeline management. The

creation of outputs that resulted in customer satisfaction through the optimisation of processes drove organisational efficiency and profitability to new levels and played a key role in establishing the field of supply chain management (Waters, 2007, p31). Supply chain management takes cross-optimisation beyond organisational boundaries in order to achieve economies of scale at a higher level, resulting in vertical integration between all channel members i.e. farmers, vendors, wholesalers, retailers and customers, and it was only through business information technology that horizontal integration was made possible.

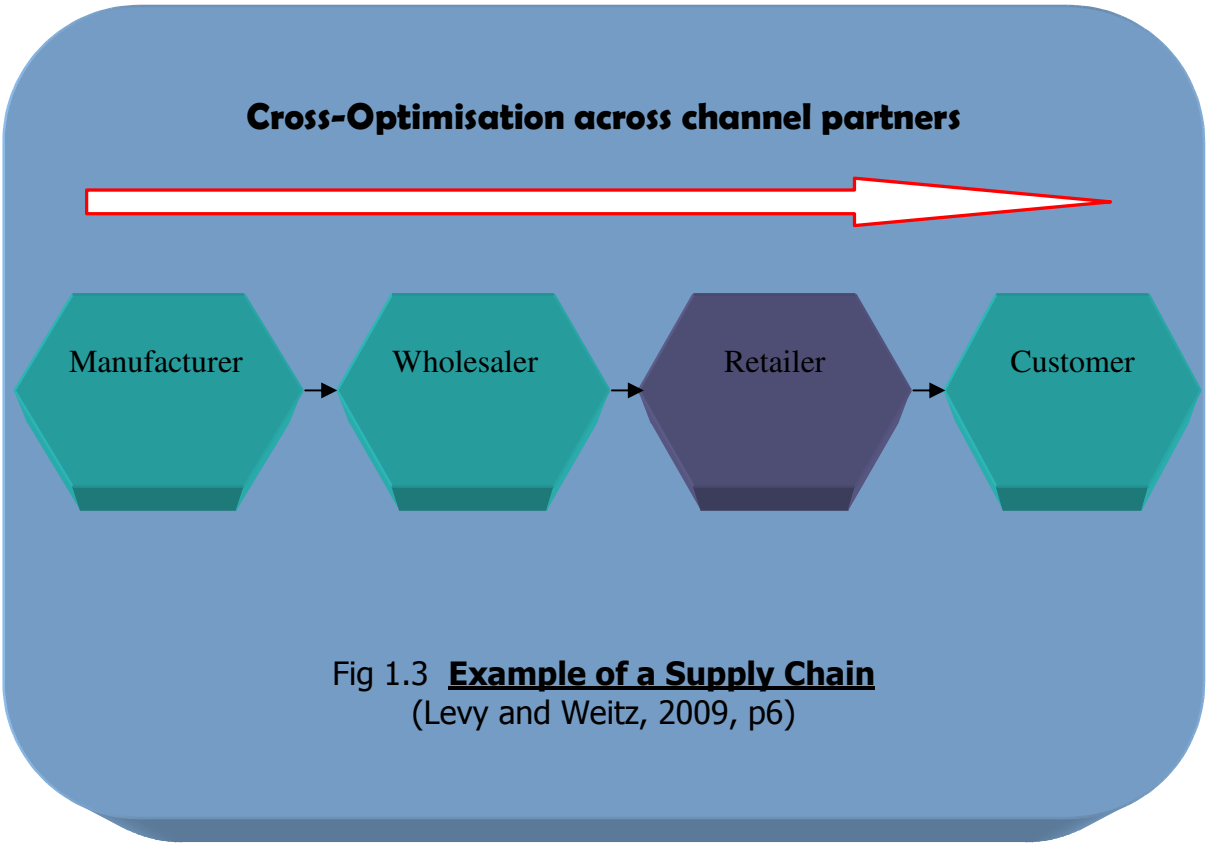


Fig 1.3 **Example of a Supply Chain**
(Levy and Weitz, 2009, p6)

This research focuses on the retailing element within the supply chain. Retailers are the final link between a chain of suppliers and the consumer. Retailing is defined as "the set of business activities that adds value to the products and services sold to consumers for their personal or family use" (Levy and Weitz, 2009, p6). Retailing adds value to the supply chain by breaking bulk into smaller packages, offering an assortment of products, and retaining stocks (Levy and Weitz, 2009, p7). The effective management of the supply chain aids retailers in fulfilling the '7 Rights of Retailing', which are: having the 'right' product in the 'right' quality and 'right' quantity in the 'right' place at the 'right' time and 'right' price with the 'right' service

(Cant, 2005, p8). In order to achieve this, retailers require business information system technologies that support the management of information, product, service and financial flows throughout the chain of suppliers.

Supply chain management (also referred to as SCM) is defined as:

> *The collaborative effort of multiple channel members to design, implement, and manage seamless value-added processes to meet the real needs of the end customer. The development and integration of people and technological resources as well as the coordinated management of materials, information, and financial flows underlie successful supply chain integration (Burt, Dobler and Starling, 2003, p10).*

SCM is the collective undertaking of channel partners to create a seamless value-added network through the integration of technological resources, human resources, and the flow of information and materials. SCM leverages itself on business information system technology, penetrating all business processes from extraction through to consumption, with its core focus being valued-added customer service (Levy and Weitz, 2007, p276).

Business information system technology, on the other hand, not only provides a platform from where SCM can subsist, but provides its own array of benefits to organisations in its own right. Business information technology (also referred to as BIS), can be described as a technology that facilitates information flows which stimulates "a pattern of interaction between people and technology that results in changed work practices, organisational routines, or inter-organisational processes" (Andersen and Vendelo, 2004, p65). It is patterns of interaction such as these within the retail environment that improve the flow and efficiency of the supply chain that this research study will assess. (Haag *et al*, 2006, p528). As far back as 2002 Szewczak and Snodgrass stated that "it is readily apparent that advancing information technologies have forever changed the management landscape" (Szewczak and Snodgrass, 2002, p1). Haag *et al* assert that it is "software that automates the different steps and stages of the supply chain" (Haag *et* al, 2006, p528).

The purpose of this research is to perform a critical analysis of the relationship between BIS technology and SCM within large enterprises in the food and drug retail sector within KwaZulu-Natal in order to determine whether BIS technology can be used to make SCM more efficient and effective. The terms, critical analysis, relationship, optimum efficiency, are defined as follows:

A definition of the term 'critical analysis'

The word 'critic' "arises from the Ancient Greek word *κριτής, krits*, meaning a person who offers reasoned judgment or analysis, value judgment, interpretation, or observation" (The Free Dictionary by Farlex, Encyclopedia, online, critical defined, para 1). Likewise, the term 'critical' in the above context, is characterized by a careful, exact evaluation and judgment of the information or problem being researched (The Free Dictionary by Farlex, online, critical defined, para 1).

The term 'analysis' is described as "The separation of an intellectual or material whole into its constituent parts for individual study" (The Free Dictionary by Farlex, online, analysis defined, para 1).

Therefore the meaning of the term 'critical analysis' can be best described as a careful, exact evaluation resulting in reasonable interpretation and judgment of a material whole (for example: SCM) by separating it into constituent parts (procurement, inbound and outbound logistics, operations, etc) in order to study each part individually.

A definition of the term 'relationship'

The meaning of the term 'relationship' is best described as a relation or connection between people or things; the state of being related; having a connection or association (The South African Pocket Oxford Dictionary, 1994, p543). An example is the relationship (the connection) between BIS and SCM within the food and drug retail business sector.

A definition of the term 'optimum efficiency'

The term 'optimum' is described as "making the best or most effective use of" and 'efficient' is explained as "productive with minimum waste of effort" (The South African Pocket Oxford Dictionary, 1994, p203). Optimum efficiency can be described in a business context as maximizing productivity and minimizing waste in the most effective manner.

1.5 Motivation for the Study

BIS technologies enhance communications and transactions with all of an organisation's stakeholders such as customers, suppliers, government regulators, financial institutions, managers and employees. It accomplishes this by offering a diverse set of management systems and computer-based applications that transcend organisational boundaries. These management systems and applications facilitate seamless information, process, material and financial flows between an organisation and its stakeholders throughout the supply chain (Hugo, Badenhorst and Van Biljon, 2004, p259). "Information technology facilitates the integration, synchronization and automation of supply chain interactions between businesses" (Hugo *et al*, 2004, p260). Supply chain managers are using BIS technology to source good suppliers, collaborate closely with them and achieve efficiency gains, develop quality products and cost savings (Thompson, Gamble, and Strickland, 2004, p95) - for example, electronic collaboration that informs all participants within a supply chain of changes in customer demand enables better inventory planning and reduces inventory holding throughout the chain. The reduction in inventory holding will reduce channel member storage costs, stock obsolescence and speed new products into the marketplace - as the time taken to clear old products will be reduced. New products that arrive in the marketplace first usually receive the majority share in profits.

The motivation for research within the large enterprise food and drug retail sector in South Africa rests in the fact that there is much scope for research in the field of SCM and BIS technology within this sector, as the majority of past research has focused on the manufacturing sector. Furthermore, the preference in researching large enterprises within the food and drug retail sector specifically was motivated by

their extensive and well-established use of advanced BIS technology together with advancements in their SCM. A 'large enterprise' is defined as an organisation that has more than "100 employees, and an annual turnover of more than R30 million per annum" (Department of Trade and Industry, Small Business Act 1996, online, p15).

Over the last decade there has been a substantial amount of growth in the food and drug retail sector as food and drug retailers strive to compete on a global platform. The three major food and drug retail chains in South Africa are Pick 'n Pay stores, Shoprite Holdings, and Spar Group. As Pick 'n Pay stores held the majority market in South Africa at the commencement of this research (2008), it was duly selected for the case study element of this research.

During the development of the research proposal, discussions with Mrs L. Mounter from Antinomy (Pty) Ltd, who specialize in BIS technology, were conducted. Antinomy (Pty) Ltd acts as a BIS service provider to a large portion of the retail sector within South Africa – Pick 'n Pay being one of their major clients. The need to optimise supply chain efficiency through the use of BIS technology in the food and drug retail sector was emphasized. Achieving and sustaining a competitive advantage has therefore moved beyond the attributes of products and services. With today's market-facing organisations that have an 'outcomes' focus, a competitive advantage is now determined more by how organisations meet changing market conditions around them. The effective use of BIS's technology within a supply chain could have a substantial impact on: meeting the marketplace; cost and price; end product quality and design; length of product life; and after sales service.

As BIS touch virtually every aspect of business, and continue to move forward at a rapid rate, the food and drug retail sector is one of many that will need to evaluate the steps forward within its supply chain/network and technological advancement, in order to gain and sustain a long-term competitive advantage within its sector.

1.6 Brief discussion on Business Information System Technology in the Business Environment

According to Haag *et al* "Information technology is any computer-based tool that people use to work with information and support the information and information-processing needs of an organisation" (2006, p7). As a result, the need for enterprise-wide BIS technology emerged. "Business Information systems can be defined as a system which integrates information technology, people and business. BIS brings business functions and information modules together for establishing effective communication channels which are useful for making timely and accurate decisions" (International Journal of Business Information Systems, 2007, online, para 1). This BIS technology challenged functional silo structures and initiated cross-optimisation within and beyond organisational boundaries.

BIS have been a significant force and enabler of change within the business environment over the past 25 years. As far back as 1995, Edwards, Ward and Bytheway claim that, "the mid-1980s saw the development of several techniques to help analyze an organisation's objectives and methods of operation in order to reveal more innovative opportunities based in information systems" (Edwards, Ward and Bytheway, 1995, p2). BIS technology proceeded to shift its focus from mere internal process improvement to a continuing transformation of the entire marketplace. "Technological advances, rapid globalization, and continuing social and economic shifts – all are causing profound changes in the marketplace. As the marketplace changes, so must those who serve it" (Kotler and Armstrong, 2001, p22). Today, businesses are forced to align their business and process strategies with their technology strategies as businesses are competing in a borderless environment, which demands high levels of flexibility to change and rapid response rates. Richard Love of Hewlett-Packard observes, "The pace of change is so rapid that the ability to change has now become a competitive advantage" (Kotler and Armstrong, 2001, p22). Therefore, BIS provide a platform from which seamless flows of information are leveraged. These information flows enable timely and accurate decisions and speed response rates to changing market conditions. "The availability of accurate, timeous mass information has introduced the knowledge-based industrial revolution" (Hugo *et al*, 2004, p258). In addition, these information

flows have caused businesses to move away from a process-based orientation, and toward an outcome-based orientation, thus making the customer the starting point.

Therefore, the efficient and effective use of BIS technology that facilitates information, product, service and financial flows throughout a chain of suppliers can improve market responsiveness by speeding the right products and services to the market; increase turnover and profitability, reduce operating costs, and in so doing, provide a competitive edge. Market responsiveness is a core-competence in market-facing organisations today.

1.7 Brief description of Supply Chain Management in the Business Environment

"Supply chain management encompasses all activities with the flow and transformation of goods from raw material stage (extraction), through to the end user, as well as the associated information flows" (Waters, 2007, p2). The purpose of SCM is to assemble a chain of suppliers that can cross-optimise processes and information flows associated with the transformation of goods from extraction to consumption in order to minimize across-the-board costs while maximizing the value of the goods or services for the ultimate customer.

In the past, companies found their competitive edge through strategies such as: TQM (total quality management), JIT (just-in-time), QR (quick response), MRP (materials resource planning) that focused mainly within the boundaries of an organisation. These systems aim to optimise processes within various business functions in an organisation. According to Stevenson (2005), "MRP was developed as a way for manufacturing companies to calculate more precisely what materials were needed to produce a product, and when and how much of those materials were needed" (Stevenson, 2005, p591). The aim is to maximize throughput and minimize inventory holdings.

Technological advancement, however, progressively transformed these BIS that were function-specific to BIS that integrated processes throughout an organisation. In the early 1990s ERP (Enterprise Resource planning) systems began to emerge enabling enterprise-wide cross-integration of functions within and beyond

organisational boundaries to partnering firms, and removed the geographical boundaries in the marketplace. Organisations found themselves partnering and managing material and information flows more effectively with those throughout their supply chains, and competing globally with quickly developing global supply chains. This has changed the way we see and do business for some time (Rashid, Hossain and Patrick, 2002, online, p2). In addition, it must be noted that global trends may differ from country to country. According to Hugo *et al,* "The globalization of markets is perhaps the most important driving force in the creation of supply chain management" (Hugo *et al* , 2004, p258). Irrespective of these differing trends, BIS and SCM are intrinsically built into the framework of many organisations worldwide. Hugo *et al* supports this statement by stating that, "Supply chain management is becoming central in the survival of firms in a global business environment" (Hugo *et al*, 2004, p5). Haag, Baltzan and Phillips state that in order "to succeed in today's competitive markets companies must learn to align their supply chains with the demands of the markets they serve" (Haag *et al*, 2006, p109).

Therefore, in order to remain competitive, organisations have been under enormous pressure to integrate not only their internal operations, but also their management processes and infrastructure beyond their organisational borders. SCM is entirely and unequivocally reliant on BIS in order to make this competitive advantage a reality. Effective SCM requires that supply chains become integrated to the point where "suppliers" and "customers" become partners in the firm's strategy.

1.8 Theoretical basis of the Research Study

"A theory is a statement or a collection of statements that specify the relationships between variables with a view to explaining phenomena such as human behaviour in some or other population" (Welman, Kruger, and Mitchell, 2005, p21). It is the relationship between two fields of study (SCM and BIS technology) and their associated influence on the business environment within the context of the food and drug retail sector that is being researched. Theories are constructed to explain the existence of phenomena which occur within some or other population.

In 1937, Ronald Coase saw the need to account for hierarchical structures that had developed within the market i.e. a firm or organisation. This was based on the notion that any market transaction between independent individuals requires both time and negotiation, and thus carries with it a cost. If a firm could supply the market at a lower cost than the market itself, competition would let it prevail. Coase, therefore, developed the 'transaction cost theory of the firm'. "The 'Theory of the Firm' set out to describe the nature of the firm, its behaviour and its relationship to the market" (Theory of the firm, online, para 1). Investopedia affirm this by stating that the Theory of the firm is "a microeconomic concept founded in neoclassical economics that states that firms (corporations) exist and make decisions in order to maximize profits. Businesses interact with the market to determine pricing and demand and then allocate resources according to models that look to maximize net profits" (Investopedia ULC, online, para 1). According to Levy and Weitz, the "Net profit margin is improved by increasing the gross margin and lowering expenses" (Levy and Weitz, 2007, p 270).

The economic 'Theory of the firm' provides the theoretical basis for this research study, with regard to the ultimate goal to improve profitability. As stated above, if a firm could supply the market at a lower cost than the market itself, competition would let it prevail. Similarly, if a group of firms (a chain of suppliers) can supply the market at a lower cost than the market itself, competition would let it prevail. When a chain of suppliers integrate processes, products, services and information flows efficiently and effectively, it reduces operating costs and increases its supply rate to meet market demands. An integrated chain of suppliers aligns itself more readily with market demands. This alignment results in increased market responsiveness and increased inventory turnover which reduces stock holding, damage and obsolescence and speeds new products to the market. Reduced costs and improved turnover increase the profit margin. In addition, a chain of suppliers may be able to offer an assortment of goods that are more attractive than the assortments offered by competitors, which results in profit maximization (Lambert and Cooper, 2000, p74).

The aim is to determine how large food and drug retail chains utilise BIS technology in order to optimise their supply chain efficiency through cost reduction and market alignment.

1.9 Brief History on the Global Food and Drug Retail Sector

Forty years ago, people would frequent traditional shops such as the local butchers, bakers, grocers, hardware, clothing stores and news agents. Over the years, the traditional shops were superseded by supermarkets that sell all of these goods. Many supermarkets subsequently grew into the large retail chains that we see today (The People History, 2012, online, para1). As these retail chains expand, they seek new ways to become cost effective and market driven. For example, Walmart is renowned for its leading global supply chain systems which are leveraged by advanced, seamless BIS technologies. "Other discount retailers and supermarket chains have found it virtually impossible to match Wal-Mart's sophisticated distribution systems and its finely honed merchandising expertise despite years of trying" (Thompson *et al*, 2004, p4). These changes were not only leveraged by BIS technology, but driven by advancing BIS technologies and changing markets. For example, advancing communication systems have transformed two-week snail mail shipping to instantaneous messaging via email, chat groups and websites. This facilitates seamless supplier collaboration and real-time updates on changes in demand.

Currently, retailers make use of: internet technology to provide information and sell products and services to their customers; Geographic Information Systems (GIS) to determine cost effective store locations; Radio Frequency Identity (RFID) tagging carrying product information and location; collaboration, planning, forecasting and replenishment (CPFR) integrated supply chain systems to assist the efficient and effective movement of goods throughout the supply chain; the analysis of customer databases to identify and tailor services to the best customers; and decision support systems (DSS). These technologies optimise decision-making processes in setting prices in different markets, taking markdowns and allocating merchandise (Levy and Weitz, 2009, foreword). Customers now source products from all around the world, which has triggered highly developed global transport systems that track, trace and

route goods in transit (GIT). Customers can enjoy the benefits of enhanced demand management and distribution systems that have an 'outcomes focus' – customer satisfaction. These changes have moved the retail sector towards mass production as it caters for expanding populations, extends global reach and growing market needs. Even though food and drug retailers are stocked with low cost, mass produced merchandise, they are all plagued by one common problem. They retail standardized merchandise which is accessible at most food and drug retail stores. Consequently, consumer loyalty is spread amongst a number of food and drug retailers. If products are not found in one store, customers simply move onto the next. "The pressure of readily available and attractively priced substitutes creates competitive pressure by placing a ceiling on the prices industry members can charge without giving customers an incentive to switch to substitutes and risking sales erosion" (Thompson *et al*, 2004, p50). As a result, food and drug retailers have pursued a competitive edge by utilizing advanced BIS and supply chain philosophy to become the lowest cost provider, in its sector, that offers the best value product. Being a low cost provider comprises reducing costs throughout the chain of suppliers by: reducing inventory holding levels; simplifying production; improving production techniques; sourcing quality products; and meeting customer demand as accurately as possible. Food and drug retailers seek a low cost competitive edge as they merchandise standardized products (Interview with Leanne Mounter).

From a supply chain perspective, the retail sector's primary challenge is to meet customer demand, whilst keeping stock holding and its associated costs to a minimum. Yeates and Wakefield affirm this by stating that

> "*One of the continuing headaches for retailers is the level of inventory, or stock, they keep in their stores. If it is too high, excess funds are tied up in it, profit margins are depressed by it, and it occupies floor-space that could be more usefully employed to display and sell goods. If inventory is too low, they risk 'stockouts' and customers cannot buy what is not on the shelves"* (Yeates and Wakefield, 2004, p9).

In addition, the food and drug retail sector stocks both perishable and non-perishable goods for its customers. The perishable goods require specific care to ensure that stock is sold prior to their sell-by dates, or goods become defective and obsolescent. In response to this dilemma, BIS technology has been developed to monitor sales of fast moving consumer goods (hereinafter referred to as FMCGs) automatically initiating replacement stock orders with suppliers when stock levels reach a predetermined minimum level. As the last item is sold, the replacement stock arrives and is loaded directly to the display shelves, thus reducing the need to maintain storage facilities. This approach aligns with the just-in-time principle adopted in SCM. It is clear that BIS, when used fittingly, can reduce costs and as a result improve a firm's competitive position.

1.10 Scope of the Study

Firstly, a broad review of both BIS technology and SCM will be established in their own right within the global and local retail sectors. Secondly, BIS technology and SCM will be researched in terms of their requirements, influence, best practices, challenges and trends within the global and local food and drug retail sectors. Thirdly, the local food and drug retail sector within KwaZulu-Natal will be explored for BIS and SCM requirements, utility, trends and influences. This information will be applied to an empirical research case study on a large local food and drug retail enterprise, namely the Pick 'n Pay retail chain store in KwaZulu-Natal, South Africa. Pick 'n Pay has been selected for two primary reasons: it is a long-standing business that is one of the leading food and drug retail stores within South Africa. "Pick 'n Pay Group is one of Africa's largest and most consistently successful retailers of food, clothing and general merchandise" (Pick 'n Pay - Latest Company News, online, Anon, Para 1). Furthermore, according to Leanne Mounter, a BIS specialist from Antinomy (Pty) Ltd, a company that specializes in BIS design, development and implementation:

> *Pick 'n Pay make extensive use of advanced BIS technology, utilizing systems that are well established – having stood the test of time, together with SCM philosophy in order to capture a competitive advantage (Interview (2008), Leanne Mounter).*

In order to appreciate the parameters of the empirical contribution of the research, a detailed illustration of Pick 'n Pay's supply chain/network structures and information flows will be examined. The empirical research information will be drawn from the Pick 'n Pay Group Ltd chain stores, by means of in-depth interviews, in order to accomplish a thorough investigation into the respective relationship that SCM has with BIS technology within the Pick 'n Pay retail food and drug chain in KwaZulu-Natal. The challenges and constraints within the food and drug retail sector will then be determined and discussed and may even consequently provide several guidelines in directing future pathways for the sector to follow. Lastly, recommendations for actions to be taken in the future as well as further research within this area will be given.

1.11 Brief Introduction to Pick 'n Pay's Food and Drug Retail chain in South Africa

Pick 'n Pay is a family owned business which started off with four small stores in South Africa in 1967. One year later the Group was listed on the JSE Securities Exchange South Africa as Pick 'n Pay Stores Limited. Since then, Pick 'n Pay have grown to a magnitude of 530 stores within South Africa. Its growth and success can be attributed to two fundamental principles: an unwavering belief in consumer sovereignty; and the application of the 'four legs of the table' principle: referring to the four legs that hold a business together - administration, merchandise, promotion and social responsibility and people (Latest company news, online, Anon, para 1).

Pick 'n Pay comprises two major divisions, namely the retail division and the group enterprise division. The retail division focuses on Pick 'n Pay's core business such as hypermarkets, supermarkets, family Franchise stores, butcheries and financial services. The group enterprises division manages other activities, including score supermarkets and TM supermarkets. The researcher's focus will be on Pick 'n Pay's Corporate stores within the food and drug retail sector in KwaZulu-Natal. This will encompass supermarket store formats.

Hypermarkets, with a total of 20 outlets throughout South Africa, represent the largest store format. Pick 'n Pay's 160 Corporate stores, 285 Franchise stores and

65 Boxer stores countrywide focus first and foremost on convenience as opposed to price orientated Hypermarkets. They are smaller, yet better equipped to deliver the best services to customers whose priority is convenience shopping (The Pick 'n Pay Family, online, Anon, para 4).

The first to venture into a Franchise operation were the Pick 'n Pay family stores. Pick 'n Pay provides sourcing and operational support to the stores. These franchising stores are run by owner managers. These Franchises enable the company to enter areas where a Corporate store would not be warranted. In addition, Pick 'n Pay has bought the group of Boxer superstores for 186.6 million. Their focus is primarily concerned with the low cost, low margin operations, retailing merchandise to South Africa's rural market (The Pick 'n Pay Family, online, Anon, para 7).

Pick 'n Pay's values such as: fighting for customers rights, respecting each other, fostering personal growth and opportunity, nurturing leadership skills, rewarding innovation and shared accountability are harvesting a combination of effective SCM techniques concurrently with the use of BIS technology. According to Leanne Mounter, Pick 'n Pay utilize an advanced, integrated BIS known as SAP R/3 (Interview with Leanne Mounter).

1.12 An Overview of Related Studies

YEAR	NAME	TITLE AND DEGREE TYPE	UNIVERSITY
2002	K. Padayachee	An interpretive study of software risk management perspectives	University of Natal
2007	C. van der Westhuizen and J.A. Kok	Intellectual Capital Management in a South African retail company	University of Johannesburg

1.13 Summary and Application of Related Overviews

The above reviews are related to the research under study, either by means of a shared research approach and methodology, or the study in common fields of research. Below is a brief discussion on how each study is related and can be applied to this research.

1.13.1 An interpretive Study of Software Risk Management Perspectives

The interpretive study of software risk management perspectives by Padayachee (2002, p94) finds its relation to this research by two means: it makes use of research methodologies that are applicable to this research, and it acknowledges the complexity and uniqueness of organisational environments behind various computer software systems, which in turn has a unique impact on the functionality of the computer software systems. Padayachee (2002) uses an interpretive epistemology or anti-positivist research approach as opposed to a positivist research approach. "The positivist approach underlies the natural-scientific method in human behavioural research and holds that research must be limited to what we can observe and measure objectively" (Welman *et al*, 2005, p6). The positivist approach endeavours to unearth *general laws* of relationships (Welman *et al*, 2005, p7). The anti-positivist approach holds "that the natural-scientific method is designed for studying molecules or organisms and is therefore not applicable to the phenomena being studied in the human behavioural sciences" (Welman *et al*, 2005, p6). The anti-positivist approach is concerned with the *perspectives of the people* being examined, with the desire to understand their behaviour (Welman *et al*, 2005, p7). The interpretive/anti-positivist epistemology holds that the study of the relationship between two or more variables cannot be separated from those who experience it, or its environment. The relationship under study is influenced by the environment in which it occurs; therefore the variables can not be drawn out of the situation to be studied, without the consideration of their environment. Similarly, the uniqueness of organisational environments, which have a direct impact on why, what, where, when and how they do things, will deal with SCM and BIS practices and applications in a unique and environmentally complex manner. The anti-positivist research approach used by Padayachee (2002) is relevant to this research study.

1.13.2 Intellectual Capital Management in a South African Retail Company

BIS strive to leverage information throughout an organisation so that people within the organisation can be informed and make decisions timeously on accurate information. "Decision support systems (DSS) enable management to improve both their strategic and short term decision making processes" (De la Rosa and De Jager, 1999, para 1). Decision support systems are one of the functions within BIS. These systems aid in the creation and effective use of intellectual capital within organisations. Today, intellectual capital is seen as a competitive advantage, as organisations who receive accurate information timeously will be able to respond to changing market conditions quicker than technology-subservient competitors. Furthermore, supply chain networks are intrinsically reliant on BIS technology in order to facilitate information flows from source to consumption, and more accurate decision making. When intellectual capital is managed effectively within the entire supply chain, it is not just individual firms responding to direct changes, but the supply chain as a whole (Hamzah and Ismail, 2008, p5).

1.14 Delimitations of the Study

The primary focus in this research study is to critically analyze the relationship between BIS technology and SCM with special reference to optimum supply chain efficiency in order to determine whether BIS makes SCM more efficient and effective.

The limitations to this research will lie in the fact that:

- Anti-positivist research acknowledges that the researchers have biases and subjectivity intrinsically linked to the way the study was conducted. For example, the researcher invariably influenced the study by evaluating various focal points. However, the qualitative data was validated by the researcher confirming that their interpretation corresponds to the respondent's interpretation.
- Participants' views were subject to their personal knowledge and experiences in the field and can not be generalised across the food and drug retail sector within KwaZulu-Natal.

- One retail group, Pick 'n Pay, was selected in order to conduct an in-depth case study, which means that findings cannot be generalized across the entire sector.
- The interview with Pick 'n Pay's Regional Buyer did not take place due to the inability to secure time with him.
- Not all recipients were expected to respond to all the questions, and this resulted in incomplete data. However, in order to minimize these limitations, the participants were interviewed individually, enabling them to communicate their thoughts and opinions openly. Personal interviews helped to ensure that the data was as complete as possible.
- In order to ensure that the responses were obtained from the recipients, interviews were set up with each recipient where they were encouraged to answer as many questions as possible. It must, however, be noted that they had the option not to answer various questions as it was done on a voluntary basis.

1.15 Methodology

In order to obtain a comprehensive understanding of how Pick 'n Pay (Pty) Ltd Corporate stores employ SCM techniques together with BIS Technology in the KwaZulu-Natal region, and to investigate their relationship and the effect thereof within the retail environment, an explorative qualitative case study approach will be used. The case study approach will facilitate the collection of data and provide the basis for a thorough investigation and analysis of detailed information. In this section, the research strategy and the research methods utilized will be discussed, together with the rationale for a case study approach.

BIS and SCM have been co-existent for a number of years, resulting in benefits and challenges. This co-existence consists of a complex, multi-faceted web of interconnected and interdependent parts which, in turn, rely on this co-existence for relevance and survival. States that, "IT is like a nerve system for SCM" (Gunasekaran and Ngai, 2004, p271).

There is limited literature available regarding SCM and BIS in the food and drug retail sector and, therefore, much scope for research in these fields, as the majority

of past research focuses on the manufacturing sector, not the retail and service sector. With a view of adding to the present body of knowledge in these fields, the purpose of this research is to critically analyze the relationship between BIS technology and SCM with special reference to optimum supply chain efficiency in large enterprises within the food and drug retail sector in KwaZulu-Natal. Thereafter, this information will be applied to a case study approach to Pick 'n Pay (Pty) Ltd Corporate stores in KwaZulu-Natal.

"The choice of method determines what type of information will be sought for subsequent analysis" (Whitman, 2004, p308). Robson identifies the three common research strategies as: experimental, survey and case study (Robson, 1993, p33). According to Martins, Loubser and van Wyk, "a greater volume and wider variety of data can be collected by verbal and written communication methods than by observation and experimentation" (Martins *et al*, 1999, p124). For the purposes of this inquiry, a case study approach has been adopted as the primary research methodology, due to its ability to facilitate an in-depth exploratory study of the phenomena concerned in context-rich and dynamic environments. "The term *case study* pertains to the fact that a limited number of units of analysis are studied intensively. The units of analysis include individuals, groups and institutions" (Welman *et al*, 2005, p193). According to Whitman, the case study approach "captures subjective knowledge and situational meaning" (Whitman, 2004, p306). It is this research approach that aligns with the data type and information needs of the research at hand.

1.16 Summary

SCM and BIS technology have left their mark in the business arena. "Rapid changes in technology coupled with recent trends toward the globalization of business have raised the intensity of the competitive environment in just about every industry" (Haag *et al*, 2006, p12). SCM and BIS technology have played a primary role in this advancement. They have done this in two primary ways: by providing a platform that facilitates strategic relationships between organisations and markets irrespective of their location around the globe; and by facilitating seamless information and process flows throughout organisations and their supply and customer networks.

The focus of this research is primarily on the Food and Drug Retail Sector within KwaZulu-Natal, South Africa. The researcher will therefore take a closer look at BIS technology and SCM in more detail over the next two chapters. The third chapter will then review the relationship between these two fields and their combined contribution to the food and drug retail sector.

1.17 Framework for the Study

Chapter 1: Introduction and background

This chapter introduced the study, the purpose for the research, the research problem and the objectives of the research. It also presented the motivation for the study, and provided a background of the food and drug retail sector as well as the selected organisation, Pick 'n Pay Limited.

Chapter 2: Business information system technology in business and retail

In this chapter, BIS technology is reviewed from a business perspective. The influence, trends and requirements of BIS technology within the food and drug retail sector are discussed, together with the challenges and constraints.

Chapter 3: Supply chain management in business and retail

Chapter 3 reviews the literature in the SCM field with regard to its requirements, influence and trends within the food and drug retail sector. The challenges and constraints are also discussed from both global and South African perspectives.

Chapter 4: The relationship between BIS and SCM in retail

Chapter 4 discusses the marriage between SCM and BIS technology within the food and drug retail sector in KwaZulu-Natal. This chapter reviews where these fields meet within this business environment and the combined influence they have.

Chapter 5: Research Methodology

Chapter 5 discusses the methods that will be employed in order to obtain the required information for the research study. The primary research approach constituted both qualitative and quantitative research approaches.

Chapter 6: Findings and recommendations

The data gathered will be examined in order to provide a statistical analysis of the data received in relation to the secondary data found in the literature review.

Chapter 7: Summary, caveats and conclusion

A comprehensive summary of the research and its findings will be given, together with any limitations to the empirical research element. A final conclusion will be drawn and any gaps in knowledge for further research will be identified.

CHAPTER 2

REVIEW OF RELATED LITERATURE IN THE FIELD OF BUSINESS INFORMATION SYSTEM TECHNOLOGY

2.1 Introduction

Chapter 1 introduced the motivation and basis of the study being undertaken, and outlined the anticipated research plan and process. In this chapter, literature in the field of BIS technology has been closely explored, in order to determine its background and role in business, its contributions in the food and drug retail sector, the challenges faced and the current trends, within this environment. The terms 'business', 'information', 'system' and 'information technology' are addressed individually in order to gain a better understanding of 'BIS technology' as a whole.

"For some thirty years organisations have been developing computer-based information systems." These computer-based information systems together with the explosive growth in information technology has resulted in the development of many business-driven, computer-based applications that are designed to enhance organisational functionality. As far back as 1995, Edwards *et al* stated that "Before this people, paper, pens, calculators and mechanical punch card machines were the main tools available for data manipulation" (Edwards *et al*, 1995, p1). These information systems provide the platform from which BIS leverage themselves. In order to understand the term BIS technology, business, information, systems and information technology will be defined and briefly discussed.

2.1.1 Business Defined

"The activity of buying or selling goods and services, or a particular company that does this" (Cambridge Dictionary (2012) Business Definition, online, para 1). Business activity usually takes place between legally recognized organisational entities (companies, firms, enterprises) that offer a product or service to customers or other Corporate entities. Organisations produce goods and/or services for the consumer market with the purpose of producing a profit. In the production of

goods and/or services, organisations participate in a number of inter-dependent, cross-functional processes. If these processes are run inefficiently, organisations will generate excessive operation costs that reduce profit margins. An organisation's aim is to minimize operation costs and maximize profits. BIS have been developed around optimising business operations in order to overcome many of the operational challenges.

2.1.2 Information Defined

"Today, we live in an information economy, where information itself has value and commerce often involves the exchange of information rather than tangible goods" (Stair and Reynolds, 2008, p4). Information is used by people and organisations daily, in driving the production of goods and services. Information is a valuable resource, as it enhances the organisation's ability to make timeous and accurate decisions, which improves responsiveness to both operational challenges and the ever-changing market needs.

According to the South African Pocket Oxford Dictionary, information is described as, "knowledge, news, a formal charge or accusation that is told" (The South African Pocket Oxford Dictionary, 1994, p327). From a BIS perspective, information or knowledge is obtained by analyzing data that has been stored during the day to day activities of an organisation. Information in its raw material state is called data. "Data consists of raw facts, such as an employee number, the number of hours worked in a week, inventory part numbers, or sales orders" (Stair and Reynolds, 2008, p4). "Data is a meaningless point in space and time, without reference to either space or time" (Bellinger, 2004, online, para 4). If data in itself holds no meaningful relation to anything, how is meaningful information or knowledge drawn from it? Bellinger answers this question by stating that meaning is drawn from associations with previous contexts within which we have found a piece of data to be meaningful. For example, a single word such as "value" might be interpreted as "superior goods", "quality for money", "stands the test of time", thus giving it a context. Furthermore, Bellinger points out that this context may be little more than speculation, yet it does, unquestioningly, fabricate meaning. The extent of understanding is determined by the number of past associations the interpreter has

experienced with such data. Thus, information can be defined as an understanding of how pieces of data relate to one another, and relate to other pieces of information. Information is data that is in a usable form. Bellinger depicts the continuum upon which data can transform into information, information into knowledge and knowledge into wisdom. Understanding relations represents information, understanding patterns represents knowledge and understanding principles represents wisdom.

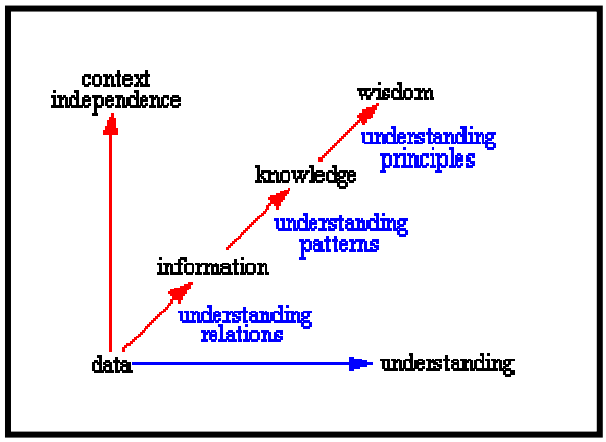


Fig 2.1 **Paradigm from data to wisdom** (Bellinger, 2004, online, para 5)

Hence beyond relation, there is pattern i.e. a relation of relations which are characterized by both consistency and completeness of those relations, thus creating its own context. A pattern relation that exists amongst data has the potential to represent knowledge. It is only when the patterns and their implications are understood that it becomes knowledge (Bellinger, 2004, online, Para 7). For example, understanding IT and how it supports organisational activity can help managers to create new ways of doing business. When a pattern that represents knowledge is understood, it provides a high level of reliability or predictability as to how the pattern will change over time. Every pattern has foundational principles responsible for the patterns representing information and knowledge and it is by understanding these principles that wisdom arises. "Without on-demand access to managed information or knowledge, every situation is addressed based on what the individual or group brings to the situation with them. With on demand access to managed knowledge, every situation is addressed with

the sum total of everything anyone in the organisation has ever learned about a situation of a similar nature" (Bellinger, 2004, online, Para 25). Finally, wisdom is comprised of accumulated knowledge. Stair and Reynolds explain that, "wisdom goes beyond knowledge in that it represents broader, more generalized rules and schemas for understanding a specific domain or domains" (Stair and Reynolds, 2008, p11).

In light of the above, data, information and knowledge associated with an organisation, its markets, its customers and its competition, need to be managed in order to facilitate effective decision making and enable a reliable level of predictability of the future. "Understanding the direct impact information has on an organisation's bottom line is crucial to running a successful business" (Haag *et al*, 2006, p6). Understanding the composition of data, information, knowledge and wisdom are fundamental to the development and use of information systems (Stair and Reynolds, 2008, p11). "Data, information and knowledge are critical assets to the performance of logistics and supply chain management, because they provide the basis upon which management can plan logistics operations, organise logistics and supply chain processes, coordinate and communicate with business partners, conduct functional logistics activities, and perform managerial control of physical flow of goods, information exchange and sharing among supply chain partners" (Waters, 2007, p177). Edwards noted as far back as 1995 that information technology has the ability to perform complex, lengthy numerical calculations and mine and manipulate data within a matter of seconds, as against days (Edwards *et al*, 1995, p1). It is this very ability that brings real-time information within the grasp of organisations today.

2.1.3 Systems Defined

A system can be defined as "a set of connected things or parts; an organised group of things" (The South African Pocket Oxford Dictionary, 1994, p670). These parts/things form a system by working together to achieve a joint purpose. According to Benson and Standing, "a system has a purpose or function; a context or environment in which it has applicability; a boundary which marks the limits of its environment" (Benson and Standing, 2005, p6). These parts/things also share

inter-dependent relationships with one another. Waters states that, "The supply chain is systemic, decisions in one area have ramifications in other areas, often requiring trade-offs balancing the local objectives of one organisation with those of another" (Waters, 2007, p162). Changes in one part will have a knock-on effect, resulting in changes in the other parts. Systems are usually complex in nature, consisting of several layers of subsystems (Benson and Standing, 2005, p6). The framework of a supply chain is comprised of multiple dimensions and decision points, together with turbulence at various levels. It is therefore imperative that all the elements work together to prevent system disruptions or failure.

2.1.4 Information Technology Defined

"Information technology (IT) is any computer-based tool that people use to work with information and support the information and information-processing needs of an organisation" (Haag *et al*, 2006, p7). Information technology is simply technology that is utilised for the purpose of processing information. In order to manage BIS, it is important to understand the nature of what is to be managed - the system components and their capabilities. "Information technology is the hardware, software and communications that support information systems" (Benson and Standing, 2005, p9). The hardware component of information technology is comprised of the mechanical devices that perform the input, processing, data storage and output functions.

Organisations are in a better position to respond to changing market-scapes and rising competitive pressures when they have speedy access to reliable and accurate information outputs. Information technology itself provides a platform for information flows within organisations. Information technology in and of itself is unable to initiate information flows. It is the software element that does this.

Enterprise application software is software that has been developed for large enterprises. Software vendors such as SAP (System Anwedung Produkte), Oracle, and JD Edwards develop enterprise application software. According to Stair and Reynolds, "Many organisations are moving to integrated enterprise software that supports supply chain management" (Stair and Reynolds, 2008, p95). Examples of enterprise application software are: accounts receivable, accounts payable, cash-

flow analysis, manufacturing control, distribution control, stock and bond management, inventory control and retail operations to mention some (Stair and Reynolds, 2008, p95). Application software is comprised of multiple software packages which combine to make 'a whole' by communicating with one another simultaneously and working along side one another, feeding information across different process functions. For example, application software integrates functions such as human resource management, accounting, finance and marketing into "a single enterprise-wide system in order to shorten timelines and yield inherent synergies" (Benson and Standing, 2005, p22). It is enterprise application software that will assume our focus in this research study.

Information technology is comprised of hardware and software components. It has the ability to receive data/information inputs, process, manipulate and analyse data/information, and output meaningful information and knowledge that organisations can use to make accurate and timely decisions. Both hardware and software components need to be selected according to their ability to support the objectives of the information system and meet the goals of the organisation. When choosing hardware or software, a firm wants to make sure they get the maximum return on investment (ROI) (Benson and Standing, 2005, p61). Maximum return on investment is achieved by acquiring hardware that supports software in optimising business processes in order to minimise costs and maximise profits.

Information technology permeates every aspect of business operations, from the basic capture of raw data, to the analysis of such data in order to create information, to the transmission of that information throughout an entire chain of suppliers. Thompson *et al* states that "Many retailers and manufacturers have online data systems connecting them with their suppliers that monitor the status of inventories, track shipments and deliveries, and measure defect rates" (Thompson *et al*, 2004, p283). This in turn will optimise stock re-order intervals with suppliers, reduce stock holding costs, reduce the need for storage space, and reduce stock-outs and stock obsolescence, resulting in reduced costs and, thus, increased profits. "Information technology is a powerful tool that can transform an organisation from doing 'business as usual' to becoming what some observers call an agile organisation, capable of anticipating and /or reacting to business opportunities and

threats" (Haag *et al*, 2006, p12). There is growing pressure to have timely, accurate and quality responsiveness to customer needs, and information technology plays a fundamental role in achieving this.

2.2 Background to Business Information System Technology

Organisations have been developing computer-based information systems for some thirty years. According to Benson and Standing, "most people accept that the birth of the modern computer age occurred in the late 1940s when a research team in Manchester University in the United Kingdom produced the first electrical stored-program computer" (Benson and Standing, 2005, p29). Information technology's ability to leverage multiple software packages that communicate with one another and feed information simultaneously across multiple processes quickly became valuable as it had the ability to enhance product and information flows within organisations.

According to Zaheeer, "Companies have consistently tried to enhance their business efficiency and effectiveness by reassessing their internal business operations such as: purchasing, warehousing, material management and distribution. These processes commit huge time and financial resources and therefore companies are continually striving to make them more effective in order to improve their financial standing and market positions" (Zaheeer, 2010, online, para 2). This need consequently compelled the development of Materials Resource Planning (MRPI and MRPII), Just-in-time (JIT) systems, Electronic Data Interchange (EDI), etc. Even though MRPII, JIT and EDI proved greatly beneficial, these systems were limited in that they only focused on discrete functions within a supply chain. These systems provided the ground work for the development of the Enterprise Resource Planning (ERP) systems that we have today. No sooner had organisations optimised internal processes, when they began to look at enhancing information flows to partnering firms in order to reduce uncertainty, share mutual benefits, and speed products to the market. The Enterprise Resource Planning systems (hereinafter referred to as ERP systems) not only facilitated information flows throughout an organisation, but were able to extend beyond organisational boundaries, to facilitate information flows with partnering firms. ERP systems originally relied on electronic data

interchange (EDI) systems to exchange information beyond organisational boundaries, but it has subsequently been superseded by using IP protocols over the internet with its vast capabilities (Hugo *et al*, 2004, p261).

"The Internet's history can be traced back to 1957, when the Department of Defense formed the Advanced Research Projects Agency (ARPA) in response to Russia's launch of Sputnik, the first artificial earth satellite" (Haag *et al*, 2006, p398). Research studies sponsored by the ARPA followed to see if a small number of university supercomputers could be made available to a number of research scientists in different geographical locations. ARPANET, the first computer network, was created in 1969, joining the University of Utah, UCLA, Stanford Research Institute and UC Santa Barbara in California. "Now the Internet is the world's largest computer network, linking thousands of networks and millions of individual computers around the world" (Haag *et al*, 2006, p398). The Internet is run and maintained by a collection of non-governmental organisations" (Yeates *et al*, 2004, p412). The 'glue' keeping the internet together is what is known as the 'Internet protocol' (IP). "IP is a set of globally accepted standards that allows computer, operating systems and applications to communicate with each other and to share information" (Hugo *et al*, 2004, p259). Due to the internet's inter-organisational information systems capabilities, it has been adopted as a routine platform for information systems development (Williamson, Harrison and Jordan, 2004, para 1). These internet-based systems utilize secure procedures using encryption, authorization and the protection of firewalls in order to prevent access by outside parties (Hugo *et al*, 2004, p261). In addition, the internet contains a webbed-network of information, referred to as the World Wide Web (www), creating a platform of information that has been used to aid commerce since its inception. For example, in commercial use, websites contain extensive information on products, comparative pricing, supplier networks, materials tracking and tracing, and competitors.

In summary, "Business information systems facilitate information sharing and coordination between internal and external partners in the chain" (Williamson *et al*, 2004, para 4). Business information systems developed as a result of organisations

trying to enhance operational efficiency and responsiveness to ever-changing markets. The internet "is a huge client/server network originally conceived in the late 1960s in the USA to link together defense agencies, suppliers and researchers," (Yeates *et al*, 2004, p412) and is flagged as the technological platform for BIS around the world.

2.3 What Business Information Systems have to offer the Business Environment

Stair and Reynolds describe information systems as "a set of interrelated components that collect, manipulate, store, and disseminate data and information and provide a feedback mechanism to meet an objective. It is this feedback mechanism that helps organisations achieve their goals, such as increasing profits or improving customer service" (Stair and Reynolds, 2008, p4).

BIS technology requires three key resources – people, information technology and information. "If one fails, then chances are the business will fail" (Haag *et al*, 2006, p8). Firstly, for information technology to be useful within an organisation it needs to be used by people who know how to use and manage it effectively. A fundamental impediment that many organisations face when adopting new technologies is the disinclination employees experience when they are required to adopt and use those new technologies. Without the people, the technology is virtually rendered useless. People need to use the technology in order for technology to work for an organisation. It is, therefore, imperative that organisations not only sell the 'bigger picture' to their employees, but that they provide adequate support and training to them (Waters, 2007, p286). Secondly, organisations need to ensure that information technology architectures/structures that are adopted not only align themselves with the organisation's strategic objectives, but that correct, accurate and complete information is being sourced in order to make those key decisions. For example, "If an organisation's information is not accurate or complete, people can make poor decisions, costing thousands, or even millions, of dollars" (Stair and Reynolds, 2008, p6). It is not so much the use of information technology, but rather how the information technology is used in meeting the needs of an organisation. If an organisation is seeking to improve their decision making and forecasting techniques, BIS technology offer a variety of

mechanisms they can use. For example, "Businesses today have access to modeling and simulation tools, algorithms, and applications that can combine information from multiple sources to build forecasts for days, weeks, and months in advance" (Haag *et al*, 2006, 106). Thirdly, information is sourced from the day to day activities within an organisation. This is referred to as online transaction processing (OLTP) - using technology to capture transaction and event information (Haag *et al*, 2006, p9). The captured information is then analysed and re-directed to key decision makers. Accurate information that is received on time will empower the organisation to make accurate decisions, anticipate change and plan for the future.

Organisations need to align their technology with their strategic objectives in order to use their resources and operations to achieve effectiveness and efficiency in meeting market needs. An organisation does this by strategically aligning its BIS architecture and core-competencies with the goals and plans of the organisation. This alignment is imperative to ensure that the right information is sourced in order to drive the organisation forward. "For example, if a primary goal of the organisation is to increase sales, as at Levi's, information technology can facilitate Levi's relationship with Wal-Mart" (Haag *et al*, 2006, p7). The challenges faced by many organisations today is that strategic alignment is not a static event, but needs to adjust to the dynamic environments that drive it. According to some of the latest strategic alignment research, "strategic alignment is a process of continuous adaption and change." It requires the "ongoing efforts to establish and maintain a series of interdependent relationships between business and enterprise information system strategies" (Tsinghua Science and Technology, 2008, p355). BIS architectures and core-competencies in their application to the business environment will be discussed in more detail below.

2.3.1 Business Information System Architectures

According to van der Klashorst, "Enterprise architecture is the bridge between the enterprise business and technological domains" (van der Klashorst, 2001, p2). In the past, "Enterprise Resource Planning Systems were designed to integrate the various functions of an individual business rather than support one or more functions or operations across a large number of businesses. As a result, they had

a closed non-modular system architecture" (Williamson *et al*, 2004, p377). Today's BIS Architectures, however, are open and facilitate vertical integration that span supply networks. They are designed to optimise and synchronize business processes throughout a chain of suppliers in order to meet multi-level demands. According to Waters, organisational networks "are created out of complex webs of exchange and dependency among multiple organisations" (Waters, 2007, p166). These BIS Architectures not only span supply networks, but facilitate flexibility to network structures which gives organisations the ability to adjust to changing organisational or market needs. They establish communication and partnerships among internal business-units and external organisations, permeating the entire supply chain and contributing value to the cluster of organisations as a whole. A network in its simplest form would be an office network that connects computers, printers, fax machines and scanners. In so doing, individuals can share information, printers, fax machines and scanners, resulting in increased information flows and reduced hardware costs (Yeates *et al*, 2004, p411). Networks add value by providing a platform which connects organisations that are geographically disparate, and facilitating information flows between them. This is facilitated via the world's largest network, the internet. For example, "car makers such as Toyota use the internet to develop relationships with owners as well as to sell cars. Its site offers product information, dealer services and locations, leasing information, and much more" (Kotler and Armstrong, 2001, p25). BIS rely on accurately aligned architecture and flexible networks to optimise business operations and realise the benefits that the core-competencies in BIS have to offer.

2.3.2 Core-Competencies in Business Information Systems

BIS's core-competencies lie in its ability to compress time, manipulate data and draw information from it, and facilitate information flows within and beyond organisational boundaries.

2.3.2.1 Time Compression

"The Time-compression approach focuses on how companies use time to deliver a sustainable fast response to customer needs, through business processes that are organised around a strategic time based focus" (Waters, 2007, p75). This approach

does not promote 'speed to market' above the product or service quality, but rather focuses on sustaining a fast response to customers' changing needs. Time compression in its most basic form seeks to add value by eliminating non-value adding process time and thus reducing time consumed by business processes.
Waters (2007) identified seven strategies that can be used to compress time: simplification, integration, standardization, concurrent working, variance control, automation, resource planning.

- *Simplification* - is a process which removes complexity that is accumulated over time;
- *Integration* - which improves information flows and operations;
- *Standardisation* - by adopting generic best practices in order to standardize components, modules and information protocols;
- *Concurrent working* - which enables processes to run simultaneously, or parallel to one another rather than one after the other;
- *Variance control* - controls the quality parameters, enabling an organisation to monitor processes and detect problems early, so that corrective action can be taken to reduce product waste;
- *Automation* - processes are able to engineer quality into products, and improve the effectiveness and efficiency of supply chain activities; and
- *Resource planning* - allocates resources according to best practices in SCM. (Waters, 2007, p76)

2.3.2.2 Data Sourcing and Manipulation

As stated earlier, information in its raw state is called data. BIS draw information and knowledge from data by creating data warehouses to store data, data mining capabilities to sort, and using business intelligence tools to manipulate and pool data.

Data warehouses are databases that hold current and historical data and are used solely to support decision-making and planning (Benson and Standing, 2005, p94). "The data warehouse provides business users with a multidimensional view of the data they need to analyze business conditions" (Stair and Reynolds, 2008, p129). Organisations analyze these business conditions by what is known as 'drilling down'

into the data stored in the data warehouse, and taking or 'rolling up' the detailed data to produce aggregate or summary reports. Data warehouses are maintained and regularly updated. Any outdated data or data inconsistencies are searched for and purged, 'cleaned up', in order to sustain an information database that is up to date and suitable for data analysis (Stair and Reynolds, 2008, p129). According to Jessup and Valacich, "an organisation that successfully deploys a data warehouse has committed to pulling together, integrating, and sharing critical corporate data throughout the firm" (Jessup and Valacich, 2008, p153). Furthermore, organisations create 'data marts' which are smaller than data warehouses and hold subsets of data for various aspects of a company's business, such as inventory, marketing and finance. Data marts contain selected information for the purpose of customising decision support applications for a particular end-user group (Jessup and Valacich, 2008, p153).

The stored data is then mined. "Data mining is an information-analysis tool that involves the automated discovery of patterns and relationships in a data warehouse" (Stair and Reynolds, 2008, p132). "The objective of data mining is to extract patterns, trends, and rules from data warehouses to evaluate proposed business strategies, which in turn will improve competitiveness, increase profits and transform business processes" (Stair and Reynolds, 2008, p133). For example, marketers may use this extensively in order to retain customers, seek out cross-selling opportunities or analyze market segments. "Data mining is also used to perform various 'predictive analysis' functions. Predictive analysis is a form of data mining that combines historical data with assumptions about future conditions to predict outcomes of events such as future product sales or the probability that a customer will default on a loan" (Stair and Reynolds, 2008, p133). Retail organisations group customers into frequent purchasers in an attempt to predict what products they will buy if the price is right. Closely coupled with data mining is what is known as 'business intelligence' which involves the process of gathering the right information, at the right time, for the right people, to have a positive impact on business strategy, tactics or operations.

Intelligent systems (also known as artificial intelligence (AI) or Expert systems (ES)) try to simulate human intelligence by reasoning and learning, and gaining sensing capabilities like seeing, hearing, talking and feeling. "An intelligent system – comprised of sensors, software, and computers embedded in machines and devices - emulates and enhances human capabilities" (Jessup and Valacich, 2008, p283). There are three types of intelligent systems that are relevant to business, namely, Expert systems, neural networks and intelligent agents (Jessup and Valacich, 2008, p284).

Expert systems (ES) – "may be used to augment the decision-making of humans or may make decisions themselves" (Benson and Standing, 2005, p102). They have the ability to manipulate both information and gain knowledge. Computers learn by acquiring understanding through experience. Stair and Reynold's explain that "If a computer does not win a game, it remembers not to make the same moves under the same conditions again" (Stair and Reynolds, 2008, p306). "Human knowledge can be represented in an ES by facts and rules about a problem coded in a form that can be manipulated by a computer" (Jessup and Valacich, 2008, p284). The ES asks the user a series of relevant questions, matching the responses with defined facts and rules, until responses direct the system to a solution.

Neural Networks – "is a category of AI that attempts to emulate the way the human brain works" (Haag *et al*, 2006, p100). Neural networks process significant sets of data, with the purpose of recognizing patterns, trends and relationships between data. For example, "neural networks are used to analyze hundreds of millions of bank, brokerage, and insurance accounts involving a trillion dollars to uncover money laundering and other suspicious money transfers" (Stair and Reynolds, 2008, p306).

Intelligent Agents (also referred to as a 'software robot') – are special-purpose information systems that set out to accomplish specific tasks for its users (Haag *et al*, 2006, p101). Examples of intelligent agents are: 'Shopping bots' which search for and provide comparative prices; 'User agents' that automatically perform a task like sending a report out quarterly; 'Monitoring and sensing agents' which keep

track of important information such as inventory levels; 'data mining agents' that conduct continual analyses and updates on data; and 'Web crawlers' that search the web for specific information (Jessup and Valacich, 2008, p287).

Once the data has been stored, accessed, drilled into and manipulated into valuable information, it can be sent to decision makers within an organisation as well as decision makers at partnering organisations. Timely information flows inform organisations and their supply networks of pending changes and/or problems, resulting in quicker response rates and a competitive advantage.

2.3.2.3 Facilitated Information Flows

BIS facilitate information flows in and beyond organisational boundaries with the use of integrated information technology and integrated application and communications software. Information flows are driven by the software component to enable accurate decision making, based on reliable real-time information. The organisation's aim is to use BIS technology to integrate the structure, resources and processes in order to effectively and efficiently maximize the added value to the customer. It is imperative that the BIS of an organisation support this. "Information systems perform a key role in facilitating the integration process and in supporting management" (Ritchie, Marshall and Eardley, 1998, p25). Furthermore, BIS facilitate the seamless flow of information beyond organisational boundaries to partnering organisations. For example, when a customer buys groceries, that data is captured at the point-of-sale. The data is then sent to an automated stock reordering system which initiates the reordering of the stock items that were sold. This information is then sent throughout a chain of suppliers in real-time, creating transparency and visibility right the way through the chain in order to ensure that a firm's direct, second and third tier suppliers are able to meet the demand. "Organisations have completely changed the dynamics of their industries because of competitive advantage gained from high visibility in the supply chain" (Haag *et al*, 2006, p108).

2.4 Business Information System Technology in the Retail Sector both globally and within South Africa

Information technology, together with its networking internet capabilities, has popularized electronic commerce (E-Commerce) or electronic business (E-Business). According to Waters, "E-business allows organisations around the world to communicate as if they are physically close – so physical distances become less significant, and organisations can become global in outlook. They can broaden their supplier and customer bases to buy, transport, store, manufacture, sell and distribute products in a single worldwide market" (Waters, 2007, p10). In light of this, "Retail technologies are becoming critically important as competitive tools" (Kotler and Armstrong, 2001, p492) within the retail sector. Computer-based technologies are being used to produce forecasts with higher levels of accuracy, manage inventory and its associated costs, and facilitate communications between, within and beyond organisational boundaries. Other technologies, such as check-out and shopper scanning systems, online transaction processing, and electronic data interchange are being utilized. Retailers have also sought to squeeze additional value from their transactional systems by utilizing Business Intelligence (BI) technologies (Suleski, Garf, D'Aquila, Carter & Martahus, 2007, p4). BI technologies give retailers access to customized/personalized marketing strategies and enables them to respond timeously to market shifts. Leading global retail superstores like Walmart, Carrefour and Tescos have made BIS technology a priority in optimising supply chain efficiency. "Walmart's core competency is retail cost leadership" (Haag *et al*, 2006, p11). Walmart learned early on of the advantages of driving costs down by utilizing BIS within its supply chain. With its global leader status, Walmart insisted that all of its suppliers own up-to-date information systems. Before Levi were able to supply Walmart, they had to get rid of their legacy systems which left executives not knowing where stocks were in the supply chain, how many pairs of jeans were being made and how many had been delivered to customers (Haag *et al*, 2006, p4). Tescos have developed 'best practices' in utilizing their BIS technologies to track the continuous replenishment of merchandise to stores (Holland, 2007, online, para 3). Pick 'n Pay (Pty) Ltd have benchmarked themselves against Tescos' best practices and have observed the same improvements. Shoprite Checkers are utilizing a central distribution system which not only allows them to

take advantage of economies of scale, increase product range and guarantee higher levels of consistency, but also reduces their dependence on supplier reliability. Shoprite Checkers make use of a (WMS) World-class warehouse management system, namely, the EXE 2000 System. This system is designed to optimise operations productivity within the distribution centre. For example, "The system makes decisions relating to slotting, productivity, service levels and accuracy. It integrates easily with stock ordering and buying systems and store replenishment systems" (Shoprite Holdings, 2009, online, Anon, paras 10 and 13). The Spar Group Limited have introduced a Virtual Private Network (VPN) which enables a high speed link with increased capacity between its distribution centres and retail stores. (Hook, 2009, online, paras 1 and 2).

In addition, enterprise resource planning (ERP) systems developed around managing business operations at an enterprise-wide level have infiltrated the retail sector. "Enterprise Resource Planning (ERP) systems, have developed from MRPII applications and now allow integration of businesses, such as suppliers and customers, through an integrated database environment" (Williamson *et al*, 2004, p377). The predominant enterprise resource planning systems in the retail sector are SAP R/3 and ORACLE. Below we will discuss the basic structures of these systems.

2.4.1 SAP R/3 in Business

SAP (pronounced S-A-P) launched SAP R/1 in 1972. SAP R/1's focus rested entirely in processing real-time information in the field of financial accounting. In the late 1970s, SAP R/2 replaced SAP R/1 with its mainframe based business application software suite, extending its real-time information processing capabilities to functional areas in business such as Materials Resource Planning, Production Planning and Human Resource Management. The SAP software was very successful in the 1980s and 1990s. In 1991, distributed client-server computing took hold of the business applications market, thus leading SAP to the development and rollout of SAP R/3. The distributed client-server computing model interconnects programs that are distributed across diverse locations. It is explained as the "distributed interactions in terms of one program requesting and obtaining a service from a

second, possibly remote, application" (Adler, 2008, online, para 1). SAP therefore facilitates and co-ordinates information exchanges and interactions between distributed applications (Adler, 2008, online, para 1). On the 6th of July in 1992, SAP AG launched SAP R/3 which could be managed on multiple platforms and operating systems, for example, Microsoft Windows or (UNIX from 1999). This opened SAP up to a whole new customer-base rendering them the dominant leader in ERP systems (SAP Our Company, 2010, online, para 4).

SAP/R 3 is comprised of defined functional modules that can be categorized into three areas. (Lin-ya Hong, 2008, p8-9)

1) Logistics
    - Sales and Distribution (SD)
    - Material Management (MM)
    - Warehouse Management (WM)
    - Production Planning (PP)
    - General Logistics (LO)
    - Quality Management (QM)
2) Financial
    - Financial Accounting (FI)
    - Controlling (CO)
    - Enterprise Controlling (EC)
    - Investment Management (IM)
    - Treasury (TR)
3) Human Resources
    - Personnel Administration (PA)
    - Personnel Development (PD)

SAP R/3 is a client/server based application that employs a 3-tiered model, comprising presentation, application and database layers. The presentation layer interfaces with the users, the application layer houses all the business specific logic, and the database layer records and stores all the information about the system (Lin-ya Hong, 2008, p9)

SAP R/3 is built on its own proprietary language which is called ABAP (Advanced Business Application Programming). It is a fourth generation language geared towards simple, yet powerful programs. SAP R/3 is a flexible system which caters for the modifying of existing SAP code and existing functionality around a specific business environment (SAP ABAP Programming Reports, 2009, online, para 1). Even though SAP R/3 has dominated the large business applications market, they are not without competition. One of SAP's chief competitors is Oracle.

2.4.2 Oracle in Business

"For almost 30 years, Oracle has been helping customers manage their business systems and information with reliable, secure, and integrated technologies" (Oracle, 2008, online, para 1). Oracle offers a host of applications that support both core and peripheral business processes. With Oracle's newly adopted service-orientated architecture, Oracle offers online support to their customer base via on demand solutions, customer feedback channels, and customer forums. Oracle's customers have access to Oracle's knowledge base of more than 400 000 solutions which comprises a collection of best practices to help organisations resolve issues and maximize their Oracle software investment. "We embed supportability into our products, and we have built over 250 support tools to help you diagnose and resolve issues before they become critical" (Oracle, 2008, online, para 7). "Oracle*MetaLink* gives Oracle customers 24/7 access to Oracle Support Services and technical information via the Web. It is your portal to our global knowledgebase, complete with answers to common problems and frequently asked questions. It includes product alerts, product lifecycle information, step-by-step installation instructions, white papers, product documentation, search engines, service request (SR) management, and bug queries. The SR management capabilities are used to facilitate and track communications between you and Oracle support engineers. You can initiate requests for help (by opening an SR), track progress on those requests, read recommendations from the support engineer working on a request, and run reports on SR activity" (Oracle, 2008 online, para 6-9).

Oracle customers are requested to complete surveys to guide Oracle's planning and decision-making process, to ensure improvement across all businesses. Furthermore, Oracle has established customer forums in order to open communication between Oracle's executive management, product development teams and their customers. In response to specific needs in the retail market place, Oracle has developed the 'Oracle Retail Practice suite'.

Retailers internationally and locally have adopted BIS/E-Business technologies. E-Business has narrowed geographical boundaries while enabling expansion into global markets. Retailers are now able to forecast demand with higher levels of accuracy, improve product and process flows through improved communication, and service their market more effectively through business intelligence solutions. These advancements, however, do present a number of challenges.

2.5 Challenges faced by the South African retail sector and Business Information Systems Technology

Rapid developments in information technology coupled with ever-changing retail market needs leaves many challenges for retailers today. They are required to build open, flexible architectures which meet the fast pace of change both internally (developing technologies and organisation capabilities) and externally (changes in competitive pressures and market demand). Some of the internal competitive pressures are: food security and traceability technologies that support and align process and merchandise flows with customer demand, access to real-time information for decision making, and providing a convenient shopping environment. Some of the external competitive pressures are: selecting the best BIS technologies for the organisational environment, and utilizing technology more efficiently and effectively than competitors.

From a food and drug retail perspective, food security is of high importance in order to ensure consumer safety and confidence. Consumers need to know that food items meet both quality and safety standards and be ensured that potentially unsafe products will be recalled. In an attempt to curb this risk, supply chain networks are building traceability systems, recording identifications throughout the supply chain

in order to identify a products origin (Bechini, Cimino, Marcelloni and Tomasi, 2007). The underlying challenges that come with the complex task of building traceability systems lie in having appropriate BIS architectures, building trust relationships with suppliers, and ensuring information flows are unhindered throughout the chain of suppliers. Technologies such as EDI and the internet facilitate communication beyond organisational boundaries which will enable a chain of suppliers to streamline merchandise and process flows.

Selecting BIS architectures that align with the current organisational environment presents a substantial challenge. Organisations not only want BIS technologies that allow for the expansion and development of the organisation, but technologies that keep abreast with an ever-changing and advancing technological environment.

2.6 The latest trends in Business Information Systems Technology in this arena

"Rapid changes in technology coupled with recent trends toward the globalization of business have raised the intensity of the competitive environment in just about every industry" (Haag *et al*, 2006, p12). According to the CIO Journal on Strategies for IT Business Leaders, "Mainstream companies are well on their way to adopting Web services and service-based architectures, and moving to virtual servers and storage" (Davis, 2006, p1). Prominent IT organisations, such as SAP, Oracle and JD Edwards are rapidly seeing the benefits of this service-based architecture and have made definite steps towards adopting these strategies. Pete Swabey from SAP states that "by offering software-as-a-service for major business applications, SAP feels it can access a largely untapped segment of a potential customer base" (Swabey, 2007, online, para 5). SAP AG states that, "By applying proven demand models to your point-of-sale data, the demand insight services from SAP provide strategic retail intelligence that balances performance objectives with shopper needs" (SAP Demand insight and innovation, 2008, online, para 1). "New technologies create new markets and opportunities" (Kotler and Armstrong, 2001, p106). SAP enables retailers to unlock their point-of-sale data in order to assemble a complete picture of buyer behaviour, thus opening the doors to achieve merchandising excellence by accelerating value added decision making and

delivering long-term shopper value (SAP Demand insight and innovation, 2008, online, para 1).

In addition, organisations are able to integrate their informational resources by using web development technologies such as Extensible Markup Language (XML) and Java. This provides fast and reliable communications between trading partners, irrespective of geographical location and accelerates the decision-making process. "For example, information on a retailer's sales may be picked up by the supplier, who alters his purchasing plan, production schedule and distribution schedule accordingly" (Williamson, 2004, p378). Therefore, firms need to examine existing legacy systems and start developing integrated solutions. Technology does not exist in a vacuum. The true value of the technology emerges only when combined with organisational best practices.

2.7 Summary

A BIS is comprised of a combination of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute data (Jessup and Valacich, 2008, p12). BIS play a key role in enhancing operational effectiveness and efficiency and growing profit margins. Organisational success relies on three elements: people, technology and information. It is imperative that the information system architecture aligns with business goals and objectives and that the right information is directed to decision makers within the supply network. BIS have a number of core-competencies such as compression time, sourcing and manipulating data and initiating information flows throughout an organisation and its partners. BIS compress time by speeding up, simplifying and automating business processes. They source and manipulate data by making use of intelligent systems that assist with sifting out specific information from data warehouses to complex tasks like decision making. BIS are used on global and local scales within the retail sector and the competitive advantages are ever-changing with the transforming landscapes in SCM and BIS. BIS have changed the nature of business and its competitive environments. If firms want to compete for market share, they have no choice but to adopt these technologies.

CHAPTER 3

REVIEW OF RELATED LITERATURE IN THE FIELD OF SUPPLY CHAIN MANAGEMENT

3.1 Introduction

In chapter 2, the nature, and need for BIS technology in business and more specifically within the food and drug retail sector was discussed. In this chapter, a review of literature in the field of SCM within this context will be discussed. A brief review of the background to SCM will be given, in order to gain a more comprehensive understanding of the field. The terms 'supply chain' and 'management' will be defined and discussed, followed by a more detailed discussion on SCM as a whole. Our focus in this chapter will be on SCM's role in business, its contributions in the food and drug retail sector, the challenges faced by SCM in this arena, and current trends within the food and drug retail sector.

3.2 Historical overview of Supply Chain Management

Even though the concept of working with suppliers and customers is as old as commerce itself, the modern idea of "the supply chain" is relatively new. It is believed that the term "Supply chain management", as we know it today was developed over a number of years due to the pioneering research of men like J. Forrester, K. Oliver, and M. Porter (Waters, 2007, p227).

Late 1950s	Forrester conducted research on pipelines and channel interrelationships between suppliers and customers and identified the phenomenon known as the *Bullwhip Effect* (also known as the 'Forrester Effect'). "It is a phenomenon named after the way the amplitude of a whip increases down its length" (12 Manage: Executive fast track, 2008, para 2). Forrester "observed that a small fluctuation in a customer's demand was magnified, as it flowed through the processes of distribution, production and supply" (Bolarin and McDonnell, 2008, p7). This produced a ripple effect of increased and/or decreased orders throughout the chain of suppliers

	affecting inventory control, capacity planning, workforce and production scheduling (Wisner, Keong Leong and Keah-Choon Tan, 2005, p425). "The Bullwhip Effect creates a distortion on the replenishment orders, which propagates amplified upstream supply chain" (Bolarin and McDonnell, 2008, p9). Forrester found that it was the existence of lead-times in delivery, together with inaccurate forecasts that propagated this amplification.

Early 1980s	According to Waters, Olivier developed the term 'supply chain management' "to describe an amalgamation and relabelling of established functions – notably 'logistics' (integrated transport, warehousing, and distribution) and manufacturing-based 'operations management' (elements of purchasing, order and inventory management production planning and control as well as customer service)" (Waters, 2007, p227). It was used as an all-encompassing term for the management of transportation, distribution and materials management.

1985 - To date	Porter published a book titled, "Competitive Advantage" analyzing the 5 primary processes from which a supply chain framework is built: Inbound logistics (receiving, storing, and disseminating inputs to the product), operations (transforming inputs into the final product form), outbound logistics (collecting, storing and the physical distribution of the product to buyers), sales and marketing (urging buyers to purchase a product) and service (enhancing or maintaining the value of the product) (Blanchard, 2007, p9-10). Blanchard states that, "Porter saw that companies could significantly improve their operations by focusing on interrelationships among business units" as it provided "tangible opportunities to reduce costs or enhance differentiation" (Blanchard, 2007, p8-10).

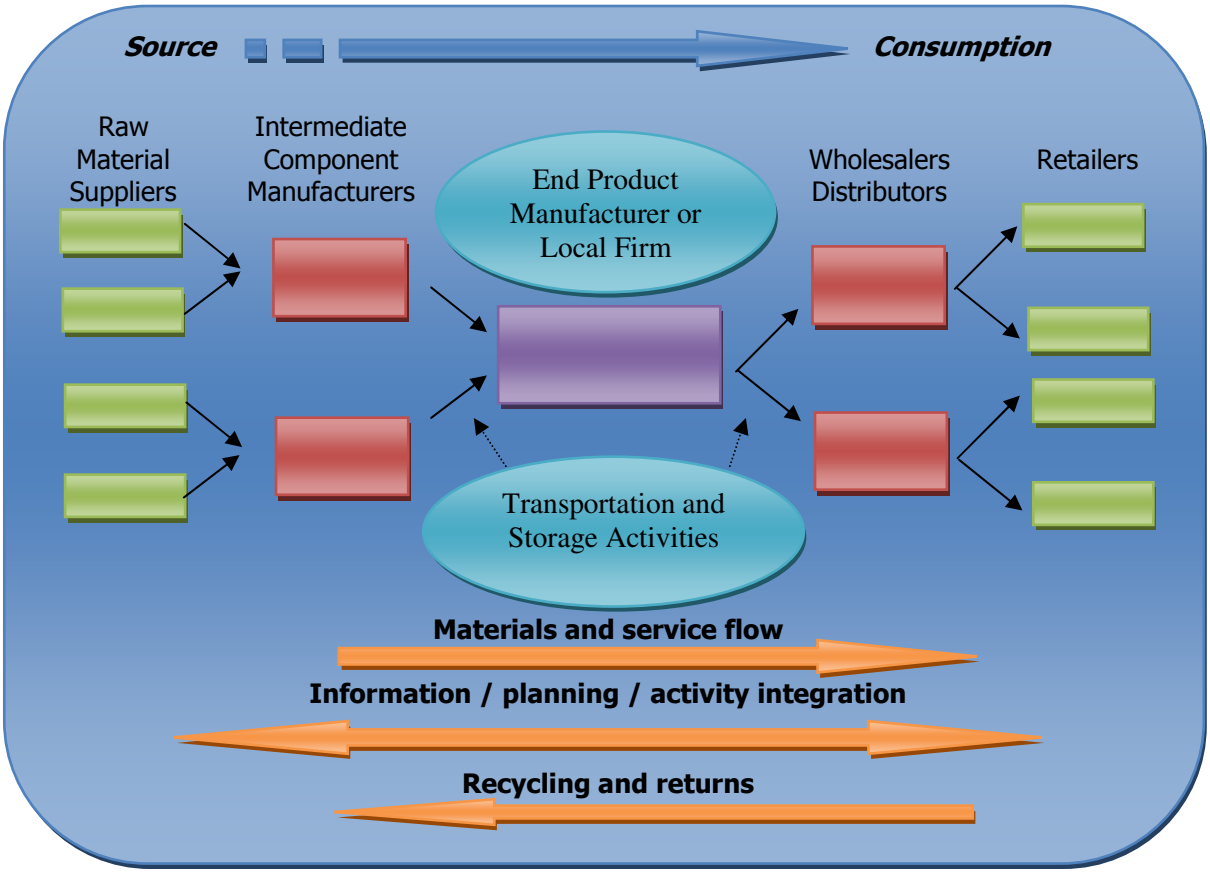
Despite Porter and Forrester's written work being separated by more than two decades, both Porter and Forrester saw the worth in a vertical strategy whereby

managers co-operate across departments and functions, share resources and promote the entire companies bottom line (Blanchard, 2007, p11).

3.3 Supply Chain Defined

"The term, 'supply chain' remains despite the near-universal recognition that supply chains are not simply linear processes. They are in fact complex systems of interlocking networks" (Waters, 2007, p226). Haag *et al* support this in describing a 'supply chain' as, "a complex web of suppliers, assemblers, shipping/logistics firms, sales/marketing channels, third-party customer support firms, and other business partners linked primarily through information networks and contractual relationships" (Haag *et al*, 2006, p106). This web of relations between these members is driven by the push of materials and services from source to consumption in order to meet customer demand.

Fig 3.1 **An Illustration of a Generic Supply Chain**



Source: Adapted from Wisner *et al*, 2005, p6

As seen in fig 3.1, the supply chain starts with raw materials suppliers which extract materials such as iron ore, wood, oil, and food from the ground and pass them onto

the raw materials manufacturers. The raw material manufacturers transform the raw materials into materials that customers (component manufacturers) can use i.e. sheet steel, copper, aluminium and inspected foodstuffs. These are sent on to the component manufacturers where the materials are converted into components such as nuts and bolts, electrical wires, fabrics, processed foods, and moulded plastic. These components are passed onto the end product manufacturer who assembles the finished products. These products are then moved onto the wholesaler who distributes the products to the retailers when ordered. The retailers sell the products to the end-user, the final consumer. Furthermore, should a consumer return a product, require repairs to be done, or throw a it away for recycling, it will initiate reverse logistics activities which are integrated into the supply chain (Wisner *et al*, 2005, p5). Throughout this process, supply chains rely on a number of companies that are indirectly involved in the supply chain process, but play a fundamental role in getting the product to where it needs to be. These companies are known as service providers, and provide services such as public warehousing, trucking and shipping, information systems, agents, consultants, and freight forwarders (Wisner *et al*, 2005, p6). In summary, Wisner *et al* state, "The series of companies that eventually make products and services available to consumers, including all of the functions enabling the production, delivery, and recycling of material, components, end products and services is called a supply chain" (Wisner *et al*, 2005, p6).

These chains of suppliers, assemblers, logistics firms, marketing channels, and other respective partners have three main links: *The flow of materials* - comprised of the inbound flow of material from 'upstream' suppliers at every level; *transformation of materials* – where each channel member plays a role in the transformation process, each transforming the materials into semi-finished and finished products; and the *distribution of products* – which is the outbound distribution of products to 'downstream' customers and end-users (Haag *et al*, 2006, p106). Waters concludes that "The supply chain is a meta-organisation, a system of connections transcending organisational boundaries and recognizing interdependence among individual enterprises" (Waters, 2007, p162). The primary task of SCM is to direct and control this process.

3.4 Management Defined

According to Smit and Cronje, "Management's task is to combine, allocate, coordinate and deploy resources or inputs in such a way that the organisation's goals are achieved as productively as possible" (Smit and Cronje, 1997, p9). Management is the process of coordinating the efforts of different individuals (within the organisation) and functions in order for the organisation to reach its desired goals in the most effective manner. By effective, it is meant an organisation's ability to produce the intended results. "Nothing affects a company's ultimate success or failure more fundamentally than how well its management team charts the company's direction" (Thompson *et al*, 2004, p32).

Managers engage in four fundamental interrelated activities in order to achieve their desired goals. These activities entail the "process of planning, organising, leading and controlling the resources of the organisation to achieve the intended outcomes as efficiently as possible" (Smit and Cronje, 1997, p11). By efficient, Smit and Cronje (1997, p11) mean using resources wisely and in a cost-effective manner. The primary management functions are briefly discussed below.

Planning – entails determining the organisation's mission and goals and identifying ways to attain those goals; identifying the resources required for the task; devising the intended future position of the firm and strategies needed in order to reach that position.

Organising – entails the allocation of human and physical resources to perform the relevant tasks set out in the planning stage. Duties and procedures outline the framework or organisational structure to indicate how people and materials should be arranged to achieve the objectives.

Leading – motivating and working with members of the organisation in order to achieve organisational goals.

Controlling – monitoring and correcting ongoing activities to facilitate goal achievement. By this, managers can identify and rectify any deviations from the plans and revise their goals and plans if required (Smit and Cronje, 1997, p11).

It is important to note that these functions are goal orientated and take place at all functional levels of an organisation - marketing, administration, finance, public relations operations and human resources. Management involves the evaluation of a firm's present performance, market position and competitive environment in order to direct it into a favourable position. The ongoing process of management builds flexibility into a firm's supply chain, enabling it to adapt to changing market conditions. If supply chains are inflexible and do not respond to the change in customer demand, it will result in lost sales due to poor responsiveness to the market and stock outs due to inadequate inventory replenishment (Wisner *et al*, 2005, p127). Thus supply chains, and the management thereof, play a fundamental role in determining a firm's long-term success or failure. This brings SCM to the fore and its importance as a core competence to any organisation.

3.5 Supply Chain Management Described

Waters suggests that "Supply chains comprise flows of materials, goods and information (including money), which pass within and between organisations, linked by a range of tangible and intangible facilitators, including relationships, processes, activities, and integrated information systems" (Waters, 2007, p226).

According to the Institute of Supply Chain Management (ISM) glossary, SCM is described as the, "The design and management of seamless, value-added processes across organisational boundaries to meet the real needs of the end customer (Wisner *et al*, 2005, p7).

The Council of Supply Chain Management Professionals (SCSMP) state that "Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities" (Blanchard, 2007, p8).

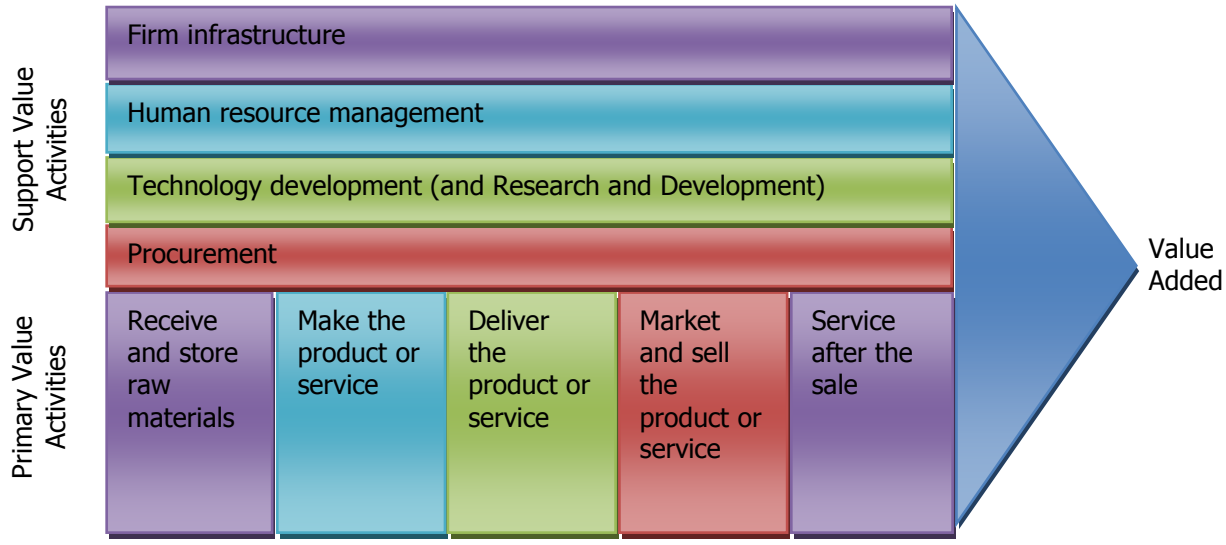
SCM is concerned with the integration of materials, goods, services and information flows within and beyond organisational boundaries. It pursues cross-integration among channel partners with a primary focus on optimising sourcing, transformation and distribution activities from the raw material stage to the final customer in order to add value to products and/or services and reduce costs. This is accomplished through the building of trust relationships with channel partners, the integration of processes and the use of integrated information systems.

Channel members partner, align and integrate business strategies and processes (purchasing, manufacturing, logistics, distribution and the delivery of real-time seamless information), forming a strategic network of partnerships, in order to achieve and sustain mutual benefits (maximize output value and minimize costs). "Supply chain management focuses on positioning the organisations in such a way that all participants in the supply chain benefit" (Wisner *et al*, 2005, p8). For example, if a product is scarce with rising prices, a firm may align itself with a supplier in order to ensure continuity of supply. As a result, the supplier may receive access to new markets and future product opportunities, resulting in the stabilising of prices for the buyer. Once a product is no longer scarce, buyers may see value in partnering with other suppliers and dissolving the original buyer-supplier alignment. As a result, supply chains are often dynamic or fluid (Wisner *et al*, 2005, p8). The strategic 'coherence' among the many activities within the supply chain is fundamental not only to achieving mutual benefits, but also to the sustainability of them.

"The theory of supply chain management is centered around the concept of value" (Hugo *et al*, 2004, p56). Each channel member plays a fundamental role in adding value to the end product or service at a specific point in the supply chain, which is also synonymous with the term 'value chain'. "The term 'value chain' has been used to trace a product or service through its various moves and transformations, identifying the costs added at each successive stage" (Leenders, Fearon, Flynn and Johnson, 2006, p6). In essence, value creation in SCM is to increase value by "increasing the functionality or use of a product or service while holding cost

constant, reducing cost while not reducing functionality or increasing functionality more than increasing cost" (Monczka *et al*, 2005, p396).

Fig 3.2 **A Graphical Depiction of a Value Chain**



Source: Haag *et al*, 2006, p19

Porter's value chain model attempts to split a generic business system into a sequence of value adding activities. The primary purpose within the value chain is to offer customers a level of value that surpasses the costs associated with the activities, thereby increasing the margin of profit (Antoniou, Levitt and Schreihans, 2008, p2). Channel members within the supply chain use their 'support value activities' (infrastructure, human resources, technologies and procurement) to drive the primary activities (receiving and storage of raw materials, transformation of materials, marketing and delivery of services and end-products). Each activity is analyzed to determine the extent to which they add value. Processes that do not add value are changed or eliminated.

The unique characteristics of integrated, value-centered supply chains are:

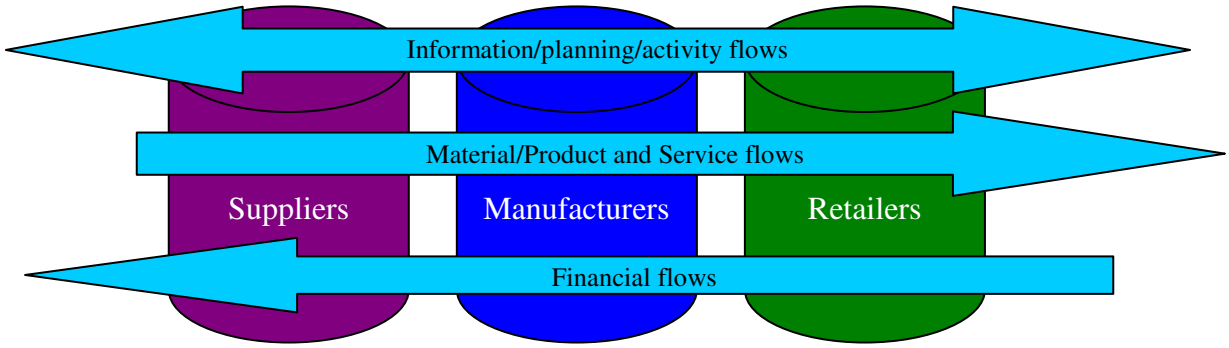
- Each member in the supply chain is an interdependent entity, which collaborates for the success of the entire chain.
- Integrated collaborative planning and scheduling is used to enhance flow consistency and reduce costs associated with irregular material, information and service flows.
- Partnered relationships in the supply chain is based on trust, resource, cost and profit sharing.
- Integrated use of information technology systems reduce geographical boundaries and provide an integrated platform for information flows.
- Integrated information flows facilitate real-time information flows in order to make decisions based on up-to-date and accurate information, i.e. receiving minute-by-minute changes in customer demand.
- Integrated logistics, production time compression and product quality engineering is created through process automation and specialization.
- Managing demand/uncertain situations through integrative strategies, which facilitate product and service flows to the customer, disseminate product information and provide customer feedback systems.
- Breakthrough innovations which result in a direct result of access to more expertise.

(Sivakumar and Sundaresan, 2008, p23)

In light of the above, the integrated, value-centered supply chain encompasses the collaborative planning and scheduling of material, service, information and logistics flows through partnered relationships with channel members. They make use of information technology to optimise these flows throughout the entire supply chain with the purpose to create a sustainable competitive advantage. This is accomplished through optimising customer service and minimizing cost.

"Supply Chain Management is a systems approach to managing the entire flow of information, materials, and services from raw materials suppliers through factories and warehouses to the end-customer" (Leenders *et al*, 2006, p10). According to Leenders *et al*, there are three principle flows in SCM: (1) Information, planning and activity flows, (2) material/product and service flows and (3) Financial flows. These flows will be discussed in more detail below while outlining their essential contributions to the SCM process.

Fig 3.3 **A Graphical depiction of Information, Material and Service flows**



Source: researcher's own construction

Information/planning and activity flows – refer to the flow of information within and beyond the boundaries of an organisation. In this case, a chain of suppliers communicate information with one another to meet the ultimate customer's need more efficiently and effectively. For example, "it enables companies to share information that can dramatically shorten processing time, eliminate value-depleting activities, and improve quality, accuracy, and asset productivity—all of which are fundamental to long-term success" (Bowersox *et al*, 2005, para 2).

Material/product and service flows – are the movement of material/products from raw material status through manufacturing, warehousing and lastly into the consumer's hands. These are flows of tangible goods – goods you can see, touch, transport and store. On the other hand, service flows are intangible and are therefore not transportable or storable. However, they can be closely related to products (i.e. after-sales service provided after the sale of a vehicle), or entirely

independent (i.e. customers request a bank loan, await loan approval and receive the required funds) (Wisner *et al*, 2005, p16).

Financial flows – involves the distribution of cash throughout the supply chain, starting from the consumer and filtering its way up to the source.

The complex inter-connective nature of supply chains, together with fluctuations in customer demand make them apt to variations in flows of information, materials, and services. These variations were observed by Forrester in the late 1950s. As mentioned in section 3.2, Forrester conducted research on pipelines and channel interrelationships between suppliers and customers and identified the phenomenon known as the *bullwhip effect*. The bullwhip effect is the logistic phenomenon of amplified stock levels at different stages of the supply chain as a direct result of changes in customer demand. For example, Grebson Manufacturing relies on ABC Bearings to make roller bearings that in turn source materials from Speciality Steels Incorporated. Grebson forecast roller bearing demand to be 25,000 units. ABC Bearings forecast 5,000 units of safety stock as Grebson's demand has been erratic over the last few months due to the emergence of competing firms. Speciality Steels, in turn, forecast 20% of what they expect to sell to ABC Bearings. The problem here is that ABC do not know Grebson's roller bearing demand over the next quarter – it could be zero or 25,000 units. ABC Bearings incur the costs of producing 5,000 units of safety stock and carry the added risk of keeping any units not sold to Grebson, or loss of current and future sales if Grebson's demand exceeds 25,000 units. Speciality is faced with the same dilemma. Grebson's safety stock was built into its order which is over and above ABC's safety stock, creating an even greater percentage of safety stock for Speciality Steel. As a result, this magnification of safety stock which is derived from forecasts already containing safety stock gets larger as it goes up the supply chain. (Wisner *et al*, 2005, p10). "This phenomenon occurs in forecast-driven distribution channels" (12 Manage: Executive fast track, 2008, para 1). Supply chains are driven by customer demand. Their primary aim is to get the right product, of the right quality, in the right place, at the right time, for the right customer. In order to accomplish this objective, channel members rely on demand forecasts.

Customer demand is a dynamic variable that is subject to constant fluctuation. For example, customer demand for a product or service may decrease when: substitute products or services enter the market at a lower price; newer products enter the market that outdate a current product or service; a product or service is seasonal (bought only at Christmas or Easter), or; there is bad publicity about a specific product or service. On the other hand, customer demand may increase when: promotional activities result in a sudden increase in sales; supply is slow and customers purchase more to stock up; the price of a product or service decreases, or; the product or service becomes popular.

"The variation of flows of items or finished goods in supply chains influence transportation costs, inventory cost and definitely costs of activities in logistic networks" (Bolarin and Mcdonnell, 2008, p9). Transportation, inventory and logistics costs will be discussed in more detail below:

- Transportation

"Transportation can play a key integrative role in supply chain structures, since carriers may be in an ideal position to integrate and coordinate flows throughout the supply chain" (Hugo *et al*, 2004, p198). Third Party Logistics providers are being used by supply chains to ensure a continuous and uninterrupted flow of goods (Wisner *et al*, 2005, p12). "Third Party logistics companies offer an array of bundled logistics services, including operational and strategic planning as well as monitoring and control of the logistics processes" (Waters, 206, p410). 3PL providers co-ordinate multi-modal (i.e. air, road, rail, sea, and pipeline) transportation systems that provide all inbound and outbound transportation within a supply chain / network. This allows for the cross-coordination of all transport activities, which reduces the overall costs i.e. 3PLs are able to ensure that product or material flows are more consistent by placing vehicles where they need to be, reducing the movement of empty vehicles and providing the convenience of an all-inclusive transport solution. Transportation costs can comprise up to 40% of the total product costs. Transportation services, in many cases, are considered as key value enhancers for supply networks. Transport by road is costly and offers more

speed and flexibility than the other modes; air carriers are more expensive and faster than other modes of transport; transport by water is slow and inexpensive; and pipeline transport is characterized by high fixed costs and low variable costs (Wisner *et al*, 2005, p15).

- Inventory

It is important that demand information is communicated to trading partners so that they can make products available at various points in the supply chain when they are required (Ireland and Crum, 2005, p5). The transfer of accurate information throughout a supply chain relies on integrated communications and processes. SCM's primary aim is to reach flow consistency while minimizing inventory levels at all points in the supply chain and consequently reduce associated costs (i.e. hefty storage overheads, obsolescence, damaged goods, and capital tied up in inventory). SCM makes use of the Just-In-Time (JIT) and Total Quality Management (TQM) principles together with Materials Requirements/Resource Planning (MRP) in order to minimize stock and maximize value. On the other hand, if material flow inconsistencies do occur as a result of variations in product availability, or supplier operational failure, or changes in customer demand, channel partners may find themselves facing unexpected opportunity costs (i.e. the costs associated to stock-outs and consequently loss of sales). While the challenge is to keep inventory at a minimum to avoid unnecessary costs, firms will generally maintain some form of buffer stock in order to curb the inconsistencies that may occur. "Buffer stocks give protection against the variability of supplier performance due to shutdowns, strikes, lead-time variations (the period of time taken between ordering and receiving a good or service), late deliveries to and from the supplier, poor-quality units that cannot be accepted, and so on" (Leenders *et al*, 2006, p151).

- Logistics

In the wholesaling and retailing industries, SCM is synonymously referred to as quick response, service response logistics or integrated logistics. Technological advancements such as electronic data interchange (EDI), the world wide web, bar-coding and radio frequency scanning has enabled the development of the integrated supply chain (Wisner *et al*, 2005, p12). Cross-integration facilitates information,

resource and skill sharing beyond organisational boundaries, making the chain of suppliers more flexible and responsive to market changes, thus creating a competitive advantage. "The development and integration of people and technological resources are critical to successful supply chain integration" (Wisner *et al*, 2005, p7). This involves coordination and collaboration with suppliers, intermediaries, third parties, and end-users.

Supply chain networks provide a strategic platform upon which firms leverage their resource and cost sharing through collaborative relationships. "Supply chain relationships represent a firm's strategic initiative to align suppliers and customers into collaborative relationships to gain competitive advantage" (Bowersox *et al*, 2005, para 18). For example, through resource and cost sharing, supply chain networks provide a low-cost competitive advantage. "The supply chain reduces organisational boundaries through collaboration, linking the process of material and product movement with information for control" (Waters, 2007, p161). Channel partners need to be selected with care in order to build long-term value generating relationships with them. It is important that they have compatible technologies that support process integration, communication, and product quality engineering. "The ability of the supply organisation to secure requirements of better quality, faster at a better price than competitors, will not only improve the organisation's competitive position, but also improve customer satisfaction (Leenders *et al*, 2006, p11).

As mentioned in Chapter 1, SCM leverages itself on various technologies. Without knowledge management, electronic data interchange, radio frequency identification tagging, the internet/intranet, and process integration, SCM is little more than a concept.

It is the management of upstream, downstream and feedback information flows that drives materials and service flows from source to consumption. An organisation that develops industry benchmarks and metrics, referred to as The Supply Chain Council, summarizes SCM in just five words: plan, source, make, deliver, and return (Blanchard, 2007, p8).

3.6 What Supply Chain Management has to offer the Business Environment

SCM brings a competitive advantage to the business environment through the following strategies and processes:

- *Supplier selection and collaborative planning*: Moser and Blome state that, "the direct and indirect consequences of poor decision-making in supplier selection become critical to the generation of competitive advantages" (Moser and Blome, 2008, p35).

- *Decision making based on information flows that span the entire supply chain*: SCM requires trust relationships which promote joint decision making and knowledge sharing in order to make decisions effectively and reduce uncertainty (Cheng, Yeh, Tu, 2008, p291).

- *Improved forecasting accuracy and flows of materials:* SCM facilitates the continuous flow of information, from the retailer's sales to the consumer, up through to the source of the supply chain in order to improve demand forecasts (Bolarin and McDonnell, 2008, p14).

- *Cost reduction:* SCM leads to cost reduction benefits through the close co-ordination between suppliers and other partners in the supply chain (Sivakumar and Sundaresun, 2008, p31).

- *Time compression:* utilizes a re-engineering approach to achieve competitiveness and requires the total commitment of the business from top to bottom (Waters, 2007, p72).

- *Customer relationship management:* SCM facilitates frequent contact with customers, in order to develop customer relationship strategies to meet delivery dates, customer requirements and resolve customer complaints (Wisner *et al*, 2005, p15).

3.6.1 Supplier Selection and Collaborative Planning

Economic pressures today are forcing organisations to change the way they do business. Competition is not only tougher, but for many it is global. Customer loyalty is scarce, yet customer demands continue to increase. Organisations find that they do not have many more operating costs to cut and simply raising prices to achieve profit margins leaves them less price competitive. As a result, many organisations have looked beyond their organisational boundaries in order to determine ways to increase profit margins and sales revenue (Ireland and Crum, 2005, p1). This has led to the development of strategic alliance relationships which are based on mutual benefits such as: reduced uncertainty/ better forecasting ability, more consistent material/product flows, and increased information flows and profitability.

In order to realise these mutual benefits, supply chain partners need to be strategically aligned, technologically compatible, cost efficient and value driven. Therefore, before partnering, suppliers need to be evaluated against a number of criteria, depending on the industry and what is important. Criteria that are commonly noted are: Quality, price, delivery, time, flexibility, service, financial status, technology and process capability, responsiveness, operations planning and control, ethical conduct and social responsibility (Hugo *et al*, 2004, p84). Quality is important as inferior materials not only result in unsatisfied customers, but cause operational disruptions. Price, for a typical manufacturer, can make up to 60% of the annual sales turnover. Therefore, suppliers using superior technologies which compress time and engineer in quality are in the position to offer better prices than their competitors. On-time delivery is critically important especially if organisations are utilizing the JIT system. Time-based competition sets out to obtain a majority market-share by getting the product to the market first. Flexibility ensures that the supply organisation is able to meet unexpected changes in demand. Service is a supplier's ability to meet the needs of channel partners or the customer. Financial status is important, as the stability of the supplier will result in stable cash flows within the chain. Technology and process capability has a direct impact on material flows, product quality and capacity planning. Capabilities determine the level of specialization the material/product may need. Responsiveness to volatile market

conditions has a direct impact on market penetration. Operations planning and control will determine the effectiveness of JIT systems and smoothing of material flows. Ethical conduct and social responsibility are of great importance. A network of supply organisations not only rely on trust relationships, but are responsible for the well-being and protection of the environment (Hugo *et al*, 2004, p86). In light of the above, "Selecting the right supply partners and successfully managing these relationships over time is thus strategically important, and it is often stated that a firm is only as good as its suppliers" (Wisner *et al*, 2005, p62).

3.6.2 Decision Making

Information exchange throughout the supply chain facilitates visibility beyond organisational boundaries as changes in demand are communicated up the chain of suppliers in a real-time fashion. Consequently, organisations are able to make decisions based on moment-by-moment information, moving the decision point in line with the latest and most accurate information. Decision making within and beyond organisational boundaries brings with it many challenges of its own. Not only are there different levels of decision making and thus different types of decisions, but making decisions between different organisations on different continents adds layers of complexity that can topple even the best decision making strategy. For example, bottom level decisions involve getting a set number of products out of the door, while higher levels involve decisions about which products or services to offer and how to develop them. In addition, a supply chain extending from America to China needs to clearly outline which decisions are made on which side of the ocean. For example, if China produces low cost components for it's American counterpart, they may need to agree that decisions affecting the 'look and feel' of a product are made in America (headquarters), while decisions that do not affect the customer experience are made in China (Brousseau, Driver, Hourihan, Larsson, 2006 , p111). Effective decision making is fundamental to a supply chain facing a rapidly changing market environment.

For any partnership or alliance to work, trust is critical. Without trust, organisations cannot share valuable information, devote resources and time to cross-integration of systems and processes, or achieve results beyond what the organisation could have

done individually. Trust promotes goodwill, a willingness to work together through conflicts, and motivates for deeper understanding in searching for constructive solutions. Even though trust does not imply easy harmony, it is a key ingredient for effective decision making in supply chain relationships (Wisner *et al*, 2005, p63). When organisations are able to share information based on trust relationships, visibility throughout the supply chain is increased, resulting in better demand forecasting throughout the chain of suppliers.

3.6.3 Demand Forecasting

"The words 'anticipate,' 'believe,' 'estimate,' 'expect,' 'intend,' 'may,' 'plan,' 'project' and 'should' and similar expressions are intended to identify forward-looking statements" (Daimler, 2010, online, para 17). They elicit a clear description of the level of uncertainty any business faces when looking forward or looking towards the future. Why then do organisations try to anticipate future events? Do they gain any value from their efforts in doing so? If the future guarantees no certainties, why do businesses invest so much in trying to determine likely future events?

The quest to determine future events lays in the fact that "Customer demand is the life blood of any enterprise" (Knod and Schonberger, 2001, p82). Knod and Schonberger further state that "Businesses forecast because they have to, not because they want to" (Knod and Schonberger, 2001, p85). It is the desire to increase competitiveness by being ready for customers – together with the reality of lead times that makes forecasting a necessary ingredient in running a business. Therefore, planning for demand develops readiness and flexibility, which will give them the desired vantage point over their competitors.

Pycraft *et al* states that "a forecast is something that should be the best estimate at any time of what reasonably could be expected to happen" (Pycraft, Singh and Phihlela, 2000, p498). Demand forecasting is, therefore, anticipating the future demand of a product or service. According to Lambert *et al*, "Forecasting attempts to predict the future through quantitative or qualitative methods, or some combination of both" (Lambert, Stock, and Ellram, 1998, p189). Demand forecasting is a technique used in order to help organisations anticipate an appropriate and timely response to the customer's future demand. Forecasts can be

short-term (projects demand into the next several months), medium-term (from 1 to 3 years and address budgeting issues and sales plans) or long-term (more than 3 years and used for long range planning and strategic issues). All three types of forecasting would be typically used.

In recent years, advances in SCM have significantly improved companies' forecasting capabilities. SCM utilizes integrative strategies which facilitate product, service and information flows to the end-user, together with feedback flows from the end-user through the chain of suppliers. Sharing accurate and up-to-date customer demand information through the chain of supplier's results in more consistent product flows and lower stock holding costs, such as: product obsolescence, warehouse overheads, or cash tied up in inventory. In the retail sector, forecasting plays a vital role where fresh produce has a limited shelf life. Fresh produce often requires refrigeration until it is in the consumers hands (Aviv, 2001, p1328).

Forecasting can, thus, have a great impact on supply chain efficiency. Supply chains are under pressure from shareholders and customers for better performance and improved service levels and they're now focusing attention on modifying supply chain strategies. Demand forecasting has made a priceless contribution towards supply chain efficiency, and there is little doubt with advancing technologies and continuous improvement that there is much ground to be covered.

3.6.4 Cost Reduction

Increasing competition for market-share combined with reduced economic growth is forcing organisations in every industry to invest more time and energy into the efficient and effective use of logistics resources. The focal point is cost reduction. SCM's core focus is on time and place utility. Its entire logistics system aims to get the product and/or service to the right place at the right time. In doing so, it focuses on: establishing and maintaining product flows that correspond with customer demand; reducing inventory holding and buffer stock; increasing productivity and agility; lowering costs and reducing lead times; and distributing the product to the customer at the right quality, so as to build customer loyalty. (Stevenson, 2005, p696).

3.6.5 Time Compression/Process Integration

Waters (2007) explains that Benjamin Franklin stated over 200 years ago that "Time is money". Twenty years ago, Stalk and Hout reiterated this by stating, "time is the last exploitable resource". Time compression focuses on the reduction of time consumed by business processes. It is how organisations use time to deliver a fast, sustainable response to customer demand. Business processes are organised around a strategic time-based approach. The focus is on strengthening the supply chain structure in order to meet time-based objectives. For example, supply chains can speed up material flows and shorten the supply chain by finding and eliminating any non-value adding activities (Waters, 2007, p72). Supply chains make use of 'Just in time' (JIT) delivery, 'Total quality management' (TQM), and 'Customer relationship management' (CRM) systems which work hand in hand with 'Enterprise resource planning' (ERP) systems to integrate, standardize, control, automate and accelerate their processes.

3.6.6 Customer Relationship Management

According to Levy and Weitz, "customer relationship management is a business philosophy and set of strategies, programs and systems that focuses on identifying and building loyalty with a retailer's most valued customers" (Levy and Weitz, 2007, p293). It is built on the philosophy that retailers are able to increase their profitability if they build relationships with their better customers. For example, a business woman is on her third business trip this month. A cab takes her from Boston Logan Airport to her favourite hotel, the Ritz-Carlton. When she arrives, her door is opened for her and she is welcomed and greeted by name. When she goes to reception, the receptionist has her room key ready and waiting. On arriving at her room, she finds that her preferences have been taken care of – a single queen-size bed with an extra blanket and pillow, a basket of her favourite fruit, a fax machine, and a view of the Boston commons (Levy and Weitz, 2007, p293). Customer service is perhaps the most important interface between the market and the supply chain. With customer requirements continuously changing, and the competitive goal posts always moving, effective customer services requires an integrated supply chain process which transcends traditional borders in order to create value (Hugo *et al*, 2004, p3). From a supply chain perspective, customer

service is a measure of how well a logistics system functions in creating time and place utility. The focal point is to attract and keep customers, thus ensuring the future profitability. Customer service includes activities such as, ordering various materials, ensuring that the materials reach the right points in the supply chain at the right times, the products are built according to the required quality specifications, ensuring the end-product is available for purchase, and offering post-sales support on an item (Lambert *et al*, 1998, p45).

3.6.7 Service Response Logistics

"Service response logistics is the management and coordination of all the organisation's activities that occur while the service is being performed" (Wisner *et al*, 2005, p374). From a supply chain perspective, the primary activities concerned with the creation and support of services are: service capacity, service quality, distribution channels and waiting times (Wisner *et al*, 2005, p374).

Despite the fact that customer service is primarily 'intangible' by nature (it cannot be held, seen, assembled or transported), the SCM concepts discussed to this point do play a key role in service organisations as well as the creation and support of services. For example, in the transportation industry, customers will request that goods be moved from one place to another (i.e. the export of aluminum from South Africa to Australia). For the customer, it is important that the goods are moved from and to the correct locations, that the goods arrive in tact and on time, and that this service is performed in the most economical manner. For the transportation provider, sophisticated information systems are used to determine the best possible route, mode of transportation, combination of warehousing, port of entry and consolidation (Wisner *et al*, 2005, p373).

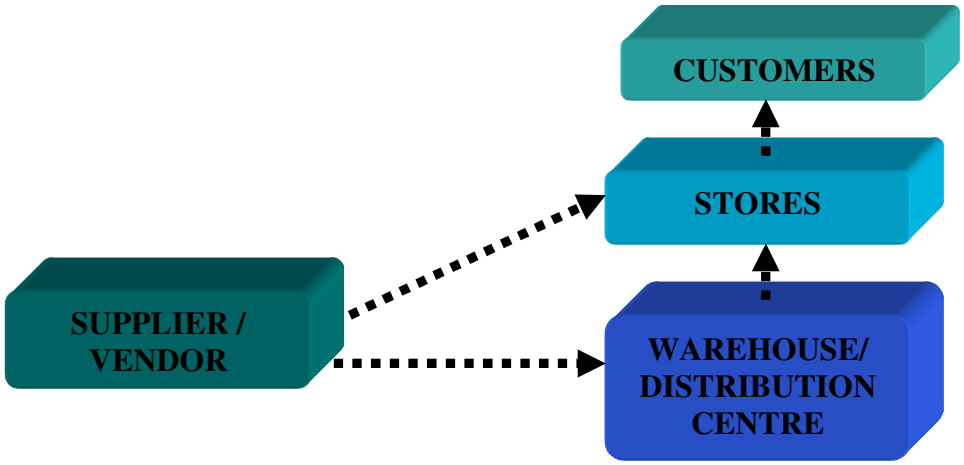
Service organisations range from offering 'pure services' (where the customer receives nothing tangible), to offering services with a more tangible element to them (the customer receives something tangible). Pure service firms such as consultancies, entertainers, legal advisors, or brokers have a higher service intangibility level than services offered by restaurants, transportation providers, retailers, wholesalers and hotels (Wisner *et al*, 2005, p363-364). Due to the fact

that this research focuses on the retail sector, it is important that both the tangible and intangible elements are looked at from a SCM perspective.

3.7 Supply Chain Management in the Food and Drug Retail Sector

In the context of retailing, "Supply chain management is the delivery of economic value to customers through the management of the flow of physical goods and associated information from vendors to customers" (Levy and Weitz, 2007, p269). It focuses on a set of business activities that manage the flow of materials from the vendor, through the distribution centres to the retailers, and finally to the consumer. These activities rely on the exchange of important information between retailers, distribution centres and vendors.

Fig 3.4 **The Physical flow of merchandise**



Source: Levy and Weitz, 2007, p276

As seen in Fig 3.7.1, the physical distribution of goods can either be direct (goods sent directly from the supplier/vendor to the stores/retail outlets) or indirect (goods are sent by the supplier/vendor to a distribution centre and then to the stores/retail outlets). The goods that are sent directly to the stores are goods that require little or no further attention before packing onto the retail store's shelves. On the other hand, the goods that are sent via the distribution centre are goods that may have temporary storage, cross docking, labeling, price tagging, bulk breaking, assembly, or postponement requirements (refer to glossary for definitions, pvii). The method of distribution depends on the type of merchandise, the nature of demand for that merchandise and the associated costs of distribution. The warehouse/distribution

centre is usually operated by the retailer. Supply chains usually comprise of a network of multiple vendors, distribution centres and stores – resulting in the management of a complex physical distribution process (Levy and Weitz, 2007, 276).

In the past, retailers were generally small, family-owned businesses, giving large manufacturers and distributors more of a dictatorship role - dictating what, when, where and how merchandise was delivered. Today, some retailers have emerged as large, consolidated national retail chains, making them more powerful than their vendors. Consequently, retailers are taking more of a leadership role in their supply chains. Today, Pick 'n Pay and Shoprite are comprised of a national chain of retailers, servicing South Africa, Botswana, Namibia, Zimbabwe, Malawi, Mozambique and Kenya (Achterberg and Hartzenberg, 2002, online, 24-25). Retailers have direct contact with their customer base and are therefore more knowledgeable about the consumer's needs and wants. They are thus in a key position, providing the link between the supply chain and its market (Levy and Weitz, 2007, p269). Retailing can be defined as "a set of business activities that adds value to the products and services sold to customers for their personal or family use" (Levy and Weitz, 2007, p7).

As mentioned in section 3.5, SCM is "The design and management of seamless, value-added processes across organisational boundaries to meet the real needs of the end customer" (Wisner *et al*, 2005, p7). With this in mind, SCM in the retail sector is focused on adding value by ensuring product availability and providing tailored assortments.

If products are not available when the customer desires, they will settle for a substitute product or go and make the purchase at another store. This translates into a loss of sales on those specific goods (also known as opportunity costs). Store managers do their utmost to try and ensure that desired products are available when required in order to maximize sales and customer service. When the flow of goods and materials through the supply chain are properly managed, retail stores are able to reduce stock-outs, lower inventory holding and storage overheads, and

increase inventory turnover which results in fewer inventory markdowns or reduced product obsolescence (Levy and Weitz, 2007, p269).

By tailoring assortments, supply chains can ensure that the right product has gone to the right store. Environmental factors may need to be considered when stocking merchandise at various stores. For example, climate has a direct impact on the sale of apparel. A store may stock thicker jackets in the colder regions in winter and thinner jackets in the warmer regions – offering consumers assortments tailored to their needs (Levy and Weitz, 2007, p269).

SCM's primary focus is the market that it serves. A brief discussion will follow on how supply chains co-ordinate the flow of merchandise through collaboration with suppliers/vendors and distributors both globally and within South Africa to meet this common objective.

3.7.1 The Physical Distribution of merchandise in the Global food and drug Retail Sector

Serving the wants and needs of customers very often involves the physical flow of merchandise. Within the supply chain, the physical flow of merchandise is referred to as logistics. Levy and Weitz define logistics as follows: "Logistics is the aspect of supply chain management that refers to the planning, implementation, and control of the efficient flow and storage of goods, services, and related information from the point of origin to the point of consumption to meet customers' requirements" (Levy and Weitz, 2007, p276). Logistics is a process of planning, expediting and controlling the flow of physical goods in a cost effective manner in order to get the right product into the right store at the right time. This process is guided by customer demand forecasts and requires lead-time planning. According to Stevenson, lead-time can be defined as "The time between ordering a good or service and receiving it" (Stevenson, 2005, p17). Lead-time can not be avoided when the physical distribution of goods is required. When there is a need or want for a specific good, the raw materials need to be gathered, the product needs to be made and to be transported to the point of customer demand. The challenge therefore, is to get the product to the market when it is needed, while taking lead-

time planning into consideration. Customer demand forecasts must show a high level of consistency with customer demand for this process to be effective.

Walmart's physical distribution with the food and drug retail sector: Walmart, the global leader in retail, is based in the USA and operates in Mexico, Alaska, Hawaii, Rhode Island, Canada, Hong Kong, Brazil, Argentina, China, Germany, Korea, United Kingdom, Costa Rica, El Salvador, Guatemala, Honduras, Japan, Nicaragua, Puerto Rico and South Korea. Walmart makes use of many small, local venders who supply fresh produce to Walmart's distribution centres. The distribution centre then distributes the goods to various retail outlets. The vast majority of Walmart's goods travel indirectly (from vendor to distribution centre and then to the retail outlet) to the market, rather than directly (from vendor to retail outlet). "Walmart have built one of the most sophisticated inventory management systems by gathering data on over 20 million transactions per day from systems such as cash registers, warehouses, and delivery vehicles" (Pike, Cobb and Rome, 2006, p2). Walmart's improved inventory management system allows for one distribution centre per 100 food retail stores. Other leading global food retailers worth mentioning are Carrefour and Tescos. These retailers are based in Europe and service the global marketplace.

Carrefour's physical distribution: Carrefour, the second leading food retailer in the world is based in France. Carrefour operates in Germany, Dubai, Qatar, Spain, Egypt, Bangkok, Cyprus, Belgium, Argentina, Brazil, Romania, Turkey, Poland, Indonesia, Greece, Italy, Colombia, China, Thailand, Bulgaria, Morocco, Russia, India, and England (Levy and Weitz, 2007, p6). "Carrefour opened its first supermarket store in Annecy, Haute Savoie in 1960, and invented the Hypermarket store concept in 1963. Today, Carrefour operate Hypermarkets in 24 countries". (Carrefour Group, Our Stores, online, para 1-2) Carrefour's physical distribution is both direct (from vendor to retail outlet) and indirect (from vendor to distribution centre and then to retail outlet). Carrefour operates 2919 market stores worldwide, with 160 market stores and Franchises in France alone. There is one distribution centre to 50 retail outlet stores.

Tesco's physical distribution: Tesco PLC, the third leading retailer in the world, is an international retailer that is based in the United Kingdom. At present Tescos operates in Turkey, the Czech Republic, Slovakia, Poland, Hungary, the Republic of Ireland, Thailand, South Korea, Japan, Malaysia and China. Tescos has one distribution centre per 40 retail outlets. Tesco PLC is starting up operations in the United States resulting in Walmart changing some of its strategies to protect its markets.

3.7.2 The Physical Distribution of merchandise in the food and drug Retail Sector within South Africa

Wayne Hook, the CEO of Spar Group Limited, explains that grocery chains in South Africa began to emerge in the 1960s (Hook, 2009, online, para 1). Since then, the rapid growth in retail chains together with advancements in technology have changed the competitive platform, resulting in the development of complex, technology based, physical distribution systems. The Leading South African food and drug retail chains that utilize these physical distribution systems are Pick 'n Pay, Shoprite, Spar (Pty) Ltd, and Woolworths.

Pick 'n Pay's physical distribution: As mentioned in chapter 1, Pick 'n Pay is based in South Africa and operates stores in South Africa, Botswana, Namibia and Australia (Franklins supermarket) and Swaziland. In 1975, Pick 'n Pay adopted Carrefour's large-scale store format by building the first large-scale format hypermarket in South Africa (Pick 'n Pay website, Company History, para 16). In 2007, Pick 'n Pay phased in a centralized distribution system in order to increase profits and streamline their delivery system. Pick 'n Pay had experienced losses in market share to Shoprite, Spar (Pty) Ltd, and Woolworths and hoped this change would stem its market share losses. Instead of vendors delivering directly to stores, they delivered to centralized warehouses. Pick 'n Pay trucks collect a variety of goods from the warehouses and deliver to the various retail outlets (The Retail Exchange, 2005, para 1).

Shoprite Holding's Limited's physical distribution: Shoprite Holdings operates 6 distribution centres in South Africa which service more than 535 Shoprite

Supermarkets and Checkers Hyper Stores. Produce requirements are sourced directly from local farmers as well as farmers in African countries, such as Zimbabwe, Zambia, Malawi, Mozambique, Tanzania, Uganda and Mauritius. Shoprite Holdings Limited also imports fruit and vegetables to ensure a wide variety of fresh produce, but the process of developing local sources of vegetables and fruit is well under way in order to increase production, improve quality and serve the growing market for these products. Shoprite Checkers used to rely on suppliers to deliver directly to their retail stores, but now make use of a centralized distribution strategy in order to access significant benefits and savings throughout their supply chain. The central distribution strategy is run through two major distribution centres which are located in South Africa in Brackenfell and Midrand (Shoprite Holdings, 2009, online, Anon, paras 1 and 12).

Spar (Pty) Ltd's physical distribution: In 1963 a group of 8 wholesalers were given exclusive rights to supply goods to 500 Spar Group Limited stores in South Africa. Today, Spar Group operates 6 distribution centres that service over 800 Spar Stores within South Africa. Spar Group Limited operates in various store formats such as Kwikspars, Spar stores and Superspars. Kwikspars are smaller in size and focus on speed and freshness. The Spar stores are slightly bigger and they focus on urban and rural supermarket shopping. Spar stores offer a wider range of goods and services than the Kwikspars. Superspar stores are larger and more competitively priced against other chain stores, offering a full range of groceries and merchandise for their customers. While retailers can take advantage of Spar's trading power, they are encouraged to source goods from local traders (Hook, 2009, online, paras 1 and 2).

Woolworths Holdings Limited physical distribution: In 1931 the first Woolworths store opened. Today, Woolworths Holdings Limited is one of the largest retail chains in the country, operating 3 major distribution centres in Cape Town, Durban and Johannesburg which service over 200 retail stores. Woolworths has 32 food retail stores in KwaZulu-Natal in South Africa (Woolworths, 2012, online, Anon, para 1).

3.7.3 Distribution Centres vs Direct Distribution

In order to determine the most beneficial means of distribution, retailers must consider the total costs associated with each alternative together with customer service needs.

The benefits of Distribution Centres	The benefits of direct distribution
Can combine forecasts for many stores serviced by one distribution centre, resulting in more accurate forecasts. Distribution centres enable the retailer to carry less merchandise. Retail storage space is more costly than distribution centres. Lowers the risk of running out of or carrying too much stock. A distribution centre is better equipped than stores to prepare merchandise for sale.	If there are only a few retail outlets, the expense of a distribution centre is not warranted. Vendors can deliver to all stores in a specific area economically. Direct delivery increases the store shelf-life of fresh produce. Speeds product to the market.

Table 3.1 Distribution centres vs Direct Distribution (Levy and Weitz, 2007, p278)

The following activities are performed at a distribution centre: "co-ordinating inbound transportation, receiving, checking, storing, crossdocking, getting merchandise floor ready, and co-ordinating outbound transportation" (Levy and Weitz, 2007, p278). Receiving and checking entails recording receipts and checking that the correct goods were received. Today, this process is automated in large organisations. Once the goods have been received and checked, they are placed into storage, or cross-docked. Goods are stored in cartons and stacked from the floor to the roof of the distribution centre. Goods that require cross-docking have been prepackaged by the vendor for a specific store and leave the distribution centre within an hour or two of receiving. Distribution centres will perform tasks like price tagging, marking or placing hangers on apparel in order to make them 'floor ready'. These tasks are performed more efficiently at a distribution centre i.e. getting goods 'floor ready' at the retail outlet results in blocked aisles. The list of

goods to be sent out to retail outlets are generated by a computer system and placed on a 'pick ticket'. Forklifts are used to lift the cartons out of storage and place the cartons on a conveyor system that feeds the truck loading dock. Sophisticated routing systems are being used to develop the most efficient routes available (Levy and Weitz, 2007, p278).

In light of the above, it is evident that despite the merchandise taking longer to reach the market through indirect physical distribution methods, the advantages in using distribution centres outweighs the added expense of having them within the food retail supply chains. Distribution centres facilitate merchandise postponement which improves supply chain flexibility and market responsiveness. Direct distribution is still, however, prevalent especially with the distribution of fresh produce items that have short life cycles (Shoprite Holdings, 2009, online, Anon, para 2). In view of this, vendors, distribution centres and retail stores must collaborate effectively with one another to ensure that the supply chain is responsive to its market.

3.7.4 Collaboration between Retailers and Vendors

Vendors and retailers are required to work together to ensure that merchandise reaches the customer in a timely and cost effective manner. Effective SCM relies on communication and collaboration between vendors and retailers. "By collaborating, vendors can plan their purchases of raw materials and production process to match the retailer's merchandise needs" (Levy and Weitz, 2007, p282). When SCM activities are not effectively coordinated between vendors and retailers, it can result in stock outs (opportunity costs) or the excessive build up of inventory (bullwhip effect). Ineffective coordination between vendors and retailers is caused by: delays in ordering and receiving of merchandise; overreacting to stock shortages and thus over ordering; and large batch ordering instead of generating a number of small orders, which leads the vendor to think demand is higher than it actually is. (Levy and Weitz, 2007, p283). Vendors and retailers make use of various technologies and approaches in order to share information within the supply chain effectively and reduce associated stocking costs. Technologies commonly used by vendors and retailers are EDI, the internet and RFID Tagging. The approaches that

are well used are VMI (vendor managed inventory) and CPFR (collaborative planning, forecasting and replenishment).

Vendors and retailers make use of Electronic Data Interchange (EDI), which is now classified as an old technology, to transmit real-time information backwards and forwards. For example, when the retailer communicates sales data to the vendor, it enables the vendor to improve sales forecasts, production and stock levels (Levy and Weitz, 2007, p284). EDI facilitates collaboration and planning to ensure that the flow of merchandise is controlled on a 'just-in-time' basis. As mentioned in Chapter 2, in many cases, the Internet has superseded EDI and become the routine Platform for information systems development. Vendors and retailers utilize the internet to transfer sales data, track stock in transit, provide information on products, and sell online to customers. Information transmitted via the internet is instantaneous and facilitates supply chain visibility and improves market response rates.

"Radio Frequency Identification (RFID) is a technology that allows an object or person to be identified at a distance using radio waves" (Levy and Weitz, 2007, p287). These tags are inserted into goods, shipping cartons or containers. The RFID tags hold substantially more information than bar codes. Information can be more detailed, updated as the goods progress through the chain and tracked on route. RFID eliminates the point-and-read operations, by relaying a signal from an onsite hub with all RFID tags in the vicinity. This significantly decreases warehouse, inventory and distribution costs, and increases margins and provides better in-stock positions.

According to Levy and Weitz (2007), "VMI is an approach for improving supply chain efficiency in which the vendor is responsible for maintaining the retailer's inventory levels in each of its stores" (Levy and Weitz, 2007, p285). The vendor is responsible for managing retail inventory. The reorder points are determined and generated by the vendor with the aim to meet the retailer's demand, and reduce stock outs. Lays, Fritos, various snack foods, candy and beverages vendors have been using the VMI for some time.

The CPFR approach can be explained as the "sharing of forecast and related business information and collaborative planning between retailers and vendors to improve supply chain efficiency and product replenishment" (Levy and Weitz, 2007, p286). It is the transmission of more detailed information between vendor and retailer - for example, sharing business strategies, promotion plans, new products, product development and production schedules. CPFR relies on trust and commitment between vendor and retailer, resulting in a more profitable supply chain.

The use of SCM concepts will vary from organisation to organisation. Leenders *et al* (2006) claim that these variations depend primarily on 3 major factors: an organisation's stage of development and/or sophistication, the industry they operate in, and their competitive position (Leenders *et al*, 2006, p6). For example, Walmart makes use of the internet via extranets for its electronic data interchange requirements (Levy and Weitz, 2007, p274). In this way, Walmart have immediate access to all its vendors, distribution centres and retail outlets around the globe at any point in time. This transfer of information keeps the entire chain of suppliers on the market pulse. For example, channel members will be informed on changes in customer demand, new or substitute products entering the market, developing market trends, changing environmental factors, or competitive forces, and will have the opportunity to respond to those changes timeously. As mentioned in chapter 2 section 2.4, Shoprite Checkers are taking advantage of economies of scale, increasing product range and guaranteeing higher levels of consistency, with reduced dependence on supplier reliability through Exe 2000, their warehouse management system. The system is designed to optimise operations productivity within the distribution centre. The Spar Group Limited have increased capacity between its retail stores and distribution centres with Virtual Private Network (VPN) which enables a high speed links.

While supply chain management in the food and drug retail sector has its many benefits, it is also faced with a number of challenges.

3.8 Challenges faced by the Food and Drug Retail sector in the field of Supply Chain Management

The world of retailing is highly competitive, and faces constant and rapid change (Levy and Weitz, 2009, p6). It is subject to both unanticipated and anticipated fluctuations in demand. Unanticipated fluctuations are driven by changes in customer purchasing power or preference, resulting in an unexpected reduction or increase in sales. Anticipated fluctuations in demand are the result of adopted push-marketing strategies, seasonal changes and annual events, such as product promotions, winter clothing, and Christmas holiday rushes. Anticipated changes in demand play an important role in the success of retailing and require effective collaboration between retailers and suppliers in order to meet these expected marketplace demands. Rosenbaum (2001) affirms this by stating that "The retail industry deals with a significant number of product promotions, which necessitates collaborative decision making between suppliers and retailers in order to align production with consumer demands" (Rosenbaum, 2001, p8). Therefore, supply chain collaboration plays a significant role in aligning production to customer demand.

Retail supply chains need to be market sensitive and flexible in the sourcing, manufacturing and distribution of all its merchandise. Changes in demand vary in both frequency and intensity. Unanticipated fluctuations with a high intensity result in sudden stock-outs or over stocking of merchandise, whereas anticipated fluctuations with a high intensity enable the chain of suppliers to mass-produce and hold anticipation stocks, or cut production beforehand in order to match merchandise stock with the anticipated changes in customer demand. "A company that can observe early sales and respond quickly with any appropriate additional merchandise can obviously reduce the likelihood of selling out of hot items" (Fisher *et al*, 2008, p48). Supply chains that are highly flexible are better equipped to meet high intensity marketplace changes. An example of this is getting new technologies out to the marketplace early, responding to competitive forces quickly, phasing out old merchandise when new market demand arise.

Furthermore, the retail landscape is ever-changing due to product life-cycles. A product life-cycle can be described as the process of "incubation, growth, maturity and decline" (Stevenson, 2005, p125). For example, when a product is introduced, it may be treated with curiosity and sell slowly to begin with. Once the product proves its reliability and customers become aware of it, the sales will enter a growth phase. After the growth phase, sales eventually level out – this is called the maturity phase. The market eventually becomes saturated with this product and sales enter the decline phase. Product life-cycles are unique to each individual product which varies in time-frame and profitability. This is a process that every product must go through. As older products are phased out, new ones – with a whole new sales dynamic, are there to replace them, changing the sales landscape on an ongoing basis. The retailing landscape is particularly challenging in this respect. Retailers stock thousands of products on their shelves, and are therefore subject to monitoring the movement and life-cycles of all their stock. Retailers rely heavily on supply chain visibility, in order to respond to product movement while keeping abreast with changing product life-cycles (Stevenson, 2005, p125).

In the food and drug retail sector, the vast majority of A-grade fresh produce is exported from South Africa to other countries, and is therefore subject to changes in commodities and financial markets. "Given that commodity and financial markets establish prices that may go up or down beyond the control of the individual purchaser, and that long-term supply agreements require price provision, the supply arena may represent a significant level of financial risk" (Leenders *et al*, 2006, p11). When the South African rand value is low, South African companies that export goods around the world reap the rewards of international prices. However, on the other hand, when the South African rand value increases, export value decreases. In order to curb the risks associated with changes in the commodity and financial markets, many supply chains will hedge against price increases in order to ensure that they are not going to have to sell merchandise for less than they paid for it. For example, a firm may occasionally suspect that a substantial increase in price is about to occur. In response, they buy larger quantities of stock which may not only get them quantity discounts, but also ensure that they can beat the increase (Stevenson, 2005, p484).

With the global growth in green supply chains, companies are becoming aware and are being held accountable for the impact that they have on the environment. Not only are firms pressured to go green, they are also pressured to reduce prices and they are aware of the rapid and ongoing competitive pressures from direct and indirect competitors. Retailers function in a cut-throat competitive environment that is plagued by direct and indirect competition. Direct competition comes from the retailers that sell the same products and target the same market group. Indirect competition comes from retailers that sell substitute products and draw customers away (Levy, Grewal, Kopalle and Hess, 2004, p17).

In light of the above, the food and drug retail sector is volatile, quick paced and subject to both unanticipated and anticipated changes in demand. It is important that a supply chain is aware of its environmental impact and direct and indirect competitors if it is to survive and develop a sustainable competitive advantage.

3.9 The latest Trends in Supply Chain Management

Globalization (the shift toward a more integrated and interdependent world economy), technology (eliminates geographical boundaries by facilitating communication, transportation and reach), intellectual capital (shared knowledge and know-how) and increasing change (ever-changing market conditions, technological advancement and capability etc.) are just some of the factors driving management toward embracing a strategic SCM perspective (Paulraj and Chen, 2007, p 32)

Supply chains are taking social responsibility to a new level and are going 'green', making social responsibility an integral part of supply chain activity (Navneet, 2011, para 2).

Retailers utilize BIS technology to data mine customer information, creating intellectual capital so that customers can be profiled. This enables them to target consumer markets more effectively (SAICA, 2011, online, Anon, para 3).

3.10 Summary

SCM plays a crucial role in the business environment as a whole and specifically within the retail sector. It utilizes information technology to co-ordinate logistical processes in order to ensure that the products reach the market on demand. With long-term win-win relationships, channel members improve their gross profit margins as they benefit from special buying opportunities at lower costs. When retailers manage their supply chain flows effectively and efficiently it gives them a strategic competitive advantage within their competitive environments. Retailers make use of seamless information flows to meet customer demand more effectively, coordinate deliveries to reduce transportation costs, run distribution centres efficiently to shorten their supply chains, and improve inventory turnover by carrying less buffer stock. In light of the above, SCM can have a substantial impact on retailers and their ability to reach their markets.

Due to the fact that SCM co-exists and leverages itself on BIS technology, chapter 4 will examine the relationship between business information technology and SCM in more detail.

CHAPTER 4

THE RELATIONSHIP BETWEEN SUPPLY CHAIN MANAGEMENT AND INFORMATION TECHNOLOGY WITHIN THE FOOD AND DRUG RETAIL SECTOR

4.1 Introduction

In chapter 3, the importance of SCM in business within the food and drug retail sector was discussed. It is important to note that SCM relies on BIS technology in order to operate. Chapter 4 has addressed the relationship between BIS technology (chapter 2) and SCM (chapter 3), examining their combined influence within the food and drug retail sector, the challenges faced by these two specific areas of study, and the developing trends in these fields within this context.

4.2 The Relationship between Supply Chain Management and Business Information System Technology

"An information system is a set of interrelated elements or components that collect (input), manipulate (process), store, and disseminate (output) data and information and provide a reaction (feedback mechanism) to meet an objective (increase profits)" (Stair and Reynolds, 2008, p8). As discussed in chapter 2, technology-based information systems have been designed to enhance business information requirements and organisational functionality. In order to accomplish this, the BIS technology that is utilized must not only support the overall mission and vision of the individual firms within a supply chain, but the supply chain as a whole. "Information technology is an important enabler of effective supply chain management, which typically spans the entire enterprise and beyond, encompassing suppliers on one end and customers on the other" (Simchi-Levi, Kaminsky and Simchi-Levi, 2008, p406). The technologies used can "vary from a simple desktop for office automation to complex wireless solutions for a mobile workforce" (Wiggers, Kok and De boer-de wit, 2004, p24). The selection of information technology is based on the organisation's history, level of expertise, evolution, product development and external alliances (Rao, 2000, p114). Supply chains are dynamic and can be established to meet new market needs as quickly as they can dissolve, when that need no longer exists. These dynamic relationships together

with ever-changing technologies result in ongoing change - whether anticipated or not - increasing supply chain volatility in the following ways:

- Developing new or eliminating old communication, product, financial, service and process flows when channel alliances begin or end.
- Channel partners may have different technologies and/or business processes which are difficult to integrate – thus affecting information, materials and process flows.
- Knowledge may be gained in the acquisition of new partnerships or lost as partnerships dissolve, thus the level of expertise will vary from supply chain to supply chain. Supply chain partners that are engaging in interlinked processes that facilitate rich information sharing, and information processing have access to knowledge beyond organisational boundaries (Wu, 2008, p241).
- Channel members who have been running well-established systems will be more mature and ready for more advanced technologies than members who have not. This results in the need to upgrade various channel member's information systems to make the SCM function possible.
- Specialist skills may be acquired or lost when channel partners change. For example, some suppliers may have the skills to engineer quality into their products through mechanisation, while others creating the same product rely on manual labour that does not produce the same quality output. A supplier that specializes in product creation or design not only improves product quality, but saves the supply chain time and money.
- Some BIS may be more inclined to experience errors, or have limitations that prevent the seamless flow of information.
- The people running the systems may impose limitations on the BIS by not running them optimally, or not extracting the right information when it is most needed.
- Data warehouses can be neglected, resulting in the loss of important, time-sensitive information or the processing of incomplete, inaccurate data for the purposes of decision making and meeting market demand.

- Business information technical support may be unsatisfactory, resulting in interrupted operations and ineffective supply chain functionality.
- Business information technology outdates rapidly. As a result, firms are constantly chasing a moving target with a wide array of technological solutions to choose from. Supply chain volatility makes these decisions ever more difficult, as firms cannot predict which technologies they may have to integrate with in the future.
- The ongoing development of security systems to protect your system data from hackers. Hackers are always finding new ways to penetrate corporate structures through electronic espionage.
- The replacement of manual work procedures to automate work procedures.

(Rao, 2000, p114)

Organisations with a supply chain focus utilize BIS technologies to facilitate the core supply chain functions, namely: demand forecasting, decision making, supplier relationship management, operations management, transportation and distribution, and customer relationship management. "As far as supply chain management is concerned, information technology consists of telecommunication, networking, and data processing technologies – and is narrowly regarded here as the technological tools used to develop information systems, capture or collect data, perform data analysis for generating meaningful information, and exchange and share this information with supply chain partners" (Waters, 2007, p178). It is the relationship between SCM and BIS technology within the context of food and drug retailing, and the influence they both have within the sector that we wish to shed light on. The relationship/point of contact within the abovementioned core supply chain functions will be discussed in this chapter.

4.2.1 Demand Forecasting

Demand forecasting, being driven by customer demand, attempts to predetermine what consumer demand will be for a particular merchandise item at a particular time and place in the future. The primary aim of demand forecasting is to have the right product at the right place, in the right quantity, at the right quality, at the right time, for the right customer. Forecasts have a direct impact on the variation of

flows of items or finished goods in supply chains which influence inventory costs, transportation costs and associated logistics network costs (Bolarin and Mcdonnell, 2008, p9). Supply chain managers make use of BIS technology and other more general technologies (the internet, satellite communications systems and web-based information resources) to aid them in taking these variables into consideration to make effective decisions. BISs are also used to analyze all the variable data and determine the quickest route for material flows; the most cost effective multi-modal transport solutions; optimise material flows through the co-ordination of production planning and scheduling; and provide a channel of seamless information throughout the supply chain (Mahdavi, Mohebbi and Cho, 2010 , p26).

There are four general methods used in demand forecasting:

1. ***Judgement methods:*** Forecasts based on a collection of expert opinions.
2. ***Market research methods:*** involves a qualitative study into consumer behaviour.
3. ***Time-series/statistical based methods:*** where mathematical methods are used to determine future performance by extrapolating information on past performance. Common time-series methods are: Moving average, exponential smoothing, methods for data with trends, Holt's method, methods for seasonal data, more complex methods (refer to glossary).
4. ***Causal methods:*** where a variety of system variables are taken into consideration in order to generate forecasts.

(Simchi-Levi, Kaminsky and Simchi-Levi, 2008, P57).

It is the selection and application of the appropriate forecasting techniques, together with the appropriate supporting technologies that are necessary for effective forecasting (Somnath, Deshmukh and Vrat, 2002, p1).

Planning and forecasting software applications have been designed and developed to aid firms in meeting their specific business forecasting needs. "Planning and forecasting software facilitate a bottom-up or top-down merchandise planning process" (Rao, 2000, p117). This software is designed to determine the anticipated vertical flow of materials throughout the entire chain of suppliers and facilitate flows

from one end to the other. Forecasting software conducts both time-series/statistical-based forecasting for order forecasting and sales, and causal-based forecasting which determine cause and effect relationships (Ireland and Crum, 2005, p91). For example, data on the sales of bread are collected over a 3-4 month period. The average number of bread loaves sold over the designated period is calculated and the re-ordering of bread loaves is based on that average. Forecasting software facilitates the flow of demand information from the retailer to the wheat farmer, to ensure supply chain visibility and consistency of flow. A forecasting software package, namely Forseon, utilizes sophisticated logic to 'cleanse' historical data in order to develop more realistic forecasts. This allows retailers to produce plans for new store locations that do not have any historical data to work from. Furthermore, forecasting software has the ability to make 'what if' assumptions and see the impact on inventory and profitability (Rao, 2000, p117). Although forecasting is never accurate, "At some point in time, a specific demand / supply relationship will have to agree on the appropriate level at which demand and supply are matched" (Wiggers *et al*, 2004, p26).

In addition, category life cycles need to be taken into consideration when determining sales forecasts and merchandising strategy. According to Levy and Weitz (2009), category life cycles can be defined as, "a predictable sales pattern" (Levy and Weitz, 2009, p340). For example, at the introduction of the product's life, sales start off slowly, then increase when customers learn about it, reach a plateau at maturity and then begin to decline at the end of its life cycle.

Furthermore, collaboration software is utilized to compare two or more forecasts with one another in order to derive a single consensus-based forecast figure. This facilitates the establishment of tolerances, alerts and adjustments as defined by the joint business plans. Voges and Warden state that electronic integration (EI) allows partnering firms to integrate their decisions and operations" (Voges and Warden, 2007, p10). As channel members integrate their processes beyond organisational boundaries, they improve their supply chain flexibility and market responsiveness.

In summary, forecasting is a crucial function in retail supply chains (Au, Choi, Yu, 2008, p615). The appropriate forecasting techniques, together with the appropriate supporting technologies are necessary for effective forecasting. It drives material flows, market response rates and customer satisfaction. Retailers are using technological tools to assist them in collation, retrieval and analysis of variable data so that decisions can be made with real-time information.

4.2.2 Decision Making

Advances in information technology have dramatically increased the speed at which information travels throughout the chain of suppliers and the speed with which decisions are made. As a result, supply chains are able to achieve results beyond what any individual organisation could do on its own. For example, channel members receive real-time, multiple-level updates on competitors' prices, or frequent updates on product demand – giving decision makers the ability to keep their hand on the pulse of market demand (Lurie and Swaminathan, 2009, p315). The technological software solutions used for the purposes of decision making are Geographic information systems, simulations, Artificial Neural Networks, and Decision support systems.

Geographic information systems (GIS) are being utilized by most large retailers in the United States and Europe. These systems help retailers in making location-based decisions. Retailers rely on these systems to analyze sales data in specific geographically dispersed store locations, competitor store data, to customer transaction data. "The most common retail GIS applications include: customer spotting, trade area analysis, customer profiling, competitor analysis, hot-spotting, sales forecasting and consumer behaviour modeling" (Hernandez, 2007, p250).

"More advanced techniques such as simulation, Artificial Neural Network (ANN), and fuzzy logic are also used for optimisation and decision making in supply chain management" (Borade and Bansod, 2008, p9). Simulations are computer generated, life-like scenarios whereby decision makers view possible scenarios that may develop from making certain decisions. For example, Nair and Closs state that simulations are used to "investigate the various effects of various manufacturing

control policies and priority structures on supply chain performance to determine the control policies appropriate for various supply chain environments" (Nair and Closs, 2005, p382). Fuzzy Logic is a subset of artificial intelligence. It is designed to handle data that is ambiguous, imprecise or vague (Borade and Bansod, 2008, p11). According to Ganguly and Guin, the theory of fuzzy sets accommodates ill-defined sets of data that are fuzzy or vague (Ganguly and Guin, 2011, p93). It creates rules that make use of subjective or approximate values when data is incomplete or ambiguous. Fuzzy logic therefore handles subjective, irregular and incomplete data, much like the human brain, in order to support the decision making process.

Business information technology leverages information to improve supply chain visibility, facilitate integrated operations and convert information into intelligence through artificial neural networks, fuzzy logic and decision support systems. The intelligence, or knowledge obtained is then used to make real-time decisions, faster than competitors and with a higher level of accuracy. Business information technology provides for the integration and management of processes beyond organisational boundaries, which requires the establishment of long-term, trust relationships with channel partners. These inter-dependent relationships are established to obtain mutual benefits and gain a competitive advantage, and therefore need to be selected with care (Haag *et al*, 2006, p108).

4.2.3 Supplier Relationship Management

Today's economy "is founded on the forces of new technologies and the increasing importance of intangible assets such as relationships and knowledge" (Ireland and Crum, 2005, pvii). Technology is one of the factors driving collaboration between channel members (Burgess, 1998, p130). Channel members form relationships with each other to integrate key processes and enhance the quality of production, manufacturing and distribution. Relationships with suppliers used to be adversarial in nature where negotiations were tough, short-term with multiple contracts and price focused (Tang, Shee and Tang, 2001, p54). This resulted in unreliable sourcing with little or no commitment or loyalty between channel partners. Product quality varied regularly, sourcing costs fluctuated, forecasting visibility was limited, resources and costs were not shared, and processes were not integrated – slowing

the movement of goods and making the supply chain less competitive. Current trends show, however, that supplier relationships have become more collaborative over the last few years. Many relationships are built on cooperation, trust, mutual benefit and relational exchange. Under the collaborative model, buyers and suppliers harness each other's expertise in developing products together, prices and product quality are more consistent, and low-cost strategies penetrate the entire chain of suppliers – thus making their supply chain more price competitive as a whole. "Collaborative planning, forecasting and replenishment (CPFR) is the sharing of forecast and related business information and collaborative planning between retailers and vendors to improve supply chain efficiency and product replenishment" (Levy and Weitz, 2009, p299). Technology and processes are integrated, improving forecasting visibility and speeding the products to market. The competitive advantage acquired in aligning and integrating with strategic partners far exceeds the ability to compete as a single organisation with adversarial supplier relationships. Kenichi Ohmae, founder and managing director of Ohmae and Associates states the following: "In a complex, uncertain world filled with dangerous opponents, it is best not to go it alone" (Wisner *et al*, 2005, p62). Organisations are aligning themselves with one another to strengthen their competitive position and clout.

Suppliers are therefore selected carefully, to ensure that they align with the entire supply chain's strategic initiative, utilize compatible technology, meet the desired quality specifications and augment the supply chains' competitive advantage through their operations.

4.2.4 Operations Management

Food and drug retail operations are characterized by: planning and managing merchandise assortments; stock receiving, storage, and delivery; store management, planning and layout; and customer service (Levy and Weitz, 2009, p283).

Retailers use Universal Product Codes (UPC) or Radio Frequency Identification (RFID tags) to control and monitor the movement of assorted merchandise. This enables

them to track and trace the movement of the goods from source to consumption, distinguish between fast-moving or slow-moving goods, respond timeously to changes in customer demand, track and monitor problem items and ensure that perishable stock items are removed from the store shelves when they reach their sell-by dates. When Target Stores' bar codes are scanned at the point of sale, information about the transaction is relayed through the stores' information system to the planners who analyze sales, control prices and manage the purchasing function. If the sales data is below expectations, the planners may reduce the price. Sales transaction data is then sent to the distribution centre and when the stock levels reach reorder point, new stock is sent to the retail store. When the stock levels in the distribution centre drop to a specified level, it is communicated to the planner who will negotiate terms and shipping dates with the manufacturer. The distribution centre is then informed by the manufacturer about the new order and delivery dates. The manufacturer then sends an advanced shipping notice (ASN) to the distribution centre detailing the items being shipped and expected delivery dates. The distribution centre makes appointments for the trucks' delivery to the loading dock, and when the shipment is received, the planner is notified and authorizes payment to the manufacturer. It is important to note that these processes may differ slightly from retailer to retailer. In the case of vendor managed inventory (VMI) the vendor controls the shipment of merchandise to distribution centres and stores. In other situations, electronic data interchange (EDI) and internet-based communication by means of extended machine language enables stores to transmit purchase order information directly to vendors as and when stock leaves the stores and notifies vendors when orders are delivered. EDI has been useful in reducing delays in transmitting and receiving orders, which has reduced inventory build up and associated costs (Levy and Weitz, 2007, p284).

Collaborative, Planning, Forecasting and Replenishment models (CPFR) are being effectively utilized by West Marine, an established boat supplies company, to manage its seasonal sales items effectively. West Marine shares a 52 week forecast with its suppliers for scheduling and production, taking all marketing and promotional events into consideration (Levy and Weitz, 2009, p300). CPFR relies on complex ERP technological infrastructures which facilitate integrated CPFR control

systems and knit channel partners together in their endeavour to meet market needs more effectively. According to Stevenson, "ERP attempts to integrate all departments and functions across a company into a single computer system that can serve all those different departments' particular needs" (Stevenson, 2005, p595). Furthermore, ERP, coupled with internet technologies, integrates processes beyond organisational boundaries, resulting in information sharing that increases market responsiveness. Enterprise-wide architectures like ERP provide a totally integrated foundational system to closed-loop processing throughout retail supply chains (Ireland and Crum, 2005, p91).

In addition to warehouses or distribution centres that store merchandise, BIS draw information and intelligence from reservoirs known as data warehouses. Data warehouses are informational stores of data for information sharing, statistical forecasting, data mining, planning and replenishment between trading partners. Retailers mine data to analyze metrics such as: store performance and growth, breakdown of sales geographically, growth trends, and the success of new products. In addition, data mining enables retailers to test the impact of promotions, shelf-space allocations, coupons, and advertisements. Stores can track what individual customers purchase, determine market segmentation and conduct market basket analyses. This information tracks and benchmarks retail performance (Rao, 2000, p112).

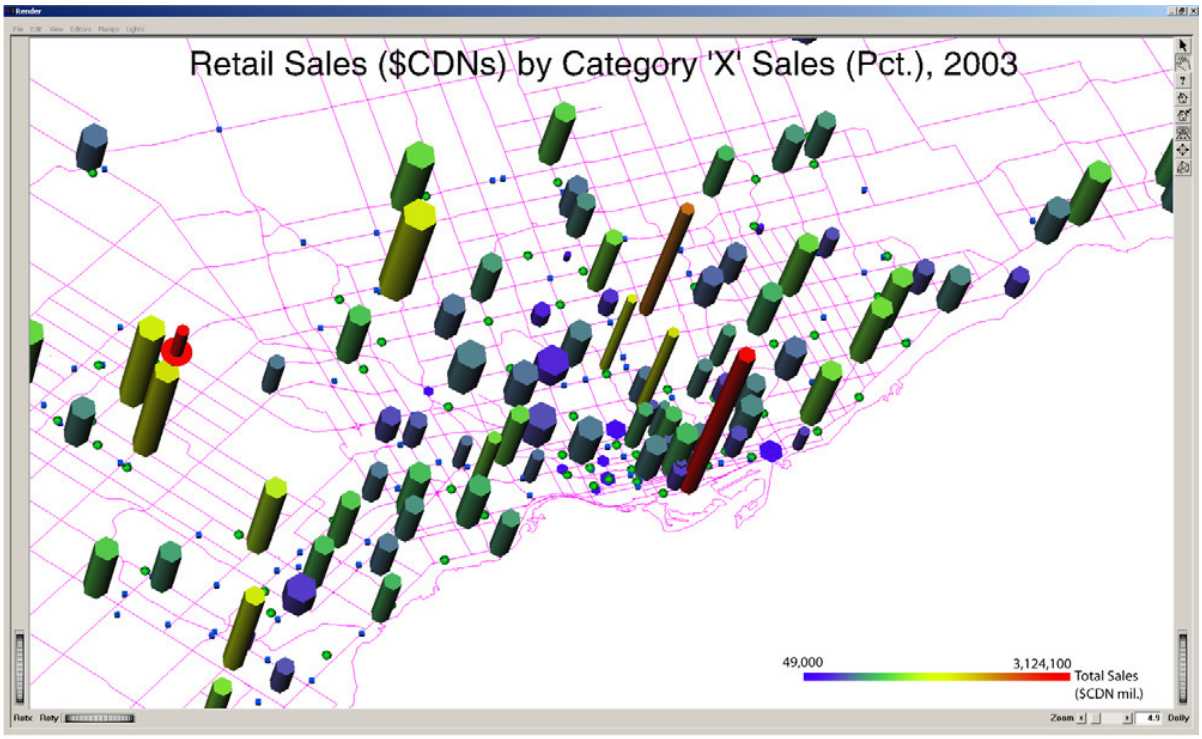
4.2.5 Transportation and Distribution

According to Blanchard, 2007, "Transportation is the lifeblood of any supply chain" (Blanchard, 2007, p103). Transportation costs, if not monitored, can become significantly high - leaving retailers no choice but to utilize efficient and effective transportation solutions in order to reduce costs. Retail supply chains that have the technology based transportation systems use Geographic information systems (GIS), ESRI's ArcGIS Tracking Analyst and Space Time Intelligence System (STIS) to improve material flows and reduce costs (Blanchard, 2007, p103).

GIS systems that track change over time and space have been developed to provide spatial-temporal data. For example, ESRI's ArcGIS Tracking Analyst and Terraseer's

Space Time Intelligence System (STIS). ESRI's uses temporal map layers, and creates animations to perform real-time tracking functions – to track package delivery systems (Hernandez, 2007, p251).

Fig 4.1 **ESRI's ArcGIS Tracking Analyst and Terraseer's Space Time Intelligence System**



Note: Height and colour of the bars represent total sales, radius of bars represent the percentage sales for category 'x' merchandise. Spheres and cubes show the location of competing firms.

Source: Hernandez, 2007, p251

STIS provides spatial analysis and creates basic map animations. They provide business intelligence through visual and numerical analysis. This is alternatively referred to as 4D mapping. Users can look at trends in complex datasets by animating the display across various independent variables (Hernandez, 2007, pg51). ESRI's will enable large food and drug retailers to conduct spatial analysis for product movement and consumption, monitor competitor behaviour and ensure a correct positioning to the market.

4.2.6 Customer Relationship Management

BIS technology feeds information throughout a supply chain, increasing its ability to meet changes in customer trends and demand. Detailed customer information can

be drawn from data warehouses, enabling the retailer to better understand their customer base and customize marketing promotions according to various customer segment needs. A retailer's primary goal is to have the right product, in the right place, at the right time, for the right customer. This requires effective demand forecasting, sensitivity to changes in demand, and flexibility to change merchandise assortments when required. In addition, the store layout and accessibility to products should create a positive customer experience, as the success of an organization depends on its ability to satisfy customers. (Wu, 2008, p243).

BIS provide both tangible and intangible benefits. The tangible benefits are: consistent product flows, lower inventories and associated costs, better responsiveness to market changes, effective tracking and tracing of goods in transit, cost effective logistics and improved customer service. Intangible benefits are real-time information for effective forecasting and decision making, the extraction of knowledge and intelligence from data, and to provide a sustainable competitive advantage. "Information systems are the effective and efficient means to manage those critical assets, and to provide sustainable competitive advantages" (Waters, 2007, p178). When IT is utilized properly, it leads to far better customer service delivery. "Therefore, IT is an important enabler for the achievement of SCM effectiveness and efficiency" (Waters, 2007, p178)

4.3 The combined influence of Supply Chain Management and Business Information System Technology in the Business Environment

In recent years, advances in technology that supports the SCM process have significantly improved companies' forecasting capabilities. Businesses today are making extensive use of modeling and simulation tools and software applications that combine data and information from multiple sources in order to build forecasts in advance (Haag *et al*, 2006, p106).

A firm's planning and scheduling capability will be determined by the power of real-time connectivity and responsiveness. "Technology such as advanced planning and scheduling (APS) systems facilitate responsiveness and flexibility by increasing accuracy of order commitments while simultaneously reducing production

scheduling lead times and inventory buffers" (Bowersox *et al*, 2005, p4). Collaborative planning and scheduling builds interdependent supplier relationships that seek supply chain efficiency for the sake of mutual benefits and sustainable competitive advantage.

"Advances in technology can dramatically alter an industry's landscape, making it possible to produce new and better products at lower cost and opening up whole new industry frontiers" (Thompson *et al*, 2004, p63). For example, automated manufacturing enables quality to be engineered into various products while reducing the element of human error.

Data warehousing enables the retailer to benchmark their regional performance, evaluate the effectiveness of supplier plans and programs, determine more effective purchasing and stocking, determine future retail planning and make more accurate decisions (Rao, 2000, p113). "Retailers are finding that information technology has enabled them to answer increasingly complex questions" (Rao, 2000, p112).

GPS information technology selects the shortest and most economical transportation routes, tracks and traces the movement of merchandise, and pre-schedules truck loading to ensure that trucks do not travel empty.

Business information technology, together with SCM, provides information which facilitates forecasting and decision making by extracting knowledge and intelligence from stored data sets, increases supply chain visibility and merchandise flow consistency through tracking and tracing systems, and reduces overall costs through integrated processes, resource sharing and effective demand management.

4.4 Challenges faced by Business Information System Technology and Supply Chain Management within the South African Food and Drug Retail Sector

Even though many retailers have turned to BIS technology to aid them in speeding their products to the market, design and engineer in quality, regulate material flows, and enhance their business operations, they find themselves confronted with a number of challenges. These include data capturing and accuracy problems,

multiple source problems, data mapping problems, and human resource problems (Rao, 2000, p113).

Data capturing and accuracy problems bring challenges of producing accurate and timely data. Incomplete data and data inaccuracy will in turn have a domino effect on data retrieval and data manipulation. Accurate and timely data capture is fundamentally important in developing effective supply chain networks (Rao, 2000, p113).

Multiple source problems are experienced when "Retailers operate with multiple media, making use of multiple database management systems, which run on multiple platforms, leaving them with a number of challenges" (Rao, 2000, p113). This often involves the integration of legacy systems with modern ERP systems which presents problems with data compatibility and results in 'down time' within the chain of suppliers.

Data mapping problems are experienced when data that are context-dependent cannot be synthesized effectively because they have different standards - for example, different names, associated business rules, or different meanings (Rao, 2000, p114).

Human resource problems are experienced when personnel are unskilled and lacking in business focus and commitment to supporting business information technology efforts (Rao, 2000, p114).

In addition, supply chain networks are facing consistent metamorphosis within themselves as a result of rapidly changing market needs and organisational capabilities (being the company's capabilities and the capabilities of everyone it does business with), but the technologies and approaches to managing these systems are also ever-changing. Organisations cannot overlook the developments and the global shifts in direction in the fields of SCM and information technology. Global trade is enveloped by an information technology revolution that consistently opens new

doors and avenues which often result in providing a competitive advantage to those who adopt them (Waters, 2007, p162).

4.5 Summary

Supply chains use BIS to establish direct links between vendors, retailers and consumers to streamline the supply chain (Levy and Weitz, 2009, p280). The management of product assortments, category life-cycles and demand forecasting is visible throughout the supply chain. The collaborative planning, forecasting and replenishment models used in monitoring and controlling information, merchandise, financial and feedback flows requires supplier and customer collaboration and process integration beyond organisational boundaries. This results in the development of inter-dependent relationships with channel partners which need to be built on trust, loyalty and mutual benefit. Technologies such as RFID, EDI, ERP and GPS leverage these integrated supply chains, ensuring flexibility and market responsiveness.

This information will be applied to a case study approach within the Pick 'n Pay Food retail chain stores in KwaZulu-Natal.

CHAPTER 5

RESEARCH METHODOLOGY OF THE STUDY

5.1 Introduction

In order to gain an in-depth understanding of how Pick 'n Pay Corporate stores utilize business information technology to enhance SCM processes, a qualitative single-case study approach has been employed. Qualitative case study research techniques foster both depth and richness of detail (Mak'ochieng, 2003, p72). The case study approach has been used not only to promote a greater degree of understanding and depth, but to draw systematically on the realities facing the relationship between SCM and BIS within the food and drug retail sector. Due to the unique nature of the relationships in this enquiry, a quantitative research approach would not correspond with the aims of the research. This chapter discusses the rationale behind the qualitative case study research approach employed, the methods used for data collection and analysis, and the reliability and validity of information at hand. In order to collect the right information, in the right way, a clear understanding of the research problem must be established.

5.2 Statement of the Research Problem

What is the relationship between BIS Technology and SCM within large enterprises in the food and drug retail sector in KwaZulu-Natal. How can BIS be used to make SCM more efficient and effective within Pick 'n Pay Corporate stores in KwaZulu-Natal?

5.3 Formulation of the Research Problem

From the literature review, it is clear that SCM relies on BIS technology for its existence. It is also clear that the cross-optimisation achieved in SCM has resulted in market-facing supply networks that are more responsive to the market, and better equipped to meet dynamic market needs. The relationship between BIS technology and SCM within large enterprises in the food and drug retail sector has been established for a number of years with observable benefits. The purpose of this research is to determine the nature of this relationship with a view to adding to the present body of knowledge in these fields. There is limited literature available

regarding SCM and BIS in the food and drug retail sector and there is therefore, much scope for research in these fields within this service sector. As mentioned in chapter 1, the integration of SCM and BIS technology reaches into every facet of a business, resulting in a complex, multi-faceted web of interconnected and interdependent parts which, in turn, rely on this co-existence for both relevance and survival. Due to the ever-changing marketplace, the ongoing advancements in BIS technology and the dynamic nature of ever-changing supply chain networks, the desired goal of 'optimal efficiency' is a moving target. Due to the ongoing growth and development in business practices, there will always be new 'best practices' available. Even though 'optimal efficiency' is in reality unattainable, all organisations share a common journey towards it.

5.4 Research Objectives

The primary objectives of this research are to:

- Identify the business information system technology and supply chain management requirements and trends within the food and drug retail sector both globally and within South Africa.
- Determine the influence that business information system technology and supply chain management have within the food and drug retail business environment both globally and within South Africa.
- Determine the business information system technology and supply chain management requirements, trends and influence within Pick 'n Pay, KwaZulu-Natal.
- Establish and illustrate an overview of the Pick 'n Pay food and drug retail chain's current supply chains/networks and information flows.
- Analyze the current effect business information system technology and supply chain management have on each other within Pick 'n Pay (Pty) Ltd, in the specific areas such as: sourcing/ purchasing, transportation (both inbound and outbound), operations, distribution, just-in-time (JIT), quick response (QR), flexibility, total quality management (TQM), customer relationship management (CRM), and enterprise resource planning (ERP)
- Determine the challenges and constraints between business information system enablers and supply chain management needs. (i.e. bottlenecks, delays

and problems that inhibit performance in the sector and the overall supply chain efficiency) within Pick 'n Pay (Pty) Ltd, KwaZulu-Natal.

- Make recommendations for actions that can be taken in response to the findings.

5.5 Research Design

"Research involves the application of various methods and techniques in order to create scientifically obtained knowledge by means of various objective methods and procedures" (Welman *et al*, 2005, p2). Welman explains two main approaches to the research process, the qualitative approach and the quantitative approach. These methods have been discussed in order to understand why a qualitative single-case study approach has been employed as the primary data collection methodology in this research.

Quantitative research focuses on the measurement (in terms of quantity, intensity, frequency or amount) and analysis of causal relationships between different variables from an objective point of view. Qualitative research focuses on the processes and meanings that are derived from the causal relationship between different variables. For example, quantitative research would attempt to measure the level of employee satisfaction with the BIS they are required to use. Qualitative research, on the other hand, would not only attempt to discover their level of satisfaction, but also determine the reasons behind their satisfaction or dissatisfaction. The aim of quantitative research is to generalize about a specific population with results from a sample of that population, whereas the aim of qualitative research is to understand the significance which participants of a specific population attach to their environment (Welman *et al*, 2005, p8). Quantitative research is based on complex structured methods and is limited in flexibility in order to prevent any bias in the results, whereas qualitative research is both flexible and explorative so that data may be changed so that a progressively deeper understanding of what is being investigated can be achieved. Quantitative research employs a 'particularistic' approach by using specific measurement instruments to collect data, whereas qualitative research employs a 'holistic' approach whereby an array of data are collected from multiple sources. Quantitative research "enables

researchers to focus on regularity, repeatability, and the verification and validation of causal relationships" (Whitman, 2004, p308). Qualitative research, however, explores unique, context-rich phenomena that can not be generalized or easily replicable. Quantitative data are drawn from a large number of cases with results being based on statistical significance, but qualitative data are drawn from small sample sizes and studied in an in-depth manner.

In this research study, the exploratory qualitative research method with thematic analysis has been utilized. "The primary task of qualitative research is to uncover and explicate the way in which people in particular settings come to understand, account for, take action, and manage their situation as well as the problems and difficulties they encounter" (Welman *et al*, 2005, p193). The employment of qualitative research techniques will "provide a richness and depth of data which cannot be matched by most of the other forms of data collection" (Martins *et al*, 1999, p135). The objective is to study the nature of a complex and multi-faceted relationship between BIS technology and SCM within the food and drug retail sector. It is for this reason that in-depth interviews have been utilized for the qualitative case study research at Pick 'n Pay (Pty) Ltd, our leading food and drug retail chain in South Africa. The primary purpose is to study the nature of the phenomenon, not the quantity or amount of it. Qualitative research techniques have been employed to study a set of unique circumstances together with unique technologies and human behaviour at Pick 'n Pay (Pty) Ltd, within KwaZulu-Natal. This qualitative research approach facilitated the intended detailed examination of the relationship between BIS and SCM, the influences they have on one another, the influence they have on their environments and the how BIS can be used to improve/optimise supply chain processes. The results from this qualitative enquiry are unique and can not be generalized across other retail chains within that sector. According to Burgess, "one case can in no sense establish a general proposition" (Burgess, 1998, p3). Variables of relationships, which were both known and unknown, have been explored and cannot be understood without appreciating the context in which they take place.

The criteria for selecting a single-case or multiple cases to study depended on whether the case was critical, topical or feasible (Yin, 1993, p33). Pick 'n Pay (Pty) Ltd was selected as a result of its local market dominance in the food and drug retail sector. It held a critical and unique position in the South African marketplace – holding majority market share.

The phenomenon being studied is topically relevant because the need for retailers to differentiate their product offering is critical in today's cut-throat market. The study is feasible, as it was only the KwaZulu-Natal region that was focused on.

In addition, a quantitative research element has been utilized to determine the characteristics that are generally applicable to the relationship between BIS and SCM in the food and drug retail sector.

To summarise, this study seeks to find out how BIS technology and SCM function, and how BIS can facilitate better/optimal SCM processes.

5.6 Research Methods and Procedures

Welman states that "Research methodology considers and explains the logic behind research methods and techniques" (Welman *et al*, 2005, p2). The research methods employed will be determined by the aim of a specific research project. These methods and procedures have been developed to ensure that the information acquired is scientific. For example, scientific knowledge can be tested for its validity and reliability in relation to systematic observation. Systematic observation is explained as obtaining knowledge in a controlled manner, whereby alternative explanations are eliminated systematically through testing. Knowledge is also referred to as scientific if it is replicable, that is, the research results must be replicable should the same research study be undertaken by someone else. Scientific knowledge is therefore open to critical assessment, and anyone replicating or repeating the research while employing the same procedures should obtain comparable results (Welman, 2005, p6). This section will explain the rationale behind the specified target population, the selection and number of participants, and the data collection methods used.

In this research study, the researcher examines the relationships that occur between two or more variables without any planned intervention. It is thus referred to as non-experimental field study research (Martins, 1999). The research will require the use of the content analysis where a single group of units of analysis is obtained and each individual is measured on two or more variables at more or less the same time; for example, the relationship between SCM and BIS technology (being the construct) being measured on two or more variables (product design, price, quality, availability, customer service).

Nominal measurements will be used where the numbers assigned to the variables only serve to distinguish them in terms of the attribute being measured (Welman, 2005). The construct (relationship) will be measured in accordance to its effect on price, quality, dependability, reliability, speed, flexibility, and after-sales service. For example, transportation systems that are integrated throughout a supply chain will reduce bottom line costs through the coordination of loads and preferential contract agreements with a PLP (primary logistics providers), consequently allowing the firm the ability to offer goods to customers at a lower price.

The qualitative approach will be used in that it takes into account that the researcher's observations are not the reality as such, but an interpreted reality. Case study research will be conducted by investigating Pick 'n Pay's supply chain activities. This will take place with semi-structured interviews.

5.6.1 Statistical Analysis

The researcher transcribed all collected data acquired at the interviews as it was recorded to Microsoft Excel. The comments were organized into similar categories. The categories were derived from data in inductive content analysis. Information relating to another category was reallocated and recorded under the correct category, and any irrelevant information was omitted. Patterns, associations and causal relationships were then identified and discussed. Interval measurements were used in order to determine perceptions of the managers on SCM and BIS at Pick 'n Pay (Pty) Ltd. For example, a Likert scale was used to determine manager's

perceptions on the effectiveness of the systems they used. Data was unitized into SCM functions and BIS technologies.

5.6.2 Specifying the target population

The literature review briefly discussed the requirements, trends, influences, challenges and future of SCM and BIS within large food and drug retail enterprises both globally and locally. This was done in order to obtain a snap-shot of / benchmark the advancement and progress of these two fields within the retail service sector around the world. One of the South African leading food and drug retailers is Pick 'n Pay (Pty) Ltd. Pick 'n Pay will be examined via an in-depth case study in order to acquire an overall view of their supply chain and BIS technology requirements and use. The aim is to obtain expert knowledge on the relationship between BIS technology and SCM from the target group of upper, middle and lower management levels from Pick 'n Pay (Pty) Ltd within the KwaZulu-Natal region. As Pick 'n Pay utilizes the same BIS technologies throughout South Africa, it was feasible to interview 3 stores, 3 regional managers and 1 national manager.

5.6.3 Number of participants

The research has been based on a single case study which cannot be generalized to whole populations. The purpose of case study research is not to generalize to whole populations, as a case study is not a sampling unit randomly selected from a whole population. The aim was to conduct a holistic, in-depth study of certain phenomenon within a unique case. "Case material can give holistic accounts of events or life-patterns" (Burgess, 1998, p6). The participants in this research comprised of 7 managers from various management levels at Pick 'n Pay (Pty) Ltd stores within the KwaZulu-Natal region. The researcher had intended to interview 8 managers, however the researcher was not able to secure an interview with the KwaZulu-Natal Regional Buyer. Privacy agreements between the parties and the researcher have been adhered to.

Company	Participants/Position	Date	Time
Pick 'n Pay Corporate store at Midlands Mall, Pietermaritzburg	Store Manager	10/10/2010	10h00-11h00
Pick 'n Pay Corporate store at Musgrave Centre, Durban	Store Manager	13/10/2010	8h00-9h30
Pick 'n Pay Corporate store at Pavilion, Westville	Store Manager	13/10/2010	11h00-12h30
Pick 'n Pay KZN Head Office at Westville	Demand Planner	21/04/2011	8h00-9h30
Pick 'n Pay KZN Head Office at Westville	Public Relations / Marketing	21/04/2011	10h00-11h30
Pick 'n Pay KZN Head Office at Westville	Category Manager	21/04/2011	12h00-13h30
Pick 'n Pay National Head office in Cape Town (interviewed telephonically)	National Supply Chain Manager	22/04/2010	11h30-13h00

Table 5.1 Participant Information

5.6.4 Data collection methods

"The data collection method is dependent on the accuracy of the information which will be obtained by a particular method" (Martins *et al*, 1999, p124). Therefore the inherent strengths and weaknesses of various methods need to be clearly understood and evaluated according to the research requirements. Data collection methods should be selected according to the type of data required. In order for data to be reliable, irrespective of whether it is quantitative or qualitative in nature, the correct data collection methods must be utilized. In addition, "the method of collection should be free from personal prejudice" (Martins *et al*, 1999, p124).

The researcher had requested permission to record the interviews, however the participants indicated that they were not happy to be recorded. The data was therefore gathered by the researcher writing down the responses during the indepth

interviews, which was less time efficient, yet still reliable. The researcher ensured that the interviews were approximately 1.5 hours in length – giving the participants an equal amount of time to answer the questions. The same questions were asked to all the participants to ensure that the data would be comparable and reliable, however the terminology was adapted to fit the background and education level of some of the participants. The interviews took place in quiet environments with no disturbances. All participants were given the opportunity to talk freely about the topics raised by the researcher.

5.6.4.1 Secondary data

Secondary data was obtained by reviewing books, accredited journals, articles, white papers and the internet.

5.6.4.2 Primary data

The primary data was collected using both the qualitative in-depth interviews, and the quantitative survey method. As mentioned earlier, the in-depth interviews provided a depth and richness of detail in order to achieve a deeper understanding of the unique realities underlying the relationship within a specific context. These interviews were conducted with specific company managers at Pick 'n Pay in top, middle and lower level management positions. For instance, the Purchasing Manager, Supply Chain Manager, Information Technology Manager, Marketing Manager and a General floor manager were interviewed at Pick 'n Pay (Pty) Ltd's Provincial Head Office in KwaZulu-Natal. Secondly, branch managers were interviewed from Pick 'n Pay (Pty) Ltd's top 5 branches with the highest turnover. Thirdly, the supply chain and information technology managers were interviewed at each of those branches. The rationale behind interviewing managers from a diverse range of management levels is to ensure that a holistic management perspective (i.e. the strategic, tactical and hands-on) on these BIS and SCM processes were obtained. On the other hand, the quantitative research survey method will facilitate an investigation into a certain level of phenomenon, enabling a sector benchmark in this regard to be established.

5.6.4.3 In-depth Interviews

In-depth interviews are usually employed in explorative research with the specific purpose of identifying important variables in a particular area, and to formulate penetrating questions around them, as well as to generate hypotheses for further investigation (Welman *et al*, 2005, p197). In-depth interviews have been used instead of participant observation, for the reason that thoughts, feelings and opinions cannot be directly observed. Due to the explorative nature of the research, a semi-structured interview approach has been employed. Structured interviews are based on pre-determined questions, are inflexible, limiting and can inhibit the free flow of information. Unstructured interviews, on the other hand, allow for the free flow of information while being guided by a list of topics or themes that the interviewer should raise (Welman *et al*, 2005, p166). Semi-structured interviews were used in order to provide sufficient guidance in terms of keeping to what is applicable to the research, but also allowing for some flexibility in obtaining new knowledge that may be applicable. As mentioned in section 5.6.4, the researcher collected the data by writing down the participants responses.

5.6.4.4 Questionnaire Design

The questionnaire was semi-structured and comprised of both closed and open-ended questions. The initial questions were broad in order to get an overview of the business as a whole. The questions following that were more specific to the field of SCM in relation to food and drug retailing operations. The closed-ended questions offered a limited set of choices which could be classified into relatively fixed categories. These questions were a mixture of dichotomous, multiple-choice, scaled questions and rankings, such as the importance and usefulness of IT facilitated supplier relationships in retailing, or the effectiveness of IT scheduling of processes and movement of stock. The open-ended questions were to establish Pick 'n Pay (Pty) Ltd's perceptions and expectations of their supply chain activities, supplier/customer relationship and services. These would determine the required stance Pick 'n Pay (Pty) Ltd is taking, and the relevance of various customer service interactions. A copy of the survey is attached as an appendix to this report (refer to Appendix i).

5.6.4.5 Measurement and operationalisation of the variables

"The type of information that is available will determine the types of analysis that may be conducted" (Whitman, 2004, p308). The research objectives should guide the entire process of data analysis. In qualitative research, a fundamental task is theme identification (Welman *et al*, 2005, p211). Descriptive techniques which are concerned with the description or summary of the data will be used. In this research study, content analysis was used in Microsoft Excel, as there were two or more variables involved (Welman *et al*, 2005, p231).

5.7 Discussion of ethical issues

A written agreement has been drawn up to ensure that confidentiality will be kept.

- **Autonomy**

  A letter of authority to conduct the research was obtained from Pick 'n Pay.

  Participants were given the option to take part in the research.

  The researcher outlined the study to ensure that the Pick 'n Pay (Pty) Ltd understood the level of information required from them in order to complete the research.

  Informed consent forms were signed by Pick 'n Pay (Pty) Ltd.

  Pick 'n Pay (Pty) Ltd were made aware of the intended audiences.

- **Non-maleficence**

  Participants remained anonymous.

- **Beneficence**

  The research benefits the researcher for benchmarking purposes.

  It benefits society by enabling organisations to realise a higher level of efficiency, and thus better overall customer service.

  The results were reported back to Professor Charles O'Neill (Supervisor), Prof Brian McArthur (Co-supervisor), Pick 'n Pay (Pty) Ltd and Antinomy (Pty) Ltd.

5.8 Summary

The research methodology adopted aligns with the in-depth information required for case study research at Pick 'n Pay Corporate stores in KwaZulu-Natal. Data types have been reviewed and the collection of data should source the required information effectively for the purposes of this research.

CHAPTER 6

EMPIRICAL RESEARCH, FINDINGS AND INTERPRETATION

6.1 Introduction

Chapter 5 described the research methods applied to collect and collate the data and information. In this chapter, the empirical data is presented and analysed. It is important to note that this empirical information is based on the participant's knowledge and perceptions on Pick 'n Pay's BIS and SCM functions.

In the preliminary stages of this research, Pick 'n Pay held majority market share in South Africa. It has, however, been noted that over the duration of this research, Shoprite Checkers has subsequently managed to usurp their market leadership profile. According to Business Day, Shoprite's low-cost reputation resulted in much growth during the recession, unlike its competitors. From July 2009 to July 2010 Shoprite's share price rose by 49% and Spar by 41%, double Pick 'n Pay's 21% (Business Day, online, 2010, para 6 and para 11). The Citizen states that, "Most of the growth Shoprite has experienced comes from having the best market position in the middle to bottom of the SA food retail market" (The Citizen, 2011, online, para 8). Even though Pick 'n Pay has taken a knock in market share, they still remain one of South Africa's two leading grocers.

In the interviews with the National and Regional managers, Pick 'n Pay commented that their focus was wrong and they were competing with the wrong competitor, Woolworths. On a front end level, while Pick 'n Pay ensued a battle for ground with Woolworths, Shoprite Checkers and Spar worked on building their low-cost brand and customer loyalty. At the back-end, Shoprite Checkers and Spar spent much of their time investing in the development of distribution centres and strengthening their supply chains – something Pick 'n Pay are only doing now. Despite this set-back, Pick 'n Pay are confident that the more recent technologies they have adopted will be a long-term weapon in regaining their market leadership.

In order to gain a broader spectrum of information from Pick 'n Pay, participants were taken from three management levels, namely, National management level (1),

Regional management level (3) and shop floor management level (3). The managers that were interviewed comprise a total sum of 90 years experience at Pick 'n Pay (Pty) Ltd. The National Head Office Supply Chain Manager (16 years at Pnp) had a comprehensive knowledge of Pick 'n Pay's SCM and BIS structures, process and information flows on National, Regional and Store levels. The Regional Managers (Avg of 16 years at Pnp) for the KwaZulu-Natal region were well versed in both front-end and back-end knowledge about Pick 'n Pay Corporate stores SCM and BIS on regional and store levels. They gave the regional perspective of the relationship between SCM and BIS within Pick 'n Pay's Corporate Stores. The Shop floor Managers (Avg 15 years at Pnp) outlined the technology and merchandise flows that occurred at ground floor level from the first-tier suppliers to after-sales customer service. Each Corporate store had between 141-218 employees per store, depending on store size. There were between 22-23 Department Managers per store and the rest of the staff were people on the floor who maintain the stocking of shelves, stock counts, till points, and store hygiene. The departments that were mentioned are: groceries, perishables, fruit and vegetables, general merchandise, toiletries, clothing and bakery.

The managers that were interviewed ranged from front-end managers (customer side) to back-end managers (supply side). The front-end managers comprised of 3 floor managers (store level), the Public Relations Manager (regional level), and Category Manager (regional level). The back-end managers comprised of the Demand Planner (regional level) and Supply Chain Manager (national level). As a result, a comprehensive range of information was obtained. Numerous attempts had been made to interview the regional buyer, however these turned out to be futile and is noted as a limitation to this research. 7 In-depth interviews were conducted in total.

Interviews were conducted using a semi-structured interview guide and it was found that the lower the level, the less the managers knew about SCM and BIS at Pick 'n Pay. Therefore, some questions were further explained to these participants so that they could provide reasonably accurate data. Answers that were unclear were left un-interpreted. In other instances, some questions could not be answered at all, resulting in gaps in information. It was found that most answers to the open-ended

questions fell into set and comparable themes. The questions they were presented with were based on the objectives of this research. These questions, together with the further explanations given to the store managers, are available in the attached interview guide (Appendix i).

The themes and sub-themes that emerged during the analysis of the data are addressed in accordance with the research objectives. Any additional information received that is applicable to the research was also included and, lastly, a summary of the findings are given at the conclusion of this chapter.

6.2 Summary Background to Pick 'n Pay's Information Technology Development

- +/- 25 Years ago Pick 'n Pay formed a dedicated information technology department.
- 13 Years ago they implemented a number of commercial software applications, namely:
    - Kronos, forecasts demand and manages overall scheduling and store performance; 'Aided Dispatch and Records Management System';
    - (ARMS) co-ordinates in-store day-to-day operations;
    - VisualFlex is an advanced software tool designed to develop database application software;
    - ASHI is a 'point of sale (POS) pricing' software application;
    - 'Wholesale Applications Community' (WAC) software counts advertised lines; and
    - 'Electronic data interchange' (EDI) which communicates sales data to the vendor, enabling the vendor to improve sales forecasts, production and stock levels and facilitate the flow of merchandise on a 'just-in-time' basis.
- These commercial software technologies were based on the premise of resource optimisation and cost saving within functional areas.
- 6 Years ago Pick 'n Pay invested in and rolled out SAP R/3 in order to align themselves to world-class retail operational and supply network efficiency using a 3 phase rollout process.
    - Phase 1 – rollout in the Western Cape in 2005
    - Phase 2 – rollout in the Eastern Cape and KwaZulu-Natal in 2007

○ Phase 3 – rollout in Gauteng in 2009
• SAP R/3 offers enterprise-wide synergies which permeate every function, but also enables existing software applications that organisations do not want to forego to plug-in to its seamless environment.
• Pick 'n Pay have successfully integrated their Kronos, ARMS, VisualFlex, WAC, Ashi POS pricing and EDI technologies with SAP R/3 to create a seamless organisational environment.
• SAP R/3 has moved Pick 'n Pay from resource optimisation to cross-optimisation (as discussed in chapter 1.4) throughout the organisation, extending to Pick 'n Pay's distribution centres and a handful of their larger suppliers.
• Pick 'n Pay's investment in SAP R/3, a leading global competitor in BIS technology, aligns with their 5th strategic pillar which is to build world-class retailing capabilities (Retailer profiles South Africa, [online], para 8).

In support, the National Supply Chain Manager states:

> *"We chose to go with SAP as it has a proven track record within the retail environment, best practice and that it would also allow flexibility around specific customizations for what our business requires" (interview with National Supply Chain Manager).*

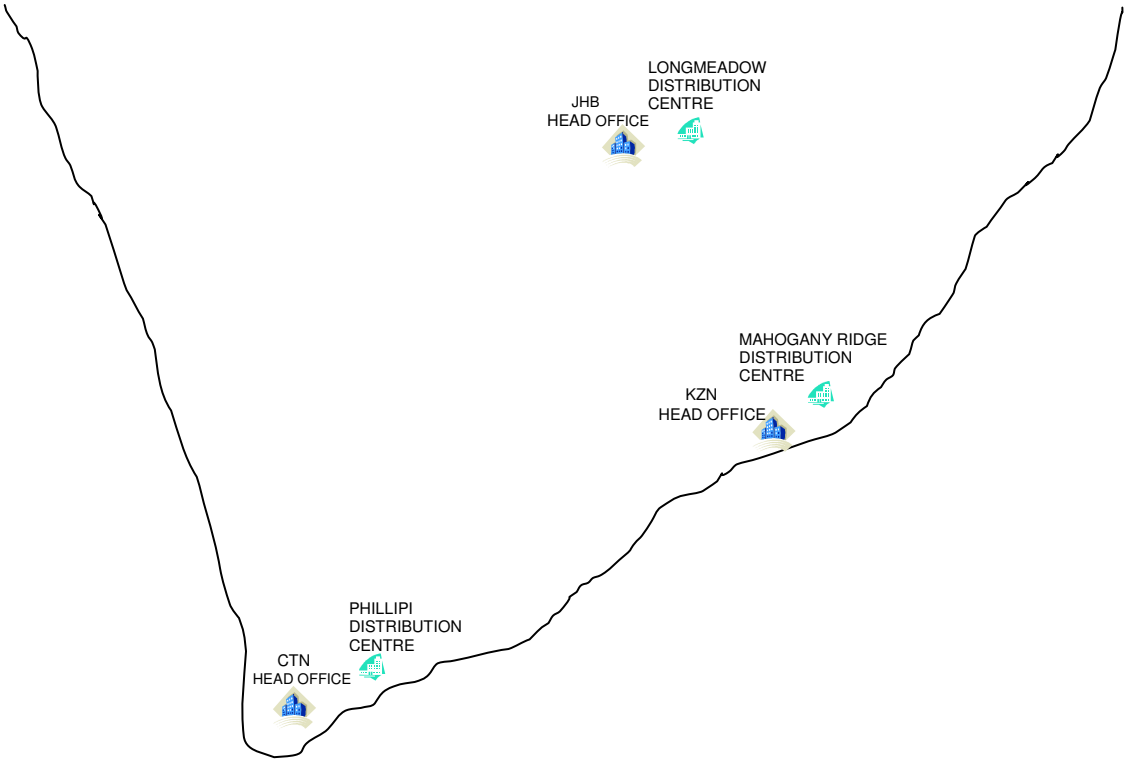
6.3 The Business Information System Technology requirements within Pick 'n Pay's Corporate Stores, KwaZulu-Natal

Pick 'n Pay's technology requirements have been determined by its size and organisational complexity. In order to understand the BIS technology requirements in Pick 'n Pay's Corporate stores in KwaZulu-Natal, Pick 'n Pay's overall BIS approach throughout South Africa has been examined.

According to the National Supply Chain Manager, Pick 'n Pay's structure within South Africa is comprised of 3 Head Office Departments and 3 large distribution centres that service those regions and a composition of 530 Stores. It was noted that a 4th

Distribution centre is in the process of being built in Durban which is to replace the Mahogany Ridge DC.

Fig 6.1 **Geographical display of Pick 'n Pay's head offices and distribution centres**

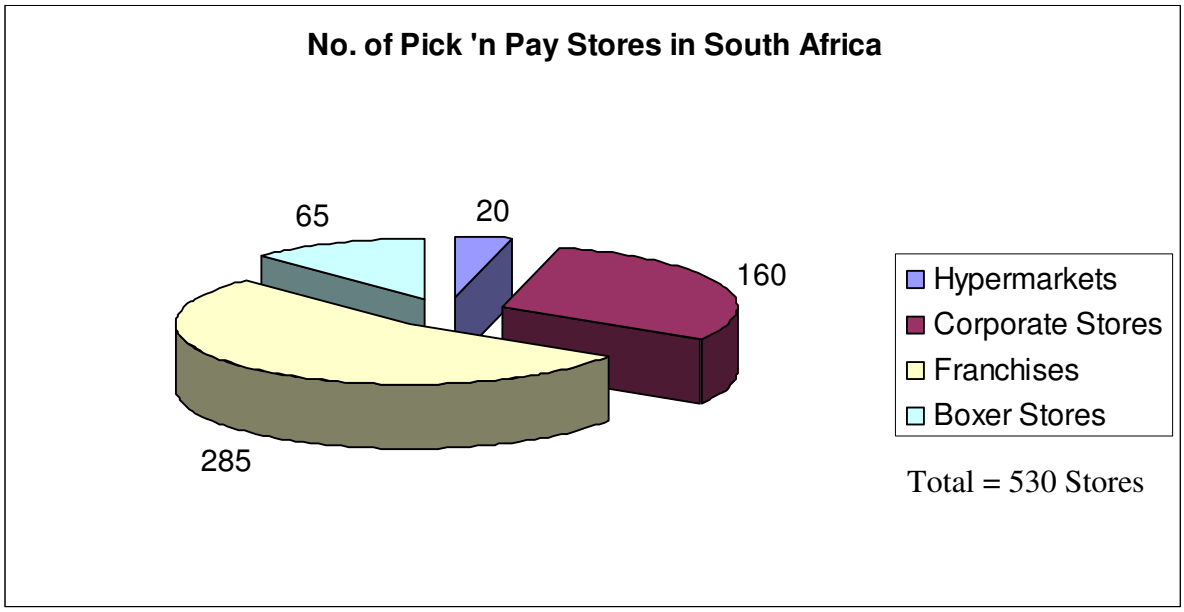


Source: researcher's own construction

The Head Office Departments not only manage and oversee Pick 'n Pay's operations, but co-ordinate a number of centralized processes. For example, KZN Head Office utilizes SAP R/3 to co-ordinate the reorders and distribution and promotions of fresh produce from the Mahogany Ridge FDC to the 27 KZN Corporate stores. The Longmeadow distribution centre has already increased in-store merchandise availability by 20% as against receiving directly from suppliers due to centralized co-ordination processes.

The participants reported that Pick 'n Pay's store structure within South Africa is comprised of Corporate stores, Hypermarket stores, Franchise stores, and Boxer stores. Pick 'n Pay's store infrastructure is laid out as follows:

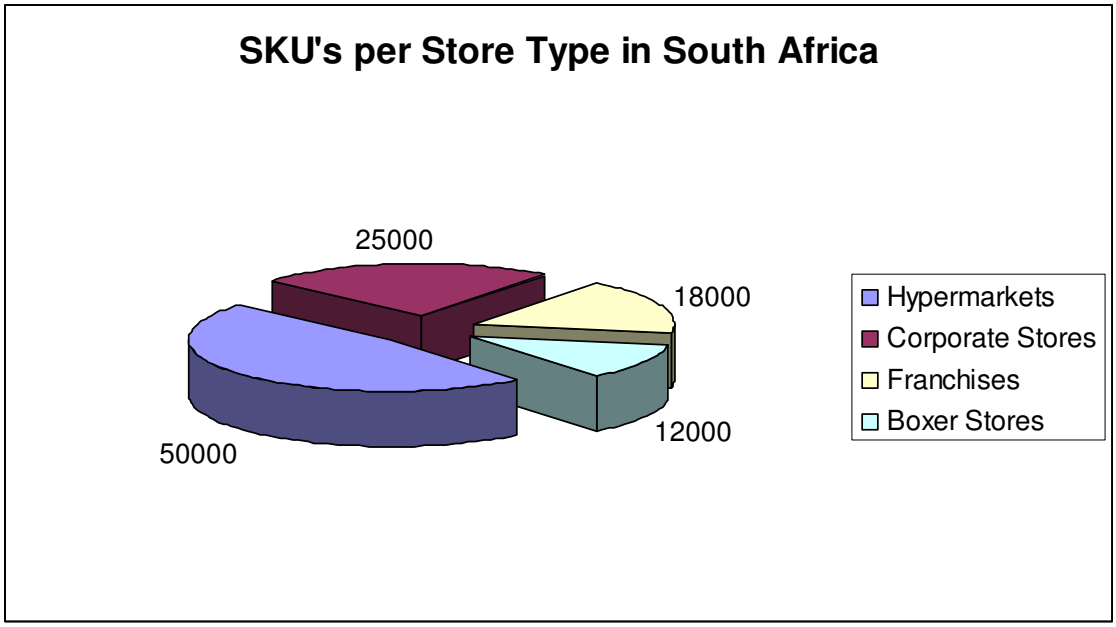
Fig 6.2 **Number of Pick 'n Pay stores in South Africa**



It was noted from the diagram above that 84% of Pick 'n Pay's business is comprised of their Corporate and Franchise stores.

Within each of these stores, Pick 'n Pay manages thousands of stock-keeping units (SKUs) at any given point in time (Interview with Regional Manager). Below is a diagram of the average number of SKUs Pick 'n Pay manages at the given store types.

Fig 6.3 **Number of SKU's per store type in South Africa**



The hypermarket stores carry almost half of the total SKU's in the country. These SKUs are comprised of a number of stock items, making Pick 'n Pay's stock-holding exponentially larger in size. If we, therefore put an understated amount of 10 stock items per SKU, Pick 'n Pay stores total average stock holding in South Africa at any given point in time would reflect as follows:

Store Type	**No. of stores**	**No. of SKUs**	**10 stock items per SKU**	**Total Avg stock for all store types**
Hypermarkets	20	50 000	500 000	10 000 000
Corporate	160	25 000	250 000	40 000 000
Franchise	285	18 000	180 000	51 300 000
Boxer stores	65	12 000	120 000	7 800 000
			Total Avg stock items	**109 100 000**

Table 6.1 Example: Total average stock for all types of Pick 'n Pay stores in South Africa

Pick 'n Pay are managing the movement of at least 109 million stock items in South Africa at any given point in time. The stock holding at the distribution centres were not given to us, however they would be over and above these figures.

In light of the above, Pick 'n Pay's investment in world class retailing BIS technology such as SAP R/3 stands true to its sheer size, structural complexity and its desire to regain market leadership within South Africa. In addition to this, Pick 'n Pay applied a number of additional selection criteria to the acquisition of SAP R/3 technology.

6.4.1 Criteria for Business Information System Selection

Why SAP? According to Pick 'n Pay's National Supply Chain Manager,

> *"Pick 'n Pay's criteria for BIS technology selection is very much guided by best practice in the environment and then according to our requirements."*

Pick 'n Pay have been benchmarking their performance for best practices with Tescos, an international retail chain in the United Kingdom. As mentioned in section 3.7.1, Tescos has made BIS technology a priority in optimising their supply chain efficiency. Tescos have developed 'best practices' in utilizing their BIS technologies to improve demand planning, reduce stock holding, create uniform reporting, deliver real-time information, and make timely and accurate decisions. Pick 'n Pay have utilized their BIS technologies in like manner and have already seen improvements in the same areas due to timely and accurate data. These improvements can be seen in the stock turns noted in Pick 'n Pay's Annual Reports over the last 4 years.

	2011 ('000)	**2010 ('000)**	**2009 ('000)**	**2008 ('000)**
Cost of Sales	42 859 600	40 245 000	40 404 700	34 216 200
Divided by Average Stock balance	3 201 350	3 201 350	3 201 350	3 201 350
No. of Stock turns per Annum	13	13	13	11
No. of days stock turns	27.6	30.2	28.7	32.3

Table 6.2 Changes in Pick 'n Pay's stock turns from 2008-2011

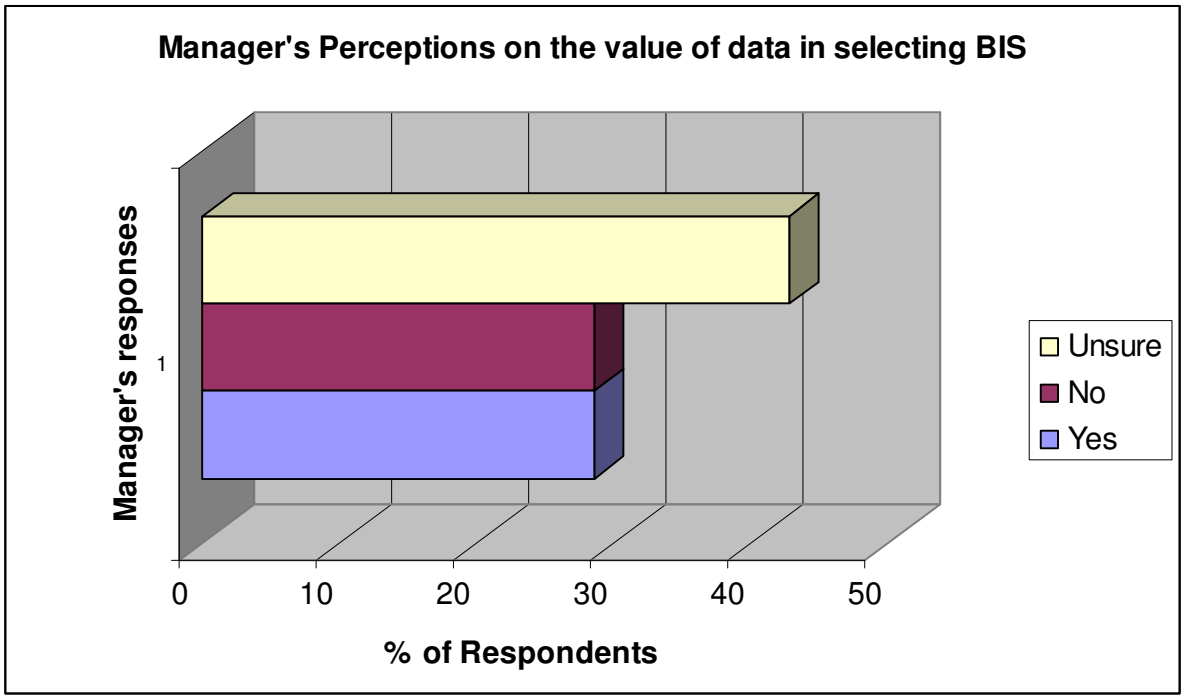
In 2008 stock turned every 32.3 days and by 2011 sock turns had reduced to 27.6 days. Between 2008 and 2011 Pick 'n Pay reduced their stock holding by approximately 5 days. According to the national supply chain manager,

> *"If we reduce our stock turns by 2 days, Pick 'n Pay save R30 million rand per annum. We are aiming for 21 days."*

This means that Pick 'n Pay fall 6 days short of their desired level of optimum efficiency in stock turns. Alternately, Pick 'n Pay, given that the R30 million saving is a constant, have increased their profits by at least R75 million rand ([R30 mil ÷ 2] x 5) by moving their stock turns from 32.3 to 27.6 days. With SAP automated replenishment systems that communicate between distribution centres and stores, Pick 'n Pay are performing very favourably in turning stock. Timely and accurate data through their BIS technology has played a critical part in optimising these processes.

The formation and delivery of timely and accurate data is the primary purpose of BIS technology. However, if data is meaningless without a context, and it is the relationship between pieces of data that forms information (chapter 2 (2.1.2)), then should the composition of data have an impact on the BIS an organisation selects?

Fig 6.4 **Manager's Perceptions on the value of data in selecting BIS**

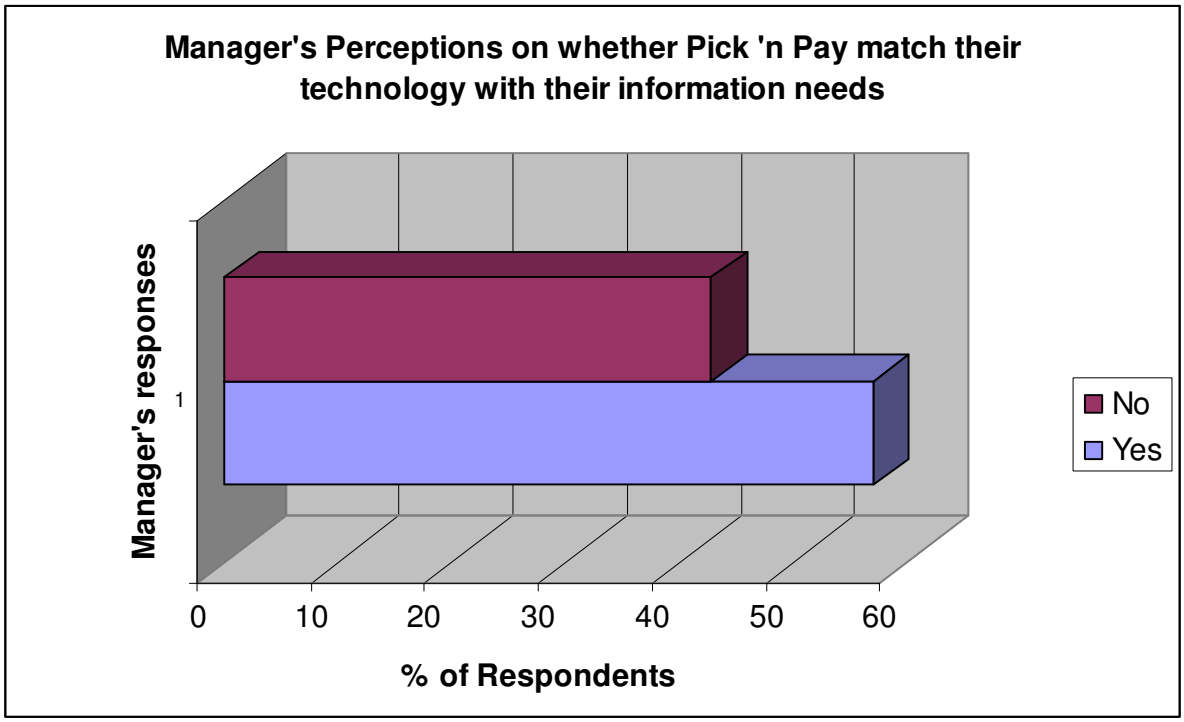


According to the results above, there was a mixed understanding of the value of the composition of data and therefore no conclusive results were found. As discussed in the literature review (2.1.2), information drawn from data is determined by the way the data is organised. Business information systems provide data stores, mine data and organise data into information. If the BIS is not aligned to the type of data, to form the correct relationships between data, it will not be able to produce meaningful information. The composition of data, which are the building blocks for the creation of information, is fundamentally important to the construction of information. However, the majority of Pick 'n Pay managers stated that Pick 'n Pay's information requirements have played a fundamental role in selecting the technologies they currently utilize, and continue to move towards better alignment.

For example,

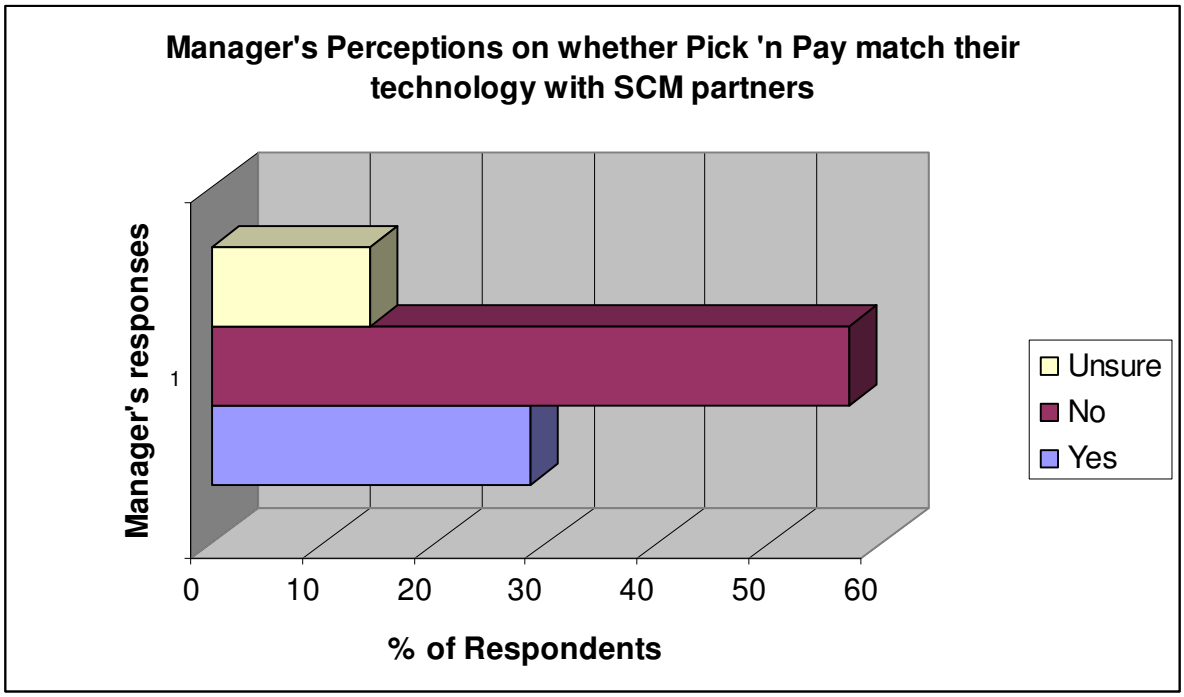
> *"SAP assists our admin team by keeping an eye on slow moving stock. Without SAP we would be relying on tedious manual processes with our orders, capacity and stock" (Store Manager).*

Fig 6.5 **Manager's perceptions on whether Pick 'n Pay match their technology with their information needs**



The participants were asked whether Pick 'n Pay is influenced by supply chain members' technology, and whether a prospective supplier's information systems have any sway on Pick 'n Pay's decision to partner with them.

Fig 6.6 **Manager's perceptions on whether Pick 'n Pay match their technology with SCM partners**



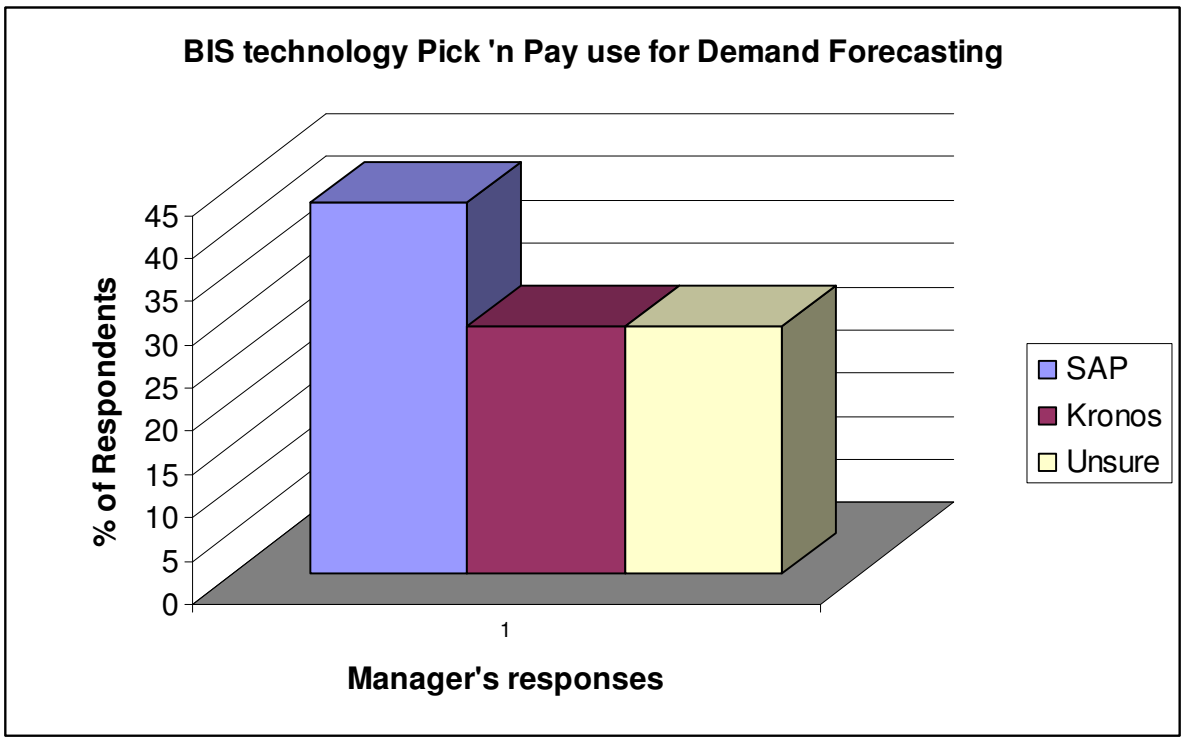
The majority of managers indicated that Pick 'n Pay are not influenced by their suppliers' technology, but are rather the influencers rather than the influenced.

6.4.2 Business Information System Technologies and their influence on Supply Chain functions at Pick 'n Pay Corporate Stores in KwaZulu-Natal

BIS technology is a computer-based tool that is specialized for a particular business function (refer 2.1.4). The participants were asked to specify whether they were aware of any BIS technologies being used at Pick 'n Pay for a number of supply chain functions. These supply chain functions are: demand forecasting, collaborative planning and replenishment, purchasing, transportation, operations, distribution, and customer relationship management. Below is a brief discussion on each.

6.4.2.1 Demand Forecasting

Fig 6.7 **BIS technology Pick 'n Pay use for Demand Forecasting**



According to the interviews, the majority of participants use SAP software applications for the demand forecasting function. The responses were as follows:

> *"SAP suggests the orders and managers adjust them according to the understanding of their lines."*

> *"Our forecast is budgeted on turnover, stock holding and customer demand. We run a budget system on SAP which assists with a higher level of accuracy on stock movement and re-ordering – this enables us to base our forecasting on more accurate and up to date information."*

> *"We use SAP portal updates – pulling reports so we can compare house brands to market leaders. We also base our Christmas stock ordering on last Christmas's and reorder our top selling lines."*

"SAP assists demand forecasts on seasonal merchandise e.g. sun tan lotion in summer and heaters in winter."

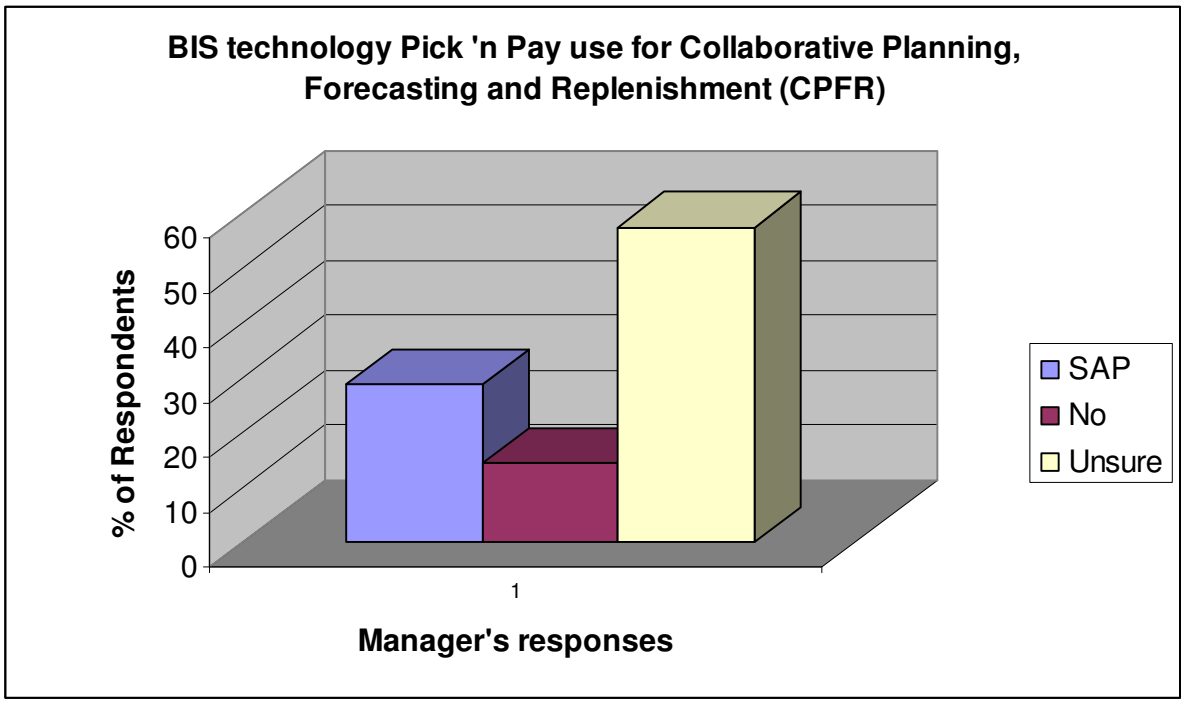
"We look at roster (scheduled) orders, past sales and season."

"Demand forecasts are worked out on average sales, excluding seasonality, month end spikes and trends."

It is noticeable from the comments above that Pick 'n Pay's demand forecasting is driven by SAP technology. SAP produces reports from data and information received on a real-time basis, offering a higher level of accuracy on stock movement. According to chapter 2, information technology receives data/information inputs and processes, manipulates and analyses the data into meaningful information (2.1.4). SAP reports are an outcome of this process and are frequently run to suggest forecast estimates. In addition, SAP reports on past orders, stock movement and average sales. Seasonality, month end spikes and trends are not included in their month by month demand forecasting, but is based on stock movement in the previous season. Kronos application software is, however, being used as a plug-in to SAP by 2 stores for both demand forecasting and in-store performance.

6.4.2.2 Collaborative Planning, Forecasting and Replenishment

Fig 6.8 **BIS technology Pick 'n Pay use for Collaborative Planning, Forecasting and Replenishment (CPFR)**



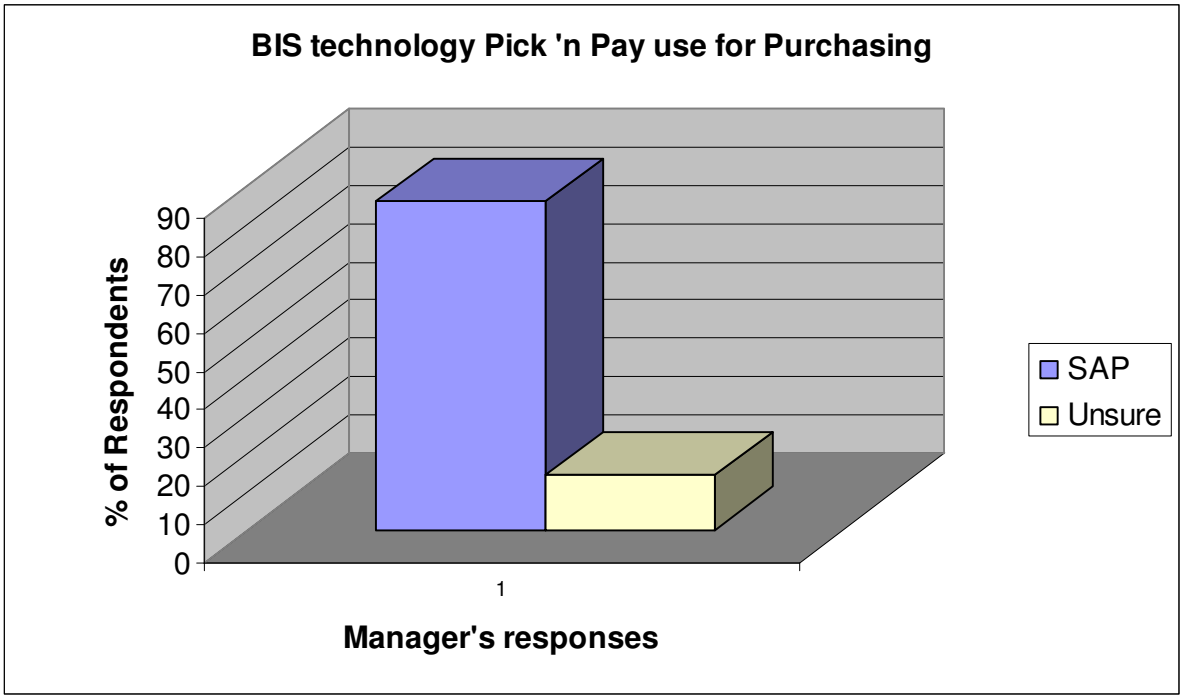
CPFR is being used at Pick 'n Pay between their stores and their distribution centres. Various stock items such as fruit and vegetables are run through SAP on an auto-replenishment system and these are managed centrally at Head Office. It was noted that Pick 'n Pay's CPFR with their suppliers is exceptionally limited. A store manager stated that,

"We print stock reports on a weekly basis and send them to our suppliers."

Even though Pick 'n Pay have direct SAP links with their larger suppliers like Tiger Brands, ABI and Nestle, and EDI, with some others they limit their transfer of information as these suppliers also supply Pick 'n Pay's direct competitors.

6.4.2.3 Purchasing

Fig 6.9 **BIS technology Pick 'n Pay use for Purchasing**



86% of the participants indicated that SAP is used for the purchasing function at Pick 'n Pay. The purchasing function is centralized and mainly performed by head office. Centralised buying equips the distribution centres to provide better JIT control over stock movement, resulting in faster stock turns. The National Supply Chain manager stated:

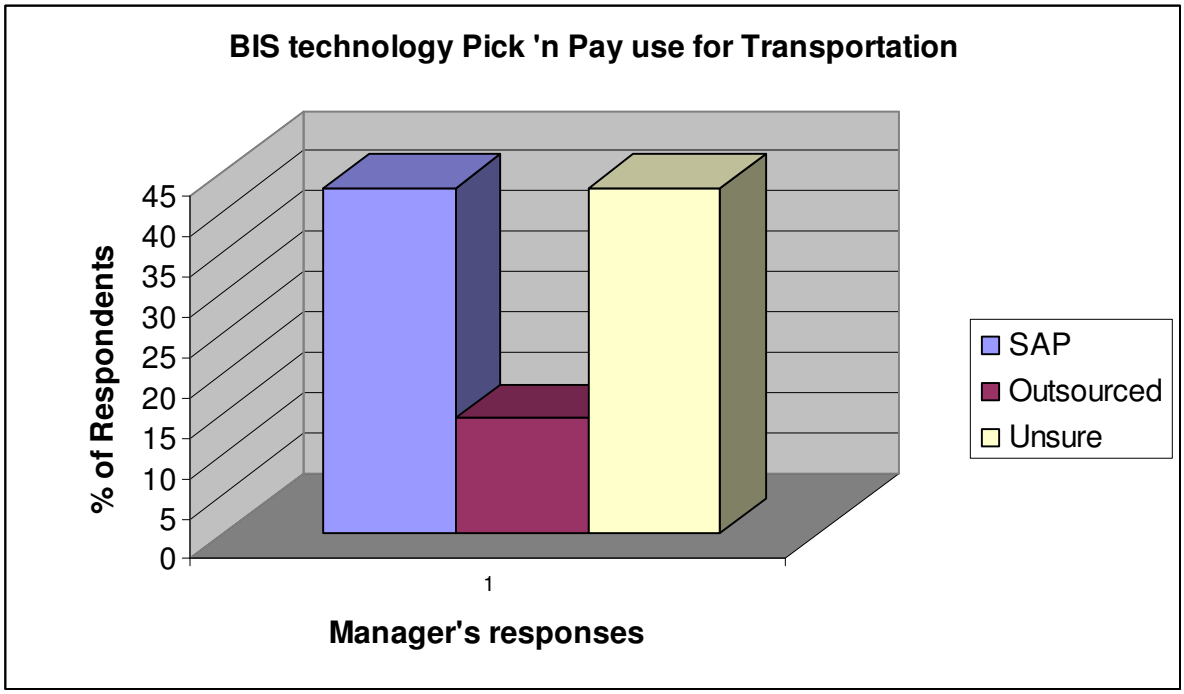
> *"We are moving towards a centralized buying environment where we'll have better JIT control and faster stock turns. The DC must have stock pressure as it is a cost centre, not a profit centre."*

Pick 'n Pay work on a 7 – 14 day delivery cycle. Various orders are capped, but store managers have the authorization to lift the capping during promotions or seasonal fluctuations. Orders are emailed from head office to the Department Managers. This information is faxed or emailed through to the reps, or given to the reps in-store. Pick 'n Pay also have a website for suppliers to access sales data and trends. It was also noted that Department Managers are given the latitude to adjust orders on request. While much merchandise comes from individual suppliers,

Pick 'n Pay's strategic grocery lines are transported by Pick 'n Pay trucks from the FDC in Mahogany Ridge.

6.4.2.4 Transportation

Fig 6.10 **BIS technology Pick 'n Pay use for Transportation**



Pick 'n Pay utilize their own transport from their distribution centre to the stores. Fruit and vegetables are delivered daily together with convenient meals and promotion lines. While the majority of managers did not know what technologies or if any technologies are used to monitor and control the transportation of goods, 1 respondent stated that Pick 'n Pay use SAP technology. It was also noted that Pick 'n Pay outsource some of their transportation to independent transport providers, namely Tanzer Transportation and Cartage Consultants.

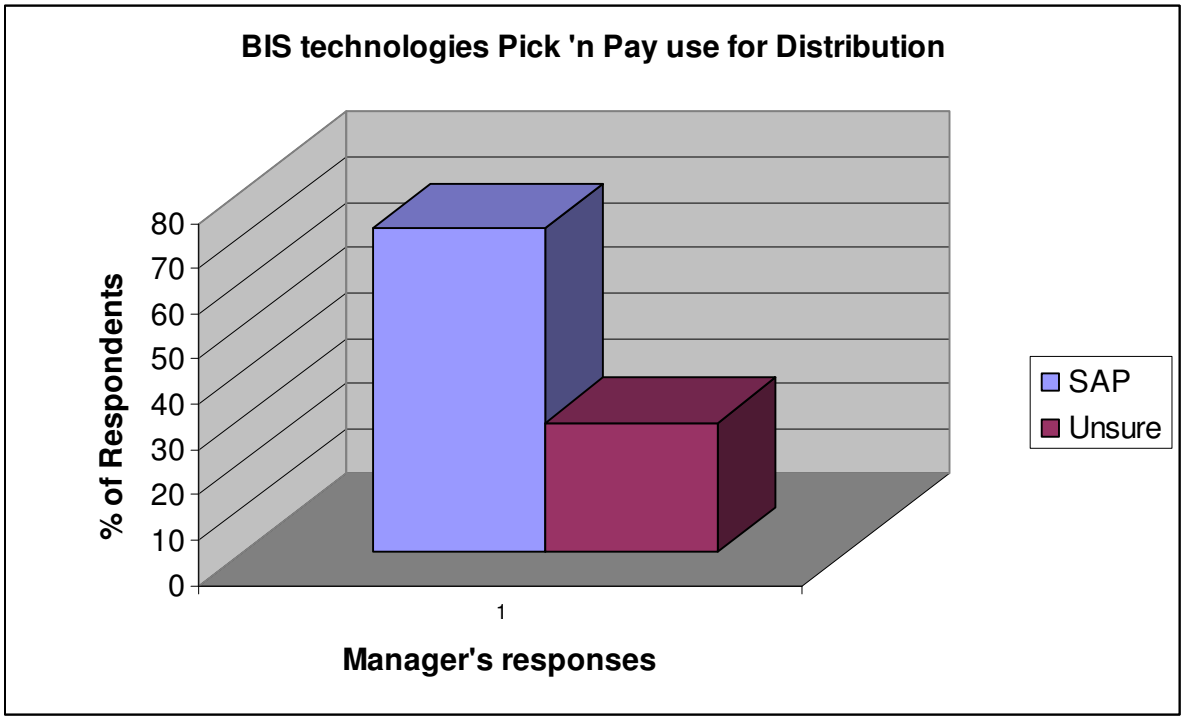
While Pick 'n Pay are not transport specialists, Pick 'n Pay find that complete vertical integration between distribution centres and stores has created significant steps towards becoming optimally efficient. For example, Pick 'n Pay trucks are filled with a variety of merchandise items, so that they travel at the highest possible capacity further reducing the number of trips between the distribution centre and the stores. The scheduling and movement of trucks is centralized and managed at head office.

While this has worked well, Pick 'n Pay are looking at outsourcing all KZN transportation to transport specialists Lieben Trans.

Pick 'n Pay have taken definite steps to align their transportation of merchandise with the movement requirements of that merchandise, moving them towards optimum efficiency. Optimum efficiency in transportation is the ability to move stock at the constant rate of customer demand, without creating waste. Pick 'n Pay are filling their trucks to capacity and reducing trips between their distribution centres and Corporate stores while managing movement centrally to eliminate any overlapping in operations.

6.4.2.5 Distribution

Fig 6.11 **BIS technologies Pick 'n Pay use for Distribution**



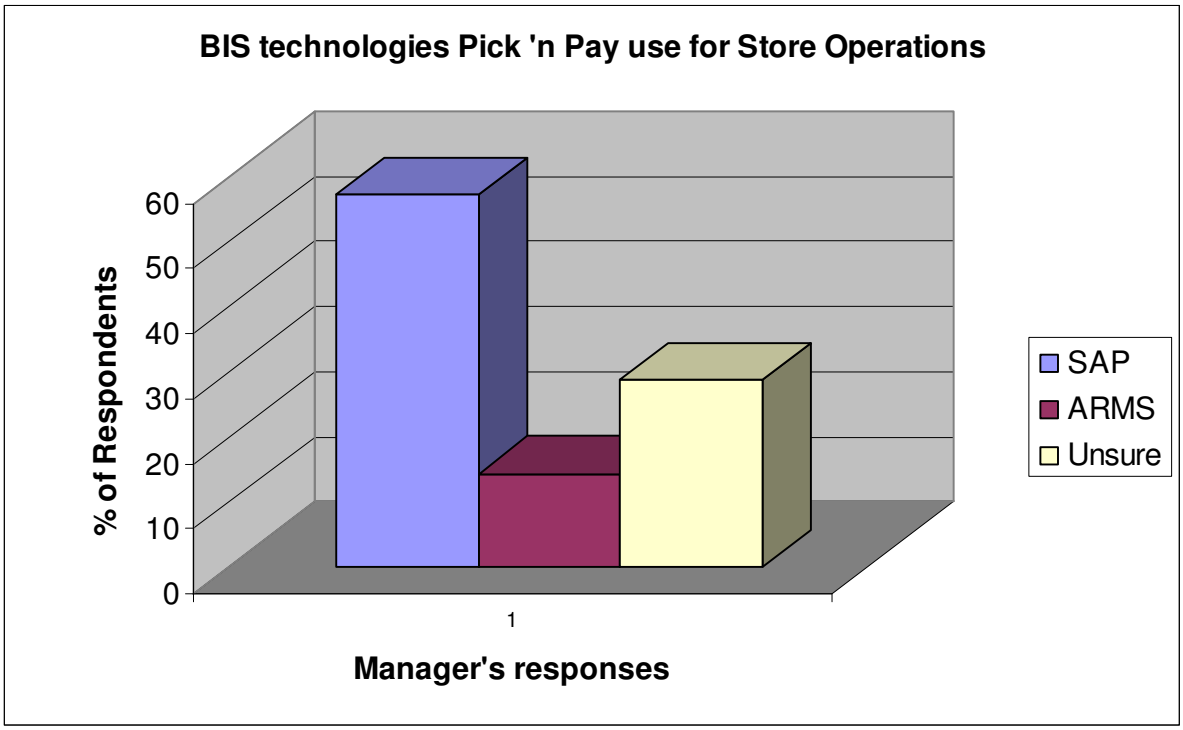
Distribution Centres – SAP technology transfers the automated replenishment orders to the 'Van der Lander' which is a cross-docking facility that co-ordinates the automated allocation of merchandise for each store in the region. The Van der Lander cross-docking facility at the Mahogany Ridge distribution centre distributes the merchandise on conveyor belts that carry the merchandise to docks that are allotted to specific Corporate stores. All goods are stocked in the distribution centre

according to their barcoded sku codes and easily located. The 'Van der Lander' allocates and stocks a variety of items per store, thus saving on the number of trips to and from a store. Pick 'n Pay's distribution centres have improved the service to the stores (Pick 'n Pay's Integrated Annual Report, 2011, p17).

Pick 'n Pay's cross-docking technology integrates with SAP. It engineers efficiency and quality into allocating merchandise to Corporate stores. Cross-docking technology eliminates human error, and cannot become ill or lazy, thus moving Pick 'n Pays distribution facility towards optimum efficiency. Optimum efficiency in this instance would be synchronizing stock movement with customer demand in such a way as to have the right stock at the right stores.

6.4.2.6 Operations

Fig 6.12 **BIS technologies Pick 'n Pay use for Store Operations**



The majority of participants confirmed that SAP is the primary technology used for in-store operations, however, Pick 'n Pay make use of 'Aided Dispatch and Records Management System' (ARMS), point of sale (POS) pricing (ASHI), 'Wholesale Applications Community' (WAC), and 'Electronic data interchange' (EDI) which

interfaces with SAP and assists with the day-to-day operation of Pick 'n Pay's Corporate Stores.

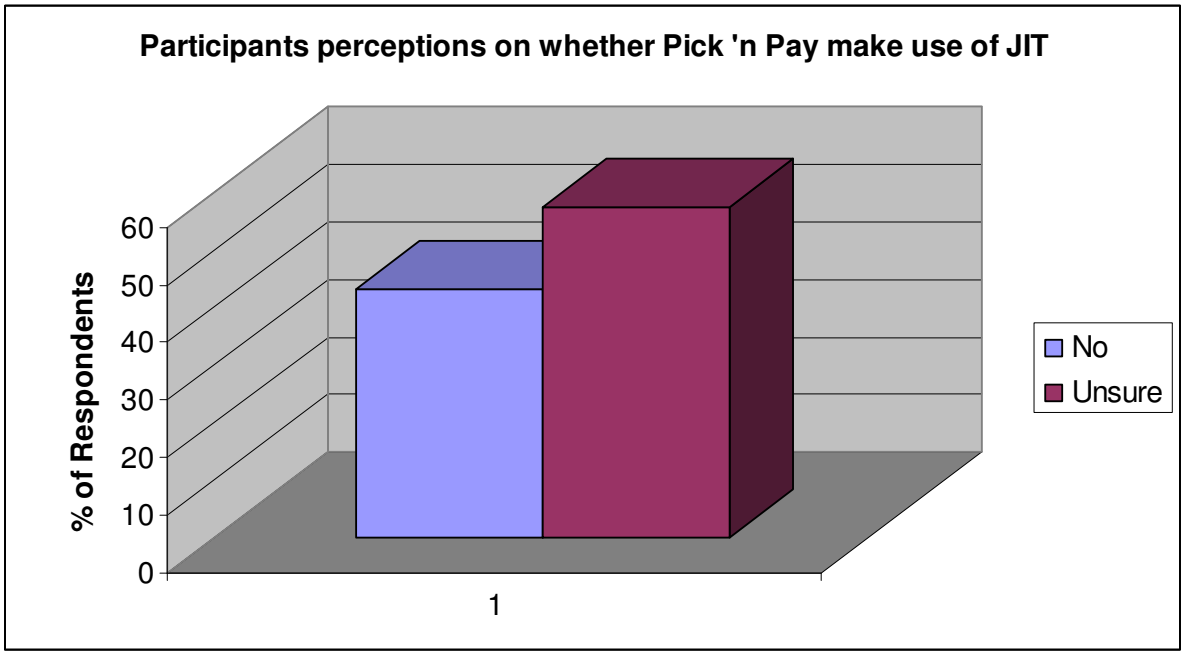
Receiving - Information on goods received is scanned in with bar-code scanners. The information scanned in is the number of items received for specific skus. The information on goods received is instantaneously available to store managers and head office managers. This enables them to monitor stock flows into their stores and track late deliveries. RFID tags are not utilized as the majority of participants stated that the costs involved in tagging a large variety of merchandised items which move through to the end-user quickly would not be cost-efficient. Bar-coding technology creates efficiencies by speeding products into store and information to decision makers.

Store layout – Pick 'n Pay's Demand Planner at the KZN head office uses computer technology to develop planograms for each Corporate store in KwaZulu-Natal. One respondent suggested that SAP is used for this purpose, however the majority did not comment. It can therefore not be concluded from the interviews what BIS technologies are used for the store planning function. The planograms are designed to facilitate store operational efficiency.

Stock - 'Wholesale Applications Community' (WAC) software interfaces with SAP. It is specialized commercial application software that counts advertised lines in-store. This enables Pick 'n Pay to monitor merchandise movement while reducing time-consuming, costly manual counts.

Just-in-time – Pick 'n Pay use telecommunication technology (faxing) to place the vast majority of their stock orders. These quantity orders are obtained from SAP reports, however, the ordering and expediting of the purchasing function is vastly a manual process that is not driven, tracked or traced by SAP. They also use 'Electronic data interchange' (EDI) to communicate sales information to a small portion of their vendors, and SAP technology to communicate with a few of their larger suppliers. With the vast majority of orders being placed by fax, Pick 'n Pay's managers do not see JIT in operation at Pick 'n Pay.

Fig 6.13 **Participants perceptions on whether Pick 'n Pay make use of JIT**



Forty-three percent of respondents stated that JIT does not work at Pick 'n Pay, however, they assured that it is coming in. The store managers mentioned that they are still experiencing stock-outs, shrinkage and absentees, while 57% made no comment.

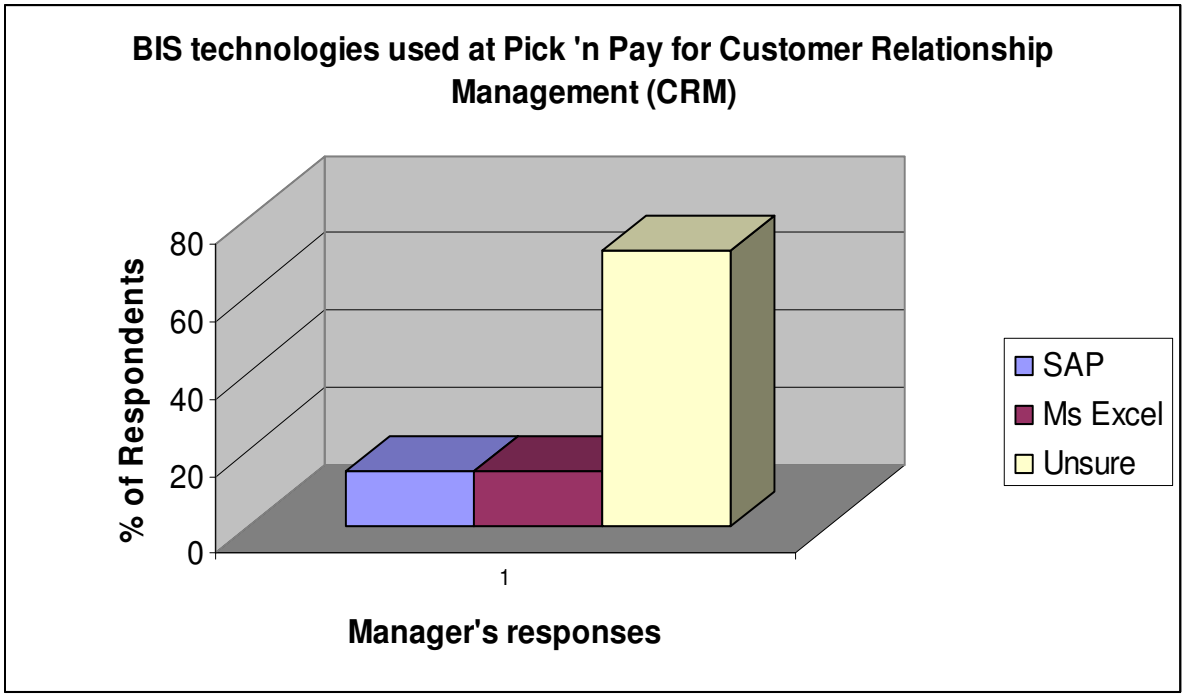
TQM – No BIS technologies were mentioned for total quality management at Pick 'n Pay.

QR – No BIS technologies were mentioned for quick response at Pick 'n Pay.

Pick 'n Pay make use of SAP, bar-code scanners, planograms, WAC software, EDI, and telecommunication technologies to aid store operations. These all work towards uninterrupted synchronization and control of stock movement in-store.

6.4.2.7 Customer Relationship Management

Fig 6.14 BIS technologies used at Pick 'n Pay for customer relationship Management (CRM)



The majority of participants did not know of any BIS technologies used to support customer relationship management at Pick 'n Pay. The focus of discussions centered on the various points of contact with the customer such as: managers meeting and greeting customers at the door, cashiers that are polite, helpful and friendly and having staff on the floor to assist with queries. However, 1 respondent mentioned that Pick 'n Pay uses a Microsoft Excel database which maintains a record on the service levels and customer experiences at each department within a store. This helps to monitor customer service and ensure that any matters arising are handled correctly. Equally, SAP was stated to make contributions to the customer service element, and despite it not being substantiated in the interview, Pick 'n Pay's Annual Financial Report explains that:

- The Smart shopper card loyalty programme was launched in March 2011. It is designed to offer customers customized service offerings (Pick 'n Pay's Integrated Annual report, 2011, p18). Pick 'n Pay's 'Smart' shopper card is designed to profile their customers and build their intellectual capital so that

they can respond effectively to changing market needs. Understanding customers' buying habits will enable them to target their marketing and promotions strategies in the right directions. The 'Smart' shopper card is also designed to build customer loyalty by giving out 10 points for every R100 spent. These points can then be converted to rands and the 'Smart' card can be used to buy goods directly from Pick 'n Pay.

- Pick 'n Pay have migrated towards web-based social networking in order to engage customers in various activities and encourage real-time interaction (Pick 'n Pay's Integrated Annual Report, 2011, p8). The Public Relations Manager states that, "*Customer experience information is filtered back to head office",* enabling real-time feedback and quick responses from Pick 'n Pay's decision makers.

- Pick 'n Pay make use of internet technology by offering 'online shopping' which allows customers to complete an online shop order and have the merchandise delivered to their home during a specified time. Their online shopping offers an array of price specials and promotions that align with these activities in-store. This not only takes customer convenience and time-saving to another level, but gives Pick 'n Pay reliable customer demand information to the end-user level.

6.4.3 The Importance of Real-time Information to Pick 'n Pay's Performance

SAP R/3 provides an end-to-end (from source to consumption) solution, integrating all processes and functions to ensure a seamless, real-time flow of information (refer to section 2.4.1). All the participants considered real-time information to be of critical importance to Pick 'n Pay's performance. It was felt that without it they would have to rely on time consuming, manual processes. With SAP real-time information, Pick 'n Pay's managers can monitor the movement of merchandise throughout the day. They can see if goods have been ordered, have arrived, have moved, or require reordering. They can identify fast (the top 20 – 50 lines) or slow moving lines, dormant stock, over stocking, promotion stock, wastage, turnover, sales, growth, busiest part of the day, and the average spend per customer. SAP provides uniform reports on store performance and sales which is reported to head office. According to the National Supply Chain Manager,

> *"Access to fast and highly accurate information leads to better decision making capabilities in an organisation".*

Pick 'n Pay utilize SAP technology to keep their foot on the pedal as:

> *"FMCGs are turning over every 14 days, and department managers are still focusing on reducing their stock holding".*

Pick 'n Pay also carry out cyclical counting to support stock movement and reduce shrinkage and prevent waste. This cyclical counting is based on consumption. The merchandised goods are therefore divided into 3 groups: A, B or C. The faster the merchandise moves, the more regularly it is counted.

Group A	Fast moving consumer goods (FMCGs)	Counted four times every 6 months
Group B	Medium moving consumer goods (MMCGs)	Counted twice every 6 months
Group C	Slow moving consumer goods (SMCGs)	Counted once every 6 months

Table 1.3 Number of stock counts per merchandise group

Real-time information helps Pick 'n Pay to react timeously not only to stocking issues, but to trends and unexpected changes in customer demand. He further states that,

> *"The most up to date information impacts on decision support, and being able to manage any issue effectively. Early detection decreases risk in decision making and improves performance."*

The majority of Head Office Managers affirmed that real-time information is critical because:

> *"Poor performance leads to poor profits."*

and

> *"No information leads to poor management and poor judgment."*

Real-time information impacts the bottom-line. If a product is tracking negatively, it must be moved into the positive by advertising, signage and promotions. They run rebate and deal periods to move negative stock from time to time. The movement of products is measured by the return on investment in respect to stock holding.

Real-time information facilitates optimum efficiency as information reaches decision makers instantaneously. Real-time information does not automatically make an organisation optimally efficient, as decision makers may not make the best decisions even with the correct information at their disposal. Pick 'n Pay are, however, realising higher levels of store efficiency due to the real-time information flows, and are reaping the benefits of decision making accuracy.

6.4.4 The Business Information System trends within Pick 'n Pay Corporate Stores, KwaZulu-Natal

According to the National Supply Chain Manager, "SAP R/3 was adopted to keep with the times". As mentioned in chapter 2 section 2.1.2, technology has the ability to crunch numbers and data within seconds as against days, bringing real-time information within the grasp of organisations today. BIS technology has been developed in an effort to gain operational efficiency and responsiveness to ever-changing markets in section 2.2. The efficiencies and synergies obtained through

BIS technology has created a vast 'performance gap' between those who have adopted these technologies and those who haven't (refer to Table 6.2). Pick 'n Pay have therefore felt the pressure to protect their core-competencies and market share by keeping up with these technological developments.

Pick 'n Pay recently installed electronic roof units that communicate wirelessly to all the 'electronic shelf labels' (ESLs) in-store. As prices change, they are automatically updated through the electronic roof units in real-time. These price updates are automatically updated throughout the system so that the point of sale scanners pick up the new price when the bar-coded item is scanned.

Fig 6.15 **Electronic Shelf Labels**

Source: The Retail Exchange, 2012, online, para1

Bar-coded scanners are used at the till points to ensure the timely throughput of customer goods, and customer convenience. SAP R/3 generates real-time price updates to the POS system, resulting in few price discrepancies between ESLs and scanned price and fewer delays in customer queues. Pick 'n Pay also have bar-code scanners placed in the stores for customers to scan and check prices on any items, should they not be able to find the price.

Fig 6.16 **Bar-code Scanner**

Source: Fotosearch, Barcode reader, 2012, online, p1

Interviews reported that Pick 'n Pay are hoping to adopt the new self-service touch-screen till points. The self-service till points will allow the customer to scan their own items and pay for them by card. This will reduce operating costs, and improve customer card safety as they will not be handing their card to anyone. Tescos have successfully installed them in the United Kingdom.

Fig 6.17 **Self-service till point**

Source: South West Systems, 2011, online, para 1

Pick 'n Pay make use of internet technology to sell products online. Customers who do not have time to shop can have them delivered to their homes.

6.4.5 The Implications of Software Upgrades

The store managers assert that with the installation of SAP R/3, Pick 'n Pay has been subject to regular BIS technology upgrades at ground level. These upgrades have had a substantial impact on the employees who work with it on a day to day basis. Pick 'n Pay's upgrades require ongoing BIS support for the installation and implementation stages of these upgrades. Despite the imposed change, it was felt by the store managers that Pick 'n Pay's employees have been less opposed to the technology changes than expected. This may be due to the fact that Pick 'n Pay

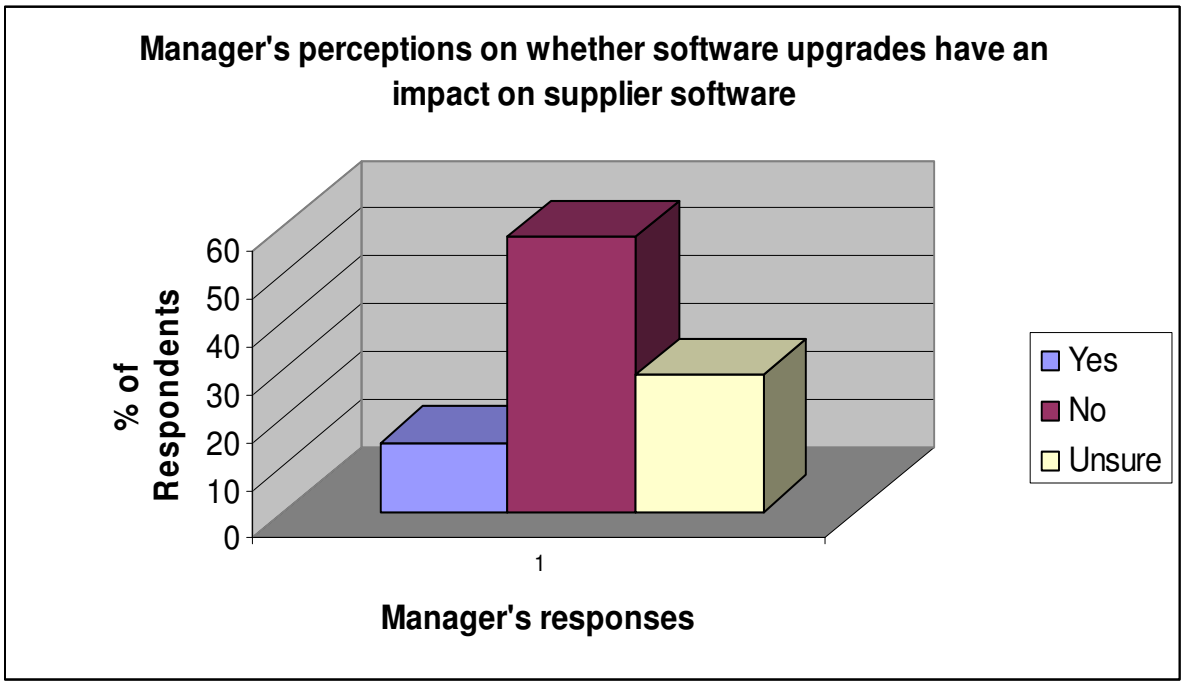
staff are prepared in advance for any changes that lie ahead. One of the respondents reported the following response from an employee:

> *"You think that the upgrade will be difficult to adjust to and when you see how much easier it makes your job, you appreciate it."*

The participants note, however that the older employees were generally more opposed to the changes than the younger employees. The head office staff did not comment on software upgrades and the impact on staff.

The participants were asked whether the upgrades to Pick 'n Pay's software had any impact on their suppliers' software.

Fig 6.18 **Manager's perceptions on whether software upgrades have an impact on supplier software**



As mentioned in section 6.4.11, we know that technological integration is exceptionally limited or non-existent due to South Africa's competition commission. The information in the graph above correlates with this and it is therefore likely that Pick 'n Pay's software upgrades do not impact much on their suppliers. As mentioned in section 6.4.2.2, Pick 'n Pay print off weekly reports on sales, fax and

email orders through, liaise directly with reps and post sales data and trends to a website which their suppliers can access. The suppliers that Pick 'n Pay's upgrades are most likely to affect are those who run SAP technologies themselves such as Tiger brands, ABI and Nestle.

In summary, Pick 'n Pay's selection of SAP R/3 aligns with their complex organisational architecture. SAP R/3 was selected to meet Pick 'n Pay's organisation requirements and align themselves with best practice in global retail. SAP spans geographical boundaries, facilitating the management of an entire chain of suppliers. Pick 'n Pay's adoption and use of BIS technology has enabled them to develop and manage their retail supply chain. A discussion will now follow on Pick 'n Pay's supply chain management approach.

6.5 The Supply Chain Management requirements and influence within Pick 'n Pay Corporate Stores, KwaZulu-Natal

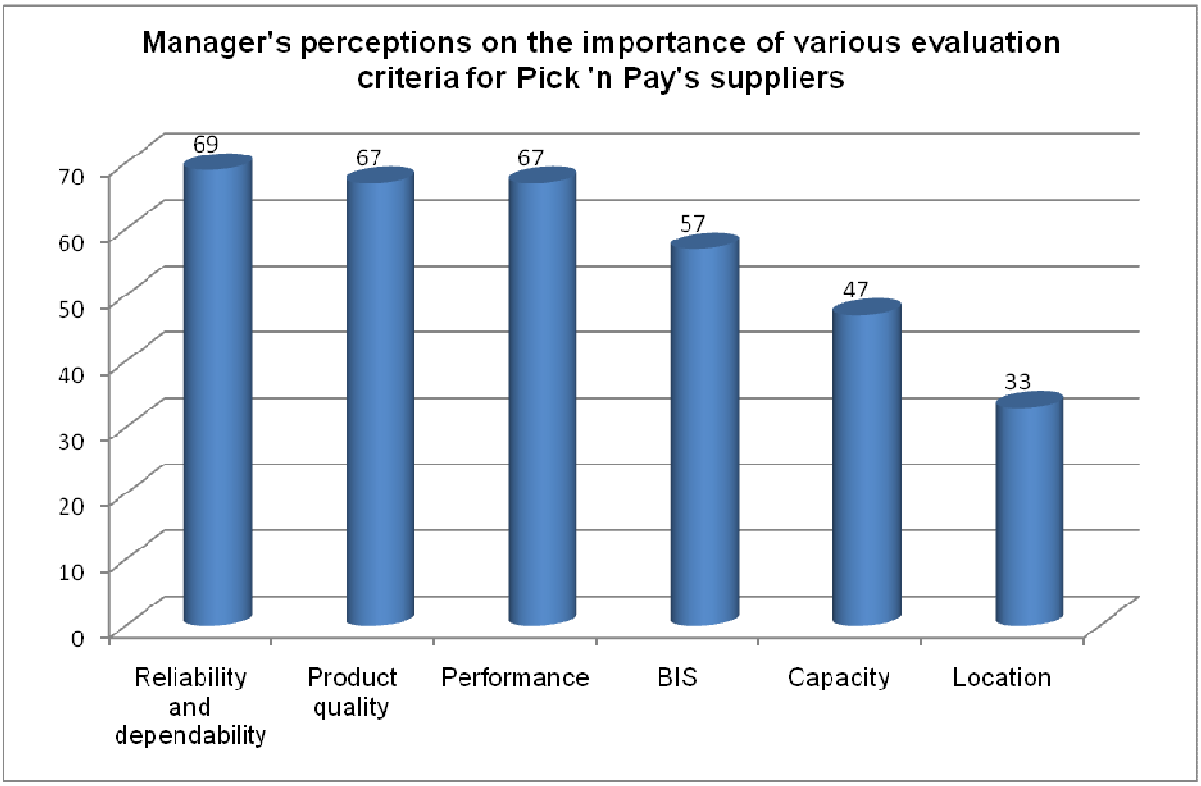
As mentioned in chapter 2 section 2.1.4, SAP R/3 is integrated enterprise software that supports supply chain management. This aligns with two of Pick 'n Pay's strategic pillars which are "to continue to deliver operating efficiencies" and "Invest to improve operating model" (Retailer profiles South Africa, [online], para 8). Pick 'n Pay's supply chain management department has been in operation for 4 years on a national level, and for 3 years in KwaZulu-Natal. The management of Pick 'n Pay's supply chain is centralized and based at Head Offices.

Supplier selection is a key function in supply chain management and the evaluation thereof is fundamentally important to the retailer. As discussed in section 3.6.1, supply chain partners need to be strategically aligned, technologically compatible, cost efficient and value driven. Any unnecessary costs incurred within the supply network will be carried down to the customer. Should the costs be significant, the products/services will reach the customer base at a higher price, rendering them less price competitive. In addition, product/service quality plays a fundamental role as customers want value for their money. It is therefore important that suppliers are evaluated and selected carefully as their impact will affect the entire supply network.

6.4.1 Supplier Selection and Evaluation

The respondents were requested to rank the importance of the following evaluation criteria for the selection of Pick 'n Pay's suppliers. While all of these criteria are important, the ranking was to establish the level of importance of the following criteria in the supplier selection process.

Fig 6.19 **Manager's perceptions on the importance of various evaluation criteria for Pick 'n Pay's suppliers**



In the graph above, supplier reliability and dependability was given the highest average ranking of 69%, indicating reliability and dependability to be the most important criteria for supplier selection. Product/service quality and supplier performance were identified as the second most important criteria with an average ranking of 67%. The importance of a supplier's current business information systems were given an average ranking of 57%, which correlates with Pick 'n Pay's limited collaboration with their suppliers. Supplier capacity received a 47% average ranking as moderately important in the selection of suppliers, while supplier location was the least important. This is due to suppliers delivering directly to stores at their own cost.

At store level, Pick 'n Pay have between 150 - 170 suppliers. Unreliable suppliers will therefore have a substantial impact on product availability and store efficiency. With SAP technology, Pick 'n Pay are in a better position to monitor supplier performance as merchandised goods sent with incorrect stock counts will be recorded by SAP, making recurring problems easily identifiable.

The regional managers confirmed that Pick 'n Pay had approximately 4000 suppliers in the KwaZulu-Natal region. They also affirmed that supplier loyalty was barely existent and that suppliers who were not willing or able to meet with set criteria were easily expended. Head Office controls the allocation of merchandise, listing of lines, the selection of suppliers and payment to suppliers. Head office establishes the trading terms with suppliers and if a product is accepted, it will be supplied at all stores. Once the fourth DC is complete, Pick 'n Pay have indicated that they will be planning on centralizing vendors. Approximately 30% of merchandise is sourced internationally and 70% locally. Due to the fact that product quality comes from suppliers, quality accreditation is vital in the process of selecting Pick 'n Pay's suppliers.

6.4.2 Quality Accreditation

Pick 'n Pay's suppliers need to pass a food quality audit. Pick 'n Pay sets the minimum specifications and outsources quality accreditation for independent food inspectors. According to the Occupational Health and Safety Act, stores are to be checked on a monthly basis. Pick 'n Pay comply with the requirements of the Occupational Health and Safety Act with Aspri SGS Services conducting monthly checks and looking at the store as a whole. They review food quality, perishables' expiry dates, and pricing. Asperata conduct weekly checks on fresh produce items and Elimco conduct weekly checks on pest controls. The store may not get less than 95% for these checks. In addition, Pick 'n Pay's National office conducts bi-annual health and safety checks in all their stores without notice. They interview customers and check that the manager is at the front of the store. As consumers shop for the purposes of convenience buying, the quality of Pick 'n Pay's service is

measured not only in product quality and customer experience, but product availability and replenishment.

6.4.3 Collaborative Planning, Forecasting and Replenishment

Collaboration with suppliers is limited and the majority of the respondents confirmed that Pick 'n Pay preferred to maintain a traditional relationship with their many suppliers. The following comments were made:

> *"We have traditional supplier relationships. Even though we have EDI and SAP links with suppliers, we can't see the supplier's needs and they can't see ours."*
>
> *"We have traditional supplier relationships, and we don't want to match systems. We prefer them to have independent data to compare ours with."*
>
> *"We don't plan with any vendors to manage demand. For many, we send orders via EDI or via our web-based supplier portal which holds our orders."*
>
> *"Collaboration takes place when we reserve stock for promotions, or try to push merchandise that is exclusive to Pick 'n Pay."*
>
> *"We collaborate with suppliers on a basic level when we have category reviews, market reviews and innovation reviews."*
>
> *"Our head offices have more liaisons with suppliers and promotions are run by head office. We send orders via EDI, fax or email."*

The store managers were not familiar with the term 'Collaborative Planning, Forecasting and Replenishment' (CPFR). In chapter 3, Collaborative planning, forecasting and replenishment was described as the transmission of detailed information between vendor and retailers such as sharing promotion plans, business strategies, new products and product development and production schedules. Store managers reported that the only information they pass to and from their vendors are stock orders and delivery information.

The respondents felt that SAP will enable Pick 'n Pay to start moving towards CPFR within their supply chains. Despite Pick 'n Pay's limited integration with their suppliers, they reported the following cost savings experienced through paperless processes.

> *"Our orders via EDI or our supplier portal has resulted in substantial reductions in costs. If we have 100 vendors connected via EDI, we save 500 sheets of paper a week, which equates to 1 box of paper per month; 200 000 sheets of paper per annum (2000 sheets per box x 100 vendors @ R25 per box) which works out to an approximate saving of R5 000 000 per annum across Pick 'n Pay South Africa."*

Cost savings on paperless orders via EDI connectivity with 100 vendors

Sheets of paper per week	500
Sheets of paper per month	2 000
No. of vendors (100) x sheets of paper (2000)	200 000
Cost per box	25
Cost savings per annum (200 000 x R25)	R5 000 000

Table 1.4 Cost savings on paperless orders

Cost savings have not only been attained through paperless orders, but through Pick 'n Pay aligning themselves with suppliers who have representatives who play a fundamental role in the management of inventory.

6.4.4 Inventory Management

While the fruit and vegetables are sourced from Pick 'n Pay's distribution centres, Pick 'n Pay's general merchandise is vendor managed. As mentioned in chapter 3 section 3.7.4 "VMI is an approach for improving supply chain efficiency in which the vendor is responsible for maintaining the retailer's inventory levels in each of its stores" (Levy and Weitz, 2007, p285). By this, inventory is controlled or overseen by Pick 'n Pay, but it is stocked and managed by their suppliers. Brand leaders such as Unilever, Simba, and Colgate produce their own planogram of how stock is to look on the shelves. The brand leaders also do their own category management

and have field marketers that manage stock into the stores. These brand leader representatives and field-marketers can speak to the departmental managers if they require more space for their products, or would like to run promotions. The small suppliers do not come into store, but use companies like Smollans Sales and Marketing Group which offer help to a group of smaller suppliers in shelf stocking and managing. This means that even though Pick 'n Pay share minimal information with their suppliers, the suppliers that manage their own inventory at the stores will have access to information such as fast moving and slow moving goods, replenishment rates, Pick 'n Pay's pricing and sales data – facilitating a level of collaborative planning, forecasting and replenishment (CPFR) to their first tier-suppliers at least. This process is not facilitated by BIS technology in most instances, and would be reliant on data capturing on the job rather than data being transferred from retailer to vendor. The exceptions in this regard are Nestle, ABI and Tiger Brands who have a direct link through SAP to Pick 'n Pay. Direct linking enables the transfer of information for fast and accurate decision making within and beyond organisational boundaries.

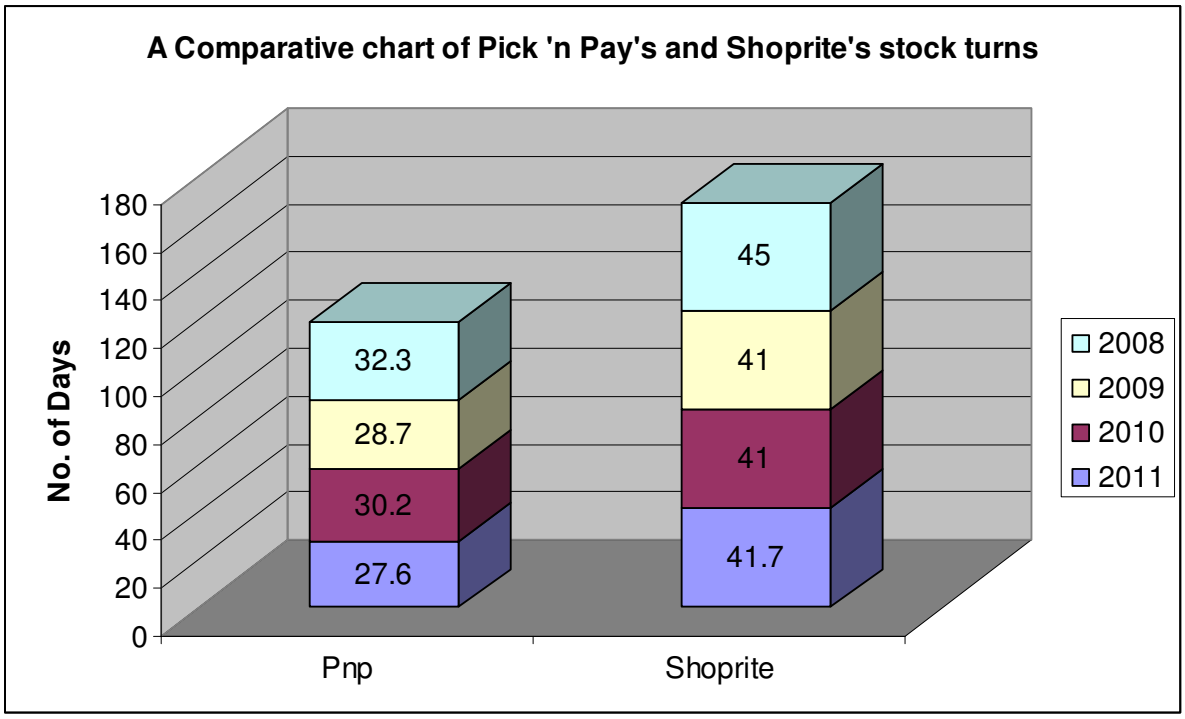
6.4.5 Decision Making

Decision making at Pick 'n Pay is predominantly a head office function. They manage the selection and evaluation of suppliers, negotiate terms of trade, manage supplier relationships, and the payment of suppliers. This is to ensure that all stores stock the same quality merchandise from an accredited supply base. Pick 'n Pay's head office control the reordering of stock, leaving the store managers with limited decision making capacity in this regard. They have a 2-3 week capping on stock orders to keep stock holding down. The capping is increased by head office during seasons such as Christmas or Easter. As mentioned in section 6.4.2.3, store managers have the authorization to lift the capping during promotions or seasonal fluctuations. SAP technology enables visibility throughout the organisation which facilitates centralized decision making processes and better overall controls. Pick 'n Pay's supply chain management takes place at Head Office level. Store managers felt they did not hear much about it.

6.4.6 Time Compression

SAP creates visibility throughout an organisation. As a result, Pick 'n Pay are able to monitor stock movements closely, minimize stock holding and increase stock turns. As seen in table 6.2, Pick 'n Pay's stock turns have improved considerably over the last 4 years. Below is a comparative graph of stock turns between Pick 'n Pay and Shoprite that have been taken from the respective company annual financial statements.

Fig 6.20 **A comparative chart of Pick 'n Pay's and Shoprite's stock turns**



Pick 'n Pay are turning their stock every 27.6 days, which is almost half of Shoprite's 41.7 days. Pick 'n Pay's competitive advantage on their stock turns enables them to bring new products to the market quicker than their competitors, and respond to changing market needs more readily. Quicker flows incur fewer costs, improving Pick 'n Pay's relationships with customers by offering them better value for money.

6.4.7 Customer Relationship Management (CRM)

As discussed in section 3.6, CRM is frequent contact with customers in order to develop customer relationship strategies to meet delivery dates, customer requirements and resolve customer complaints. Pick 'n Pay's customer relationship management approach is that customer is queen. Their core customer offering is

product availability and tailored assortments. It is convenience shopping by offering a 'one- stop-shop'. Their cashiers are the first and last line of contact as it is often only them that meet and greet the customers. The managers are encouraged to stand at the front of the store to greet the customers that arrive. The shop floor is laid out to maximize customer experience and profits. For example, shelves are not too close to each other and products are placed in the store to maximize store traffic.

Pick 'n Pay's PR Manager stated:

> *"It is vital to interact with customers, understand their needs and wants, and have friendly and helpful staff with product knowledge."*

The vital services that Pick 'n Pay offer their customers are:

Pre-sales services – reasonable parking area, customer friendly internet 'online shopping' domain, meet and greeting customers, trolleys that are clean and work well, clear landing and store has good look and feel;

Sales service - meet and greeting at the door, help finding products, technical knowledge and pricing, offering a reasonable product range and merchandise that can be easily found, offering gift cards for refunds when a customer doesn't have a till slip, show the correct and affordable product pricing, ease of movement around the store, and friendly cashiers. Additional services offered to Pick 'n Pay customers for convenience are paying telephone and lights accounts, fines and drawing cash at the tellers.

After-sales service – giving a rain cheque to customers when there's a stockout, and the customer is phoned when stock arrives, informing customers of the 14 day return policy, handing out gift cards to unhappy customers, and obtaining customer feedback from the 'Hellopeter.com' website where customers can write to give feedback. According to the PR Manager,

> *"Pick 'n Pay use the feedback from Hellopeter.com for self-improvement."*

Customers are key to Pick 'n Pay, and therefore managing customer relationships is a core function. Being able to respond quickly to a customer's needs can be critical. The loss of 1 loyal customer whose average monthly spend is R2000 per month is worth (R2000 x 12 x 10) = R240 000 over a 10 year period. According to the respondents, Pick 'n Pay does not have Quick Response (QR) processes in place and they confirm that QR depends on the supplier. Suppliers are required to respond within 24 hours.

Customers seek value for their money and product quality is a key attribute that customers look for. Pick 'n Pay have quality accreditation specifications for their suppliers and themselves to adhere to, however, the respondents were not familiar with the term 'total quality management' (TQM). The TQM approach ensures that quality is built into the product at each stage of the supply chain. The respondents did not comment in this regard.

The management of Pick 'n Pay's supply chain requires building loyalty relationships with fewer suppliers who can collaborate with Pick 'n Pay on TQM, controlling the movement of merchandise to stores, decision making based on real-time information, compressing time and speeding products to market with optimised processes and effective customer relationship management. As supply chain management develops, so do different trends. These trends will be discussed below.

6.4.8 The Supply Chain Management trends within Pick 'n Pay Corporate Stores, KwaZulu-Natal

According to Business Day, "12 Green initiatives have been implemented within the grocery division" (Business Day, A winning hand, online, para 8). These initiatives focus on reducing Pick 'n Pay's carbon footprint, monitoring water and energy management, the physical materials used for building Pick 'n Pay's distribution centres. Pick 'n Pay are going to reduce their carbon footprint by reducing their truck fleet that travels between distribution centres and stores by 40, to 100 trucks. In addition, Pick 'n Pay have a corporate branded "Green" merchandise range (Pick

'n Pay's Integrated Annual report, 2011, p19). The green range products are endorsed by 'The Department of Environment and Tourism's Indalo Yethu Initiative'.

6.4.9 The Supply Chain Management influence within Pick 'n Pay Corporate Stores, KwaZulu-Natal

With the insertion of Distribution Centres, Pick 'n Pay's Nick Badminton states that, "the most significant benefits of centralized distribution have included the improved availability of stock, lower prices and a streamlined ordering process which has freed up our store staff to spend more of their time concentrating on shopper engagement" (Pick 'n Pay website, Supply Chain, Longmeadow Distribution Centre, 2011, [online], para 5).

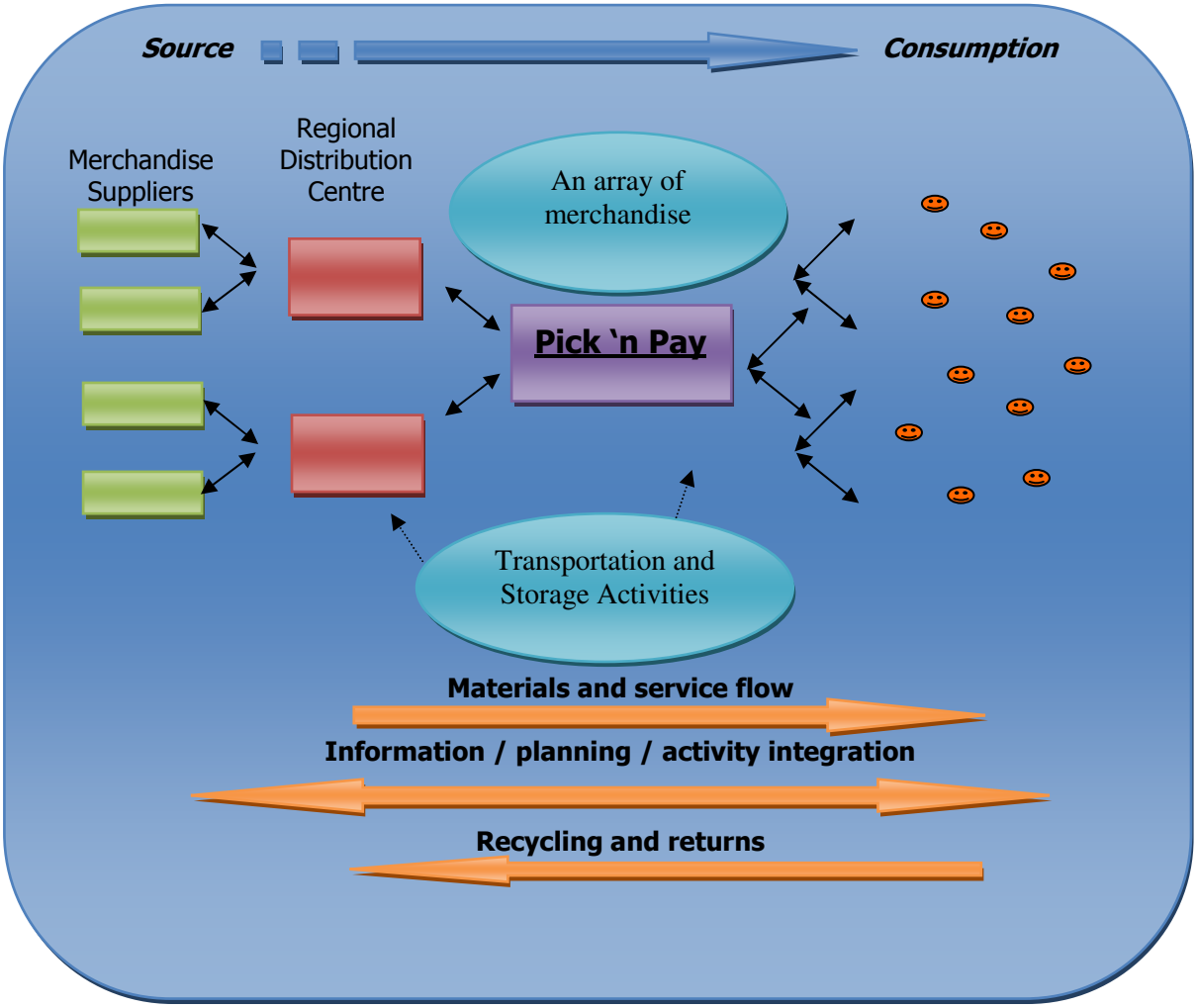
The SCM influence in the food and drug retail sector is prevalent and the competitive pressure is on retailers to get on board, especially with Walmart making its way to South Africa. As global competitive pressures rise, supply chains seek to compress time in order to speed their products to market.

With SAP technology, supply chain visibility enables the effective monitoring on stock movement and fast and more accurate decision making. As a result, Pick 'n Pay have decreased the number of days their stock turns, resulting higher profits.

6.4.10 An illustration of Pick 'n Pay's Supply Chain within South Africa

Pick 'n Pay in KwaZulu-Natal is comprised of 1 distribution centre that supplies all fresh fruit and vegetables. The merchandise flows between the distribution centres and the Corporate stores is automated and run by SAP. Each Corporate store has between 170 and 200 direct suppliers which result in regular stock-outs. A large number of orders are done manually through fax and telephone which leaves room for human error and ineffective response rates. Pick 'n Pay have centralized buying in order to ensure merchandise quality and maximize buying power. They will be centralizing vendor deliveries to their distribution centres to improve product availability and reliability. Below is an illustration of Pick 'n Pay's food and drug retail chain's current supply network information flows.

Fig 6.21 **An Illustration of Pick 'n Pay's supply chain**



Source: Adapted from Wisner *et al*, 2005, p6

BIS and SCM work hand in hand to build an optimally efficient organisational environment, however they do not come without challenges.

6.4.11 The challenges and constraints between Business Information System enablers and Supply Chain Management needs

Pick 'n Pay face challenges and constraints between BIS enablers and SCM needs in their receiving, as a result of legislation, employee absenteeism, operations, suppliers, shipping and limitations.

Receiving - The deadline on deliveries is not always met by suppliers. As a result, the SAP system forces the product to be returned to the supplier, leaving Pick 'n Pay

with stockouts. In addition, not all receiving processes are fully SAP functional, leaving room for manual recovery processes and human error. Furthermore, network connectivity problems occur from time to time resulting in delays in recording stock movements. Shrinkage needs to be manually adjusted on the system, however, sometimes stock is in storage, but employees have not found it.

Legislation - The competitive commission in South Africa prohibits complete vertical integration in the large retail chains. This is due to the fact that the development of smaller, local businesses is important and they do not want a monopoly developing in these chains.

Employees – When cashiers are sick, it is difficult to open tills, resulting in long customer queues.

Operations - A store manager stated that:

> *"JIT does not work here, we often experience stockouts, absentees and shrinkage."*

Despite regular stock counts, shrinkage still remains to be a material problem at Pick 'n Pay Stores. According to the national supply chain manager:

> *"Shrinkage can be as much as 1.5% of total annual turnover."*

The total annual turnover in Pick 'n Pay's 2011 Integrated Annual Reports is reflected as: (R51 945 800 000 x 0.015) = R779 187 000 shrinkage throughout stores in South Africa. While RFID tagging would reduce shrinkage considerably, participants stated that it would be too expensive to implement at store-level. In addition, Pick 'n Pay, receive fruit and vegetables daily and there is a lot of waste.

Pick 'n Pay are not making full use of their technology at present and they are not using it effectively enough. Pick 'n Pay are still doing paperwork in the cash office where they send information on sales and data daily to Head Office. Furthermore,

there is one computer in the store, which risks information integrity and confidentiality. For example, confidential information such as staff wages are run through SAP and are vulnerable to being accessed on the computer by anyone that uses it. Furthermore, store managers regularly have to wait for access to the computer which wastes time and affects productivity. Store managers assert that having a dedicated laptop would sort these problems out. Load-shedding used to be a problem, but stores have been fitted with uninterrupted power supplies (UPSs).

Suppliers - Some of the foremost challenges Pick 'n Pay faces in their supply chain are ongoing stock-outs. These are mostly domestic suppliers with a strike rate of half-stock 50. Suppliers have time-slots within which they must deliver goods. If these time-slots are missed, it can result in bottlenecking and head office is required to follow up. Returns are seldom an issue. Sometimes the supplier is out of stock. Pick 'n Pay run internet-based supplier portals, and sometimes stock requests are not confirmed by suppliers and need to be chased up by head office. Pick 'n Pay experience difficulty when Telkom lines are down as most of their orders are faxed through to suppliers.

Shipping – There are regular delays in Durban Harbour causing delays on the shipment of exported goods.

Limitations - Participants of the study were not aware of any limitations SCM has on BIS.

6.5 Summary

SAP technology, together with Pick 'n Pay's plug-in commercial software packages, provide a comprehensive solution to their SCM requirements. Pick 'n Pay do not use their technology to facilitate strategic relationships with the majority of their suppliers, as the competition commission have enforced policies that inhibited trust relationships and information flows. The development of Pick 'n Pay's DCs are reducing stock inconsistencies and improving stock turns. Pick 'n Pay have taken substantial steps towards optimising their operations in the DCs, receiving, in-store operations, decision making, time-compression and customer relationship management. As a result, strengths in the management of their supply chain are their merchandising, product availability, quality goods, fresh produce and customer service.

CHAPTER 7

SUMMARY, CAVEATS, RECOMMENDATIONS, AREAS FOR FURTHER RESEARCH AND CONCLUSION

7.1 Introduction

BIS is the leveraging technology for effective and efficient SCM. In the absence of BIS, SCM is little more than a management theory as seen in the literature review. The findings in the empirical research correlate with the body of knowledge in the literature review with SAP R/3 being Pick 'n Pay's SCM leveraging technology. As per the statement of the research problem (1.2), this exploratory and descriptive research was two-fold. Firstly, it set out to identify the relationship between BIS and SCM within the food and drug retail sector and more specifically within Pick 'n Pay Corporate stores in KwaZulu-Natal. Secondly, to establish how BIS could be used to make SCM efficient and effective within this sector.

7.2 The Relationship between BIS and SCM at Pick 'n Pay Corporate Stores in KwaZulu-Natal

Pick 'n Pay required enterprise resource planning BIS technology such as SAP R/3 to support a complex business environment. The technology selected needed to be a technological fit with Pick 'n Pay's infrastructure. SAP R/3 provides a software platform that integrates all process, information and merchandise flows between Pick 'n Pay's distribution centres, KZN Corporate Stores and customers. SAP R/3 monitors and controls the movement of millions of stock items at any given point in time with automated replenishment capabilities between DCs and Corporate stores. The automated replenishment improved stock controls, reduced stock holding and increased the number of stock turns per month. It reduced stock loss, shrinkage, waste and obsolescence and sped new products to the market. SAP R/3 also controls and automates the updating of electronic shelf labels. This replaces the time-consuming task of manual updates and checks. SAP R/3 has brought Pick 'n Pay into the global competitive market with world-class BIS capabilities that will require ongoing technological support / staff development.

A fundamental reason SAP R/3 was selected was that it customizes to business environments and has plug-in capabilities. Pick 'n Pay has a number of commercial software packages that they wanted to integrate with SAP R/3, and have done so successfully.

SAP R/3 facilitates strategic management by giving real-time information to Pick 'n Pay's Head Office and National Managers. They have real-time access to store performance data in order to make timely and accurate decisions. The seamless information flows create visibility throughout the organisation, enabling the centralization of the purchasing function. This gives Pick 'n Pay purchasing power and enables them to control the quality of merchandise entering all their Corporate stores. Visibility also improves supply chain partnerships, Pick 'n Pay's demand planning and their response rate to changes in the marketplace and monitoring the bottom line. SAP R/3 enables Pick 'n Pay to monitor supplier performance on delivery, reliability, capacity, and quality. Even though Pick 'n Pay are not connected seamlessly to the vast majority of their suppliers, vendors do manage the inventory in-store. The visibility that comes with SAP R/3 technology now penetrates the customer base. Pick 'n Pay offer a 'smart card' for customers to inspire customer loyalty and understand customer preferences. Pick 'n Pay also make extensive use of internet technology to navigate demand through online orders and respond effectively to customer feedback. Pick 'n Pay are in a better position to respond to changing market-scapes and rising competitive pressures when they have speedy access to reliable and accurate information outputs. The elements of this relationship are reviewed below in terms of how Pick 'n Pay's BIS technology makes their SCM work efficiently and effectively.

7.3 How Pick 'n Pay's BIS technology makes their SCM efficient and effective

As mentioned above, SAP R/3 provides a software platform that integrates all process, information and merchandise flows between Pick 'n Pay's distribution centres, KZN Corporate Stores and customers. This integration makes Pick 'n Pay's SCM more efficient and effective in cross-optimising store operations, enabling Pick 'n Pay economies of scale that they would not gain in optimising separate functions. SAP R/3 Pick 'n Pay's manages access to monitoring real-time merchandise flows by

reducing stock outs, over stocking and waste or obsolescence. Centralised functions take on a strategic significance by being managed from head office. Visibility throughout the supply also gives Pick 'n Pay the ability to respond to external competitive pressures effectively and steer the entire retail chain in a given direction.

7.4 Challenges and Constraints providing areas for Further Research

Today, large BIS technological systems require ongoing upgrades and staff training as BIS changes in the market place, and as the organisational environment changes. This moves Pick 'n Pay from a static to a dynamic retail chain environment. However, with the competition commission in South Africa clipping the retail chain's wings in order to avoid the development of monopolies, vertical integration will remain limited. Pick 'n Pay are also aware of fuel and food inflation (Pick 'n Pay's Integrated Annual Report, 2011, p11). As a result, they have tried to keep prices as competitive as possible. Another external challenge was the congestion of export shipping containers at Durban Harbour. This impacts 30% of Pick 'n Pay's merchandise flows and hinders their ability to serve the international marketplace.

Pick 'n Pay currently has too many suppliers. They maintain traditional trading relationships with virtually no loyalty, leaving either party expendable. This limits integration and co-operation with suppliers, and reduces the economies of scale that could otherwise be gained through collaboration. It also renders Pick 'n Pay's influence over product quality to be far less effective and entirely reliant on accreditation specifications. Pick 'n Pay are also disconnected from the returned goods process, leaving the response rate entirely in the supplier's hands. Pick 'n Pay's many suppliers have been renowned for stock-outs, late deliveries and miscounted stock, thus resulting in opportunity costs for Pick 'n Pay. Pick 'n Pay's movement to DCs has resulted in substantial improvements to product availability and reliability.

With all supply chain decision making at head office, SCM is a head office function that the store managers have limited knowledge about. There was also a noted

disparity in BIS and SCM knowledge from the lowest to the highest management levels, which are likely to affect their ability to contribute the SC efficiency.

7.5 Summary

The adoption of SAP R/3 technology has carried Pick 'n Pay into the global marketplace. It has given them world-class retailing capabilities and will aid Pick 'n Pay in fighting for retail leadership in South Africa. The competition commission does not allow complete vertical integration as these companies need to give back into the communities from which they do business by supporting local wholesalers and farmers. In contrast global retail chains such as Tescos, Walmart and ASDA stores are not restricted in their vertical integration. This leaves Pick 'n Pay at a disadvantage globally because this facilitates seamless structures that are far more responsive to the market, low-cost with competitive pricing.

Pick 'n Pay is committed to improving their productivity and business efficiency (Pick 'n Pay's Integrated Annual Report, 2011, p28). These improvements can be seen in their stock turns obtained from the financial statement. Pick 'n Pay have benchmarked themselves against the global retailer Tescos and have realised substantial steps towards creating an optimally efficient environment.

7.6 Recommendations

- It is recommended that store managers gain a complete understanding of their individual contributions to the supply chain. This is likely to give the head office their desired results.
- Twenty-two store managers are limited to one computer in stores. It would be recommended that store managers have hand-held pilots which enable them to receive emails, contact suppliers direct and review stock movements and be mobile (refer to section 6.4.11).
- RFID tagging adds substantial benefits in curbing shrinkage, enables product traceability and builds accountability throughout a supply chain. It would not, however, be feasible for Pick 'n Pay to implement as an isolated supply chain partner, irrespective of their shrinkage, as the products move rapidly through their stores. It would however be recommended that Pick 'n Pay

liaise with their supply partners to evaluate the feasibility of RFID tagging be implemented at the source with shared accountability and costs. This will not only correlate with international standards, but build supply chain accountability and traceability that would facilitate product flows and recall processes. It would also enable the supply chain to go green by building accountability in the disposal of products throughout the supply chain.

- Pick 'n Pay's supply chain displays adversarial, fragmented relationships with multiple suppliers where each partner within the chain is competing for the lion's share of profits. Shared information is limited and loyalty and trust seem to be sparse. In order for supply chain management to be effective within Pick 'n Pay so that they can benefit from economics of scale in such a manner that individual organisations can not compete with, they need to reduce their supplier base and build a few loyalty and trust relationships. Global competitive dynamics have moved away from adversarial partnerships, and as global dynamics infiltrate Pick 'n Pay's market space, they may need to review their approach.

7.7 Caveats/limitations

- A non probability sample was taken and for that reason the findings cannot be extrapolated to the general industry. Apart from this limitation, it was encouraging that an 88% response rate was achieved within the sample.
- If all the food and drug retail chains within KwaZulu-Natal had been included in this study, it would have produced results with a higher level of accuracy. In addition, these results may or may not be used in other industries.
- In this research, various challenges and issues were identified that could not be examined. This would require further research. Furthermore, not all of the challenges discussed could be linked to SCM and BIS.
- "In verbal and written communication and in human observation there is the risk of subjectivity which may lead to bias results" (Martin *et al*, 1999, p124).
- The researcher did not manage to interview a 'buyer' at the KwaZulu-Natal regional office.

7.8 Recommendations for Further Research

Further research is recommended in determining the viability of rolling out RFID tagging throughout Pick 'n Pay's supply chain, first to determine the viability of giving store managers hand-held pilots to make their work flows efficient, and second to determine whether training store managers on their contribution to the complete supply chain would benefit Pick 'n Pay.

7.9 Conclusion

SAP R/3 is producing its promised results for Pick 'n Pay. Its BIS architecture aligns with the Pick 'n Pay organisational environment and Pick 'n Pay are ahead of its competitors on stock turns. Pick 'n Pay have also set targets to move towards optimum efficiency with their supply chain activities. There is little doubt that Pick 'n Pay have every intention of regaining market leadership in South Africa.

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INTERVIEWS

1. Interview with Leanne Mounter, a specialist in BIS, from Antinomy, a company that specializes in meeting the design, development, and implementation of business information technology needs in organisations.
2. Interview with 3 of Pick 'n Pay's Corporate Stores within the KwaZulu-Natal region.
3. Interview with 3 of Pick 'n Pay's KwaZulu-Natal Regional Managers.
4. Interview with Pick 'n Pay's Supply Chain National Manager.

INTERVIEW GUIDE

DATE: _____

COMPANY: _____

PERSON INTERVIEWED: _____

CAPACITY: _____

1.1 COMPANY PROFILE

- What category does your store fit into?

Family Store	
Head Office	
Hypermarket	
Supermarket	
(Other)	

- What are the total number of employees at this store? _____
- Do you have quality accreditations?

Yes ☐ No ☐

- If yes, which quality accreditations do you have? _____
  _____
  _____
  _____
- What market share percentage of the South African market does Pick 'n Pay hold? _____

2.1 BUSINESS INFORMATION SYSTEMS

- What are the criteria you use in selecting business information technology for various functions within your business? _____
  _____
  _____
  _____
  Question simplified as: What are most important aspects you will look at when choosing business information technology?

a. Does the composition of data required determine it;
Question simplified as: Will the type of data, which are the building blocks for information, affect your choice?

Yes ☐ No ☐

b. Do you match technology with information needs?
Question simplified as: Will the type of data, which are the building blocks for information, affect your choice?

Yes ☐ No ☐

c. Are you influenced by supply chain member's technology i.e
Question simplified as: Does a prospective supplier's information systems have any sway on your decision to partner with them?

Yes ☐ No ☐

- What business information system technology software programmes do Pick 'n Pay make use of for the following supply chain business functions? Please note if you utilize any home grown business information systems (i.e. personal production scheduling system), or make use of specific software programmes?

Demand Forecasting	
- CPFR	
Purchasing	
Transportation (Inbound/Outbound)	
Operations	
- Receiving	
- Warehousing	
- Store Layout	
- Just-in-time	
- Total Quality Management	
- Quick Response	
Distribution	
Customer Relationship Management	
Other	

- Do you have a department dedicated to business information systems?

Yes ☐ No ☐

- If yes, how long has this department been in existence? _____

- How long have you been using this software, and does technological advancement demand regular upgrades/changes to this software? _____

  _____
  _____
  _____
  _____

  Does this affect your supplier's software? Yes ☐ No ☐

- If yes, how?

  _____
  _____
  _____
  _____
  _____
  _____
  _____

- What impact does technology upgrades/changes have on your employees?

  _____
  _____
  _____
  _____
  _____

- Do they have a positive or negative perception of technology in their work environment?

  Yes ☐ No ☐

  Why?

  _____
  _____
  _____

- How do you forecast your demand? _____

  _____
  _____
  _____

- Do you make use of a Collaborative Planning, Forecasting and Replenishment (CPFR) system? (CPFR is a web-based collaboration tool for sharing and combining the sales forecasts of Pick 'n Pay and its major trade partners)

  Yes ☐ No ☐

- Do you feel that information is a critical asset to performance management?
  Question simplified as: Do you feel that having access to information is critical in managing the performance of your store?

  _____
  _____
  _____

- What is the value of real-time information to your organisation?
  Question simplified as: How valuable is it to your organisation in getting information without delay?

  _____
  _____
  _____
  _____

- What is the impact information flows have had on the bottom line?
  Question simplified as: What impact does information flows have on your ability to make money?

  _____
  _____
  _____

- What are some of the foremost challenges Pick 'n Pay faces with their business information systems? _____
  _____
  _____
  _____

- General Comments
  _____
  _____
  _____
  _____
  _____

3.1 SUPPLY CHAIN MANAGEMENT

- What supply chain approaches so Pick 'n Pay adopt?

Just-in-time	
Total quality Management	
Quick Response	
Collaborative planning	
(Other)	

- Do you have a department dedicated specifically to the supply chain function?

  Yes ☐ No ☐

- If yes, how long has this department been in existence? _____

- What is your total number of suppliers? _____

- How many are domestic/international?

  International ☐ Domestic ☐

- What is the extent of collaboration with your suppliers? (collaborative/ partnership/traditional)

  _____
  _____
  _____

- How do you evaluate your suppliers? (Please rate these criteria in terms of level of importance – 1 = not important, 7 = very important)

Criteria	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Information systems							
Product/service quality							
Reliability/dependability							
Location							
Capacity							
Performance							

- What are some of the foremost challenges Pick 'n Pay faces with their supply chain management? _____
  _____
  _____
  _____

- Is your inventory supplier managed or self-managed? _____
  _____
  _____
  _____

- What effect/influence has supply chain management had on Pick 'n Pay? ___
  _____
  _____
  _____

- How fast would you say SCM is evolving in the food and drug retail sector?
  _____
  _____
  _____

- Are there areas where business information systems bring limitations to the supply chain function? _____
  _____
  _____
  _____
  _____

- Are there areas where supply chain limits your business information systems?
  _____
  _____
  _____

- Are there any unique effects that business information systems and supply chain management have on one another in Pick 'n Pay's retail environment?
  _____
  _____
  _____
  _____

- Do Pick 'n Pay measure their BIS and SCM effectiveness?

  Yes ☐ No ☐

- If Yes, what are these measures and where have you placed these in the supply chain? _____
  _____
  _____
  _____

- Do Pick 'n Pay benchmark their supply chain processes and standards against other retailers?

  Yes ☐ No ☐

- If yes, what areas have Pick 'n Pay focused on? _____
  _____
  _____
  _____

- What would you say Pick 'n Pay's strengths are in the management of their supply chain? _____

_____
_____
_____

- What is your CRM strategy/approach? _____
  _____
  _____
  _____

- What customer services do you feel are vital? _____
  _____
  _____
  (pre-sales service, sales service and after sales service)

- Please can you briefly illustrate your supply chain in the box below?

- Is there anything else that you think would be helpful for me to know for the purposes of this research? _____
  _____
  _____
  _____

3.2 GENERAL

- "The global economy demands new structures, new management styles and new approaches to harnessing innovation". Do you feel that SCM and BIS have played a primary role in reforming the business environment, enabling business to take critical steps forward in business methods and all-round competitiveness? Please explain your answer._____
  _____
  _____
  _____

- Have BIS and SCM played a primary role in Pick 'n Pay gaining their retail leadership profile?

  Yes ☐ No ☐

- In your opinion, how can BIS be used to make SCM more effective within this sector? _____
  _____
  _____
  _____
  _____

- SCM is the collective undertaking of channel partners to create a seamless value-added network through the integration of technological resources, human resources, and the flow of information and materials. How does BIS and SCM facilitate strategic relationships between suppliers and markets within Pick 'n Pay's supply chain? _____
  _____
  _____
  _____

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17 May 2012

Ms C Ahern 200297939
School of Management, IT and Governance

Dear Ms Ahern

PROTOCOL REFERENCE NUMBER: HSS/0978/010M
PROJECT TITLE: A critical analysis of the relationship between business information system technology and supply chain management with special reference to optimum efficiency within large enterprises in the food and drug retail sector in KwaZulu-Natal

In response to your application dated 3 September 2010, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL.**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number. Please note: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....
Professor Steven Collings (Chair)
Humanities & Social Science Research Ethics Committee

cc Supervisor Professor C O'Neill
cc Professor B McArthur
cc Ms Deborah Cunynghame