FACTORS AFFECTING SUPPLY CHAIN INTEGRATION IN PUBLIC HOSPITAL PHARMACIES IN KENYA

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DECLARATION

I hereby declare that the work contained in this thesis is my original work and has not been previously in its entirety or in part submitted at any other university or institution for a degree. All references in the text have been duly acknowledged.

Signed -- ------------------------------

George Michugu Kamau Date

DEDICATION

This thesis is dedicated to my late dear mother, Dorcas Wanjiru Kamau, who taught me the value of hard work, for her dedication and love for education. She taught me to be rigorous, creative and dynamic in the ways I approach life. Her steadfast encouragement and support, despite all odds, moulded into me, who I am today. “I am sure you are broadly smiling from heaven on this great academic achievement.”

To my sons, Ian Kamau and Collins Ngatha, I am proud of you and wish you the best in life. I pray for you and encourage you to pursue your dreams no matter what form they take. May God guide you in the selection and pursuit of your dreams.

To Anne, my wife, I truly appreciate your unconditional love and support during the long and strenuous hours throughout this academic journey.

Lastly, to my dad, Edward Kamau Waitathu, thank you for your prayers and encouragement.

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In addition, I would like to extend special thanks to Prof Cecil A. Arnolds, whom I consider an honour and a privilege to have as my co-supervisor. I acknowledge the valuable advice, support and inspiration he provided during the entire research project.

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ABSTRACT

The purpose of this study was to develop and empirically test the Supply Chain Integration Framework (SCI framework) in order to develop a framework to address the inefficiencies experienced in the public hospital pharmacies' Supply Chain (SC) in Kenya. Supply Chain Management (SCM) can be regarded as a vibrant business entity that is changing and evolving continually because of constant changes in technology, competition and customer demands.

The study investigated and analysed how the independent variables, namely SCI initiatives, performance improvement drivers, organisation environmental forces, workforce and management support, financial factors, flow and integration, regulatory framework and information sharing and technology influenced the SCI. The SCI was categorised into three components namely: customer order fulfilment, supplier collaboration and dedicated SC as the dependent variable. The literature reviewed established that globalisation and intensive worldwide competition, alongside technological developments, creates a completely new operating environment for organisations.

The researcher reviewed various models and theories related to SCI which include systems theory, value chain models and value ecology models among others. An SCI framework was then developed to capture the interacting variables within the SCI network that could be adopted for the public hospital pharmacies in Kenya.

The study was conducted using a survey questionnaire (Annexure B) that comprised both open and closed ended questions that were distributed to managers in public hospitals and pharmacies in Kenya. The population for the survey was 154 public hospital pharmacies in Kenya, with the final sample comprised of 280 respondents.

The study was conducted using a survey questionnaire (Annexure B) that comprised both open and closed ended questions that were distributed to 325 respondents in 154 public hospitals and pharmacies in Kenya. The population for the survey was 154 public hospital pharmacies in Kenya, with the final sample comprised of 280 respondents. Exploratory factor analysis was used to ascertain the validity of the measuring instrument and the Cronbach alpha coefficients were used to measure the reliability of the measuring instruments.

Key preliminary tests performed were the Kaiser-Meyer-Olkin test (KMO test) of sample adequacy, the Bartlett’s test of sphericity and the Kolmogorov-Smirnov test (Z-Statistic test) for normality and multi-collinearity diagnostic. Analysis of Variance (ANOVA) and multiple linear regressions were the main statistical procedures used to test the regression model fit and the significance of the relationships hypothesised among various variables in the study. Statistical softwares, namely Statistica 10 (2010) and Statistical Package for Social Sciences (SPSS) Version 18, were used to analyse quantitative data.

The study identified five statistically significant relationships between customer order fulfilment and workforce and management support, financial factors, flow and integration, information sharing and technology, supplier collaborations and dedicated SCI. In addition, a total of six statistically significant relationships exist between the supplier collaborations and SCI initiatives i.e. performance improvement drivers, workforce and management support, financial factors, flow and integration, information sharing and technology adoption as well as dedicated SCI. Furthermore, four statistically significant relationships were found between dedicated SCI and SCI initiatives, workforce and management support, financial factors, flow and integration, information sharing and technology adoption.

KEY WORDS: Supply chain, supply chain integration, supply chain management, public hospital pharmacies, customer order fulfilment and supplier collaborations.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

CHAK	Catholic Health Association of Kenya;
ERP	Enterprise Resource Planning;
FBHs	Faith Based Healthcare facilities;
GIS	Geographic Information System;
GOK	Government of Kenya;
GPS	Global Positioning System;
KEMSA	Kenya Medical Supplies Authority;
KES	Kenya Shilling;
KNH/UON ERC	Kenyatta National Hospital/University of Nairobi Ethical and Research Committee
KPA	Kenya Pharmaceutical Association;
MEDS	Mission for Essential Drugs and Supplies;
MOH	Ministry of Health;
MOMS	Ministry of Medical Services;
MOPHS	Ministry of Public Health and Sanitation;
NMMU	Nelson Mandela Metropolitan University;
PPB	Pharmacy and Poisons Board;
RFID	Radio Frequency Identification;
NMMU RTI	NMMU Faculty Research Technology and Innovation Committee
SC	Supply Chain;
SCI	Supply Chain Integration; and
SCM	Supply Chain Management.

CHAPTER ONE

INTRODUCTION AND BACKGROUND TO THE RESEARCH

1.1 INTRODUCTION

The environment in which businesses operate in the twenty-first century is highly influenced by the fast changing technological developments. Technology has transformed all spheres of businesses resulting in faster communication, information and resource sharing, online tracking of products, shorter product life cycles, increased focus on product and process innovation and as a result, intense global competition.

The resultant global competitive landscape has forced organisations, both in the public and private sectors, to proactively design innovative ways to gain a competitive edge or improve service delivery. In this business environment, an organisation's competitive advantage is dependent on efficiency and productivity across functional areas within the organisation as well as that of its upstream suppliers and downstream distribution networks (Manzini, Accorsi and Bortolini, 2014). Globalisation, aided by intensive adoption of Information Technology (IT) has opened up the operating environment, forcing players within the global market to continuously seek better ways to satisfy the final consumer through excellent performance (Saldanha, Mello, Knemeyer. and Vijayaraghavan, 2014).

The performance of businesses within this volatile market place is gauged on how well they deliver the right product, in the right place, at the right time and at the right price. However, the resources required to meet and exceed customer expectations are often difficult to marshal and maintain by a single organisation. It is therefore, essential for organisations to collaborate and leverage complementary core resource proficiencies through partnership-based co-ordination (Rese, 2006).

Globalisation has also changed the way organisations deliver customer satisfaction, since this is increasingly dependent on factors beyond its sphere of control. The function of manufacturing organisations has changed from supplying domestic markets to supplying international markets through a broader network based on global partnerships and collaboration pegged on shared goals.

In order for SCs to be successful in the eyes of the consumer, they must have seamless connections from raw material supplier, to manufacturer, to distributor through to the final consumer. This calls for process integration and efficient Supply Chain Management (SCM) throughout the value chain.

Williamson, Harrison and Jordan, (2004: 375) defined supply chain management as *“the management of interconnected parts of the organisation, which relate to each other and to upstream and downstream processes that produce value in the form of product and service to the ultimate customer.*”

This definition indicates that for an organisation to be seen as responsive to the customer needs, it should do much more than offer timely delivery of a good quality product or service. Since it depends on others across the supply chain, it is essential that the organisation collaborates and integrates functions and processes with SC partners as a way to jointly gain competitive advantage or improve customer experiences.

SC integration links an organisation with its customers, suppliers and other channel members by integrating their relationships, activities, functions, processes, systems and physical infrastructure (Bode and Wagner, 2015). This integration supports the current business shift from the conventional relationship to cooperative, long-term business partnerships and strategic alliances (Morash and Clinton 1997; Adabi and Omrani, 2015). As a result, the final customers benefit from SCI through lower prices and better product choices, when and where such final product is needed.

In this chapter, the researcher presents the preliminary information on the study. The study is placed into context by providing an introduction and a background to the study as well as clarification of concepts used. The researcher also presents the problem statement, research problem as well as research questions and objectives. The other sections in this chapter cover the research methodology, the structure of the research, summary and conclusions.

1.2 TERMINOLOGY

The aim of this section is to provide an overview of the concepts and terms used in this research study. It is important to note from the onset that in the interpretation of SC, SCM and SCI many concepts and approaches exist in academic literature and no sufficiently cohesive definition is available for these terms. Figure 1.1 presents the key SCM concepts used in the study.

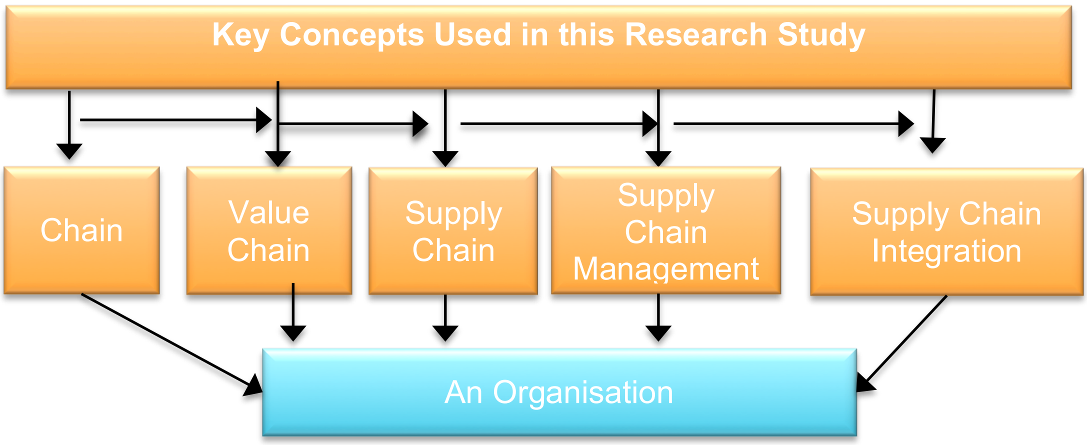

Figure 1.1: Key concepts used in the study

Source: Researcher's own construct

These concepts are highlighted and discussed in detail in the sections that follow. They are briefly introduced here to clarify concepts in light of the discussion on healthcare SCM.

⇒ **An Organisation;** a company, business firm, manufacturing entity, private and public entity and for-profit and not-for-profit entity.

⇒ **A Chain:** organisations (or individuals) that interact to supply goods and services in a collaborative and sequential manner.

⇒ **Value Chain:** a series of activities that a business organisation performs to achieve its goal(s) at various stages of its production processes.

⇒ **Supply Chain:** inter-firm cooperation in all logistics and processes, as well as all activities involved in creating, generating and delivering a final product or service, from the supplier's supplier to the customer's customer.

⇒ **Supply Chain Management:** a set of processes employed to efficiently integrate suppliers, manufacturers, warehouses and stores, so that merchandise is produced and distributed at the right quantity, to the right locations and at the right time, in order to diminish system wide costs while satisfying customer needs.

⇒ **Supply Chain Integration:** an approach aimed at improving performance to create seamless linkages between activities, processes, departments and functions within an SC to optimise customer order fulfilment.

1.3 BACKGROUND TO THE RESEARCH

The objective of this research is to determine the SCI factors and understand their impact on supplier collaboration and customer order fulfilment in public hospital pharmacies in Kenya.

Over the past twenty years, academics and practitioners have developed an increased interest in Supply Chain (SC), Supply Chain Management (SCM) and Supply Chain Integration (SCI). As a result of this new body of knowledge, practitioners are using SC, SCM and SCI in order to reduce operational costs and to significantly improve customer service in a globally competitive business environment in order to improve the competitive position of their organisations. In addition, practitioners have been using SCM and SCI to minimise inefficiencies in their management processes (Basu and Wright, 2008).

Lambert, Cooper and Pagh, (1998a: 1) define SCM as the "*integration of* *business processes from end user through original suppliers that provides products, services and information that add value for customers*. "This definition emphasises integration of process and task. Handfield and Nichols (2002: 8), further expand on this perspective and describe SCM as "*the integration and management of SC organisations and activities through cooperative organisational relationships, effective business processes and high levels of information sharing to create high-performing value systems that provide member organisations a sustainable competitive advantage*." It is therefore clear that a single coordinated and streamlined effort is needed to provide full value to the end customer.

For organisations to effectively compete in today's global market that is electronically connected and dynamic in nature, they must work hard to increase their organisational competitiveness. There is an urgent need to improve their agility level with the intention of being flexible and receptive to the changing business environment (Anatan, 2006). One salient feature of current business environment is that it is SCs that compete and not individual organisations and the end customer experience determines the success or failure of SCs (Lu, 2011).

Organisations need an SC model that addresses strategic and customer perspectives to help cope with the fast changing business landscape of the twenty-first century. It is therefore, necessary to add value by integrating an organisation's SC so it can lead to superior quality product, better production output, efficient equipment deployment and reducing space, eventually improved logistic efficiency and flexibility (Kim and Narasimhan, 2002).

Managing SC effectively requires the organisation to embrace internal integration in the relevant key business processes and then to collaborate outside the organisation to integrate these processes with strategic business partners. This bold step requires removing barriers to integration within the organisation coupled with setting up high level of trust and working experience with the organisation's business partners (Bakker, Boehme and van Donk, 2012). The integration process involves the use of suitable technologies and performance measures to improve internal and external integration competences. Process integration is not a one-time event but rather a complex journey and it evolves over time within an organisation's workforce and its SCs.

The term integration in this research is used to mean coordinating and sharing information and resources to jointly manage shared business processes and activities over information sharing platforms such as the internet. Integration can occur both internally and externally with respect to the organisation and is a reflection on how amicably staff or partners work jointly to complete shared undertakings (Bode and Wagner, 2015; Basnet and Wisner, 2012).

Bowersox (1990) proposes that the process of SCI should progress from internal integration then move to external integration with suppliers and customers. The external and internal integration can be accomplished by continuous standardisation of each internal logistic function and by efficient information sharing and strategic linkage with suppliers and customers. Information Technology (IT) system plays an important role in each stage of an SCI (Lu, 2011).

The IT system design must be capable of linking or coordinating the IT system(s) of the individual partners into a cohesive whole. In the twenty-first century business environment, it is not possible to achieve an effective SC without IT since the business partners are located in different geographical regions. It is essential, therefore, to integrate the processes both inside and outside of the organisation, which calls for sharing and indeed standardisation of information on various business activities along the SC (Barnes and Liao, 2012). Sharing of relevant and accurate information is a critical component in managing a SC.

In order to assess the level of integration occurring within the organisation and encourage continued integration activities, the organisations should design performance metrics around desired collaboration activities. Performance should be regularly monitored and improvement initiatives undertaken when necessary. The old cliché, "*what gets measured gets done,*" certainly applies to the design and support of SCI activities. Performance metrics is beyond the scope of this study and is therefore not discussed further.

In Kenya, a State corporation called Kenya Medical Supplies Authority (KEMSA) manages the public SC. KEMSA's performance has often been reported to be sub-optimal (KEMSA Task Force, 2008).

From the literature reviewed, the researcher found no comprehensive studies performed to analyse benefits of supply integration within the healthcare sector in Kenya. However, it is easy to gather the general sense from the literature that inefficiencies in health SC result in patients' dissatisfaction with the health system which affect the patients' healthcare-seeking behaviour. For instance, if an individual makes what is likely to be a strenuous trip to a distant healthcare facility only to find that the facility is out of medicine, the likelihood that the same individual would make the trip again in the future is lessened. When this scenario becomes commonplace, an entire community might become less likely to seek healthcare services, even when they are needed. This might result in spreading of diseases that could have been diagnosed and treated at a very early stage.

According to the World Health Organisation (WHO), the two biggest factors preventing healthcare from reaching a larger proportion of the population are the high cost of services and poor access to health facilities (WHO, 2010). An efficient integrated SC in Kenya would go a long way in reducing the cost and making healthcare accessible to the general populace.

This study aims to provide an understanding of the current and potential role associated with the integration of public healthcare SCs in Kenya and to provide recommendations regarding how national and county government policymakers, private investors, donors and other stakeholders should think about investment in public health SC initiatives in Kenya. This study puts a primary focus on the activities of the public hospital SCs with special focus on pharmaceutical products' SC at public hospitals in Kenya.

1.4 PROBLEM STATEMENT

A supply chain usually consists of multiple players, ranging from upstream multi-tier suppliers and including manufacturers, distributors and retailers all with a shared goal of efficient delivery to the end customer at a profit margin. Globalisation, facilitated by IT advancement and expansive Internet access, has facilitated intense competition, which drives organisations to seek efficient ways of improving performance beyond their internal boundaries (Simon, Serio, Pires and Martins, 2015). How well an organisation is able to link with its upstream and downstream SC partners defines its success or otherwise in achievement of enhanced performance (Jap, 2007; Spekman, Kamauff and Myhr, 1998; Simon et al., 2015).

As the TecNet Consultation Report (2008) rightly observes, the SCs of essential medicines in developing countries are becoming increasingly complex and as disease burden increase, availability and access to medicines are critical to the welfare of a nation and to keep people healthy. If the healthcare products do not reach the final destination in a timely manner, the process flows would be severely affected and links within the SC would break, causing problems for other partners down the value chain.

While agreeing with the complex nature of the pharmaceutical SC, Fundafunda, (2007), asserts that availability of essential drugs and supplies in the public health sector is a continuing problem due to a combination of problems which must be resolved urgently to avert tragic outcomes through SC accountability. Copacino, (1997), is of the view that if the pharmaceutical SC is well managed, it can enhance efficient flow of medical products and ultimately help to avert health problems amongst the rural poor.

Sadly, as Lokollo, (2004), asserts, not much is known about the functioning of the SCs in developing countries like Kenya. This view is supported by Jap, (2007), who observes that the SC approach has been practiced more in developed countries than in developing economies and where it exists in developing countries, it is focused on agriculture and primary industries and tightly linked with social structures. This could perhaps explain why many organisations in developing countries have not embraced the concept of SCM. Furthermore, Ntayi, Gerrit and Eyaa (2009), concede that policy makers, particularly in developing countries like Kenya, should build sound interventions by promoting SC approach to grassroots communities to make sure that pharmaceutical products are affordable and available in a timely manner even at the remotest public facility in the country.

According to the Government of Kenya Economic Survey (2008), the Kenyan populace continues to suffer and eventually die from shortage of medicines in most public hospitals. The sad paradox is that while most public hospitals face severe shortage of medicines, there have been reports of high cases of medicines expiry, leakages and poor storage practices of healthcare products in some public hospitals resulting in wastage. This raises issues of effectiveness and efficiency in public distribution, storage, information management, demand forecasting and the entire management of healthcare products' SC in public hospitals in Kenya. One of the reasons cited by the Ministry of Health (MOH) for healthcare product shortages in public hospitals is the enormous cost associated with the procurement and distribution of medicines and medical equipment (MOH, 2005).

A survey conducted by USAID-funded Strengthening Pharmaceutical Systems (SPS) Programme in 2008, recorded high levels of stock-outs of pharmaceutical products and other related supplies especially in district hospitals and dispensaries in most parts of Kenya (SPS, 2008). The Survey further reported that wide stock-outs had been experienced over time across the country.

In addition, the survey observed that there was poor inventory management coupled with logistical inefficiencies in healthcare products' SC. Moreover, the Survey recorded widespread incidents of expiration of healthcare products in the public hospital pharmacies. This therefore calls for need for efficient inventory management and an assessment of the entire healthcare products' SC against the backdrop of limited supplies and inventory shortages in some hospitals.

A report by a government-commissioned taskforce on KEMSA noted poor coordination and disconnect between the procurement function and other functions such as distribution and warehousing of healthcare supplies. The report further noted that the procurement, distribution and warehousing strategies of independent healthcare supplies to KEMSA do not seem to be properly connected nor do they seek synergies with each other (KEMSA Taskforce Report, 2010).

Despite the challenges noted above, no comprehensive study has been done in Kenyan public hospital pharmacies to establish why the hospital management, as well as policy makers at the MOH and the associated stakeholders like KEMSA, have not embraced SCM and integration to curb the high levels of inefficiencies. This indicates a need for an urgent attention and led to the following research question that is addressed in this study:

> *What are the critical factors that influence SCI and how do they impact on supplier collaboration, dedicated SCI and customer order fulfilment in the public hospital pharmacies in Kenya?*

The problem statement pertaining to this research can thus be phrased in the following strategically orientated sub-questions:

⇒ How do SCI initiatives affect SCI in public hospital pharmacies in Kenya?

⇒ How do performance improvement drivers affect SCI in public hospital pharmacies in Kenya?

⇒ How do organisational environmental forces affect SCI in public hospital pharmacies in Kenya?

⇒ How do workforce and management support affect SCI in public hospital pharmacies in Kenya?

⇒ How do financial factors, flow and integration influence the SCI in public hospital pharmacies in Kenya?

- ⇒ How does the existing regulatory framework affect the SCI in public hospital pharmacies in Kenya?
- ⇒ How does information sharing and technology adoption within the context of web-based systems influence the SCI in public hospital pharmacies in Kenya?
- ⇒ How do supplier collaborations affect the SCI in public hospital pharmacies in Kenya?
- ⇒ What are the solutions and guidelines that need to be adopted to address the various inefficiencies experienced in public hospital pharmacies integrated SCs in Kenya?

Apart from identifying the determinants of the healthcare products' SC, the problem statement can be extended towards the complexities and dynamism of the medical and non-medical supplies, which is linked to the SCI in public hospital pharmacies in Kenya.

To address the problem identified and fill the research gap, the research objectives are outlined as shown in the next section.

1.5 OBJECTIVES OF THE STUDY

In the sections that follow, the primary objectives of the study and the secondary objectives supporting the study are highlighted.

1.5.1 Primary Objective

The primary objective of this study is to investigate the factors affecting SCI in public hospital pharmacies in Kenya in order to develop a framework to address the inefficiencies experienced in the SC of pharmaceutical products in these pharmacies.

1.5.2 Secondary Objectives

To help achieve the primary objective, the following secondary objectives were formulated:

- ⇒ To undertake a detailed theoretical investigation into the factors affecting SCI in public hospital pharmacies in Kenya;
- ⇒ To propose a SCI framework regarding the implementation of SCI in public hospital pharmacies in Kenya;
- ⇒ To test the proposed model empirically by assessing the factors affecting SCI in public hospital pharmacies in Kenya;
- ⇒ To provide guidelines for effective implementation of SCI in public hospital pharmacies in Kenya; and
- ⇒ To formulate policy recommendations, strategies and solutions aimed at addressing the various inefficiencies experienced in the public hospital pharmacies integrated SC in Kenya.

1.6 HYPOTHESES OF THE STUDY

The hypotheses are clear statements of what is proposed to be investigated in a research. Therefore, hypotheses should be specified before a research is conducted and openly stated in reporting the results (Armstrong, Brodie, and Parsons, 2001) . This allows the researcher to:

- ⇒ Identify the research objectives;
- ⇒ Identify the key concepts involved in the research; and
- ⇒ Identify its relationship to both the problem statement and the literature review.

A problem cannot be scientifically solved unless it is reduced to a hypothesis form. Thus, a hypothesis is a formidable tool for the development of knowledge, consistent with existing knowledge and conducive to further enquiry (Armstrong el al., 2001)

From the research objectives of this study, it is presumed that reality exists independently of human thoughts and beliefs or knowledge of their existence, but it could be interpreted through social conditioning (Alzahrani, Stahl and Prior, 2012). Consequently, this study uses post-positivism as the scientific approach to the building of knowledge. The dependent variable for this study was SCI, which was categorised into the following three components:

⇒ Customer Order Fulfilment;

⇒ Supplier Collaborations; and

⇒ Dedicated SC.

Therefore, the hypothesised relationships were classified into three categories as indicated below.

1.6.1 Relationship between independent variables and customer order fulfilment

$H0_{1.1}$: There is no relationship between SCI initiatives and customer order fulfilment;

$H_{1.1}$: There is a positive relationship between SCI initiatives and customer order fulfilment;

$H0_{1.2}$: There is no positive relationship between performance improvement initiatives and customer's order fulfilment;

$H_{1.2}$: There is a positive relationship between performance improvement initiatives and customer's order fulfilment;

$H_{1.3}$: There is a positive relationship between organisational environmental factors and customer order fulfilment;

$H0_{1.3}$: There is no positive relationship between organisational environmental factors and customer order fulfilment;

$H0_{1.4}$: There is no positive relationship between workforce and management support and customer order fulfilment;

$H_{1.4}$: There is a positive relationship between workforce and management support and customer order fulfilment;

$H0_{1.5}$: There is no positive relationship between financial factors and integration and customer order fulfilment;

$H_{1.5}$: There is a positive relationship between financial factors and integration and customer order fulfilment;

$H0_{1.6}$: There is no positive relationship between regulatory framework and customer order fulfilment;

$H_{1.6}$: There is a positive relationship between regulatory framework and customer order fulfilment;

$H0_{1.7}$: There is no positive relationship between information sharing and technology adoption and customer order fulfilment;

$H_{1.7}$: There is a positive relationship between information sharing and technology adoption and customer order fulfilment;

$H0_{1.8}$: There is no positive relationship between supplier collaborations and customer order fulfilment;

$H_{1.8}$: There is a positive relationship between supplier collaborations and customer order fulfilment;

$H0_{1.9}$: There is no positive relationship between dedicated SCI and customer order fulfilment.

$H_{1.9}$: There is a positive relationship between dedicated SCI and customer order fulfilment.

1.6.2 Relationship between independent variables and supplier collaborations

$H0_{2.1}$: There is no positive relationship between SCI initiatives and supplier collaborations;

$H_{2.1}$: There is a positive relationship between SCI initiatives and supplier collaborations;

$H0_{2.2}$: There is no positive relationship between performance improvement initiatives and supplier collaborations;

$H_{2.2}$: There is a positive relationship between performance improvement initiatives and supplier collaborations;

$H0_{2.3}$: There is no positive relationship between organisational environmental factors and supplier collaborations;

$H_{2.3}$: There is a positive relationship between organisational environmental factors and supplier collaborations;

$H0_{2.4}$: There is no positive relationship between workforce and management support and supplier collaborations;

$H_{2.4}$: There is a positive relationship between workforce and management support and supplier collaborations;

$H0_{2.5}$: There is no positive relationship between financial factors flow and integration on supplier collaborations;

$H_{2.5}$: There is a positive relationship between financial factors flow and integration on supplier collaborations;

$H0_{2.6}$: There is no positive relationship between regulatory framework and supplier collaborations;

$H_{2.6}$: There is a positive relationship between regulatory framework and supplier collaborations;

$H0_{2.7}$: There is no positive relationship between information sharing and technology adoption and supplier collaborations;

$H_{2.7}$: There is a positive relationship between information sharing and technology adoption and supplier collaborations;

$H_{2.8}$: There is no positive relationship between dedicated SCI and supplier collaborations.

$H_{2.8}$: There is a positive relationship between dedicated SCI and supplier collaborations.

1.6.3 Relationship between independent variables and dedicated SC

$H0_{3.1}$: There is no positive relationship between SCI initiatives and dedicated SCI;

$H_{3.1}$: There is a positive relationship between SCI initiatives and dedicated SCI;

$H0_{3.2}$: There is no positive relationship between performance improvement initiatives and dedicated SCI;

$H_{3.2}$: There is a positive relationship between performance improvement initiatives and dedicated SCI;

$H0_{3.3}$: There is no positive relationship between organisational environmental factors and dedicated SCI;

$H_{3.3}$: There is a positive relationship between organisational environmental factors and dedicated SCI;

$H0_{3.4}$: There is no positive relationship between workforce and management support and dedicated SCI;

$H_{3.4}$: There is a positive relationship between workforce and management support and dedicated SCI;

$H0_{3.5}$: There is no positive relationship between financial factors flow and integration and dedicated SCI;

$H_{3.5}$: There is a positive relationship between financial factors flow and integration and dedicated SCI;

$H0_{3.6}$: There is no positive relationship between regulatory framework and dedicated SCI;

$H_{3.6}$: There is a positive relationship between regulatory framework and dedicated SCI;

$H0_{3.7}$: There no a positive relationship between information sharing and technology adoption and dedicated SCI:

$H_{3.7}$: There is a positive relationship between information sharing and technology adoption and dedicated SCI.

These hypotheses are graphically depicted in Figure 1.2

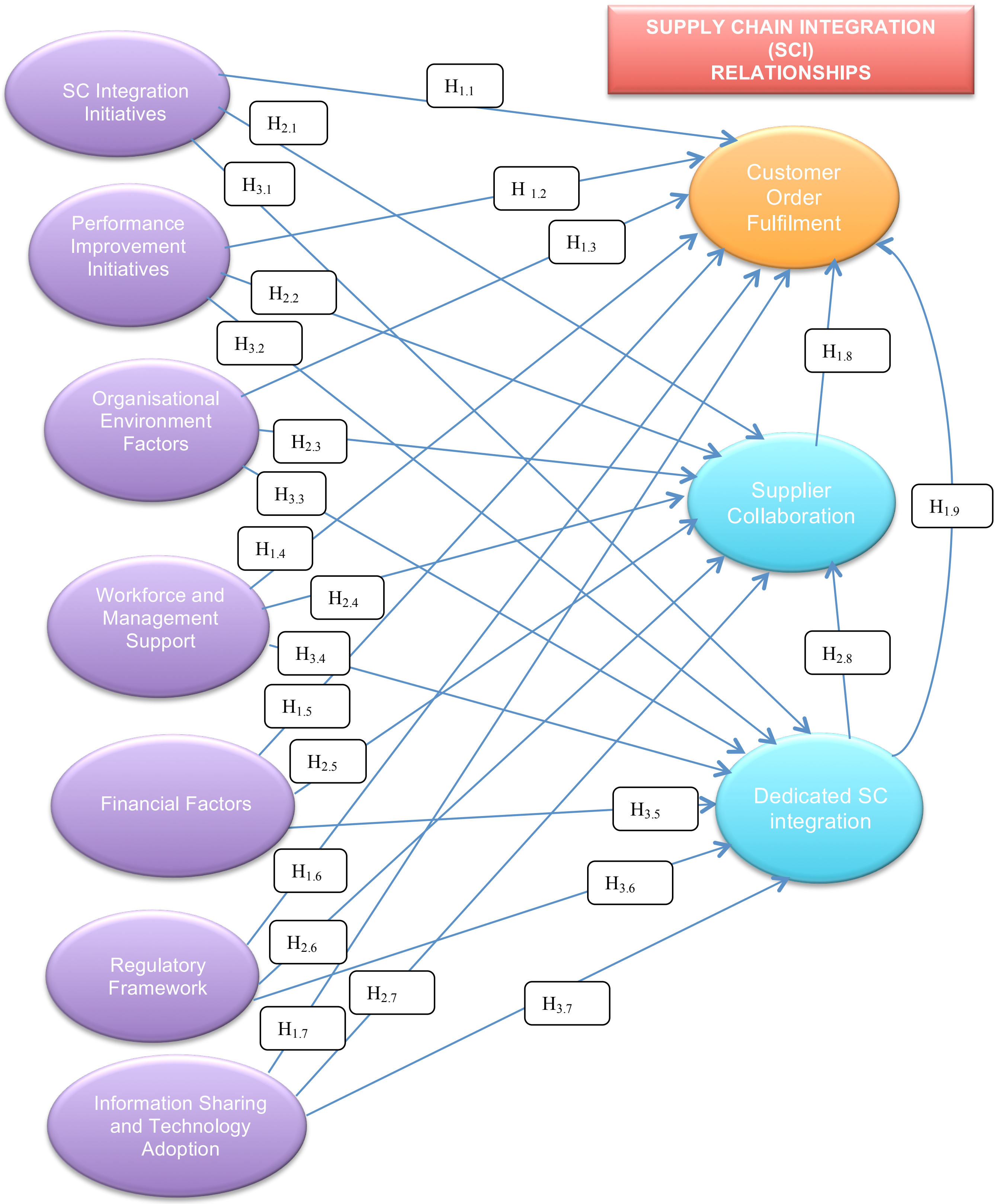

Figure 1.2: Hypothesised relationships model

Source: Researcher's own construct

1.7 SUPPLY CHAIN INTEGRATION FRAMEWORK

In this section the researcher introduces the Supply Chain Integration Framework (SCI framework) for public hospital pharmacies in Kenya as developed in this study. Figure 1.3 depicts the interactions and conceptualisation of the variables in the model. The SCI framework illustrates that the raw materials for pharmaceuticals products are delivered to the manufacturers. Once the products are manufactured, they are either obtained by suppliers then delivered to KEMSA or the manufacturers can supply directly to KEMSA.

KEMSA, a State Corporation, is the legal body mandated by the Government to procure and distribute pharmaceutical products to all public hospital pharmacies in Kenya. A number of variables have been hypothesised to affect the SC in public hospital pharmacies in Kenya (DFID, 2014). Based on these variables and the interaction between them to support an effective and efficient supply chain model in Kenya, Figure 1.3 introduces the SCI framework developed in this study. The SCI framework consists of the entire set of processes, procedures, the supporting organisations and business practices that connect suppliers' suppliers through to the customer at the public hospital (Bagchi, Skjott-Larsen, 2002). A basic SC involves four distinct flows namely:

- ⇒ Requirements (order) information from buyer to seller which sparks all succeeding activities;
- ⇒ Transfer of goods from sellers to buyers;
- ⇒ Change of ownership from seller to buyer; and
- ⇒ Payment from buyer to seller.

Coordinating these flows in a network requires integration of SC partners to facilitate unhindered flows at each of the many buyer-supplier interfaces in an SC network (Bagchi, Skjott-Larsen, 2002). For the SCI framework to work, there is need for efficient management of information flows and closer collaborations among SC partners.

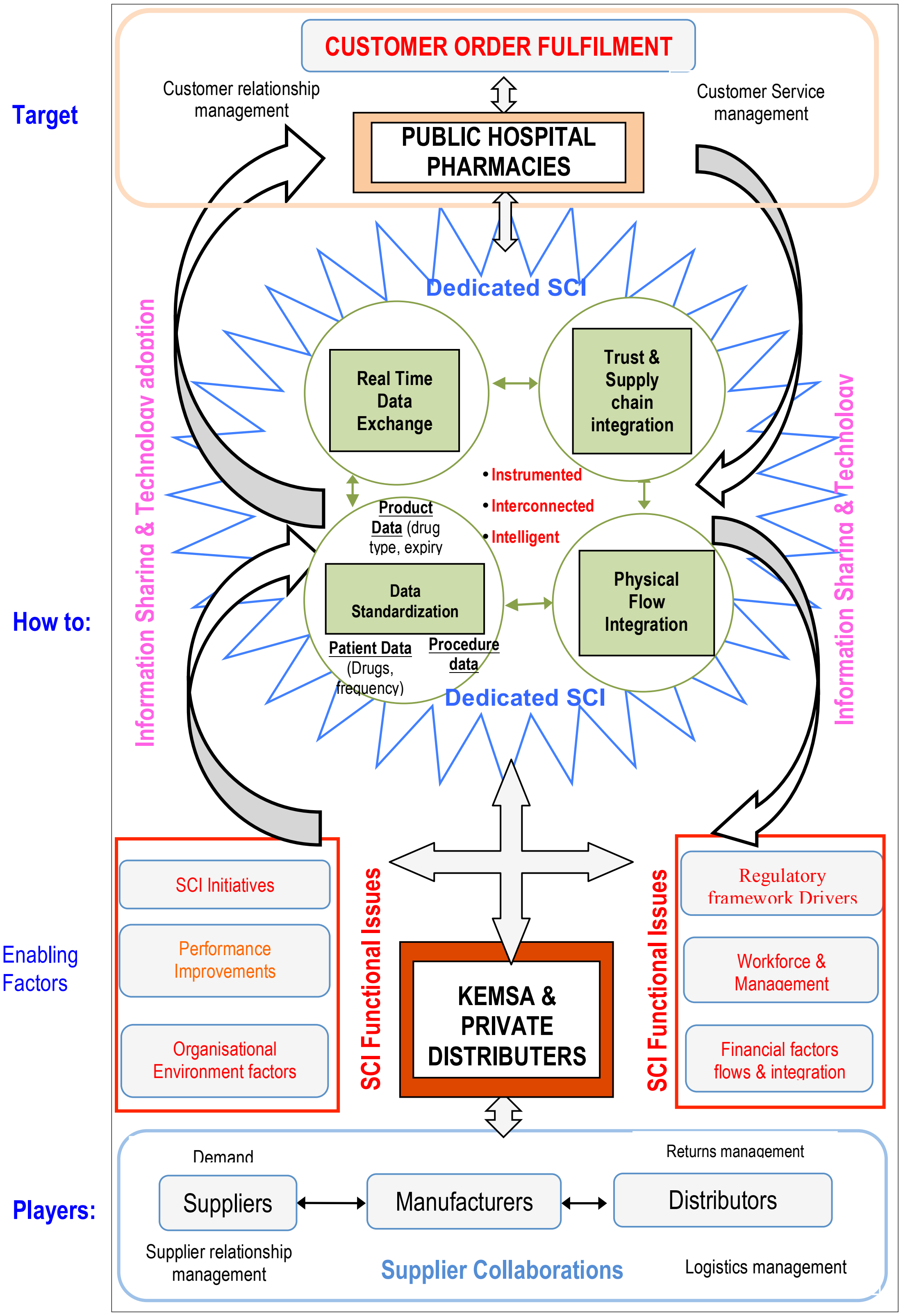

Figure 1.3: Proposed SCI framework for public hospital pharmacies in Kenya

Source: Researcher's compilation based on Kritchanchai (2012: 111)

This framework outlines three key dimensions of SCI: supplier collaborations, information sharing and technology adoption and customer order fulfilment process. This conceptual framework, also referred to as SCI framework, is presented in Figure 1.3 but is discussed in section 4.5. This framework shows that supplier collaborations encourage partners such as KEMSA and private distributors, manufacturers, transport and logistics companies as well as individual public hospitals to become more entrenched members of the network and inspires a sense of belonging to the SC (Bagchi, Skjott-Larsen, 2002). It becomes easier to generate trust among partners in an integrated SC. Trust promotes collaboration and organisational integration (Vanpoucke, and Vereecke 2010).

The SCI framework has information sharing and technology adoption as its backbone. Information sharing and technology adoption refers to the integration of information and knowledge among the partners in the SC, including demand forecasts, production plans and inventory status. Organisational linkages include communication channels between the members in the SC, performance measurement and sharing of common visions and objectives while coordination refers to the realignment of decisions and responsibility in the SC (Saldanha et al., 2014; Bagchi, Skjott-Larsen, 2002).

The SCI framework links the partners of the network and the functions to facilitate uninterrupted flow by matching supply and demand flows in the network and securing accurate response at each buyer-seller transaction in the chain. This enhances timely and accurate delivery of the medicines to the patient in the public hospital in Kenya.

The structure of this research study has been configured to address the various elements of the SCI framework presented above.

1.8 RESEARCH METHODOLOGY AND DESIGN

Research methodology and design are reviewed in Chapter Five. With reference to the research hypotheses and research objectives stated in the above sections, a survey research approach was used in this study. A survey involves the collection of information from individuals (through mailed questionnaire and personal interviews) about themselves or concerning the social units to which they belong (Rossi, Wright and Anderson, 1983).

Surveys are useful to test hypotheses and to generalise findings (Hair, Black, Babin, Anderson and Tatham, 2006). In a post-positivist research, a survey approach is intended to gather primary data from a sample, with a view to analysing them statistically and generalising the results to a population (Collis and Hussey, 2003).

The main method used in this research was a survey questionnaire tool designed to collect information on the nature of the problem within a post-positivist study context. Collins, Onwuegbuzie and Jiao (2010) are of the view that researchers using quantitative approaches should themselves as post-positivists, indicating that there is an independent reality to be studied, but that all observation is inherently fallible. As a result research can only estimate the reality, never clarifying it flawlessly or completely.

Data collection was based on the procedures such as information needs, sampling design, instrumentation, data processing and report generation (Fowler, 1993; Alreck and Settle, 2004). Surveys are widely used data collection methods for organisational research (Zikmund, 2003). Forza (2002) also stresses that survey research is important and extensively used in operations management to solve an existing problem.

The selection of research approach (quantitative and/or qualitative) depends on the nature of the phenomenon and the type of research questions. The quantitative approach using a survey questionnaire was used to collect data on the variables of the phenomena identified in the literature (Parker, 2012). Creswell (2009) argues that research questions designed at explaining relationships among variables by examining variation are ideal for the quantitative approach.

This study incorporates key research questions, which are aimed at determining the relationships between variables of the SCI determinants, supply relationships and customer's order fulfilment at the pharmacy in Kenyan public hospitals. Additionally the conceptual research model (Figure 1.3) presents relationships between variables. A mixed research approach would be suitable for this research since the objective of the thesis is to explore causal relationships among the variables.

1.8.1 Population and sampling

This study was conducted in Kenya with a specific focus on public district and county referral hospital pharmacies countrywide. The target population included the procurement officers, pharmacists, medical doctors and senior management of the district, county and national referral hospitals in the country. In addition, KEMSA and pharmaceutical SC practitioners in Kenya were also targeted. Sampling was done using stratified, simple random and purposive sampling technique. A stratified sampling technique was used to classify Kenya into regions formally referred to as provinces before devolution of governance resulting in eight categories as shown in Table 1.1.

Table 1.1: Targeted sample

Region	National, County and District Hospitals	30% sample	Number of Target Hospitals	Respondents per hospital	Survey Sample size
Rift Valley	39	15.6	16	5	80
Western	15	6	6	5	30
North Eastern	11	4.4	4	5	20
Nyanza	26	10.4	10	5	50
Eastern	28	11.2	11	5	55
Nairobi	7	2.8	3	5	15
Central	12	4.8	5	5	25
Coast	16	6.4	6	5	30
Stakeholders					
KEMSA					20
Total	**154**	**61.6**	**62**		**325**

Source: Researcher's own construct

From each of the eight regions, the population of all eligible hospitals was constructed and a 30% sampling percentage selected to serve as the targeted public health facility (Mugenda and Mugenda, 2010). Simple random sampling was used for this process. This means that any public health facility within the category had an equal probability of being selected. Purposive sampling was used in the final instance to select specific respondents from the selected health facility.

1.8.2 Data collection

Both primary and secondary research methods were used to collect data relevant to the study. Primary data was collected using questionnaires that contain both open and closed ended questions. According to Collis and Hussey (2003:173), a questionnaire comprises a list of carefully structured questions, chosen after considerable testing, with a view to eliciting reliable responses from a chosen sample (Hennink, Hutter and Bailey, 2011). The Researcher obtained secondary data from documents and reports, such as Ministry of Health Strategic Plans, KEMSA Taskforce Report, Journals released by the Pharmacy and Poisons Board, Ministry of Health Reports WHO Reports as well as observations.

1.8.3 Data analysis and statistical procedures

The research investigated and analysed how the independent variables influence implementation of SCI in public hospital pharmacies in Kenya (dependent variables). In order to achieve this, the opinions of stakeholders and other respondents (as explained above) on SCM implementation were canvassed and statistically analysed.

The research instrument was subjected to prior testing to evaluate the validity and reliability of the scales. This was followed by an assessment of the reliability of the research instrument by means of an internal consistency measure (the Cronbach alpha reliability coefficients). Statistica 10 and Statistical Package for Social Sciences (SPSS) statistical software version 18 were used to analyse the data.

The data was then subjected to quantitative analysis whereby descriptive statistics such as percentages, means, standard deviations and frequencies as well as inferential statistics such as Chi-square, Analysis of Variance (ANOVA) Multiple Linear Regression and Correlation analysis were utilised. The findings are presented in Chapter Six using *inter alia* graphs, pie charts, frequency distribution tables and percentages.

1.9 STRUCTURE OF THE THESIS

The thesis consists of seven chapters and Figure 1.4 depicts the logic and flow between them.

In Chapter One, the researcher covers the introduction and the background to the research topic and links to the factors affecting SCI in public hospital pharmacies in Kenya.

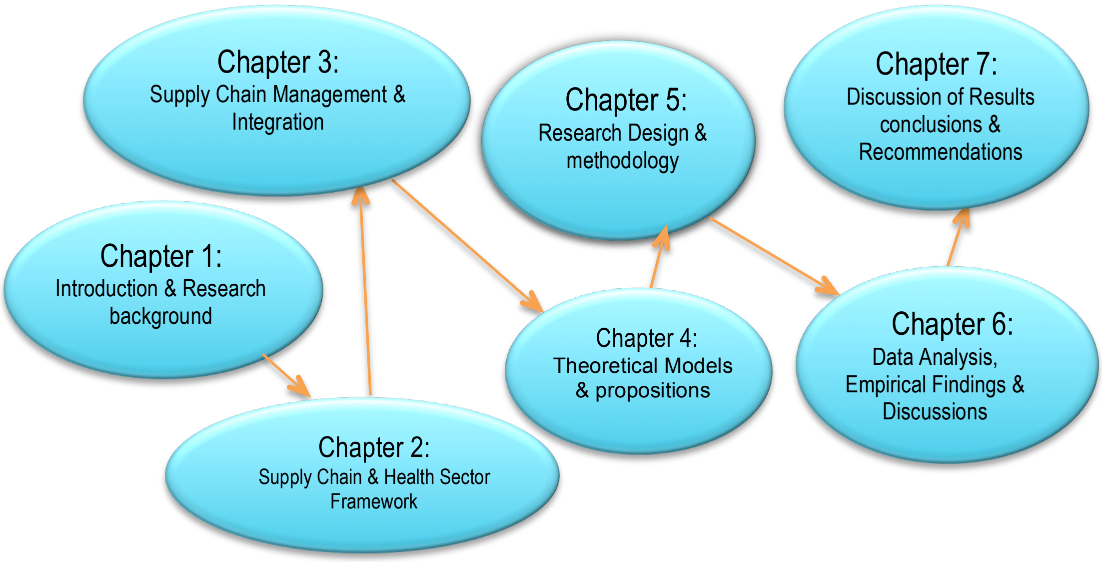

Figure 1.4: Structure of thesis

Source: Researcher's own construct

In Chapter Two, the researcher reviews the healthcare sector in Kenyan context and provides a background to the healthcare sector in that country.

In Chapter Three, the researcher focuses on the theoretical review of SCM and SCI.

In Chapter Four, the researcher reviews literature on theoretical models of SCM and Logistics.

In Chapter Five, the researcher presents the research design and the methodology adopted for the study.

In Chapter Six, the researcher discusses the analysis of the empirical data and presents the survey results.

In Chapter Seven, the researcher discusses and presents conclusions plus the linkage between the research problems, objectives and the findings of the study.

1.10 SUMMARY

There is a growing recognition that SC process integration creates significant opportunities for business partners to achieve high levels of competitiveness and financial returns. However, this entails sharing information and requires cultural change in the way organisations operate internally and how they interact with other organisations within the extended enterprise.

SC partners must first achieve internal process integration, which means breaking down integration barriers that include the silo mentality, the organisation's culture and trust issues. It is only when organisations have become proficient at internal process integration that they can turn their attention outward to external process integration or collaborating with trading partners. Many issues influence process integration, including new uses of technology, global trade and process outsourcing.

Additionally, poor management of the hospital SC has led to shortage of medications and other vital medical equipment as well as drug leakages and expiries in public hospital pharmacies in Kenya. This raises the issues of the effectiveness of the entire SC from the manufacturers to the end users of the products who are the customers/citizens. An integration model is needed to effectively address these shortcomings and create a coordinated system around which government and private sector can rally their efforts to the improvement of the quality of life for people in Kenya.

In this chapter, the introduction and the background to the research topic and links to the factors affecting SCI in public hospital pharmacies in Kenya are presented. In addition, the researcher presents and describes the problem under investigation as well as the objectives of the study. The SCI framework for public hospital pharmacies in Kenya is presented and the research hypotheses are formulated. A brief overview of the research methodology is also presented in this chapter.

CHAPTER TWO

SUPPLY CHAIN MANAGEMENT AND THE HEALTH SECTOR FRAMEWORK

2.1 INTRODUCTION

In Chapter One, the introduction and the background to the study were presented. It was shown that in the past, organisations focused more on profits and survival but this has dramatically changed due to customer demand and intense competition. Organisations are now focusing on strategies that assist them to influence the entire SC starting with raw material supplier to manufacturer all the way to delivery to final consumers. These strategies are aimed at creating value and removing waste across the entire SC. In Chapter One, it was also noted that the SC focus has changed from a supply perspective to incorporating all partners within the entire value chain.

In this chapter, the researcher reviews the frameworks for the healthcare SC and the experiences in the healthcare area pertaining to SCM and integration. In addition to this, the researcher puts the study into perspective by reviewing the healthcare sector in Kenya and SC studies in that sector. The researcher contextualises the environment in which the public hospital pharmacy operates in including the organisation and regulatory framework for the pharmaceutical sector in Kenya.

2.2 FRAMEWORK OF THE HEALTHCARE SUPPLY CHAIN

The Kenya healthcare framework is organised in a hierarchical pyramid as shown in Figure 2.1. The Government provides the largest proportion of healthcare services, accounting for about 41% of all healthcare facilities. The private sector (for-profit and non-profit) providers also serve a substantial percentage of the populace, accounting for 34% and 14% of healthcare facilities respectively (MoMS, 2010).

Figure 2.1: Organisation of the Kenya healthcare framework

Source: Researcher's own compilation based on MoMS (2009)

As shown in Figure 2.1, village healthcare centres comprise the largest element of the sector, but are also at the bottom of the pyramid. There is a progression in size and shape of facilities as you move up the pyramid from dispensaries to district healthcare centres and county hospitals. The Kenyatta National Hospital in the capital city, Nairobi and Moi Referral hospital in Eldoret town, are positioned at the top of the pyramid (Mbindyo, Okello and Kimani, 2010).

The Ministry of Health at the national level sets policies, develops standards and allocates resources for healthcare services. The Government reports that there are more than 5,000 healthcare facilities in Kenya. The public sector controls 41% of healthcare centres, NGOs run 15% and the private sector operates 43% (MoMS, 2010). The county governments manage county hospitals, health centres and dispensaries under the devolved healthcare system.

In Kenya, only qualified pharmaceutical personnel are allowed to dispense, yet their numbers remain low at 19 personnel per 100,000 citizens, compared to 60-100 pharmaceutical personnel per 100,000 citizens for Organisation for Economic Co-operation and Development (OECD) countries (KNBS, 2013). OECD countries cover many of the world's most advanced economies from North and South America, Europe and the Asia-Pacific region (DFID, 2014, pp. 23). The problem of inadequate numbers is worsened by poor distribution, with studies showing the majority working in major urban locations (Barnes et al., 2009). This situation calls for adoption of IT and system visibility to enhance management of the pharmaceutical SC to increase efficiency.

2.3 HEALTHCARE FINANCING IN KENYA

Like with many developing and middle-income countries, Kenya finds it difficult to develop and sustain efficient healthcare financing mechanisms that can provide adequate service provision while cushioning against the costs of healthcare (Carrin and Jones, 2005). Appropriate healthcare financing safeguards the population and provides for quality services when and where they are needed. In addition to this, a functional healthcare financing system establishes whether the healthcare services are indeed provided (Sebergsen, and Bagger 2010).

The public and private sectors provide the mainstay of healthcare service in Kenya, with the National government being the largest provider through the MOH (Kimalu, Nafula, Manda, Bedi, Mwabu and Kimenyi, 2004). The public healthcare system is primarily funded through taxpayers. The financing system has undergone a number of policy changes. Some of the past policies have affected public healthcare delivery, for example, the cost sharing (user fees) system initiated in 1989. The introduction in 1989 of new cost sharing in public health facilities represented a major policy change from a policy of "free" healthcare services for all at the time of Independence. This change, together with concerns about the welfare loss it would likely engender, led in a large part to a lack of its acceptance by the public as well as a lack of political will to implement it (Sebergsen and Bagger 2010).

Financing gaps in healthcare funding has been a particular challenge (Deloitte, 2011). It is widely known that inadequate funding by national governments results in the public paying for services at a high cost through private providers. Similarly, elevated poverty levels adversely affect healthcare financing and access to primary care. With almost 46% of the populace surviving on below a dollar per day (WHO, 2010), this suggests that a substantial proportion of Kenyans especially the poor face huge economic barriers to accessing healthcare. Financing healthcare in Kenya is a complex and fragmented system especially the funding mechanism, management of funds, service payments and accessibility of healthcare services as indicated in Figure 2.2.

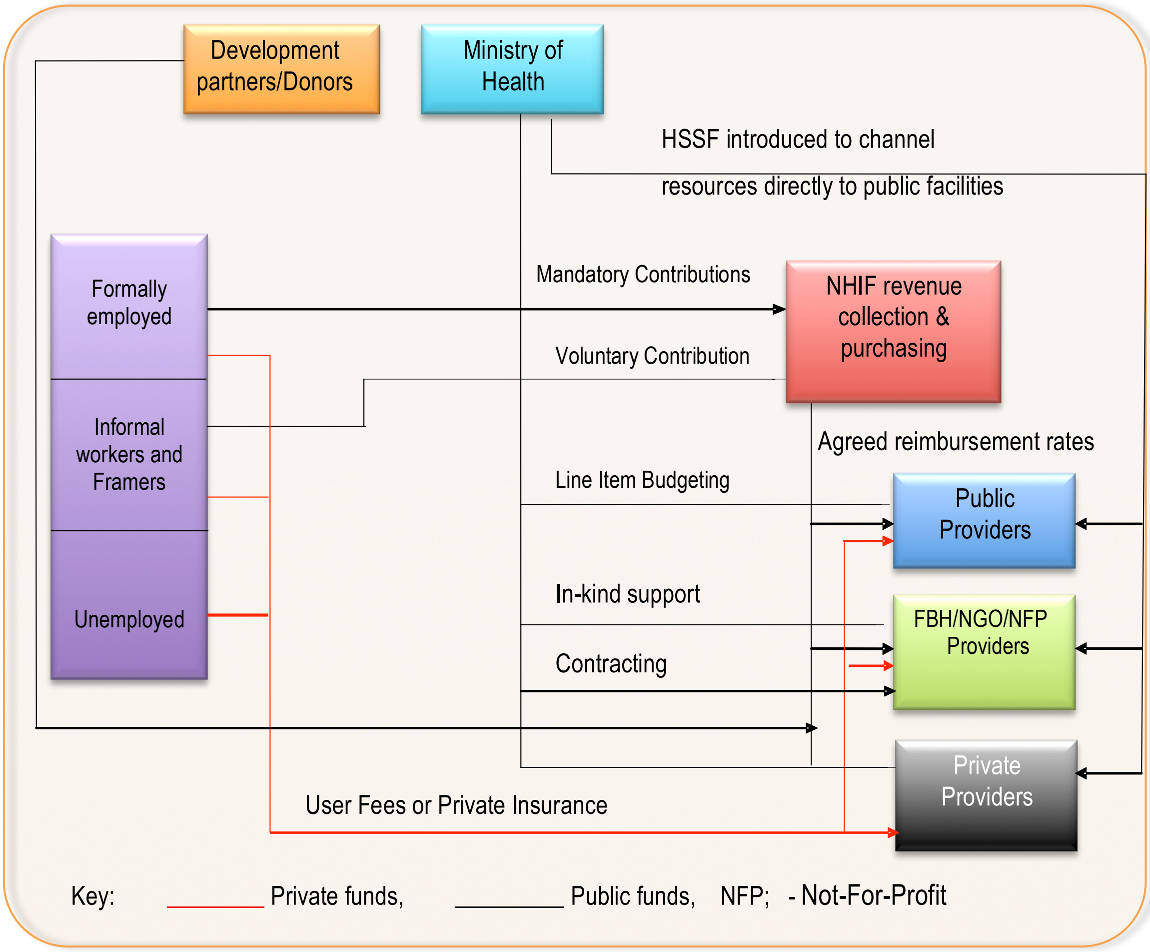

Figure 2.2: Healthcare Financing in Kenya

Source: Adapted from GOK (2009: 4)

The MOH contributes about 30% of all health expenditures in Kenya, which is mainly in the public sector (Kamau and Holst, 2008). Funds from donors are directed mainly at supporting specific non-curative expenses, for example, behavioural changes and healthcare system strengthening. The proportion of the population who are in formal employment have their healthcare funding mandatorily deducted from their salary and channelled into the system through the National Health Insurance Fund (NHIF). The NHIF has not succeeded in reaching out to the Kenyan populace, specifically the low income and the informal sector workers (Carrin et al., 2007; Durairaj, D'Almeida and Kirigia, 2010; Kirigia et al., 2006; Mathauer, Schmidt and Wenyaa, 2008).

In the past, some policies in the Kenyan health sector may have contributed to low coverage of the informal sector particularly those imposing heavy fines for non-compliance. For example, the NHIF penalises late contributions at a rate that is five times the contribution amount (Kimani, Ettarh, Kyobutungi, Mberu and Muindi, 2012). Such a regulation would hinder and discourage the workers who are in informal employment. Apart from the mandatory NHIF system of accumulating health funds, the other system is unpredictable and unreliable (Kamau and Holst, 2008). As a result, it is difficult for the Government to assure quality access of healthcare services.

The above-mentioned scenario suggests that for Kenya to realise universal healthcare, the Government must review its funding and service delivery system. This can be facilitated through *inter alia* investment in efficient healthcare SCs that facilitate timely and cost effective delivery of healthcare services. It is not simply about increased financing of the current system, but rather having an improved system itself.

2.4 OVERVIEW OF KENYAN PHARMACEUTICAL MARKET

The Kenyan pharmaceutical market expenditure grew from Kenya shillings (KES) 33.02 billion (US$ 417 million) in 2010 to KES 38.72 billion (US$ 450 million) in 2011, representing a 17.3% growth (BMI, 2012). The upward growth is projected to continue alongside that of other sub-Saharan African countries, with estimates suggesting the continent's pharmaceutical market would be worth US$ 23 billion by 2020 (UNIDO, 2012).

The growth of the Kenyan pharmaceutical industry has been linked to the overall development of the economy in the past decade and increased expenditure on health by the Government and its partners (Wafula, Abuya, Amin, and Goodman 2013). Healthcare expenditure has grown from KES 147 billion (US$ 1.85 billion) in 2010 to KES 167 billion (US$ 1.90 billion) in 2011, representing a 14% growth (BMI, 2012).

This market for prescription medicines was estimated to be worth KES 34.4 billion (US$ 432.2 million) in 2012 (Frost and Sullivan, 2013) and projected to increase at the rate of 11.8% to 2019. The combined prescription and over the counter sales were KES 18 billion (US$ 235 million) in 2008 (BMI, 2012). Although prescription medicines account for three-quarters of the market, forecasts suggest that the over-the-counter market would experience higher growth rates over the next five years (Frost and Sullivan, 2013).

This calls for a robust SC system that can handle this growth in an efficient and effective manner hence an urgent need to review the current public hospital pharmacies SC in Kenya. With SCI, the public hospital pharmacies can provide the right products with lowest costs and accurate amounts at right time and right place through integration of internal principal processes. In addition, enhanced internal integration could greatly support efficient decision-making capabilities.

2.5 HEALTH SECTOR REGULATORY FRAMEWORK IN KENYA

The healthcare sector in Kenya is regulated directly by at least four pieces of legislations, namely:

- ⇒ The Public Health Act of 1961 (Chapter 242 of the Kenyan laws);
- ⇒ The Pharmacy and Poisons Act of 1959 (Chapter 244);
- ⇒ The Food, Drugs and Chemical Substances Act of 1965; and
- ⇒ The Narcotic Drugs and Psychotropic Substances Act of 1994.

Aside from these laws that govern public healthcare directly, there are other laws which govern aspects of public health, albeit with less direct impact. These include the Anti-Counterfeit Act of 2008 and the elaborate County Government Act. In addition, there are Pharmacy and Poisons Board (PPB) guidelines that govern the registration of premises, issuance of licenses and wholesaling and retailing practices.

Finally, the Pharmaceutical Society of Kenya (PSK) and the Kenya Pharmaceutical Association (KPA), the professional bodies for pharmacists and pharmaceutical technologists, enforce professional ethics and standards respectively. Confusion on the role that the different regulations play and on who is responsible for the enforcement of provisions is commonplace in the Kenyan pharmaceutical sector (Wafula, Molyneux, Mackintosh and Goodman, 2013).

Following the promulgation of a new Constitution in 2010, the processes of developing a new law to govern the healthcare sector is underway. The new bill, presently referred to as the General Health Bill, is expected to repeal the Public Health Act, which served as the parent legislation for the healthcare sector under the old Constitution.

After enactment of the General Health Bill, it is expected that the different pieces of legislation governing the healthcare and pharmaceutical sectors would be reviewed, merged or repealed (direct communication from Ministry of Health Official). This includes the Pharmacy and Poisons Act. There is already a Bill under preparation to replace this Act. The Bill entitled “Pharmacy and Poisons (Amendment) Bill”, is expected to significantly change the structure and composition of Pharmacy and Poisons Board (PPB)) and the pharmacy practice. The Bill also creates a PPB Director General position to help separate the roles of the Government Chief Pharmacist from those of the regulator.

Two provisions of the General Health Bill would be expected to significantly change the pharmaceutical landscape in Kenya: the Health Professionals Oversight Authority and the creation of a Foods and Drugs Authority similar to that of the US (Kamau and Holst, 2008). The former Bill seeks to, among other things, separate regulation of pharmaceutical professionals from that of pharmaceutical services, giving the mandates to different agencies. The latter Bill, on its part, seeks to separate the governance of medical commodities from that of pharmaceutical services, again creating a new agency in the process. Both Bills are still under discussion and may change considerably before enactment. However, should they remain as they are, the pharmaceutical sector can be expected to change substantially, with the emergence of new institutions with narrower mandates and (possibly) a window of opportunity for new and more innovative policy interventions across the sector.

Under the current law, the Government oversees the regulation of medicines, medical devices and practitioners through one agency, the PPB. The Act gives authority to the Cabinet Secretary for Health to among other things, appoint the PPB management Board, control the manufacture, trade and use of all medicines and medical products and determine fees chargeable for licenses. PPB's current management board is composed of the Director of Medical Services (chairperson), the Government Chief Pharmacist (registrar), the Director of Veterinary Services, four pharmacists proposed by PSK and one pharmaceutical technologist proposed by KPA. The Board operates through departments, which include inspectorate, drug registration, pharmacovigilance, training and medicines information units.

Retail sector regulatory enforcement is done by Good Dispensing Practice (GDP) inspectors. The GDP inspectors, popularly referred to as pharmaceutical inspectors), are employed by PPB. Another cadre, the "drug inspectors" were employed directly by MOH to conduct similar inspections and reported directly to the Government Chief Drug Inspector. However, this Department was closed and drug inspectors moved to PPB under the Inspectorate Department. Nonetheless, the old term "drug inspector" is still popularly used in reference to pharmaceutical inspectors and usually carries a negative connotation, as drug inspectors are widely remembered as unfriendly (at times violent) individuals with a police-like approach to inspections, who are said to differ from the more recent PPB employed pharmaceutical inspectors (Wafula et al., 2013). This style and culture of inspection appears to have negatively affected the enforcement of regulations across the commercial SC.

Pharmaceutical inspectors are few in numbers and operate at the regional, rather than district or community level. For this reason, the district healthcare managers often ask Public Healthcare Officers (PHOs) to inspect commercial retail shops in addition to their other roles, which are mainly centred on inspecting hygiene practices in hotels, schools and other institutions. However, PHOs' training focuses on general public healthcare matters rather than governance and inspection of medicines, creating concerns over inadequacies in the regulatory enforcement mechanisms at community level.

It is hoped that implementation of the enhanced regulatory framework discussed above, would spur growth in the pharmaceutical subsector in Kenya. The hospital pharmacy SC must also reinvent itself to be able to operate in this framework. An integrated SC can help public hospitals ensure they provide customers with the right products at the least possible price and precise cost at the right time and place. This can reduce litigations against health practitioners arising from wrong or delayed prescriptions, which is likely to occur with the current enhanced regulatory framework.

2.6 SUPPLY CHAINS IN THE KENYAN HEALTH SECTOR

Supply chains are indispensable instruments for getting goods to consumers. They provide links among the variety of organisations, people, resources and processes involved in delivering products to the customers (Raja and Mohammad, 2014). The Strengthening Pharmaceutical Systems (SPS) project report highlights the importance of good governance in the sector. The SPS report describes a functioning SC as encompassing the interdependent processes of identification, purchasing, distribution and consumption of medicines together with the pharmaceutical services that support patient care and treatment. These interdependent processes are anchored on a strong management support system that includes financial, organisational, human resource and information management (SPS, 2011).

These components must be linked seamlessly to form an integrated SC cycle. Integration is characterised by clear roles and responsibilities, agility, rationalised procedures, prominence of information, trust and collaboration and configuration of goals (USAID, 2011). Figure 2.3 depicts supply chains of healthcare products in Kenya.

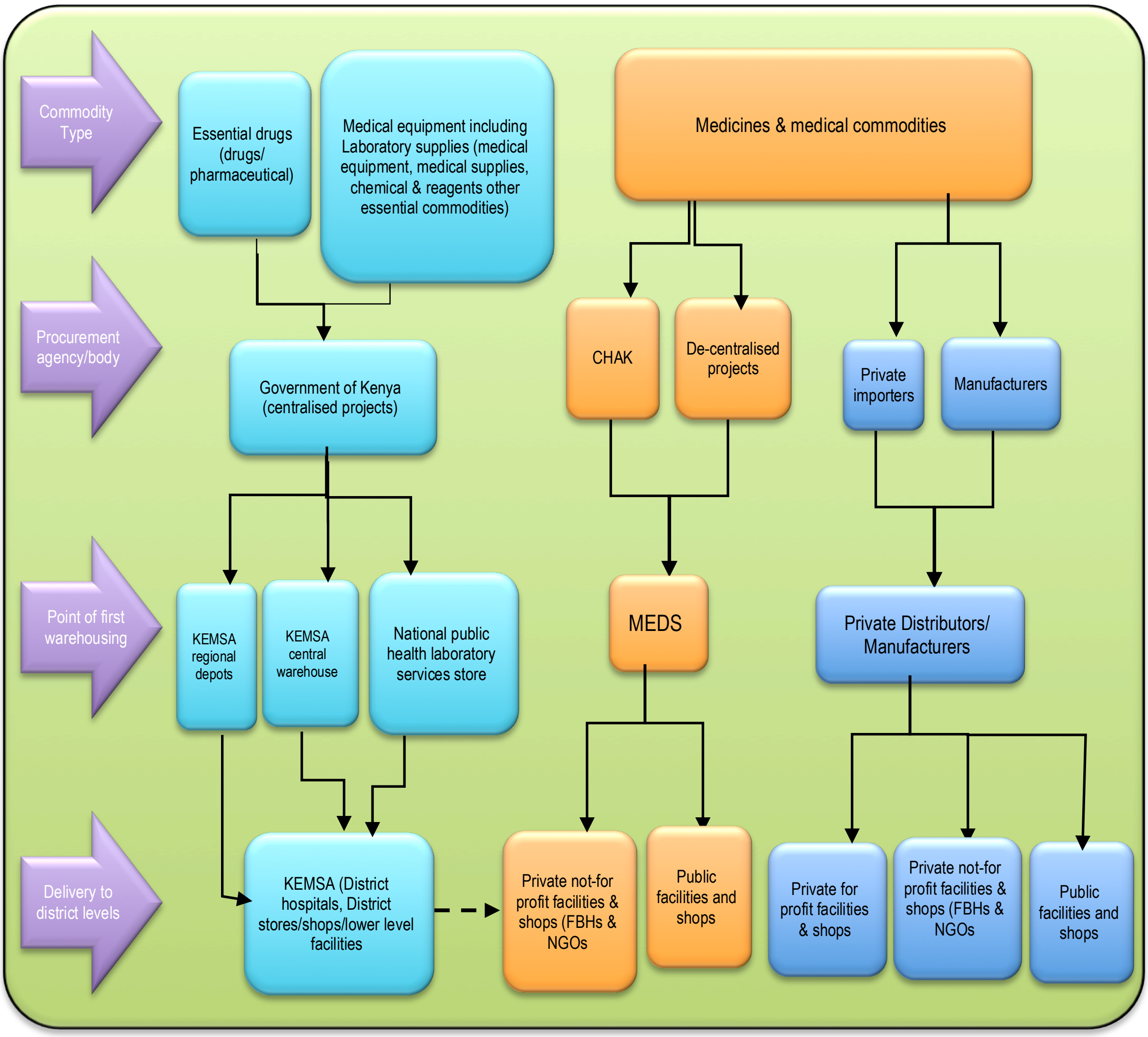

Figure 2.3: Supply chains of medicines and medical supplies in Kenya

Source: Adapted from DFID (2014: 29)

As shown in Figure 2.3, in Kenya, the pharmaceutical drugs requirements are met through three SC streams that operate alongside each other: the public SC, the private non-profit SC and the private commercial SC. The public and private non-profit chains supply the public and faith-based institutions respectively, while the private chain mainly supplies private healthcare facilities and commercial medicine retailers.

The public SC is managed by KEMSA, a State Corporation established under the KEMSA Act of 2013 and operating under the auspices of MOH. The Pharmacy Unit at the same Ministry provides policy leadership in provision of pharmaceutical services through the public sector, while the Pharmacy and Poisons Board (PPB) regulates pharmacy practice and medicines.

The Mission for Essential Drugs and Supplies (MEDS) is responsible for the bulk of procurement and supply of medicines and medical supplies to the private non-profit facilities. MEDS, a Christian-based non-profit organisation, was established in 1986 following a feasibility study that identified gaps in commodity supply to Faith Based Healthcare facilities (FBHs) (WHO, 2004). Prior to that, faith-based facilities received supplies from the then Central Medical Stores (now KEMSA), which experienced frequent stock-outs. Worse still, whenever some medicines were available, government facilities would receive priority over their FBH counterparts, resulting in stock-outs that sometimes lasted for months. In 2012, pharmaceuticals contributed 72% of MEDS' product sales, with surgical and laboratory products contributing 22% and 6% respectively (MEDS, 2013).

The Kenyan pharmaceutical sector supplies nearly half of the Common Market for Eastern and Southern Africa (COMESA), with over half of manufacturers in the region having their operational bases in Nairobi (Kenya Pharma Expo, 2014). Kenyan private organisations enjoy negotiated duty exemptions in exports to several countries in the region, including Tanzania, Uganda and Rwanda (Kenya Pharma Expo, 2014). About 50% of Kenya's pharmaceutical exports are destined for East African Community States (UNIDO, 2010).

One of the leading pharmaceutical suppliers in Kenya, GlaxoSmithKline (GSK), controls approximately 12% of the market share, supplying over 40% of all anti-infective medicines in private pharmacies (Frost and Sullivan, 2013). The ten largest manufacturers are said to control nearly 80% of local production (UNIDO, 2010), although updated information on the identity and market share controlled by each, is unavailable. According to the report by Frost and Sullivan (2013), GSK's market dominance results from its control of a specific segment of market, which account for over 40% of prescriptions medicines revenue. Over-the-counter medicines represent roughly one third of the Kenyan market, with 2008 estimates putting the value at KES 6.5 billion (US$ 81 million) (Barnes, 2010).

Suppliers of generic medicines dominate the Kenyan pharmaceutical industry. According to a recent report, the value of generic medicines imported in 2008 exceeds the total value of medicines produced locally (AUC and UNIDO, 2012). However, clients are reported to have high preference for branded innovator products overall (Frost and Sullivan, 2013). This has been attributed to aggressive marketing by local importers and distributors affiliated to multinational pharmaceutical organisations.

Kenya's healthcare products' distribution chain has a pyramidal structure, with a few large distributors at the top and a large but undefined number of retailers at the base (estimates put the number at roughly 6,000 in 2009) (Barnes, 2010; Broadreach Healthcare, 2011; Ministry of Medical Services (MoMS), 2010a; UNIDO, 2010). The distribution of pharmaceutical distributors and wholesalers is highly skewed in favour of major towns. A previous assessment found that the majority of distributors operate within the capital, resulting in excessive competition for the pool of retailers within the city (Barnes, 2010). This has been linked to undercutting of prices and some suppliers procuring commodities from countries with less stringent regulatory enforcement (otherwise known as parallel importation).

The situation is made worse by blurred boundaries between the different levels, with some distributors and wholesalers engaging directly in retail business. This has contributed to low quality of services through parallel importation at the retail level, as well as other perverse behaviours like pilfering medicines from the public sector (Wafula et al., 2013). The excessive fragmentation has also been linked to reduced economies of scale, resulting in poor supply of medicines to retailers operating away from major towns. The local manufacturers and direct importers supply the wholesalers, who in turn supply the commercial pharmacies and other institutions such as healthcare facilities.

2.7 ROLE OF KEMSA IN HEALTHCARE SUPPLY CHAIN IN KENYA

In Kenya, KEMSA, a state corporation operating under the auspices of MOH- manages the public hospital healthcare SC. The Pharmacy Unit at the same Ministry provides policy leadership in provision of pharmaceutical services through the public sector, while the PPB regulates pharmacy practice and medicines (Wafula et al., 2013).

KEMSA previously operated as an agency under the Kenya Medical Supplies Order of 2000 (KEMSA, 2014b). Its responsibilities in the past included procurement, warehousing and distribution of commodities to public institutions, but have recently been expanded under the KEMSA 2013 Act to include procurement, warehousing and distribution to county Government as well as other private networks. The new KEMSA Act also saw the organisation's name change from "Kenya Medical Supplies Agency" to "Kenya Medical Supplies Authority" to reflect the change in its mandate.

Up until 30th June 2013, supplies were made to facilities on a quarterly basis based on a supply driven system ("push-system") that was linked to the available stocks as opposed to needs of individual healthcare facilities. Individual facilities and districts (now sub-counties) were not charged for the supplies; so the healthcare facilities did not have much clout on what was to be supplied. However, following devolution of healthcare services at the start of 2014, the procurement and supply functions were fully transferred to 47 County Governments, with KEMSA's last "free" round of supply to facilities being completed towards the end of 2013 (KEMSA, 2014a).

Going forward, counties are required to place individual orders and pay directly to KEMSA according to own needs and budget. However, the counties also have a mandate to reach out to alternative suppliers, including private pharmaceutical distributors, via competitive bidding, should they feel KEMSA has failed to meet their needs.

Two provisions of the recently enacted “KEMSA Act of 2013” are likely to have an impact on KEMSA’s business model going forward. These are section 6(g), which allows KEMSA to operate a subsidiary that would compete with commercial agencies and section 6(h), which allows KEMSA to enter into partnerships with local and international entities (including commercial entities), for purposes of increasing its competitive edge (KEMSA, 2013). This creates a good foundation for KEMSA to embrace the SCI framework proposed in this research study.

In the past, KEMSA’s performance has often been reported to be sub-optimal (KEMSA Task Force, 2008). It is expected that the strengthening of its management structure and enactment of the KEMSA Act 2013 would significantly improve its competitiveness. KEMSA is faced with several challenges ranging from human resource limitations to lack of a fully functional Enterprise Resource Planning (ERP) system. The current ERP needs to be strengthened in order for KEMSA to reach its full potential (Deloitte, 2013). Enhanced ERP functionality is required to improve the quality and speed of warehouse operations and monitoring and evaluation. Creating the right governance and accountability structure is critical in making KEMSA and, in the end, the service delivery to the patient, successful.

2.8 KEMSA SUPPLY CHAIN NETWORK

The population of Kenya is approximately 42 million people with annual increment of 2.6% (GOK, 2013). The populace is spread across the nation with high population density in cities and towns, suburbs and in countryside areas. Almost all main cities and towns are linked by road network and can theoretically be accessed within a day (about 500 km radius from the capital city, Nairobi). However, the vast proportions of rural areas are remote and difficult to reach, particularly during the rainy seasons when roads that are not tarmacked become impassable.

KEMSA utilises a central warehousing model, which supplies all customers directly from its two Nairobi warehouses. In addition, KEMSA owns eight regional depots, primarily used for keeping slow-moving stock. KEMSA outsources transportation of supplies to private transport companies. The KEMSA network, just like the population spread, is also located across Kenya (GOK, 2013). KEMSA's total warehousing size is shown in Table 2.1.

Table 2.1: Current KEMSA warehouse size

Warehouse Location	Area (sq. ft.)
Commercial Street, Nairobi	42,000
Embakasi, Nairobi	206,000
Mombasa	6,160
Kisumu	8,400
Eldoret	7,920
Nakuru	7,210
Nyeri	9,120
Kakamega	2,000
Meru	2,000
Garissa	2,000

Source: Researcher's own compilation based on DFID (2014: 31)

Apart from KEMSA, other players in the healthcare SC include Mission for Essential Drugs and Supplies (MEDS), which distribute pharmaceuticals and other medical products to FBHs. MEDS is run by Christian Health Association of Kenya (CHAK) and Kenya Episcopal Conference (KEC). MEDS is tasked with distribution of pharmaceuticals commodities to faith-based and other not-for-profit healthcare facilities.

Both KEMSA and MEDS enjoy substantial procurement discounts from local and foreign manufacturers and have devised systems of pooling orders before dispatching to facilities via outsourced transportation. By having a system of pooling and packaging orders from one locality and outsourcing transport to firms with a good operations network within the respective localities, both KEMSA and MEDS have been reported to have lowered their last mile delivery costs substantially (Sebergsen, and Bagger 2010).

A shift is expected in how the SCs work and intersect following the recent devolution of health services in Kenya. Counties, rather than the National Government, are now responsible for procurement and supply management processes. This presents opportunities and threats to both public and private SCs and has already elicited shifts in business models and led to adoption of new business strategies.

The on-going transitions present a great opportunity for government, policymakers and other stakeholders to introduce improvements at all levels of the healthcare SC. It is predicted that the coming years could see a cycle of continuous learning, where different options would be tried and best practices copied and replicated in other counties (World Bank, 2012). It is also a great opportunity to initiate an integrated SC system linking KEMSA with all the healthcare facilities.

2.9 STUDIES ON THE HEALTHCARE SUPPLY CHAIN IN KENYA

Riungu (2012), studied distribution channel strategies and opportunities in the pharmaceutical SC in Kenya and noted that strong SCs are vital to effective service delivery in public, faith-based and private healthcare facilities. Riungu (2012) recommends that Kenya and sub-Saharan Africa should establish regional distribution centres, establish strategic partnerships with local stakeholders, differential pricing and ensure distribution flexibility through ownership of market authorisation in the target countries. These strategies would lead to innovative SC practices that promote wide distribution coverage, better prices to customers and overall profitability of all the stakeholders in the SC.

A study by Strathmore University on Minimising Risks in the Supply Chain of Health Commodities concluded that lack of stewardship of the medical supply in Kenya was the key deterrent to an efficient and effective system (Strathmore, 2013). The study noted that there is a need to strengthen the coordination framework of the SC from a national level perspective with the participation of all key stakeholders at all levels of the healthcare system. This would facilitate tracking medical supply processes at the county level and in so doing significantly reduce ineffectiveness and inefficiency risks.

The key challenges affecting and relating to the MOH and KEMSA's operations are delayed delivery and a lack of accountability after delivery. The situation is further complicated by the application of a mix of push and pull systems and a weak, essentially manual, information system therefore making compiling data for resource allocation an intricate process.

Basic data such as service statistics indicating number of patients seen annually in facilities is a key parameter in quantification not easily available, forcing officials to compile bits and pieces from some of the healthcare facilities whilst extrapolating for the rest. Demographic and epidemiological data, even though it could be available as is evident from numerous reporting tools is sub-optimally used for decision-making (GOK, 2010; Strathmore, 2013). Consumption data was also reported not to be reliable due to weak inventory management systems at facility level.

The studies conducted in Kenya mentioned above point to key challenges in the Kenyan healthcare SC. However, these studies neither identify critical determinants influencing the SCI nor the impact it has on an integrated supply relationships and customer's order fulfilment in public hospital pharmacies. The aim of this research therefore is to fill this gap and develop a model for evaluating the degree of SCI in the SC within the public hospital pharmacies in Kenya.

2.10 CHALLENGES IN THE HEALTHCARE SECTOR

Supply chains are vital in determination of the final cost and availability of health commodities. A functional healthcare SC should provide wide geographical access to competitively priced, quality healthcare commodities. Further, SCs must function efficiently, transparently and with agility (Aguirre and Goudge, 2014).

A broad range of SC processes are critical in functions such as sourcing, financing, shipment and delivery of healthcare commodities to the final customer. These activities are enabled by availability of market and product information, efficient and timely financial flows and effective national regulation and enforcement.

SCs reinforce the whole healthcare delivery system and form a critical component in provision of reliable and affordable quality health commodities delivered to all parts of the country where and when needed. Furthermore, SCs transmit quantification information back to managers and policymakers. In addition, the SCs facilitate financial flows so that the entire value chain is sufficiently funded. A disjointed SC can potentially cripple the entire health structure and could weaken healthcare delivery outcomes (Cohen, Sabot O., Sabot K., Gordon, Gross, Bishop, Odhiambo, Ipuge, Ward, Mwita, and others 2010).

A report by UNIDO indicates that Sub-Saharan Africa account for about 25% of the global disease burden coupled with some of the weakest healthcare delivery systems. Nonetheless, the continent accounts for just 1% of global healthcare expenditure (AUC and UNIDO, 2013).

Significant proportions of populations in the developing world have no access to quality healthcare, mainly due to lack of predictable healthcare financing, poor infrastructure and harsh terrains. Countries require functional public healthcare systems to facilitate timely services delivery across the entire country (AUC and UNIDO, 2013). Public healthcare systems are grossly underfunded and often concentrated only in cities and major towns.

There are less than three medical doctors per 10,000 people in most countries in Sub-Saharan Africa (World Bank, 2010). In some countries, warehousing and distribution mechanisms are missing or are poorly managed, occasioning huge losses of medicines in the healthcare medical SC. The World Bank estimates that for each US$100 expended by African governments on healthcare commodities, barely US$12 worth of medicines reaches the final beneficial (World Bank, 2009). Health SCs in several less developed and developing countries score poorly and have low private sector participation (Dalberg Global MIT-Zaragoza International Logistics Programme, 2009).

Healthcare SCs occur as greatly disjointed structures in which manufacturers, distributors, wholesalers and logistics providers work independently of each other. Disintegration confounds the task of linking the partners operating at any phase along the value chain (Dobrzykowski and Vonderembse, 2009; Burns, 2002). Burns (2002) observes that most players in the healthcare sector still lack harmonised effort, strategic alliance formation and knowledge sharing. Gibbons (2009), observes that a healthcare value chain is an information intensive environment and access to quality and timely information is essential for delivery of quality and safe healthcare services.

The SC enablers such as supplier collaborations and adoption of IT are critical threads that run across the entire processes and phases of the SC network (Vanpoucke, and Vereecke 2010). Better information can improve the use of resources, which are often in short supply (Aguirre and Goudge, 2014). For instance, correct information on consumption patterns which is recorded at the public hospital pharmacies and flows that back up in the chain can be crucial for effective quantification and ordering at all levels in the SC.

Appropriate stock levels at KEMSA and at public hospital pharmacies could be determined to help set up replenishment frequencies at the different stages of the SC. Keeping preferred stock levels limit the likelihood of stock-outs and surplus inventory, which could contribute to product expiration currently experienced in the public hospital pharmacies (SPS, 2008). Information on stock levels and composition flowing through the system would, strategically, inform upstream decisions about quantities to be procured.

Functional financial flows are also important as they provide critical support to the SC and the entire healthcare system for it to operate efficiently. Timely financial flows between various levels in the SC would help facilitate an continuous flow of products and a sustainable system that is able to reliably deliver products and services (Aguirre and Goudge, 2014). All too often in developing countries like Kenya, uncoordinated or belated financial flows hinder timely procurement (Dalberg et al., 2009).

Regulation cuts across the entire value chain, joining commodity registration, through to product inspection at the importation entry points, the supervision of distribution and registration of pharmacists and technicians. In addition, regulation provides guidelines on inspection and licencing of pharmacies and chemist shops. Lack of sufficient regulation at every phase in the SC could result in compromising product quality and integrity, resulting in deaths that could have been prevented. (Aguirre and Goudge, 2014).

2.11 SUMMARY

In order to address the growing challenges in the healthcare system highlighted in this chapter, the Government of Kenya (GOK) through KEMSA, needs to review its existing SC system with a view to adopting an agile system of an integrated SC.

Integrated system should aim at linking its customer relations, purchasing, warehousing and supply teams with the supplier base early in the process when building relationships with their suppliers. The traditional approach, generally taken by many organisations, when dealing with their suppliers focus on costs, quality and schedule. This approach needs to be changed to a collaborative relationship. SC partners must work together so that they get the right supplies on time, the first time.

With a devolved system of governance and decision making in the 47 counties that are autonomous and not obliged to procure only from KEMSA, it must as a matter of necessity, come up with satisfactory solutions that are very agile, flexible and cost effective. The devolved governance system calls for KEMSA to confront challenges they may not have confronted before. To make that possible, agility, customer care and integration within the SC could turn out to be critical factors.

In this chapter, the researcher has reviewed the SC theories and health sector framework. In particular, the framework of health sector SC and healthcare financing in Kenya are captured. An overview of the Kenyan pharmaceutical market, health sector policy as well as the regulatory framework in Kenya are also discussed in this chapter.

In addition, the SC in the Kenyan health sector and the role of KEMSA in the medical SC in Kenya are discussed. Studies on healthcare SC in Kenya as well as challenges in the healthcare sector are also reviewed in this chapter.

CHAPTER THREE

SUPPLY CHAIN MANAGEMENT AND INTEGRATION

3.1 INTRODUCTION

In Chapter Two, the researcher discussed the healthcare sector in Kenya and highlighted the operating environment and challenges it faces. In this chapter, the focus now shifts to SCM and SCI.

In addition to this, the researcher focuses on historical, theoretical perspectives and frameworks relating to SCM. Furthermore, the researcher explores the global overview of SCM and integration as well as the role of logistics in SCI. Other issues addressed in the chapter include SCM in hospitals and pharmacies, inventory management approaches in hospitals as well as inefficiencies experienced within the SC.

3.2 SUPPLY CHAIN MANAGEMENT: A HISTORICAL PERSPECTIVE

The first introduction of the term "Supply Chain Management" (SCM) popularised in noticeable media and literatures can be tracked back to the early 1980s. It featured for the first time in a *Financial Times* article written by Oliver and Webber in 1982 explaining an array of activities implemented by an organisation in procurement and management of supplies (Oliver and Weber, 1982).

During its early phase, SCM was considered as a synonym for logistics. It is only in the late 1990s that many scholars noticed that SCM, aided by IT advancement, was making significant strides as a distinct discipline. Subsequently, research in the domain and scope of SCM gained significant prominence in that period (Cooper, Lambert and Pagh, 1997; Harland 1996; Lummus and Vokurka 1999; Mentzer, DeWitt, Keebler, Min, Nix, Smith and Zacharia, 2001; Simon et al., 2015). SCM was a novel topic in the 1990s and going by the widespread literature on the subject since then, it is reasonable to infer that its acceptance and adoption has been raised to even higher levels in recent years.

According to McDonough and Braungart (2002) and Gripsrud, Jahre, and Persson (2006), the term “Supply Chain Management,” is a critical element in organisations due to its benefits arising from integrating business processes. The phrase “Supply Chain” is actually somewhat deceiving, for what is better embodied as a network and not a straight line. However, the fundamental idea remains the same and that is to strengthen and harness the connections between an organisation and its environment in terms of relationships, activities and flows (Grieger, 2006). Currently, the phrase is very common among researchers and industry practitioners.

In the last few decades, SCM gained more prominence in productive sectors due to its capability to increase competitive advantage in the organisations. Today, one may correctly say that competition is not among organisations as such, but rather amongst their SCs (Lu, 2011). Therefore, a good SCM strategy would in future determine who survives in the competitive environment (Boston Consulting Group, 2009).

SCM has elicited increased interest in academic cycles as well as in global business organisations and in economic development organisations, such as the World Bank (Cattaneo, Gereffi and Staritz, 2010), the World Trade Organisation (WTO and IDE-JETRO, 2011), the Organisation for Economic Cooperation and Development (OECD, 2011), the International Labour Organisation (ILO), the U.S. Agency for International Development (USAID, 2011) and the U.S. International Trade Commission (USITC, 2011).

In the twenty-first century, SCM has graduated from an operational orientation (sharing information) to strategic orientation (business process integration) (Lummus and Vokurka 2008; Mentzer et al., 2001) and evolved as a multivariate discipline (Cousins, Lawson, and Squire, 2006). SCM has benefited immensely from IT advancement making it a powerful business process (Cachon and Fisher, 2000).

SCM’s potential benefits make it one of the critical factors to an organisation’s competitiveness and success in the global environment (Charvet, Cooper and Gardener 2007; Georgi, Darkow and Kotzab, 2010; Shiau and Dwivedi, 2013).

It is important to note that SCM in the twenty first century must address the concerns of environmental and social responsibility as well as transparency in order to develop sustainable value chains (Ageron, Gunasekaran and Spalanzani, 2012; Bjorklund et al., 2012; Gimenez, Van der Vart and Van Donk, 2012; Green Zelbst, Meacham, and Bhadauria, 2012).

Notwithstanding the broad body of academic and popular literature on the topic, Fermi, Fiorello, Krail and Schade (2012), contend that there are very few instances of very successfully executed SCM cases and in many organisations, SCM is either not existing or still in the rudimentary phase. This researcher seeks to explore how the public hospital supply chain can leverage on benefits of SCI to efficiently deliver benefits to the patients at the tail end of the chain.

3.3 SUPPLY CHAIN MANAGEMENT THEORETICAL PERSPECTIVES

The literature on SCM is grounded on numerous theories and frameworks, making it hard to select the best theory or framework appropriate for study of SCM and its application. While the field of SCM is fast evolving, there still lacks academic literature about methodologies to guide and support evaluation SCM and its implementation (Akkermans, Bogerd and Yucesan, 2003; Croxton, Garcia-Dastugue, Lambert, Rogers, 2001; Lambert 2008). The literature on SCM tends to change between description, prescription and trend identification (Storey, Emberson, Godsell and Harrison, 2006).

Going through the diverse body of knowledge, it is easy to note the many different definitions of SC. Lu (2011), defines supply chain as *“a group of inter-connected participating organisations that add value to a stream of transformed inputs from their source of origin to the end products or services that are demanded by the designated end-consumers”*.

In this definition, there are several features that have been used to paint the picture of an SC. Firstly, an SC is created where there are more than one participating organisation. Secondly, the partner organisations within an SC are not necessarily part of the same business ownership and hence, there is a legitimatised independence between them. Thirdly, the participating organisations are inter-connected and have a common commitment to add value to material flow that runs through the SC. For each organisation, this material flow enters as transformed inputs and exits as value added outputs.

Instinctively, one can visualise an SC as resembling a “chain,” where the “links” are the partners carrying out the value addition activities as shown in Figure 3.1. The connection on the upstream flank of the material flow is the supplier’s supplier (supply network) and on the downstream side of the material flow is the customer (distribution network).

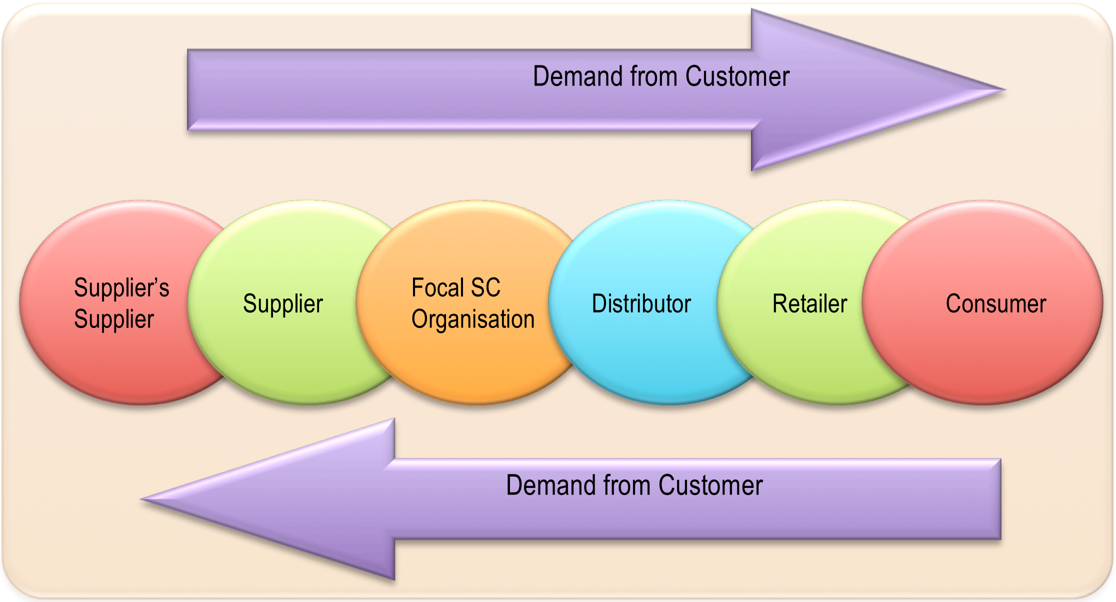

Figure 3.1: Basic supply chain model

Source: Lu (2011: 10)

At the end of an SC, there are products and/or services that are produced by the SC for the end consumers. Thus, the critical aim of an SC is to serve the end-consumers. The existence of SC is centred on the existence of the demand from the consumers. SC should considers consumers as the object which it serves (Chin, Tat and Sulaiman, 2015). All actions and processes of an SC are propelled by the needs and wants of the end-consumers (Ageron et al., 2012).

An SC can be viewed as a cluster of organisations, or a complex process executed by organisations that cooperate in delivering products or services to the market (Nagy, 2010). SCs are mostly structured around a focal organisation, which is the originator of the SC rational and coordinated operation (Nagy, 2003). Christopher (2012), describes an SC as a linkage of upstream and downstream relationships (that is, suppliers and customers) in order to create increased value in the final market place at a lower cost thereby increasing competitiveness.

The extent to which an SC can serve the end consumers ultimately defines its competitive edge in the business environment. The actual SC is much more complicated than the one illustrated in Figure 3.1. It is not a “chain” but is more of a “network” when you consider that there are usually several suppliers and numerous customers for each partner within the chain. There is also a possibility of nested chains within the chains. For example, a pharmaceutical machine-manufacturer’s SC is a nested SC within the greater healthcare SC.

An organisation’s competitiveness, illustrated in Figure 3.2, depends on how well it meets customer demands in terms of service, cost quality and agility by designing the SC that is more effective and efficient than the competition. Optimisation of this equilibrium is a constant challenge for organisations within an SC network.

SCs comprise of the organisations, individuals and processes required to design, make, deliver and use a product or service. Organisations depend on their SCs to provide them with what they need to survive and thrive. Consequently, each organisation must fit into one or more SCs and has varied roles to play in each one of them.

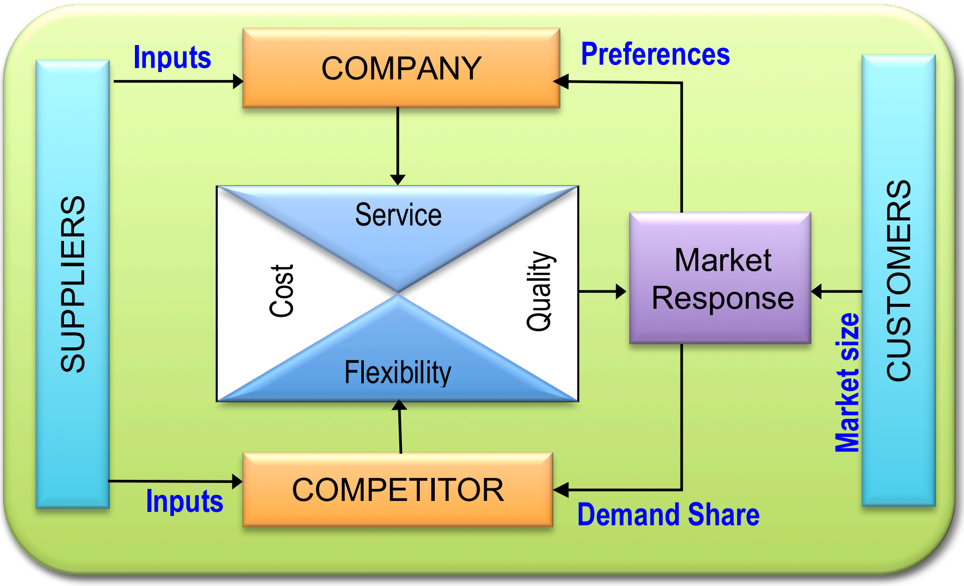

Figure 3.2: Competitive framework in a Supply Chain

Source: Ernst, (2002: 120)

Since the principal motivation of SCs is to increase efficiency, the primary objectives are mainly to lessen “friction” (for example, delays, blockages, or imbalances), reduce outages or over-stocks, lower transaction costs and ultimately improve customer order fulfilment and customer satisfaction (Feller, Shunk and Callarman, 2006).

According to Seuring and Muller (2010), SCs vary in size, complexity of links amongst the members and distribution of physical presence. Figure 3.3 illustrates the different types of channel relations in the SC namely: direct and extended SCs. According to Halldorsson and Larson (2000), a direct SC comprises of one supplier and one customer of an organisation while the extended includes supplier’s supplier and customer’s customer as shown in Figure 3.3.

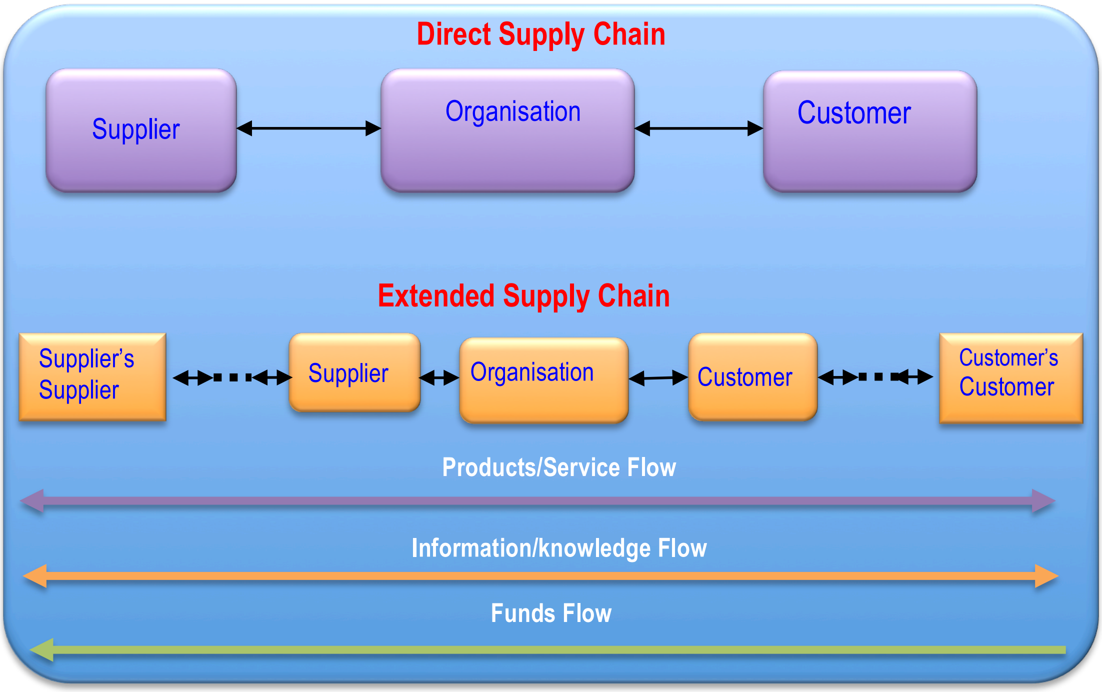

Figure 3.3: Relations and flows across a supply chain

Source: Researcher's compilation based on Halldorsson and Larson (2000); Huo, Jiang and Li (2005); and Seuring and Muller (2010)

As shown in the Figure 3.3, SCs are vibrant and involve the flow of information, products and funds between different phases. The product or service flow refers to the various value-adding processes from material acquisition to end customers. Value is added to products when they move along the SC and encounter physical changes, packaging, launch, customisation, service support and other relative activities up until they meet the needs of end customers.

The knowledge and information demand flow is an inverse flow from end customers to suppliers. It encompasses the exchange information on demand, customer feedback as well as warehousing and logistical information. Information is critical to SC planning process as it helps SC partners to match supplies with customer requirements and consumption status. Consequently, improved plans are formulated that are geared towards SCs that work collaboratively. Information flow is a linked communication flow between SC partners. This could demand forecasts, shipment schedules, inventory information, invoice, payment and replenishing requirements. Information sharing can activate, control and direct the flow of product in an SC. With IT advancement, more information is exchanged through mobile devices and networks than manual paper-based processes.

The money flows always moves in the opposite direction to the value-adding processes. Increased profit margins are of great importance to SC performance. The four flows discussed as per Figure 3.3 can occur even when there is no formalised coordination in the SC. However, in an environment of low integration and poor coordination, the flow movements are erratic resulting in delay, redundancy and inefficiency in the SC. SCI accelerates the flows in the SC to generate predictability and efficiency in the value chain.

SCM comprises the control of flows between and among the SC partners with the aim of maximising the total SC profitability thereby increasing the total value created throughout the SC (Coleman and Bhattacharya, 2005). Successful application of SCM should be viewed as closely related to the necessity for breaking down barriers not only between internal functional areas and business processes, but also across organisations within the entire SC (Vollman Berry and Whybark, 1997).

3.4 SUPPLY CHAIN MANAGEMENT FRAMEWORKS

Frameworks provide a common platform for SC operations and a general guide of the key activities needed to manage effective and efficient SCs. In this study, four SCM frameworks are reviewed namely:

⇒ Strategic Alignment model;

⇒ Global Supply Chain Forum (GSCF) framework;

⇒ Collaborative Planning, Forecasting and Replenishment (CPFR) tool;

⇒ Supply Chain Operations Reference (SCOR) framework.

3.4.1 Strategic Alignment framework

The Strategic Alignment framework, proposed by Gattorna in 1998, brings together the four elements that must be aligned to achieve sustained superior performance Christopher and Gattorna (2005). He postulates that for organisations to develop sustained operational and financial performance, they need to align their strategies, cultural capabilities and leadership styles with customers. This strategic alignment is illustrated in Figure 3.4.

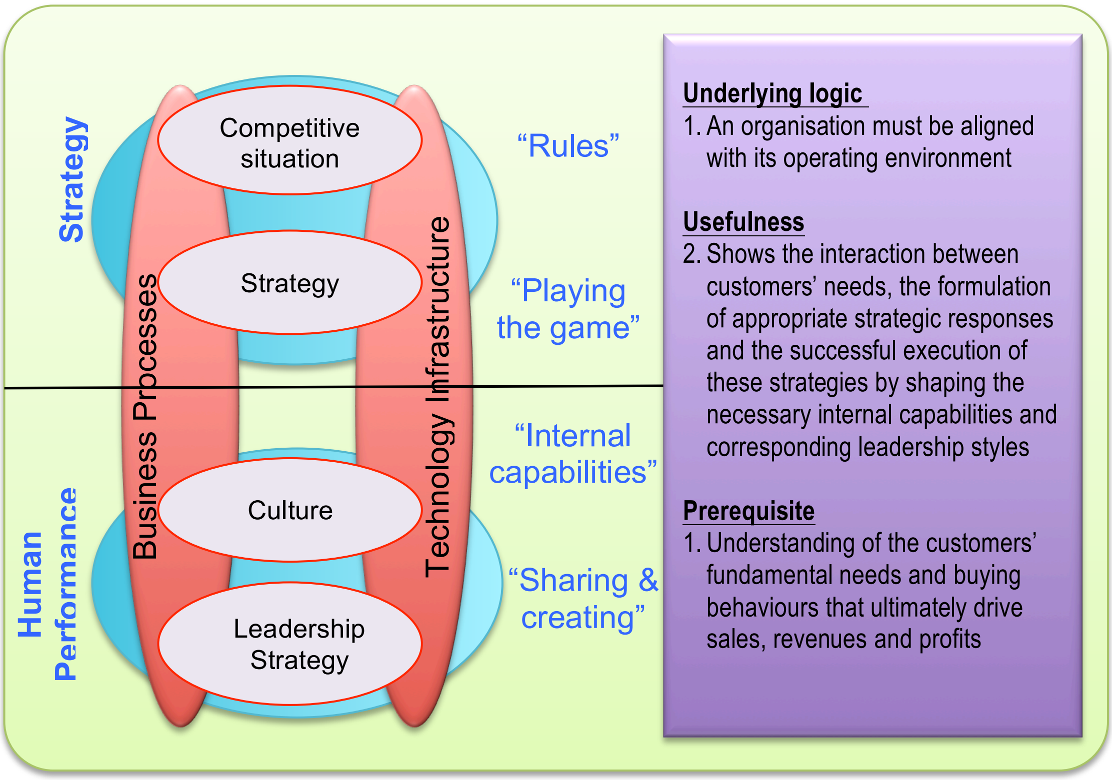

Figure 3.4: Strategic alignment framework

Source: Adapted from Christopher and Gattorna (2005: 12)

However, only few organisations have perfected the art of aligning and properly linking these four levels. The trick lies in understanding and interpreting the market by going beyond economic concepts as depicted in Figure 3.4. The best way to segment markets is along "buyer behaviour" lines but most organisations use internal considerations that provide little or no indication of how customers intend to buy products and services.

In his study on buyer behaviour, Gattorna (2006), observed that customers may show a limited number of dominant buying behaviours for a particular product or service and that these conduct tend to change if the situation changes. He summarised the four types of buying behaviour, which appear to be present in many product/service situations in Table 3.1.

Table 3.1: Customer buying behaviours

Collaborative	Efficiency/ Consistency	Demanding/ Quick Response	Innovative Solutions
Close working relationships for mutual gain	Consistent response to largely predictable demands	Rapid response to unpredictable supply & demand conditions	Supplier-led development & delivery of new idea
• Mostly predictable • Regular delivery • Mature or augmented products • Primary source of supply • Trusting relationship • Teamwork/ partnership • Information sharing • Joint development • Forgiving • Price not an issue	• Predictable demand within contract • Regular delivery • Efficiency low cost focus • Multiple sources of supply • Little sharing of information • More adversarial • Standard processes • Power imposed • Transactional • Very price sensitive	• Unpredictable demand • Commodity relationship • Time priority/urgency • Opportunity focus • Ad hoc source of supply • Low loyalty, impersonal • Fewer processes • Outcome oriented • Commercial deals based on pragmatism • Price aware	• Very unpredictable demand • Higher risk • Flexible delivery response • Innovation focus • Rapid change • Individual decision making • Solutions oriented • Management of IP • Incentives/ego • No price sensitivity

Source: Adapted from Gattorna (2003:32)

The mix of the four buying behaviours presented in Table 3.1 varies across product and service categories and countries. Collaborative buying behaviour is propelled by a need for trusting relationships and predictability, rather than price. The consistent buying behaviour is propelled by predictable low-cost service and is very price sensitive. The dynamic buying behaviour is price awareness but customers are willing to pay a premium if their largely variable and unpredictable demand is met timely. Lastly, the innovative solutions buying behaviour is only interested in a quick and creative solution, at practically any price.

The critical task, according to this model, is to understand the mix and integration of these four elements for any product or service category. When that is achieved, a pricing plan by customer-segment category is easily created particularly in business-to-business marketplaces. Where the initial segmentation is performed well, then even if a particular customer is forced to change their preferred or dominant buying behaviour for short intervals because of internal or external pressures, they would under normal circumstances move to alternative of the known buying behaviour options, thus making the task of responding much easier than the situation where exceptions are constantly created, often at very high cost.

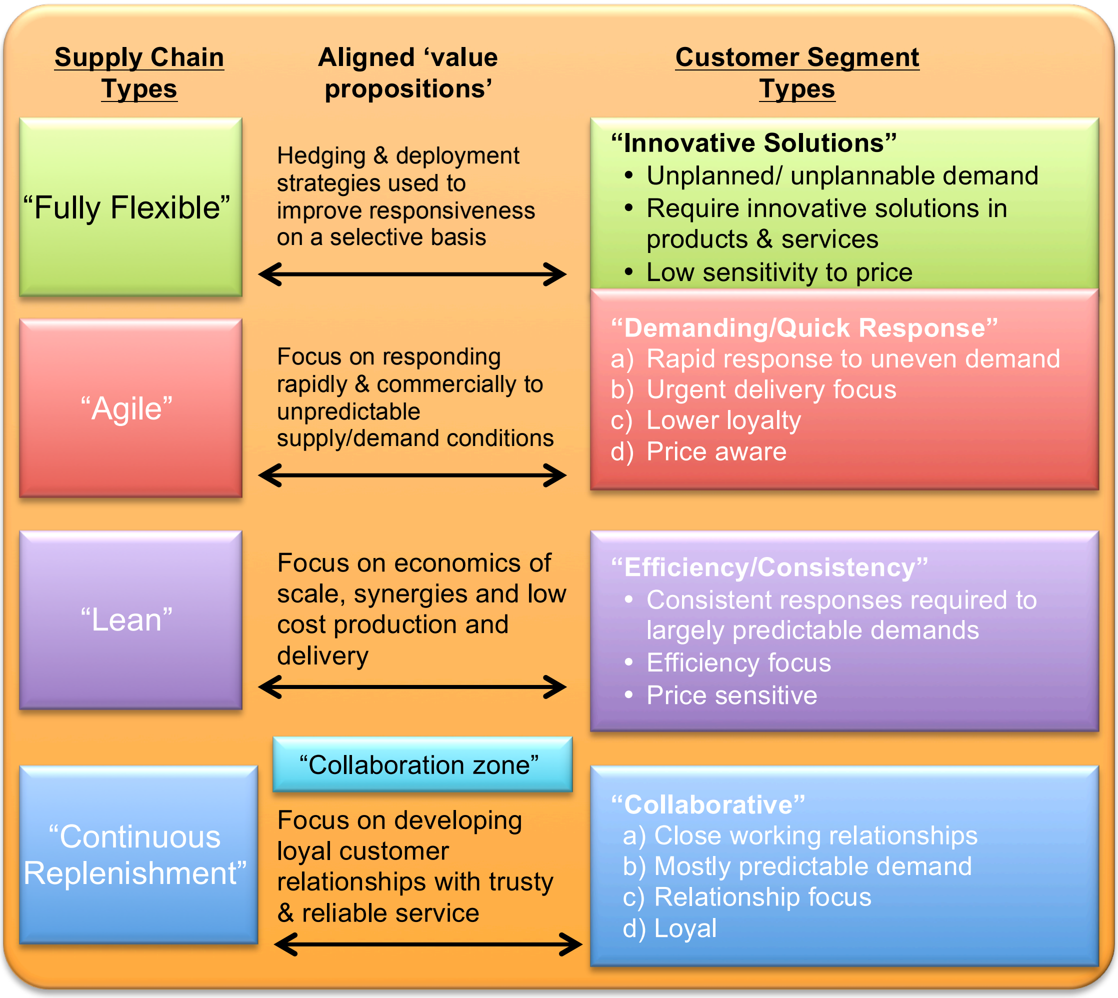

Figure 3.5: Value propositions, strategies and SC solutions

Source: Adapted from Christopher and Gattorna (2005: 13)

Therefore the suitable "value propositions," including pricing and other service considerations in this "multiple supply chain alignment" setup would look as shown in Figure 3.5.

Effectively, Gattorna (2003) recommends a 'horses for courses' principle for SC design, which borrows from human behavioural as well as economic factors. Adherence to the 'alignment' approach demystifies the market and removes much of the trial and error method of management that was prevalent before globalisation when resources were ostensibly abundant.

3.4.2 Supply Chain Operations Reference framework

The Supply Chain Operations Reference (SCOR) framework is a process oriented. "*SCOR is a process reference model that has been developed and endorsed by the APICS Supply Chain Council (SCC) as the cross-industry standard diagnostic tool for SCM. SCOR enables users to address, improve and communicate SCM practices within and between all interested parties*" (APICS Supply Chain Council, 2014).

Table 3.2: SCOR Process

	Process	Description
1	Plan	These are processes that balance cumulative demand and supply to design strategy that best meets sourcing, production and delivery requirements of the organisation.
2	Source	These are those processes that procure goods and services in order to meet planned or actual demand.
3	Make	Here are processes that transform a product to a finished state to meet planned or actual demand.
4	Deliver	These include processes that provide finished goods and services to meet planned or actual demand, including order management, transportation management and distribution management.
5	Return	These are processes associated with returning or receiving returned products for any reason. These processes normally extend into post-delivery customer support.

Source: Adopted from APICS Supply Chain Council (2014)

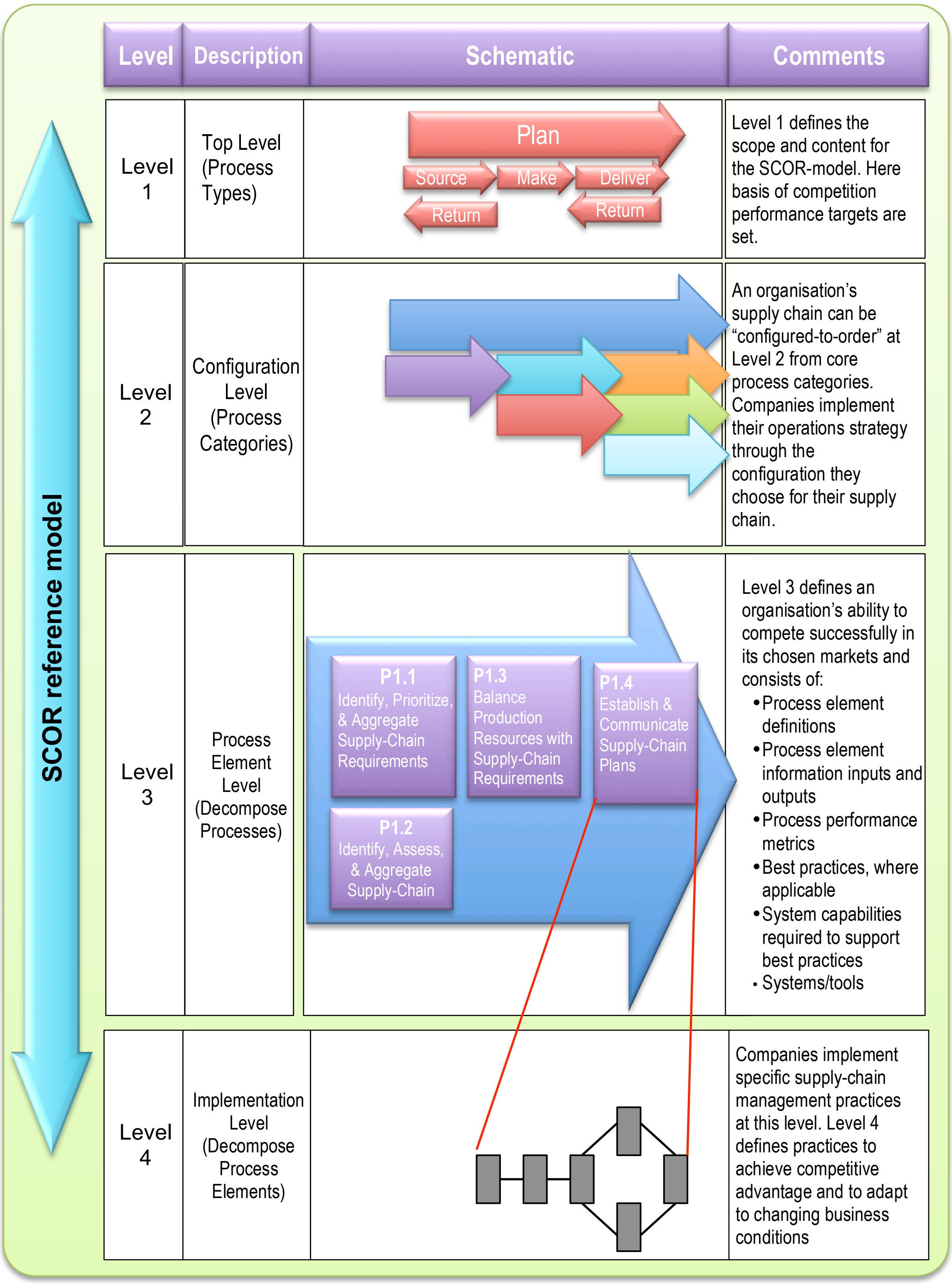

Figure 3.6: SCOR Model

Source: Adapted from Zhou (2003:18)

The SCOR framework divides a supply chain into five processes namely plan, source, make, deliver and return as expounded in Table 3.2. Each of these processes is implemented in four levels of details as shown in Figure 3.6. As depicted in this Figure, the SCOR framework has four levels of processes. The highest level of process is Level One or the core process. This level defines the scope and content of the SCOR model. The lower level process is referred to as Level Two or sub-process. It organises the SC components at the process level by using core process categories.

Each of the five processes identified at the top level is divided into several core process categories. Level Three is the process decomposition level. At this level, the SCOR model identifies information needs, best practices, performance metrics for each process element and each process element's position in the overall framework. Level Four may be drilled down from a Level Three process. While every industry may have their particular processes which may not be standardised, implementation of these processes is voluntary, not provided. The SCOR framework involves great planning, which matches cumulative demand and supply to come up with a strategy that best meets the needs of the source, make and deliver processes (Christopher, 2012; Lambert Garcia-Dastugue and Croxton, 2005).

The framework has been adopted by a number of companies such as Intel, Daimler-Chrysler and Coca Cola in the USA. It has not been widely adopted on a global scale. This could be due to the reason that it needs extensive information input from employees in order to analyse the business process properly. This notwithstanding, the basic processes that underpins the model provide a very logical and rational approach to sequential and interconnected stages of flow as represented through an SC.

3.4.3 Global Supply Chain Forum framework

The Global Supply Chain Forum (GSCF) framework proposes eight practices that form the basis for SCM (see Figure 3.7). According to Croxton et al. (2001), the common business vision of business processes is of significant importance. According to Cooper, Lambert and Pagh (1997), there are eight GSCF business practices as shown in Figure 3.7.

These processes cut across functions and through functional silos in every organisation (Croxton et al., 2001). Functional silos include marketing, research and development, finance, production, purchasing and logistics. Each of these functions is further disaggregated into a sequence of strategic sub-processes, thus offering the scheme for execution for the model (Lambert, et al., 2005). It is therefore an excellent tool for integrating processes and breaking down functional thinking.

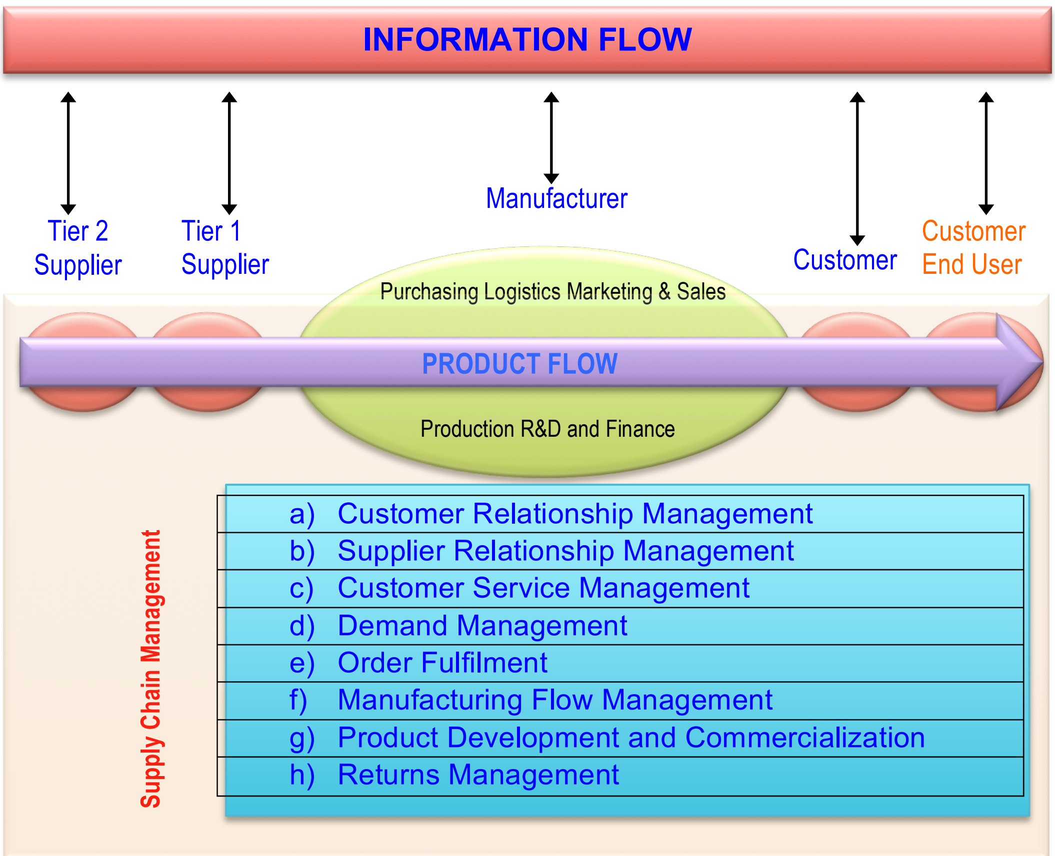

Figure 3.7: GSCF framework

Source: Adapted from Lambert (2008: 3)

Out of the eight functions, demand management, order fulfilment customer relationship management and supplier relationship management offer critical links to external organisations in an integrated SC. While all organisations in an integrated SC should consider all processes and functions, significance of each function, process or activity may vary (Croxton, Garcia-Dastugue, Lambert and Rogers, 2001). Some organisations may need to connect only a single critical function while for other organisations it is crucial to connect several functions. It is critical to identify which vital processes to integrate and implement in a particular situation (Cooper et al., 1997).

The GSCF model emphasises the significance of using a process method, in which all functions and processes that are involved in a product or touch on its service delivery ought to be harmonised. In addition, it is vital that businesses must keep close collaborations with its crucial clients and suppliers. In addition, GSCF model proposes a collaboration framework to assist organisations develop important relationships when executing the customer and supplier relationship management functions (Lambert, 2008). The model supposes that once necessary coordination tools are adopted throughout the different functions and processes, the outcome is an efficient and effective SC, which is a key facilitator of SCI.

3.4.4 Collaborative planning, forecasting and replenishment framework

Collaborative Planning, Forecasting and Replenishment (CPFR) framework is a web-based framework designed to harmonise different processes amongst SC partners. These processes include production and purchase planning, demand forecasting and inventory replenishment (Attaran and Attaran, 2007). The CPFR framework aims at sharing select internal information over networks to offer dependable and long-term perspectives of demand inside the SC (Fliedner, 2003). Improved planning in the SC comprises possible gains to SC partners in areas such as sales growth, decline in stock levels and increased customer service (Cassivi, 2006). The framework is based on information technologies as compared to process-focused SCOR and GSCF models discussed earlier.

The CPFR process is divided into four key steps:

⇒ **Step one – strategy and Planning**: This comprises front-end agreements and the development of a joint business plan between supplier and customer;

⇒ **Step two – demand and supply management:** This step involves projecting demand and supply;

⇒ **Step three – Order execution**: In this step, the customer's order is raised and supplies are dispatched, received and stocked on retail shelves;

⇒ **Step four – Review:** This entails analysis, where SC partners join hands in sharing experiences and fine-tune plans to increase planning and implementation moving forward (Cassivi, 2006; Attaran and Attaran, 2007).

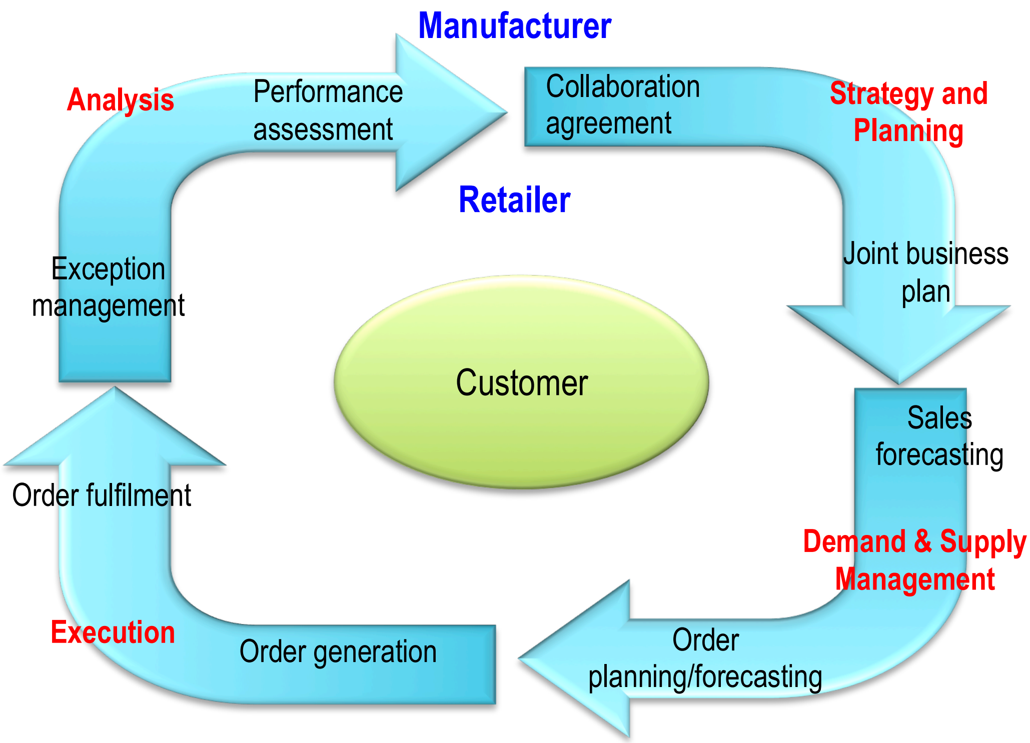

Figure 3.8: CFPR Model

Source: Adapted from Naslund and Williamson (2010: 17)

As shown in Figure 3.8, a thorough planning stage is necessary in CPFR since SC partners foster collaboration efforts and create terms of agreement with each other in this initial stage. The other stages are mainly functional and improve on the concepts agreed on during the planning stage. The CPFR method uses common business tools and processes to increase SC planning by way of enhanced information flow (Naslund and Williamson, 2010).

3.4.5 Mentzer framework

The Mentzer framework was advanced by Mentzer et al. (2001) with a view to create a reliable method for explaining the SCM concept. Mentzer et al. (2001: 1), defines SCM in this framework as "*the systematic, strategic coordination of the traditional business functions and tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.*"

These authors' explanation of SCM is based on broad literature review of attributes that typify SCM. Based on this definition, SCM comprises several organisations and numerous business undertakings, in addition to the process focus to coordinate activities throughout functions and across organisations in the SC. This resulted in the development of a conceptual SCM model as presented in Figure 3.9.

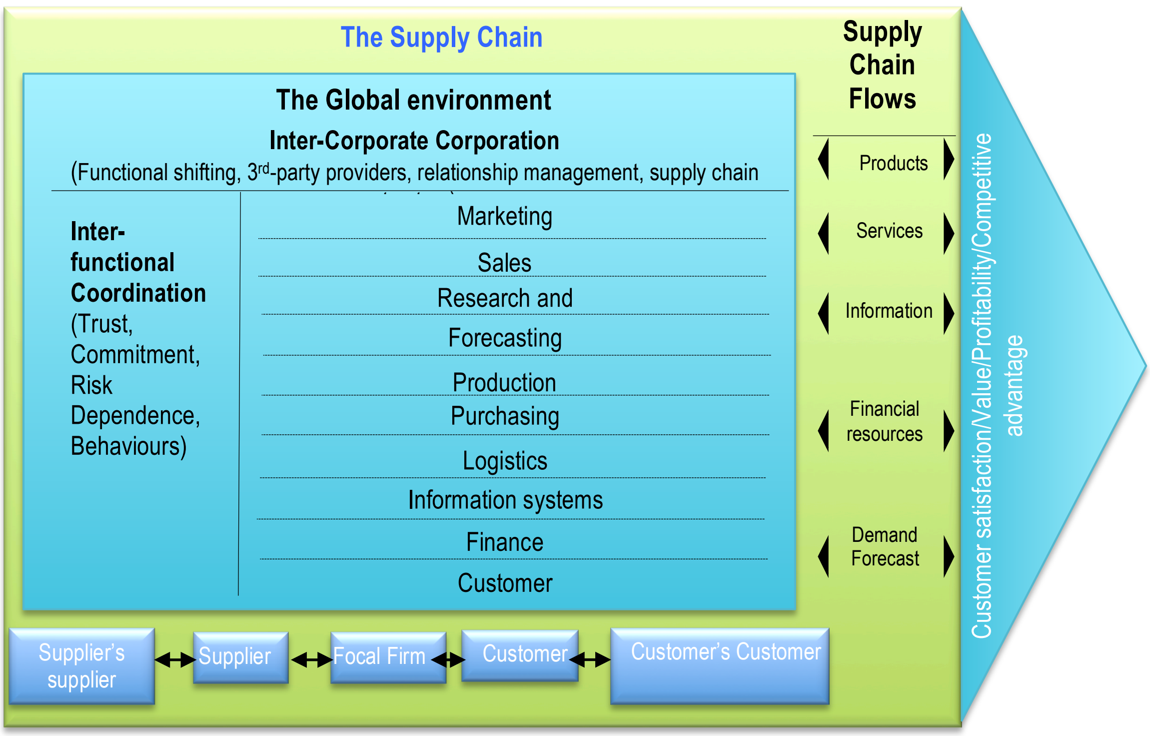

Figure 3.9: Mentzer model

Source: Adapted from Naslund and Williamson (2010: 19)

In the Mentzer model, the SC is depicted as a channel, showing the SC flows, the inter-functional coordination of traditional business functions and the inter-organisation coordination between SC partners from the supplier's suppliers through the customer's customer to ultimately provide value and satisfaction for the final consumer. Mentzer and his colleagues highlight customer value and satisfaction as a critical element towards realising competitive advantage and profitability, both at individual level and in the SC in its entirety (Mentzer et al., 2001).

Similar to the Mentzer model the aim of the present study seeks to ultimately provide value and satisfaction for the final consumer at the public hospital pharmacy. This model borrows elements from Porter's value chain. Where the value chain is single-entity focused, the Mentzer model extends value creation beyond the organisation and into its external partner connections.

3.5 GROUNDING SUPPLY CHAIN MANAGEMENT IN ORGANISATIONAL THEORIES

When doing research it is crucial to understand the theoretical foundations of the subject being investigated. In this section, the researcher briefly reviews some of the theories that can be applied to the SCM context which are borrowed from fields such as accounting, management, economics, sociology and engineering. As a relatively new concept, SCM and integrated SCs can become clearer and richer if examined from a variety of important theoretical perspectives. The majority of the theories that are increasingly being explored in SCM literature are actually older than the SCM concept itself. These theories are:

- ⇒ Transaction Cost Economics theory;
- ⇒ Principal-Agency theory;
- ⇒ Resource Dependence theory;
- ⇒ Institutional theory;
- ⇒ Game theory;
- ⇒ Social Network theory;

⇒ Strategic Choice theory; and

⇒ Resource-based View/Knowledge-based View theory.

These theories are discussed in the sections that follow.

3.5.1 Transaction cost economics theory

The Transaction Cost Economics (TCE) theory tries to answer the question pertaining to why organisations exist. In SCM context, TCE aims to reduce the costs associated with carrying out a transaction when deciding whether to make-or-buy (Lipczynski, Wilson and Goddard, 2005). Three attributes influence an organisation's decision to make or buy. These are frequency of transaction, asset specificity and degree of uncertainty associated with a transaction. In general, the TCE theory argues that different control and governance mechanisms should be employed to mitigate the risk of opportunistic behaviour of SC organisations when outsourcing (Ulaga and Eggert, 2006).

The TCE theory offers a natural fit with SCM since it is based on the ‘‘make or buy’’ decision, that is, whether an organisation should manufacture a product or purchase it from an outside supplier (Williamson, 1975). The primary objective is increasing performance and profitability by reducing transaction costs within and between organisations.

According to proponents of TCE theory, managers should work towards decreasing transaction costs while deciding on whether to make or buy. Transaction costs are the expenditures created by identifying fair market prices, negotiating and carrying out economic exchange (Williamson, 1991). In some situations, internalising a process decreases such costs, while in other situations, purchasing a product or service from another organisation is a better option.

Supply chain practitioners should balance these likelihoods to reach appropriate levels of collaborations across a chain. Within SCs that are not integrated, short-term transaction costs are the prevailing apprehension. This creates the potential for opportunism, wherein one organisation takes advantage of another organisation (Peteraf, 1993). For instance, one supplier may lower the quality of its products in order to raise its own profits. In such a scenario, trust between SC partners is hard to create and maintain. In contrast, the partners within an integrated SC place emphasis on overall cost, not just short-term transaction costs, to base make or buy decisions.

There is appreciation that operating speculatively has long-term implications as a supplier that is viewed as excessively self-seeking may find them excluded from SCs unless it offers a product or service that is extremely exceptional. This segregation represents economic costs that prudent organisations are not willing to jeopardise. This leads to, short-term costs being relegated to a secondary role as SC partners dedicate their efforts to establishing long term relationships, based on trust, that benefit all partners in the entire SC thereby greatly enhancing integration efforts.

3.5.2 Principal-Agency theory

The Principal-Agent (P-A) theory is concerned with the governance and control mechanism structure of organisations to mitigate the chances of opportunism, conflicting interests and information asymmetry between the Principal (delegating authority) and the Agent. Contracts are used as governance and control mechanisms whilst incentives are provided for meeting the minimum expected standards of the Principal (Ulaga and Eggert, 2006).

P-A theory provides a natural fit with SCI research. This theory centres on instances where an organisation apportions authority to another to act on its behalf (Eisenhardt, 1989). Difficulties may occur in such circumstances since agents often concentrate on the activities and ways that are advantageous to them not to the principals. Consequently, principals must carefully observe agents' actions and develop an environment that supports preferred behaviours. Relations involving one organisation delegating authority to another characterise SCs resulting in possible conflicts of interest within traditional SCs (Burt, Dobler and Starling, 2003).

The SC partners must choose between courses of action that benefit their organisation only or those that benefit the entire chain. Most managers in this circumstance would select the former option because their primary loyalty lies with their home organisation (Wiengarten, Fynes, Humphreys, Chavez and McKittrick 2011).

Integrated SCs must recognise and anticipate this tension. As discussed above, integrated SCs leverage tools such as reward structures and cultural competitiveness to ensure alignment among partners' interests. This removes the temptation to take advantage of other SC partners. Partners within integrated SCs must also recognise that the sequential nature of SCs demands that they are agents in some links and principals in others (Wiengarten, et. al, 2011). Thus, other organisations in the chain can punish opportunism in one's role as an agent therefore. Trust is very important in an integrated SC.

3.5.3 Resource dependence theory

Resource Dependence Theory (RDT) centres on how organisations become reliant on others for desired inputs such as goods and materials and how organisations manage such collaborative relationships (Pfeffer and Salancik, 1978). The disproportionate interdependence that subsists in these inter-organisation relationships is critical to reduce uncertainty for some organisations (Conner and Prahalad, 1996; Barney, 2012).

When SC members begin to work together closely, they often become more reliant on each other. Thus, RDT has a high level of value in the SC context. Ireland and Webb (2009) and Crook and Combs (2007) discuss RDT's implications for key aspects of SCM. They contend that stronger organisations desist use of bargaining power in situations where applying their strength could result in conflict that could jeopardise harmony across SC. Therefore, gains of SCM vary based on how bargaining power is exercised by partners.

RDT can help shed light on the role of bargaining power and its influence over the creation and distribution of gains from SCM. For managers, knowing who has power and when it is likely to be used should aid in compromises as well as help build realistic expectations on possible gains of SCM involvement (Goh, 2003). For example, many pharmaceutical suppliers of Kenya's biggest public healthcare products supplier, KEMSA, sells almost all of their products to a giant buyer for distribution in public hospitals. In Kenya, distribution of healthcare products is concentrated in the hands of a few distributors mainly KEMSA for public hospitals and MEDS for private hospitals. If, say, KEMSA or MEDS failed to renew a supply agreement, suppliers have few, if any, outlets to replace lost sales.

Overall, SC members offering high magnitude or critical resources who participate in highly concentrated industries are stronger. Weaker members, on the other hand, lack such resources. Whereas it is an important first step to understand how resources shape dependencies and hence bargaining power, it raises the question of when and to what degree stronger members use their power (Ketchen and Giunipero, 2004).

While building on Thompson's (1997) description of pooled, sequential and reciprocal task interdependence, Crook and Combs (2007)) propose that stronger chain members use their bargaining power when task interdependence is low but forbear its use when task interdependence is high. "*We hope that knowledge about the presence and appropriate use of bargaining power will not only help weaker organisations develop realistic expectations about the benefits of SCM, but help stronger and weaker organisations alike improve their performance over the long run*" (Crook and Combs, 2007: 554).

Thus, from the viewpoint of integrated SCs, collaborations should be based on mutual benefits and trust and not to create competition and excessive manipulation by one partner over the other in the same SC (Barnes and Liao, 2012). Pfeffer and Salancik (1978) are of the view that although resource importance and concentrated control give rise to dependencies, the interactions between the partners result in stronger linkages and the greatest bargaining power.

3.5.4 Institutional theory

The Institutional Theory (IT) underscores the importance of environmental influences on organisational activities, many of them subtle and evolving (DiMaggio and Powell, 1983). IT examines how external pressures influence a company (Hirsch, 1975). Within IT, there are three forms of isomorphic drivers namely, coercive, normative and mimetic (DiMaggio and Powell, 1983). Coercive isomorphic drivers occur from influences exerted by those in power. IT can be used to study how a company addresses SCI issues due to external pressures (Jennings and Zandbergen, 1995) and thus IT has become a major research direction to explain institutional practices (Lounsbury, 1997).

Mimicry occurs when there is uncertainty and a dominant party that urges imitation. "*When goals are ambiguous or when the environment creates symbolic uncertainty, organisations may model themselves on other organisations*" (DiMaggio and Powell, 1983:150). When an organisation is faced with a problem whose cause and resolution is not clear, it could opt to imitate the actions of successful competitors to duplicate their successful paths.

Normative isomorphic drivers make organisations to conform and adapt so as to be viewed as having appropriate legitimate activities. Social normative pressures can explain environmental management practices among enterprises (Ball and Craig, 2010). Mimetic isomorphic drivers occur when organisations imitate the actions of successful competitors in the industry, in an attempt to replicate the path of their success (Aerts, Cormier and Magnan, 2006).

Traditional SCs depend more on industry structural composition and best practices to steer SCM processes. Adopting best practices from SC leaders such as Nakumatt supermarket in Kenya, Wal-Mart, FedEx and DHL, is a prudent approach. In comparison, integrated SCs use industry structural composition and best practices to advice, as opposed to dictating SCM processes. Those SCs acknowledge the possible irrationality of imitation.

3.5.5 Game theory

Game Theory (GT) is the formal investigation of conflict and collaboration and is applied to situations where two or more parties interact. The GT looks at the conflicting and cooperative behaviours of two intelligent and rational decision makers for different scenarios (that is; win-win, win-lose, lose-win and lose-lose). It uses mathematics and hypothetical scenarios to draw conclusions about the likelihood of decisions and actions (Axelrod, 1984; Ketchen and Hult, 2007).

Collaboration between organisations in order to share resources is becoming increasingly common with rising competition and globalisation. Collaboration includes creation and sharing of resources such as knowledge and facilities (Goyal and Joshi, 2003). The benefits of collaboration efforts can only be defined by analysing the conditions that collaboration requires (Vanpoucke, and Vereecke 2010).

Studies such as collaboration among SC actors (Nagarajan and Sosic, 2008), modelling of buyer-supplier relation with cooperative/non cooperative games (Esmaeili, Aryanezhad and Zeephongsekul, 2009), modelling of customer-supplier relation with the GT approach (Laaksonen, Jarimo and Kulmala, 2009), can form a basis for SCI research. In their study, Bhaskaran and Krishnan, 2009, define three collaboration models, revenue sharing, investment sharing and innovation sharing.

Although the GT is at times critiqued as exceedingly mechanistic, its application could help managers arrive at more insightful decisions and strategies. Predicting the actions of the opponents is the basic element of game theory.

In an SC setting, partners in traditional SCs have reason to be apprehensive of each other’s motives (Ketchen and Hult, 2007). This results in protective behaviour and suboptimal chain performance along key issues such as speed, quality, cost and flexibility. In contrast, mutual dependence and trust overcome members’ temptation to pursue selfish behaviour within integrated

SCs, which results in a positive sense of collaboration that builds agility and adaptability at the SC level.

3.5.6 Network theory

Network Theory (NT) contends that organisations rely on their relationship with direct partners and with the extended network of relationships with SC organisations. Proponents of this theory argue that competitive advantage can only be achieved through efficiently and effectively integrated SCs. Therefore, the focus of the NT is to develop long-term, trust-based relationship between SC organisations.

Network Theory defines and predicts relationships between interconnected organisations (Thorelli, 1986). SCs consists of networks, therefore, NT can help explain possible characteristics about SCs. Strong and weak links are fundamental concepts in NT and as the names indicate, strong links comprise organisations that are tightly connected and weak links comprise organisations with weaker connections (Granovetter, 1973).

Each category has particular advantages to SCs; a strong link provides greater consistency and dependability, for instance, while a weak link enhances flexibility. In traditional SCs, strong and loose links are created on a need basis without considering the entire network structure. However, when it comes to integrated SCs approach, the links are strategic. A mix of strong and loose links that fits SC requirements (such as reliability and flexibility) is structured to maximise SC performance.

3.5.7 Social network theory

The Social Network Theory (SNT) looks at the behavioural and social aspects of many different relationship types, including organisation-to-organisation, individual-to-organisation and individual-to-individual relationships. It helps to analyse these relationships from different perspectives such as technical, financial and social elements. Social networks differ from economic networks in that the specific benefits of network are not contractually and explicitly fully specified; partners have a social bond out of social influence. SC collaboration can be explained by SNT with the examination of social influence (for instance, power). According to this theory, power is regarded as the most important sociological aspect of an inter-organisation relationship when one organisation needs to influence another's decisions.

The SNT identifies that the organisations forming SCs are comprised of people and that the interpersonal skills and relationships among these people define SC activities and outcomes (Nahapiet and Ghoshal, 1998). Within traditional SC, every person has conflicted loyalties between the organisation and SC. The resultant mix of shared and organisation-level goals, values and experiences restricts shared objectivity and limits performance. In contrast, the affiliation among integrated SC partners creates a framework where shared goals, values and experiences build shared objectivity and improved performance.

3.5.8 Strategic choice theory

Strategic Choice Theory (SCT) is a relatively less explored theory due to difficulty and its limits in implementation. The focus of the SCT is to address strategic issues and political forces related to SCs as a whole in contrast to functional approach regarding individual SC organisations (Miles and Snow, 1978).

SCT contrasts externally oriented approaches such as institutional theory (Ketchen and Hult, 2007). This theory asserts that managers' decisions play a significant role in the success or failure of an organisation (Child, 1972). The fundamental concern of the SCT is strategic revitalisation and business repositioning. The basic assumption in this theory is that organisations can endorse and proactively shape their operating environment (Ketchen and Hult, 2007).

Strategic decisions in traditional SCs are taken with one organisation as the principal driver. This approach restricts organisations to application of a generic strategy, for instance, as a prospector (Miles and Snow, 1978) or as a low cost leader (Porter, 1980). However, in integrated SCs strategic decisions are taken with concern for the entire chain being the main driver. This strategic SCM creates room for exceptional mixed strategies that go beyond the organisation and offer the chain with improved responsiveness flexibility and malleability (Barney, 2012).

3.5.9 Resource-based view/Knowledge-based view theory

The Resource-based View (RBV) theory is concerned with how strategic resources provide organisations with competitive advantages and superior performance (Barney, 1986). Organisations need to take critical analysis to determine which SC processes meet the criteria for serving as strategic resources. For the processes to be strategic, they should be rare, valuable and difficult to imitate or substitute. In addition, the processes should contribute towards long-term competitive advantage.

If these strategic resources are present in only one organisation for a particular product that organisation has, potentially, competitive advantage over its competitors (Barney, 1986; Ketchen and Giuniero, 2004; Rungtusanatham et al., 2003). Another way for an organisation to gain a competitive advantage is to optimise one or more processes and activities. Nevertheless, consideration should be made to avoid sub-optimal goals where one function optimised at the expense of the overall goal (Lumsden, 1998; Porter, 1985).

The knowledge-based view is an offshoot of the resource-based view and is mainly concerned with how wisdom, intelligence and good judgment can act as a strategic resource (Grant, 1996). Employing this concept to the SC perspective, one can evaluate the extent to which knowledge exchange facilitates collaborative SC action and improved results among SC partners. It also helps determine the extent and the way knowledge management facilitates international SC partners to cross cultural gaps.

The RBV of a firm explains its competitive advantage as possession of unique resources and capabilities. The resources created through integration in supply chain are of higher value than individual firm's resources. Therefore companies involved in resource integration are granted with more benefits (Halldorsson, Kotzab, Mikkola, and Skjott-Larsen, 2007).

The above-mentioned theories are not the only theories in SCM literature and there are many more theories applied to SCM context. The problem with multiplicity of theories is that it makes it very difficult for defining, implementing and studying SCM from a single point of view. Nevertheless, each of the above theories has a different aim in management and structure of SCs so each gives a unique perspective of the SCM phenomenon. This could explain the reason why unified theory of SCM does not exist and need not to.

3.6 SUPPLY CHAIN INTEGRATION

Supply Chain Integration (SCI) is the magnitude to which an organisation strategically collaborates with its SC partners and collaboratively manages intra- and inter-organisational processes (Flynn, Huo and Zhao, 2010). According to Lu (2011), SCI is the close internal and external coordination across the SC operations and processes under the shared vision and value amongst the participating members. A number of studies have looked at a couple of topics in an effort to shed light on the structure of SCI together with the aspects that facilitate it and the effects of realising it.

Kim (2013) noted the role of participants in dealing with the SC flow and generating value due to the direction of the integration being associated with the flow of material and information. In some of the studies reviewed, some authors classify SCI into internal and external integration (Gimenez and Ventura, 2005; Sanders, 2007), while other studies view external integration in the perspective of both customer and supplier (Devaraj, Kraiewski and Wei, 2007; Flynn et al., 2010; Zhao et al., 2011). Flynn et al., (2010) pointed out the connection between SCI (customer, supplier and internal integration) and their interactions on overall results. Gimenez, Van der Vaart and Van Donk (2012) show that SCI increases performance moderated by a context variable like SC complexity.

A fully integrated SC should exhibit high visibility, lower inventory, high capacity utilisation, short lead-time and high product quality (low defect rate). Therefore, SCI is a critical approach that could help organisations that embrace it to reap substantial benefits in the global environment. The SCI instrument is comprised of three dimensions, namely internal integration across the SC, a company's integration with customers and a company's integration with suppliers as shown in Figure 3.10.

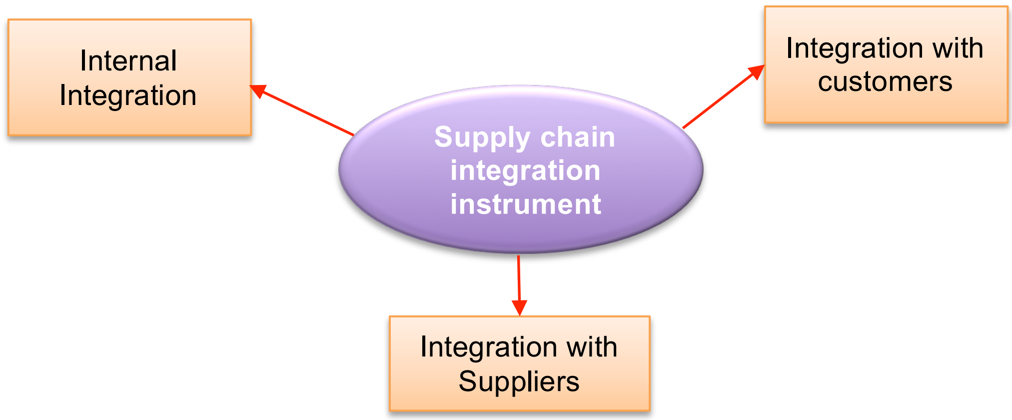

Figure 3.10: Supply chain integration instrument

Source: Researcher's own construct

Frohlich and Westbrook (2001) and Frohlich (2002) studied the effect of web-based integration on demand chain management's operational performance. In their study, web-based SCI was measured by two constructs:

⇒ e-integration with suppliers;

⇒ e-integration with customers.

This study adopts the concept of SCI from previous research by using two sub-constructs to measure integration with suppliers and integration with customers (Frohlich and Westbrook, 2002; Frohlich, 2002). Integration with customers involves determining customer requirements and tailoring internal activities to meet these requirements (Koufteros, Vonderembse and Jayaram, 2005). As an organisation gets to know its customers better and becomes committed to understanding and meeting their needs, a strong relationship is formed between the organisation and its customers (Wiengarten, et. al, 2011).

Integration with customers ensures that the voice of the customer plays a vital role in the innovative process within the organisation. Integration with suppliers is characterised by a long-term commitment between the collaborators, openness of communication and mutual trust. Supplier collaborating seeks to bring participants early in the product life cycle; thus entailing early supplier involvement in product design or the acquisition of access to superior supplier technological capabilities (Narasimhan and Das, 1999; Peterson et al., 2005).

Bowersox and Daugherty (2005), classified integration in the SC context into six different types. These are:

⇒ Customer integration;

⇒ Internal integration;

⇒ Material and service supplier integration;

⇒ Technology and planning integration;

⇒ Measurement integration; and

⇒ Relationship integration.

These aspects of SCI are illustrated in Figure 3.11.

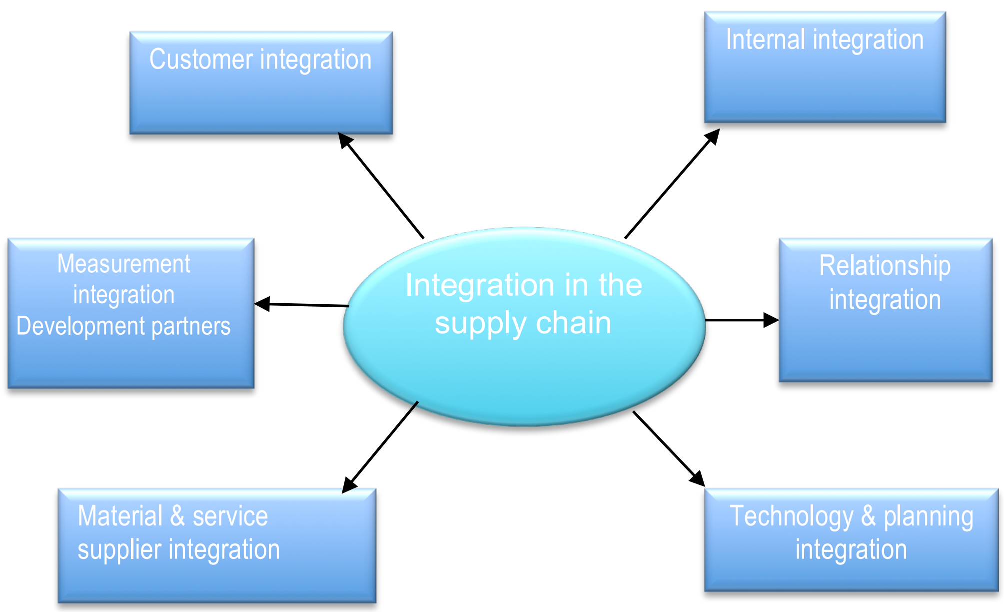

Figure 3.11: Integration in supply chain

Source: Adapted from Bowersox and Daugherty (2005).

SC was initially viewed as a business entity that was primarily concerned with the upstream suppliers and supplier management. By the mid-1990s, there was a change in orientation. The focus shifted from the upstream to the entire SC. According to Gattorna (2006), the start of second decade of the twenty-first century has seen an evolution to another shift; that is, shift of focus from SCM to strategic SCM. Gattorna (2006) further argues that the "new" shift in the SC focus is characterised by three major traits, namely: Strategic, Dynamic and Customer-driven. Therefore, the SC managers need to recognise that their role has moved from being tactical to being strategic.

Figure 3.12 shows that information sharing between SCs partners can only be fully leveraged through process integration.

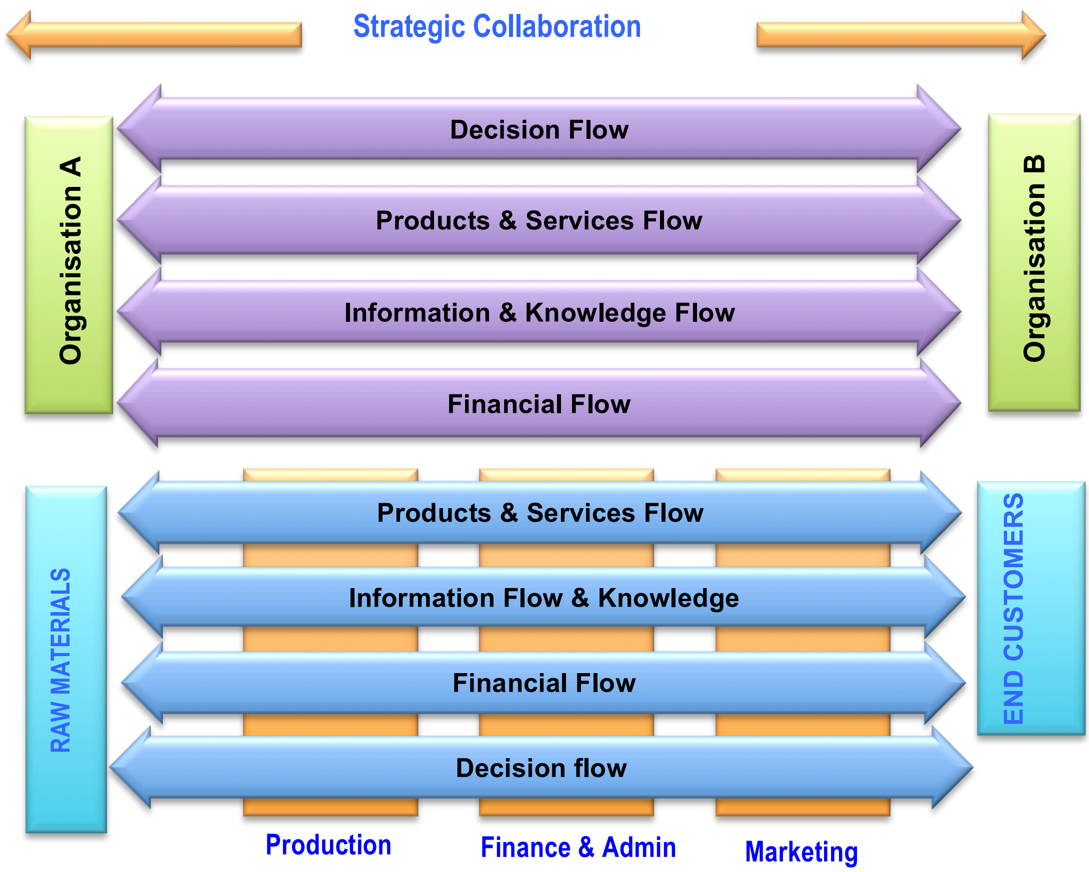

Figure 3.12: Illustration of an integrated strategic supply chain

Source: Adapted from Christopher and Holweg (2011)

Three broad key business processes run the length of the SC and cut across organisations and functional silos within each organisation. SCM requires a serious integration and continuous flow of information from planning process to order and sales. In addition to internal organisation integration, the organisations should share their stock, production and promotion estimations and plans with customers and suppliers, which form the other rings of the chain (Christopher and Holweg, 2011). However, most of the enterprises still avoid sharing since they fear that their rivals could obtain this information. Reservation of information and the avoidance of the use of technology by some enterprises reduces pace and effectiveness of SCs.

Figure 3.12 also shows that successful SCI requires a change from managing individual functions to integrating activities into key SC processes. For instance, the purchasing department places orders as requirements become known. The marketing department, responding to customer demand, communicates with several distributors and wholesalers as it attempts to determine ways to satisfy this demand.

SCI is considered a suitable approach for improving business performance in highly competitive markets (Narasimhan, Aram and Carter, 2001). Lack of integration between members of an SC results in functional inefficiencies and hinders the performance of the SC (Gimenez et al., 2012). Frohlich and Westbrook (2001) found that integration with both suppliers and customers had a high level of correlation with organisational performance. In addition, the two researchers reported that an organisation that embraces high levels of internet-based supply integration and demand integration experience the highest levels of performance.

Rosenzweig, Roth and Dean (2003) supported these findings adding that SCI leads to improved business performance. Additionally, Zailani and Rajagopal (2005) argued that the potential benefits of integrating the SC are realised only if the collaborations among different parts of the SC are recognised and proper alignment is realised between the design and execution of the organisations competitive strategy. Lack of integration between members of

SC results in operational inefficiencies and hinders the performance of the SC.

In a study of the performance benefits of SC logistical integration, Stank, Keller and Closs (2001) found that SCI creates value through improved customer service levels and reduced costs. Cost savings result from reductions in inventory. Inventories can be reduced by increasing the speed at which materials move through the SC and through reduction in safety stocks.

Integrated SCs involve complex dynamics that determine performance of SCs and a better understanding of how they work has become crucial for superior performance of SCM (Chen, Shek and Bu, 2011; Li, Yang, Sun and Sohal, 2009; Akkermans and Dellaert, 2005). Effective SCM that guarantees competitive advantage requires seeking close and long-term working relationships with capable suppliers and customers, developing interactive relationships with each other and working together to solve common problems and jointly plan for the future (Akkermans and Dellaert, 2005; Spekman et al., 1998).

SCI is critical in success of all the partners and processes within the SC (Chen and Paulraj, 2004; Meade and Sarkis, 2002). According to Boddy, Macbeth and Wagner, (2000), first-class organisations are fast tracking their efforts to align and integrate all their components throughout their entire SC to meet the rising expectation of demanding market places. In support of this argument, Chang and Makatsoris (2001) assert that first-class organisations have realised that non-integrated manufacturing or distribution processes coupled with poor collaborations with suppliers and customers are insufficient for their success and survival. Additionally, Lummus and Vokurka (2008), Li (2007) and Lambert and Cooper (2000) argue that SCI is not an option but a fundamental incentive for an organisation‘s enthusiasm which stems from the belief that partnering other organisations can create a new capability that would otherwise not be created separately.

Since the interrelated elements of the SCs (such as suppliers, supplier‘s supplier, customer, among others) are surrounded by uncertainty, interaction of its various components greatly affects the SC activities (Lummus and Vokurka, 2008). In addition to integration, there is need for SC managers to gain a deeper understanding of the impact of their decisions both on their operations and their partners to increase the performance of their SCs (Lummus and Vokurka, 2008; Li, 2007; and Lambert and Cooper, 2000).

There are a number of benefits that accrue to organisations that implement integrated SC practices and processes. According to Boddy et al., 2000 and Spekman et al., 1998), integration of SCs can help organisations to obtain information, share risks, access complementary resources, reduce product development costs, reduce logistical costs, reduce transaction costs, improve quality improve technological capabilities and enhance productivity.

Cao (2007), Li (2007) and Warkentin, Bapna and Sugumaran (2001), agree with these advantages and add that organisations make use of SCI to increase the profitability of every link of the SC, synergise activities in order to make better decisions as well as capture key challenges and opportunities in a dynamic, fierce and volatile global market. Similar assertions are made by Maloni and Benton (1997), Sterman (2000) and Lambert and Cooper (2000), who argue that SCI offers the opportunity to capture synergy of intra-organisation and inter-organisation integration and management while lack of how to manage this complex SC system can lead to excessive lead time for responding to changes in customer demands (Warkentin et al., 2001).

Bowersox (1990) propounds that the process of SC should progress from the integration with supplier and customer. The external and internal integration can be accomplished by continuous standardisation of each internal logistic function and by efficient information sharing and strategic linkage with supplier and customer (Zhao, Baofeng, Willem, and Hoi 2011). IT plays an important role in each stage of SCI by helping partners share critical resources via Internet.

3.7 DEDICATED SUPPLY CHAIN INTEGRATION

In this study, dedicated SCI includes management behavioural issues, which may have an impact on an organisation's ability to integrate management processes and corporate culture practices in hospitals. It also denotes the nature of management orientation towards the customers and suppliers. Thus, the contention is that SCI should be measured to determine critical management behavioural factors enhancing supply SCI in hospitals (Swanson, 2013).

To achieve SC efficiency, three elements must be considered, namely data standardisation, performance improvement and information sharing. These elements function within the confines of information sharing and technology adoption. The relevant elements are discussed below.

3.7.1 Data standardisation

Data standardisation is focused on the unique codification system for all materials and information flown in the chain. These include product data, patient data and procedure data. The objective is to achieve the identifications and traceability of drug, medical device, the patient, procedure treated in the chain and other materials and information that flows from the suppliers through to manufacturers, distributors, healthcare providers and involved government players in the chain. At this level, it requires all players to implement the same data standard and system so that they can speak the same electronic language.

When it comes to inter-process coordination mechanisms, Mintzberg (1996) proposes six basic coordination mechanisms namely:

- ⇒ Mutual adjustment;
- ⇒ Direct supervision;
- ⇒ Standardisation of work processes;
- ⇒ Standardisation of output;
- ⇒ Standardisation of skills; and
- ⇒ Standardisation of norms.

The information availability and accessibility in regard to the status of products is the basis on which intelligent SC decisions are made. In addition, it is not satisfactory just to track the status of the products across the SC; there is also a need to alert diverse systems to the implications of this movement. This goal calls for standardisation of product identification, for example bar coding, across organisations (Simchi-Levi et al., 2004).

3.7.2 Performance improvement

The tendency of concentrating on core business and outsourcing the rest has stimulated a growing number of organisations to look beyond their own boundaries for supplier and customer resources that can be leveraged to create synergies (Flynn et al., 2010; Swink, Narasimhan and Wang, 2007; Zhao et al., 2011). SCI assists organisations to restructure their resources and capabilities internally and externally to consolidate their SC in its entirety to improve their performance in long term (Huo, 2012).

SCI is fundamental in attaining performance and competitive advantage (Flynn et al., 2010; Zhao et al. 2011). Ultimately, performance of an integrated SC is measured not by a written formula, but by the way it competes in the market place. The market place to gauge performance of SC is volatile and unpredictable due to the fast changing operating environment (Lu, 2011). The critical measure for the fitness of an SC is its responsiveness to customer order fulfilment (Zhao et al., 2011).

3.7.3 Information sharing

Organisations seek to share performance experiences to external stakeholders, but may find it difficult due to absence of not full knowledge of the products, processes and materials flowing through their SCs. Normally, suppliers may hold more information on their area of operation as well as that of the customers (Delmas and Montiel, 2009).

The function of information sharing is important for managing an SC (Wong, Boon and Wong, 2011). The control and sharing of information is critical not only for corporate image, but also for adherence to international regulatory standards. For example, Kenya Pharmacy and Poisons Board (KPPB) regulation bans certain medical ingredients from import into Kenya. KEMSA is therefore dependent on its suppliers to disclose medical information about medical compositions of the products supplied.

3.7.4 Enterprise Resource Planning System

Enterprise Resource Planning (ERP) refers to a computer-based integrated information system, which is designed to process an organisation's transactions and to integrate the various functions/departments/divisions within an organisation. It can also extend to suppliers and customers giving them visibility into production and distribution scheduling (Zhao, X., Zhao, H. and Hou 2010). Thus, an ERP system is a set of application software that integrates manufacturing, finance, sales, distribution, human resources and other business functions. It is an enterprise-wide information system designed to coordinate all the resources, information and activities needed to complete business processes such as order fulfilment or billing (Wieder, Booth, Matolcsy and Ossimitz, 2006).

The ERP systems therefore, allow decisions and databases from all parts of the organisation to be integrated so that the consequences of decisions in one part of the organisation are reflected in the planning and control systems of the rest of the organisation (see Figure 3.13). ERP is the equivalent of the organisation's central nervous system, sensing information about the condition of different parts of the business and relaying the information to other parts of the business that need it. The information is updated in real time by users and yet is always available to everyone logged into the ERP system.

ERP serves as a cross-functional enterprise backbone that integrates all the processes of the business and helps manage the resources of the organisation. These systems help in focusing on production capacities, logistics management and working out financial implications of each decision rather than just computing costs (Davenport 1998). The basic philosophy of an ERP system is that business processes are to be integrated at all levels and all the resources of an organisation should be treated as common resources which can be further efficiently used for meeting the demands of the customers (Tarn, Razi, Yen and Xu, 2002).

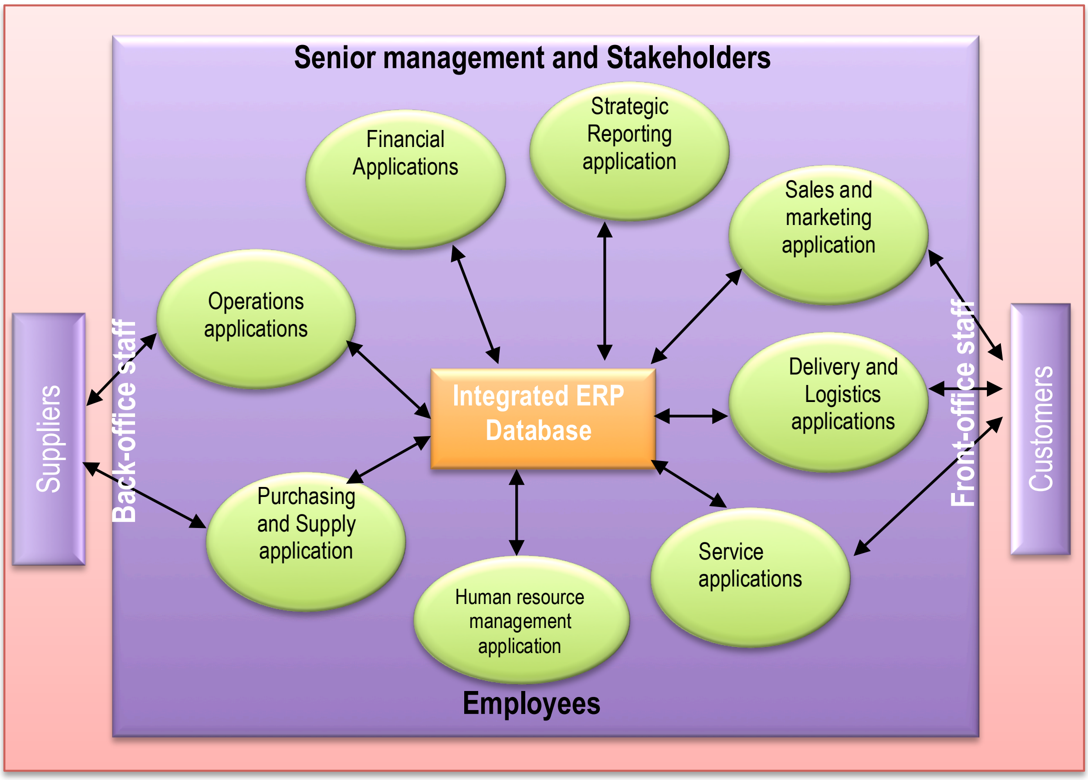

Figure 3.13: ERP System

Source: Adapted from Davenport (1998: 124)

As the needs of customers keep on changing, ERP systems provide adaptability to these changing needs. ERP systems enable a manager to take an overall view of the business as a whole instead of having a myopic view of business functions and thus, offer the benefits of synergy of various functions in achieving the mission, goals and strategies of an organisation. These systems also offer flexibility to business processes as the entire process itself, instead of some function in the process, is automated. Ideally, the data for the various business functions are integrated (Park and Koh, 2013). In practice, the ERP system may comprise a set of discrete applications, each maintaining a discrete data store within one physical database.

In order for a software system to be considered ERP, it must provide an organisation with functionality for two or more systems. ERP systems can cover a wide range of functions and integrate them into one unified database (Davenport 1998). For instance, functions such as human resources, SCM, customer relations management, financial management, manufacturing functions and warehouse management functions used to be stand-alone software applications, usually housed with their own database and network, they can all fit under one umbrella-the ERP system (Parthasarathy, 2010).

In November 2010, a leading lifestyle retailer in Kenya, Deacons was reported to have invested over KES 36 Million (US$ 448,000) in a new ERP system for its retail chain. The ERP was aimed at linking different business processes by correlating information from various functions and using ERP system to run the whole business more smoothly. In addition, the ERP system was expected to help the organisation operate a lot more effectively and efficiently. Deacons hoped that with the ERP it would be much easier, for instance, to monitor profitability per division and track performances per brand. More importantly, ERP was assisting the organisation to have comprehensive, up-to-date financial information making it easier to spot trends and gain insight into their business activities. A similar system tailor made for Kenya public hospital pharmacies could potentially result in similar efficiencies.

Nowadays ERP has evolved to become far more than just an “internal” enterprise tool. Organisations are using their internal ERP systems to link with the ERPs of their suppliers and customers to make stock replenishment orders and receive supply orders respectively. This system if fully adopted by KEMSA, could create a great opportunity for them to link their systems to those of first tier suppliers and customers.

3.8 SCI FUNCTIONAL ISSUES

SCI functional issues refer to the functional activities in the organisation that have impact on integration of SC. Slack, Chambers and Johnston (2010) explain an operation as the transformation of customers, materials and information in the production of outputs of goods and/or services. This research focuses on the following SCI functional activities:

⇒ SCI initiatives;

⇒ Performance improvement;

⇒ Organisation environmental forces;

⇒ Regulatory framework;

⇒ Workforce and management support;

⇒ Financial flows and integration; and

⇒ Information sharing and technology adoption.

These functional issues also represent the factors influencing efficient supply chain management as proposed in this study.

In line with the SC Operations Reference (SCOR) framework, all of the processes and activities that make an organisation functional relate to each other and making these processes efficient means minimising their total cost. This integrated set of activities support the organisation's overall strategy (APICS Supply Chain Council, 2014).

The SCOR framework is key to identifying, measuring, reorganising and improving SC processes through a cyclical process that includes:

⇒ Capturing the structure of an SC;

⇒ Evaluating the functioning of the SC and comparing it against internal and external industry goals; and

⇒ Reorganising SC activities and best practices to fulfil unrealised or shifting business goals.

Croxton et al., (2001) are of the view that while all companies within the SC need to take into account process and function, the significance of every function, process or activity may vary based on the situation at hand. Barki and Pinsonneault (2005: 165) define the concept of structural integration in an organisation as "*the extent to which distinct and interdependent organisational components constitute a unified whole*". The authors note two intra-organisation integration processes:

⇒ Workflow integration; and

⇒ Integration of administrative or support functions of an organisation.

Akkermans, Bogerd, Yucesan and Van Wassenhove (2003) found that business managers anticipated more integration of processes between suppliers and customers across the entire chain. The functional SCI issues, such as SCI initiatives, performance improvement, organisational environmental forces, regulatory framework drivers, workforce and management support and financial factors flows and integration drivers are discussed in the following sections.

3.8.1 SCI initiatives

Braganza (2002) contends that organisational integration initiatives are not equally important and they differ by their purpose. Enterprise integration initiatives are based on the capabilities developed for an organisation. Nelly, Filippini, Forza and Vinelli (2001) stress that external competitive pressure appears to influence the number of initiatives that companies implement. They found that there is a relationship between the level of competitiveness in the external situation and innovation. Corbett and Van Wassenhove (1993) also argue that a company should start the initiatives with the aim of achieving a certain level of performance consistent with qualifying and order winning criteria for competitiveness (Corbett and Van Wassenhove, 1993).

External inadequacy drives organisations to seek out integration (Danese, Romano and Vinelli, 2006). They found that external factors affect the nature of SCM initiatives to be adapted since they are selected based on the performance indicators to be improved (Danese, et al., 2006:1210). Pieter Van Donk, Akkerman and Van der Vaart, (2008: 218) support the results of Danese et al. (2006). They portend that ambiguities in business environment coupled with multifaceted business conditions support the need for SCI.

Rai, Patnayakuni and Seth (2006) found that integrated IT infrastructures enable an organisation to develop the higher-order capacity of SC process integration. In addition, they emphasised that management should focus on supporting an integrated IT infrastructure as a backbone to improving process capabilities for the integration between an organisation and its SC partners (Rai et al., 2006: 225). Morrell and Ezingeard (2002) stress the use of inter-organisational information systems in order to improve SC performance.

In order to understand the nature of SCM as it is practiced, Fawcett and Magnan (2002) sought experience and insight of industry managers engaged in SCI initiatives. They found that SCI practice does not always resemble the theoretical Principal and emphasised that decision makers must be cognisant of the pressure that could arise between SCM's competitive potential and inherent difficulty of collaboration (Fawcett and Magnan, 2002:339). Fawcett and Magnan (2001:11) found a strong functional bias in the data that functional areas such as organisational departments individually consider unhelpful or even obstructive.

3.8.2 Performance improvement

Kim (2006a: 241) conducted a study on effects of SCM practices, integration and competition capability on performance and found that in small organisations, efficient SC integration could be vital in sustainable performance improvement, while, in big organisations, the close collaboration between the SCM processes and competition capacities may have a more significant effect on performance improvement (Brandenburg and Rebs, 2015).

When SCI has been initiated, it is better to focus on SCM practice and competitive capabilities (Kim, 2006a: 241). In an empirical study on the effect of SCI on alignment between corporate competitive capability and SC functional capability, it was found that the influence of integration between organisational competitive capacities and SC functional capacities on performance improvement becomes irrelevant as the introductory phase of SCI expands (Kim, 2006b: 1084).

Briscoe, Dainty, Millett, and Neale (2004) found that clients are key drivers of performance improvement and innovation and they are the most significant factor in attaining integration in the SC. However, Frohlich and Westbrook

(2001: 185) concluded that there is consistent evidence that the greatest integration with suppliers and customers has the greatest link to performance improvement.

Stratman (2007: 203) proposes that organisations that aim at promoting external market and SC performance improvements must start with creating the basis for internal functional performance improvement before they can reap benefits of customer satisfaction and SC benefits. Sundarraj and Talluri (2003) stress that sharing and coordination of information across the SC at the right time, are major factors to improving the performance of an organisation. Fawcett and Magnan (2002) identified four highest-ranked benefits: Responsiveness to customer requests, on-time delivery, overall customer satisfaction and order lead times, which are keys to performance improvement.

3.8.3 Organisational environmental forces

Daft (2000: 73) refers to the organisational environment as all the factors that exist outside the organisation that have the potential to influence the organisation. Environmental factors such as competition, suppliers, economic conditions, social attitudes, customers, culture, shareholders or finance and IT innovations are constantly changing. In order to clearly understand the way organisations function and to improve their capabilities, it is important to establish how to achieve internal and external balance. In addition organisations should be able to adapt to changes in their operating environment and the demand placed upon them (Briscoe et al. (2004).

Fawcett and Magnan (2002) found that the desire to improve customer satisfaction is the key factor among the environmental forces to SCI followed by improving SC productivity, intensifying competition, an opportunity to build the best team of SC partners, compete against global SCs, focus on competence in services, customers initiated integration, access to global markets, shifting channel power and suppliers initiated integration.

3.8.4 Regulatory framework

Legal frameworks provide a very important foundation upon which the operations including the mandate of an organisation are anchored. The frameworks define the scope of mandate including functions, the organisational structure and composition amongst others Daft (2000). The legal and regulatory framework governs the relationships between parties, businesses and organisations. It provides a general platform within which two or more parties can legally operate and transact. A rigid or skewed framework may not only constrain the operations of the organisations, but also could expose them to unnecessarily high levels of risks detrimental to their functioning and long term survival (Micah and Msimangira, 2013).

One of the problems facing most organisations in developing countries is the lack of elaborate and functional regulatory frameworks dealing with SCM. This problem is compounded by the lack of high-speed electronic information systems and access thereto (Wei, Qiao, and Fu, 2014). It is important that parties relying on electronic systems have a way of allocating risks, of identifying security and privacy responsibilities and enjoying some reasonable degree of legal certainty with electronic transactions. The absence of proper regulations in the SC makes its implementation difficult. Integrated SCM is achieved and coordinated through an electronic management system making a proper legal framework essential (Wei al., 2014).

Legal uncertainties in SC networks are problematic for parties in both developed and developing countries. The difference, however, is that developed countries have implemented some regulatory frameworks while most developing countries have not (Wei al., 2014). Government and business in developed countries have formulated nationwide, industry-wide, or specific Electronic Data Interchange (EDI) agreements while legislative frameworks are being considered. Most developed countries are gradually enacting laws to facilitate paperless transacting.

Although legal impediments to paperless transacting remain in most developed countries, steps are being taken to remove such impediments

(Morrin, 2002). As a solution to addressing the SCM inefficiencies, sophisticated software systems with Internet interfaces as well as web-based application services are usually put in place to provide part or all of the SCM service for organisations. This is critical to corporate planning towards achieving customer satisfaction. For effective achievement of this, a proper regulatory framework is essential.

3.8.5 Workforce and management support

According to Helms, Ettkin and Chapman (2000), executive management provides direction to workers and guide them towards pursuing a common mission within the organisation. The leaders influence their relationship with their followers in the attempt to achieving their mission. Effective leadership is very crucial during SC implementation and can be achieved through participation by all groups and individuals captured in the supply network.

A good strategic leader operates without bias, acts as a visionary, is self-confident, has empathy and respects others, is well trained and experienced and has sound morals. Effective adoption and implementation of an integrated SC calls for proper leadership, which is enhanced through training, people oriented management, focus and upholding of organisational, community and social ethics (Wei et al., 2014). All these factors are important ingredients of realising desired output in the SC. Efficient and effective leaders guide the employees through the SC implementation process with some ease and provide solutions and explanations when dealing with uncertainty (Toften and Olsen, 2003).

Healthcare workers across the globe play a key role in providing proper healthcare services. Where there are healthcare worker shortcomings, health systems suffer, resulting in insurmountable, but preventable deaths and disease. Such is the case now in sub-Saharan Africa where the healthcare worker shortage of over one million workers represents a bottleneck in healthcare delivery. The World Health Organisation (WHO) estimates that sub-Saharan Africa faces a shortage of more than 800,000 doctors, nurses and midwives and an overall shortage of 1.5 million healthcare workers (WHO, 2015).

Inadequacies and gaps of the healthcare systems in the West African countries affected by the Ebola outbreak can possibly help to explain how the outbreak reached an unprecedented scale. For comparative purposes, Spain spends over $3,000 per person at purchasing-power parity on healthcare; for Sierra Leone, one of the countries severely affected by Ebola, the figure is just under $300 (Data Team-Economist, 2015; WHO, 2015). The United States has 245 doctors per 100,000 people while Guinea has ten per 100,000 people. The particular vulnerability of healthcare workers to pandemic diseases like Ebola is therefore doubly tragic. As of 22 April 2015 there had been 864 reported Ebola cases among medical staff in the three West African countries (Guinea, Liberia and Sierra Leone), as well as 503 deaths (WHO, 2015).

Having a well-motivated and happy workforce is crucial to the effective implementation of SCM and integration. A well-functioning integrated SC requires an organisation to have the right people in the right numbers on-board. It includes workers with the required competencies and skills needed to support the SC (Fadlalla and Wickramasinghe, 2004). In the subsequent stages of the implementation of integrated SC, there is a need to expand employee skills through training, recruitment of specialised skills and addition of new competencies required to make the SC operational (Toften and Olsen, 2005).

Healthcare is a growing industry in Kenya and indeed in many African countries. Poor quality in healthcare is related to a highly fragmented delivery system that lacks even rudimentary clinical information capabilities resulting in unnecessary duplication of services, long waiting times and delays (Fadlalla and Wickramasinghe, 2004).

The key driver behind SCI is the removal of inefficiencies from the SC. If unchecked, such inefficiencies could translate into excess costs and excess inventories in SC. These inefficiencies ultimately find their way to the customer and various links in the chain (Holmberg, 2006). By having a coordinated effort between customer, supply networks, management and the entire workforce, inefficiencies in the SC can be significantly reduced.

3.8.6 Financial factors, flows and integration

The organisation needs to have sufficient capital and time to support the implementation of effective SCM. This allows for the estimation and identification of true costs. True costs include realistic time commitment from staff to achieve a goal, a clear identification of expenses associated with a tactic, or unexpected cost overruns by a vendor. Additionally, employees are given enough time to implement any additional activities that they are not currently performing in the SC (Toften and Olsen, 2003).

This calls for proper budgeting of the available resources. A budget is a resource collection that helps strategic managers to coordinate operations and facilitates managerial controls in the SC. Effective implementation of any SC depends on rational and equitable resource allocation across the SC network. The resources need to be well managed and includes financial, physical, human, technological and goodwill resources (Birnbaum, 2000).

Effective resource allocations ensure that activities in the SC are well funded. It also eliminates deficit budgeting during the SC implementation period and in future. Hybrid interventions that combine internal competencies and outsourcing may need to be considered, especially in respect of specialised activities and processes. In order to attain financial sustainability, during the planning period, it is necessary to identify alternative sources of revenue to reduce dependency on one revenue line, streamline the collection and accounting for revenue and lobby for enhanced long term funding. This should be complemented by structural changes that would ensure that resources are allocated to specific areas and operations that are critical to the success of the SC (Lasher and Sullivan, 2004).

There are vast differences in funding systems for governmental institutions, but the main source of funds is governmental allocations through annual budgets. Salmi and Hauptman (2006) presented a typology of funding system.

They distinguish between direct public funding of institutions, performance-based funding, funding for specific purposes such as project funding, tax benefits and funding from external institutions such as the development banks and IMF among others.

Classifications described in the literature have been used to categorise the systems studied (Geuna, 2001; Jongbloed and Vossensteyn, 2001; Lasher and Sullivan, 2004). According to Jongbloed and Koelman (2000), there are two fundamental questions that must be asked when classifying public funding arrangements: What the government is funding and how it is being funded? The first question concerns the funding base for the allocations: Is funding tied to output or input?

The second question concerns the market orientation or driving force behind the funding system, expressed by the degree of competition and the degree of centralisation. Different funding systems have diverging impacts, yet they seem to come in “packages” among which policy makers are free to choose not only the funding policy but also the unintended impacts as well.

In Kenya, the financial allocation to the healthcare sector has been on the decline. Reviews of public expenditure and budgets in Kenya show that total healthcare spending constitutes 8.6% of total government expenditure which remains far below the WHO recommended level of 15% (GOK, 2006). This has a negative effect on the quality of services offered by the government-owned healthcare facilities and on the subsequent procurement and stocking of drugs and other health equipment in government health pharmacies.

3.8.7 Information sharing and technology adoption

In the context of the SC, one of the most important factors is the use of modern technologies or adoption of technology. Introduction of information systems in SCM originally was limited to automation of clerical functions (Williams, Avril, Dimples and Terence, 2007). Information systems were viewed as providing infrastructural support to the value chain and having an indirect impact on competitiveness of a product. Companies were able to reduce costs through information systems but the benefits were not typically apparent to customers (Swanson, 2013). With intensification of competition, organisations started to utilise information systems to directly influence the processes comprising the value chain (Gattorna, 2006; Rushton and Oxley, 2004 and Williams et al., 2007).

Through utilisation of information systems, companies have been able to integrate similar functions spread over different areas as well as curtail unnecessary activities thus enhancing their capability to cope with sophisticated customers needs and meet product quality standards (Bardi, Raghunathan and Bagchi, 2004). Prajogo and Olhager (2012) observed that the significance of process integration could be more easily achieved by organisations that engage in producing differentiated products or services. Lu (2011) rightly notes that information flow through SC is the essential infrastructure for integration.

The IT and internet facilitate ties between suppliers and buyers and amongst the suppliers themselves and virtual partnerships are made possible. Strategically, critical functions such as product design and customer care can be undertaken by independent organisations at a short-term basis (Wong et al., 2011). Market forces rather than formalised arrangement link SC partners backed by sophisticated IT systems. In this partnership, there is high level of information sharing and disclosure between the parties (Tang and Qian, 2008). It provides for high visibility into processes, demand information and supply activities. It also facilitates lean supply chain processes (Swanson, 2013).

In an SC, there are information flows pertaining to product design, production, scheduling and demand forecasting (Zhao, X., Zhao, H. and Hou 2010). In contrast to the material flow, the information can flow in both directions, that is, upstream and downstream. An SC is characterised by a unique set of information flows that are fundamental to its survival and which are often carefully protected against those of other SCs (Wong et al., 2011). The first step of supplier integration is to integrate information, processes and resources to realise quick response to customer needs.

The importance of time as a competitive tool and the ability to meet customer needs with shorter delivery times is important and can present an organisation with a competitive edge in the market (Park and Koh, 2013). Organisations should focus on flexibility and agility in order to respond to the unique needs of customer and markets (Fawcett, 2013). Getting the right product, at the right price and at the right time to the consumer is not only critical to competitive success but also the key to survival. These are crucial elements for consideration when attempting to establish a new SC strategy (Fawcett, Fawcett, Watson and Magnan, 2012). Having the right product available, in the right place at the right time, enables the business to compete in the volatile global marketplace (Anatan, 2006).

To provide effective support for functional SCI, the IT system must be capable of linking or coordinating the information system of the individual parties into a cohesive whole. These situations highlight the importance of IT in integrating partnering organisations in the SC. It is impossible to achieve an effective SC without IT since business partners are located all over the world and sometimes in very distant markets (Lu, 2011).

It is therefore important to integrate the activities both inside and outside of an organisation and it requires sharing integrated, accurate and valid information on various value adding activities along the SC. The implementation of IT facilitates, information sharing and the coordination between internal and external partnership is known as inter-organisational information systems integration.

3.9 SUPPLIER COLLABORATIONS

The GSCF model was reviewed in detail in section 3.4.3. It emphasises the importance for businesses to collaborate closely with its key clients and suppliers. In this study, the construct of supplier collaborations refers to the type of business relationships existing between a supplier and a customer.

Lambert (2008: 21) defines supply relationship management as the process that "*provides the structure for how relationships with suppliers are developed and maintained*." Baily, Farmer, Jessop and Jones (1998), identify two main extremes of supply relationships in the literature: Adversarial (arm's length) and partnership. However, as evident from theory, there are many types of supply relationships (Sorce and Edwards, 2004; Golicic, Davis, McCarthy and Mentzer, 2002: 851).

In this study, the construct supplier collaborations, is intended to measure the nature of supply collaborations within public hospitals, between public hospital and KEMSA and between KEMSA and external suppliers. The construct is used to determine the extent of supply collaborations practices in the public hospitals in Kenya.

3.9.1 Supplier relationship management process

Supplier relationship management defines how the organisation manages its relationships with suppliers. Organisations in actively managed SCs seek out small numbers of the best performing suppliers and establish on-going, mutually beneficial, close relationships with these suppliers in order to meet cost, quality and/or customer service objectives for key materials, components and products (Miah, Ahsan and Msimangira, 2013). Integration activities in this process include screening and selecting suppliers, negotiating product and service agreements, developing or improving supplier capabilities and then monitoring supplier performance and improvement initiatives (Lu, 2011).

Key suppliers most likely have a cross-functional and cross-organisational team to manage their progress towards meeting the organisation's current and long-term requirements and establishing a record of performance improvement over time. Supplier relationship management personnel routinely communicate with production personnel to obtain feedback on supplier and purchased item performance and with marketing personnel to obtain customer feedback. This information can then be passed along to suppliers during periodic performance review meetings (Lu, 2011).

3.9.2 Demand management process

According to Simchi-Levi, Kaminsky and Simchi-Levi (2004: 200), demand management is the communication of the projected market demand as a critical component of the success of the SC. This concept of demand management is seen as a marketing-related business process that SCM must manage across the SC.

Demand management is further extended towards demand chain management by Juettner, Christopher and Godsell (2010), who view it as an understanding of current and future customer expectations, market characteristics and of the available response alternatives to meet these through deployment of operational processes. This suggests an overlap between the demand and the supply processes and reinforces that demand chain management is the true concept that aims to integrate demand and supply oriented processes within a business organisation.

Juettner et al., (2010), argues that the fusion between demand and supply process integration can be achieved through applying management principles, specific organisation capabilities or technology.

The demand management process balances customer demand and the organisation's output capabilities. Demand management activities include forecasting demand and then utilising techniques to vary capacity and demand within the purchasing, production, marketing and distribution functions. Various forecasts can be used, based on the timeframe, the knowledge of the forecaster, the ability to obtain customers' point-of-sales information and the use of forecasting models contained in many ERP systems (Ragatz, Handfield and Petersen, 2002).

A number of effective techniques exist to smooth demand variability and increase or decrease capacity when disparities exist between demand and supply. Contingency plans must also be ready for use when demand management techniques fail or when forecasts are inaccurate (Wei et al., 2014). Inter-company teams can thus decide how best to share new market and future purchase requirements, point of sale information and planned production quantities (Lu, 2011).

The creation of formal Collaborative Planning, Forecasting and Replenishment (CPFR) agreements as discussed earlier in this chapter, is one way to share this type of information and tends to result in lower safety stocks throughout the SC. Integration activities can then also include the use of forecasting techniques, purchasing agreements and order quantity decisions.

3.9.3 Demand management and bullwhip effect

Demand management functions well as long as all stages of the chain take actions that jointly increase total SC profits. Each partner in the chain is expected to maintain honest and transparent actions in relation to other partners and the SC. If the demand chain coordination is weak or does not exist at all, a conflict of objectives appears among partners in the chain, who try to maximise personal profits through for example withholding critical information (Chopra and Meindl, 2007).

The key aim of demand chain management is to have smooth processes and to avoid unpredictable ordering behaviour of the main customers, more specifically, to avoid the upstream demand amplification. This phenomenon was studied in system dynamics models (Forrester 1961) and popularised as the "*bullwhip effect*" (Lee, Padmanabhan and Whang, 1997). Bullwhip effect refers to an SC wide phenomenon where a modest change in customer demand is distorted and amplified towards the upstream end of the SC resulting in large variations of orders placed upstream (Lu, 2011).

The bullwhip effect, therefore, occurs when there is a lack of coordination among the elements of the demand chain at the moment when there is a variation in the quantity demanded by the final client, with the reactions of suppliers tending to be amplified at each passage upstream through the chain (Lee et al., 1987). All of them react increasing or diminishing the orders differently from what is necessary, seeking to protect themselves. This often leads to over-ordering and the build-up of unnecessary inventory in the SC with the end customer not being provided with a value proposition, but rather additional costs due to waste such as inventory buffering (Lu, 2011). For long chains, the results may be extremely negative, as distortions, which accumulate in the client to supplier direction, amplify in a non-linear way. This effect is caused by the lack of an adequate and coherent SCM as a whole (Miah, Ahsan and Msimangira, 2013).

3.9.4 Demand chain and push/pull system

SC processes fall into one of two categories depending on the timing of their execution relative to customer demand. The Push/Pull view of SCM is very useful when considering strategic decisions relating to SC design. The pull process depends on the customer demand whereas push processes are the predictions of demands (Simchi-Levi et al., 2004).

With push view, execution is initiated in anticipation of customer orders, that is, manufacturer produces goods and services thinking that there would be a forecasted demand or requirement for the product or service produced, while in pull processes, execution is initiated in response to a customer order or known demand. Push systems therefore represent a top down approach. The core assumption of push systems is that demand can be anticipated and that it is more efficient and reliable to mobilise resources in pre-specified ways to serve this demand (Simchi-Levi et al., 2004).

For SCM, the distinction between pull and push helps an organisation determine the best strategy for SC design. Most SCs consist of a combination of pull and push processes. It is worth noting that a push system is associated with waste and inventory build-up, while pull could lead to fewer inventories due to improved integration of systems. A pull system is a lean approach to SC coordination and is therefore, the more preferred system to SCM (Lu, 2011).

3.9.5 Returns management process

The returns management process, given little importance in some organisations, can be extremely beneficial for SCM in terms of maintaining acceptable levels of customer service and identifying product improvement opportunities. Returns management activities include environmental compliance with substance disposal and recycling, composing operating and repair instructions, troubleshooting and warranty repairs, developing disposal guidelines, designing an effective reverse logistics process and collecting returns data. Returns management personnel frequently interact with customers and personnel from customer relationship management, product development and commercialisation and supplier relationship management during the returns process (Aguirre and Goudge, 2014).

One of the goals of returns management is to reduce returns. Communicating return and repair information to product development personnel, suppliers and other potential contributors guide the improvement of future product designs.

Transportation and distribution services may also be included in the returns feedback communication loop. Product recalls, typically initiated because of safety or quality problems, involve informing customers and determining the most effective return, repair and/or replacement procedures. Other collaboration activities for the returns management process include developing policies for disposing of hazardous materials and recovering waste packaging across the SC (Van Weele, 2014).

Until recently, disposal of hospital waste in Kenya was being practiced without uniform standards and policies (Bid and Mistry 2013). Sadly, even after the formulation of policies and laws on healthcare waste management, many healthcare establishments in Kenya still lack enforcement of legislation for handling and disposal of healthcare waste (GOK, 2010).

Considering that most of the healthcare facilities sub-contract disposal of wastes to general waste collectors, a large amount of expired drugs and unsterilised medical waste actually ends up in dumps. Toxic ashes from incineration are also disposed here leading to soil and water contamination (Mazrui, 2010).

3.9.6 Logistics management and supplier collaborations

For several years, there has been some confusion about the difference between “logistics" and “SC management" with the usage of each term varying according to the industry. Lambert, Stock and Ellram (1998), defines logistics as that part of the SC process that plans, implements and controls the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption in order to meet customers' requirements. This requires coordination of activities both within and between organisations in the SC. The logistics effectiveness function is crucial to the success of the SC. SCM requires a logistics model based on quick order to delivery response. According to Gilmore (2002), a logistics model focuses on door-to-door delivery from supplier to customer.

Srivastava and Srivastava (2006) and Meade and Sarkis (2002) propose frameworks to manage product returns in reverse logistics by focusing on product ownership data, average life cycle of products, past sales, forecasted demand and likely impact of environmental policy measures. It is observed that reverse logistics is one of the toughest SC challenges (Aguirre and Goudge, 2014).

3.9.7 Logistics cycle

Logistics management includes a number of activities that support the customer expectations in a logistics system (Aguirre and Goudge, 2014). Over the years, logisticians have developed a model to illustrate the relationship between the activities in a logistics system; usually depicted in the logistics cycle (see Figure 3.14).

The logistic cycle indicates repetitive nature of various elements contained therein. Each activity depends on and is affected by the other activities. The activities in the centre of the logistics cycle represent the management support functions that inform and affect the other elements around the logistics cycle (Aguirre and Goudge, 2014).

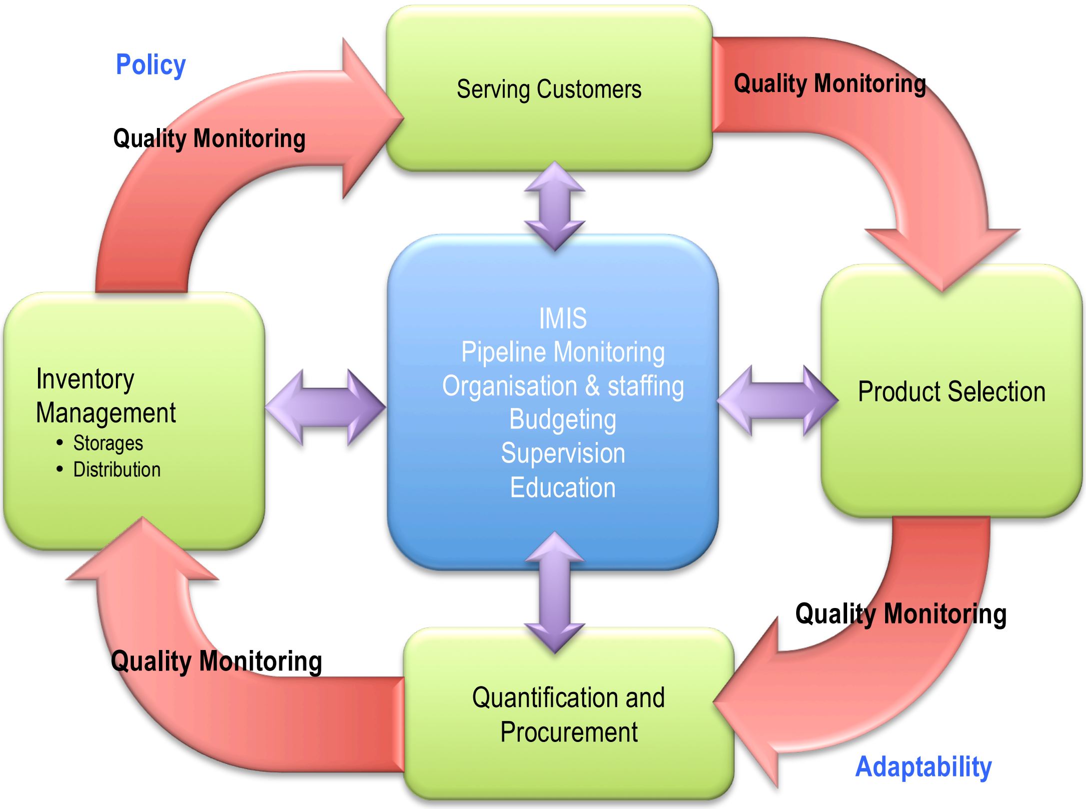

Figure 3.14: Logistics cycle

Source: Adapted from Dowling (2011: 2)

Those involved in logistics processes must remember that they work to meet customer expectations. The expectations of logistics improvement are also referred to as six rights and they define the purpose of a logistics system - it ensures that the right goods, in the right quantities, in the right condition, are delivered to the right place, at the right time, for the right cost (USAID/DELIVER Project, 2011). Whether the system supplies soft drinks, vehicles, or pens; or manages contraceptives, essential drugs, or other commodities, these six rights always apply (Whewell, 2010).

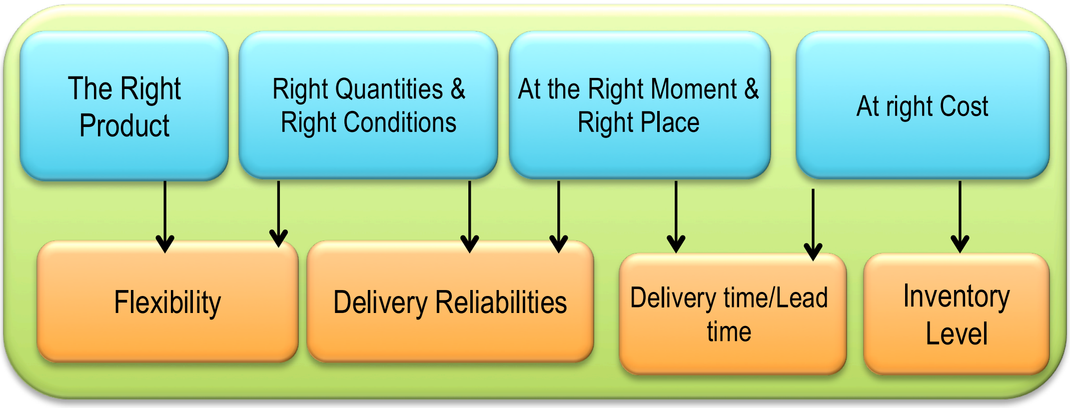

Figure 3.15: Six rights of logistics

Source: Researcher's compilation based on USAID/DELIVER (2011)

As can be seen in Figure 3.15, the two middle boxes in the lower row (that is delivery reliability and delivery times) are both aspects of customer service, which is highly dependent on the first box, flexibility and on the last box, inventory. This illustrates the interrelations in the various components of logistics.

It is therefore, evident that if customers would not wait for a delivery, the manufacturer needs to plan and estimate future demand by making demand forecasts. If co-ordination of product supply and demand were perfectly tuned, it would be possible to implement a pure Just in Time (JIT) strategy, with components arriving as they are needed and finished goods being shipped as they leave the assembly line. Nevertheless, in an SC, there are many events that cannot be foreseen and uncertainties that need to be accounted for. These may include late shipments from suppliers, defective incoming material, imperfect production yield, production process breakdown, or highly uncertain product demands (Sharma, Giri and Rai, 2013).

3.10 CUSTOMER'S ORDER FULFILMENT

The order fulfilment process is the set of activities that allows the organisation to fill customer orders while providing the required levels of customer service at the lowest possible delivered cost. Thus, the order fulfilment process must internally integrate the organisation's marketing, production and distribution plans as well as allow customers to provide input in order to be effective (Lambert, 2008).

As Msimangira, (2010) points out, organisation's distribution system must be designed to provide adequate customer service levels and the production system must be designed to produce at the required output levels, while marketing plans and promotions must consider the organisation's output and distribution capabilities. Issues related to order fulfilment include:

- ⇒ Location of suppliers;
- ⇒ Modes of inbound and outbound transportation;
- ⇒ Location of production facilities and distribution centres; and
- ⇒ Systems used for entering, processing, communicating, picking, delivering and documenting customer orders.

The order fulfilment process must align closely with demand management, customer relationship management, customer service management, supplier relationship management, returns management and directly with key suppliers and customers. This ensures that customer requirements are being met, customer service levels are being maintained, suppliers are helping to minimise order cycle times and customers are getting undamaged, high-quality products on time (Fawcett, Magnan and McCarter, 2008).

Croxton (2003) indicates that the order fulfilment process is more complicated than just filling a customer's order. It entails designing a network and a process that allows an organisation to meet customer demands while reducing the total product cost. In order to realise minimised delivered total cost, high degree of collaboration is required on different levels of processes involved in delivering the product to the customer as well as use of IT (Barnes and Liao, 2012).

The main encounter that the SC practitioners face is how to transform SCs from being supplier-centric to customer-centric. Traditionally, SCs have been developed from production facilities outward so that the company's business model may be continued without major change. The management emphasis was on ways of making production processes operate efficiently and ensuring products are cost effectively distributed. The marketing function needed to find ways to fit customers to the products rather than making the products that fit to market needs.

3.10.1 Customer relationship management process

Customer relationship management process provides the organisation with the structure for developing and managing customer relationships. As discussed earlier, key customers are identified, their needs are determined and then products and services are developed to meet their needs (Aguirre and Goudge, 2014).

Over time, relationships with these key customers are solidified through the sharing of product and service information, SC strategies, product development strategies, the formation of cross-company teams to design and improve products and services, the development of shared goals and finally, improved performance and profitability for the trading partners (Krishnapriya and Baral, 2014).

Collaboration elements also include the formation of product and service agreements to meet customer needs, decisions regarding product packaging, transportation and storage and the development of guidelines for sharing process improvement costs and benefits (Gimenez et al., 2012).

3.10.2 Customer service management process

The customer service management provides information to customers while also providing on-going management of any product and service agreements between the organisation and its customers. Information can be provided through a number of communication channels, including websites, group interactions, information system linkages and printed media (Whewell, 2010).

Objectives and policies are developed to facilitate timely distribution of products and services to customers, to adequately respond to product and delivery failures and complaints and to utilise the most effective means of communication to coordinate successful product, service and information deliveries (Gimenez et al., 2012). The process also includes methods for monitoring and reporting customer service performance, which allow organisations to understand the extent to which their management efforts are achieving the process objectives (Aguirre and Goudge, 2014). External integration elements include the gathering of customer satisfaction feedback, the methods used for information dissemination and the adequate and long-term solutions to customer problems and complaints (Shukla, Garg, and Agarwal 2011).

3.10.3 Customers-supplier relationship

Customer satisfaction is absolutely essential for staying ahead of the pack in competitive environments and this can only be achieved by quick responses to customer needs. A fundamental element of effective supply base management comprises downstream integration of customers coupled with management of upstream suppliers (Msimangira, 2010).

Each partner within the SC is a supplier as well as a customer. When a customer-driven vision is implemented jointly with supply base management practices, it can produce a competitive edge in a number of ways. These include increases in productivity, reductions in inventory and cycle time, increased customer satisfaction, market share and profits (Lu, 2011).

3.11 STANDARD HOSPITAL SUPPLY CHAIN

According to Rivard-Royer, Landry and Beaulieu (2002), the standard hospital SC is characterised by inflated inventories and high occurrence of stock outs (90-95% fill rate). In general, medical staff have no incentive or time to be concerned with efficient material operations as they are much more concerned with taking care of patients. In addition, the lack of an inventory system makes it virtually impossible for the personnel to know which inventory is oversupplied and which is in short supply as they have no visibility into the inventories that are scattered all over the hospital.

Nathan and Trinkus (1996) argue that in a standard hospital SC, all material operations are controlled by the hospital. Material personnel include purchasers, material handlers and stockroom personnel. Other personnel, mainly nurses, technicians and pharmacists, also spend a significant amount of time with material operations. Purchasers and material handlers are typically assigned to one or more wards within a hospital.

According to Sjoerdsma (1991), material from the hospital’s various suppliers is delivered in bulk to the hospital’s loading dock and transported to a main storeroom. Material handlers then transport material from the main storeroom to various secondary storerooms in wards throughout the hospital as the inventory in those wards diminishes. Typically, hospitals do not track perpetual inventory, but rather use visual cues to decide when to place an order for more material. Various hospital employees can pull inventory as they see fit with no record or accountability.

3.11.1 Vendor Managed Inventory

According to Marino (1998), while stockless inventory systems have clear benefits for hospitals with virtually no inventory control, the system still does little to reduce costs and optimise operations within the entire SC channel. It removes fiscal accountability from hospital employees placing orders on the distributors (Akyuz and Gursoy, 2014).

With no cost penalty, hospitals can, for example, order one item every day rather than consolidate to weekly shipments of multiple items. In short, there is no incentive for the purchasing/ordering group to be efficient (Byrnes, 2004). To no surprise, over time, many distributors increase their charges for their stockless accounts to offset these inefficiencies inherent in the system. Therefore, Vendor Managed Inventory (VMI) could address this problem (Sjoerdsma, 1991).

According to Byrnes (2004), under VMI, the distributor hires employees to work in the hospital and assume all material operation duties, including material handling, warehousing and purchasing. The distributor not only purchases material from its own facilities, but also from manufacturers and their competitors, as directed by the medical staff. The VMI stockless system is mutually beneficial to both channel partners as they reduce costs by removing redundant functions and inventory within the channel and alter the picking, materials management and information processing systems.

Sjoerdsma (1991) argues that since the distributors have a high incentive to focus on the SC efficiency, they are able to implement inventory systems within the hospital operations and focus on optimising order sizes and inventories. In addition, Byrnes (2004), argue that VMI has a major impact on the control of “unofficial inventories”. Unofficial inventories are those inventories that are unaccounted for in the hospital accounting and inventory records. Sjoerdsma (1991) further argues that it is estimated that conventional hospitals may have six times more unofficial inventory than reported.

According to Harrison and Van Hoek (2008), many hospitals have begun to transit to Vendor Managed Inventory (VMI), which are arrangements to manage the inventory on behalf of the customer. This management practice allows the supplier to position employees within the hospital. These employees perform all of the purchasing and warehousing of the materials in the central stores area. This arrangement is designed to decrease the amount of unaccounted for inventory that resides in the hospital, thus reducing material costs (Sjoerdsma, 1991). In this type of arrangement, the vendor has significant incentive to optimise the SC within the hospital through determining optimal ordering quantities and safety stock levels.

According to Harrison and Van Hoek (2008), two main issues are not improved with the implementation of VMI policy. Firstly, the amount of space that is occupied by non-critical inventory within the hospital is not reduced and therefore the hospital must maintain a large amount of floor space dedicated to the storage and management of inventory. The second aspect of the SC that is not significantly impacted is the inventory that is held within each of the units.

Hoarding of inventory by the healthcare workers is likely to happen across nearly all hospitals. This excess inventory is accounted for, but adds to the cost of the hospital's SC. In order to resolve these two issues, another system must be introduced that removes all non-critical inventories from hospitals and delivers necessary items directly to patients (Ojwando and Rotich, 2013).. The introduction of SCI mechanism in public hospital SC in Kenyan is likely to resolve the issue of hoarding of supplies.

3.11.2 Automated Point of Use Systems

Advancement in hospital SCs in recent years has seen the implementation of Automated Point of Use (APU) systems. According to Marino (2008), the system has medical supplies on the left, while pharmaceutical is on the right. The system is placed in the various wards throughout the hospital and only allows authorised users to pull inventory.

Pull transactions are entered directly on a computer or monitor or by pressing a "take" button located on the appropriate bin. These systems keep perpetual inventory records and automatically place orders based on the established re-order and target inventory level. According to Duclos (2009), APU systems help reduce human errors by charging patients for the actual materials that were administered to them. This way, all materials used can be directly traced to the user thereby increasing accountability.

However, according to Marino (1998) although these items can be quite effective in controlling inventory, they are also quite costly and slow down inventory deployment, as medical staff are required to login before they can take any supplies. Therefore, it may not be cost effective to place low cost, non-critical items into these devices, as they are currently designed.

According to Jones, Comfort and Hillier (2007), another benefit of APU systems is that they allow for visibility into the entire hospital's inventory. Hence, for common items, a shortage in one ward can be mitigated with excess inventory from another ward until the next replenishment arrives. This is a very significant advantage. Duclos (2009) demonstrated that point-of-use safety stock was much less effective than central store safety stock in preventing stock-outs during shock demand situations. Duclos (2009) defined shock demand as a 300% increase in typical demand for 24 hours. As emergency demand is a characteristic of many hospitals business, it is therefore a cause for concern.

DeScioli (2005) observed that the most advanced hospitals were currently using APU systems in order to track some of their medical consumable products and their pharmaceutical products. This type of inventory management system allows the user to log into the system to take an item from stock. Once the user identifies the needed item, the door opens in the location of the item allowing the nurse to take the number of items that they need (Marino, 1998). The user indicates how many of each item they are taking and then the inventory levels within the tracking system are automatically updated.

According to Duclos (2009), this type of an inventory management system requires that the users, who are generally nurses, accurately input any inventory that they take or replace. Nurses are given incentives to perform these actions accurately because they are identified upon logging on to the machine. From an audit point of view, Marino (2008) argues that with less than ten minutes effort, it is generally possible to determine who is responsible for any inventory inaccuracies. Another incentive to maintain accurate inventory counts is to make sure that proper stock levels are maintained, which in turn help nurses provide the best possible care for their patients.

Duclos (2009) points out that one drawback of using APU systems is the limited amount of space that is available in the systems relative to the large amount of space hospitals utilise for central inventory. The result of this lack of space is a lower level of safety stock and the inability to risk pool. This restriction leaves the wards unable to fulfil uncertain demand that can increase at an unexpected rate, even 300% in a 24-hour period (DeScioli 2005).

Typically, these APU systems are kept in each of the wards, so in the event that one does run out of inventory, the nurses have the option to go to another ward and attempt to obtain the desired product in another machine Duclos (2009). If the inventory level drops below the par level, then an automatic order is sent to the distributor. If the orders are placed before midnight, distributors generally have agreements set up that require them to fill the orders the following day (DeScioli 2005).

Therefore, since hospitals generally strive for quality healthcare delivery, adoption of an efficient inventory management system is crucial to reduce inefficiency in the supply. Additionally, hospitals need to operate more efficiently and find ways to reduce costs in order to meet the demands of healthcare. To this end, adoption of an APU systems is therefore inevitable.

3.12 SUMMARY

The customer's order fulfilment is the focus of the study. In this study, the construct customer's order fulfilment is intended to measure the performance of customer's order fulfilment in the public hospitals. The literature indicates that there are different dimensions of measuring customer's order fulfilment. This study determines the critical factors that enhance customer's order fulfilment in the public hospitals. The assumption is that SCI functional issues have impact on supply relationships, SCI and customer's order fulfilment. Therefore, customer's order fulfilment is dependent on improved SCI functional issues, supply relationships and SCI. The research on this relationship has not been conducted in the public health sector. Little is known regarding how public hospitals achieve SCI. This study is designed to fill this gap in the literature.

In conclusion, it is worth noting that the current SC designs are principally geared towards improving product availability, cost reduction and increased profit margins. The future SCs must be designed with additional parameters in mind like reduced carbon dioxide emissions, reduced energy consumption, better traceability and reduced traffic congestion. The new parameters could have significant impact on the current profit margins and the effect on the bottom line is expected to grow as we move into the future. As a result, current SC strategies should start looking ahead and give priority to these parameters and partners in the SC must play their part to accomplish this change.

In this chapter, the researcher has reviewed literature on theoretical models and constructs of SCM and SCI. The theoretical models of SCM and logistics are reviewed and the SCI framework for hospital pharmacies is constructed and explained. The researcher also presents the study hypotheses formulated from the SCI framework for public hospital pharmacies in Kenya with support of secondary sources from literature. Some of the models and theories reviewed include systems theory, value chain model, value ecology model and enterprise resource planning. in addition, the researcher discusses transaction cost economics theory; principal-agency theory; resource dependence theory; institutional theory; game theory; social network theory; strategic choice theory; and resource-based view/knowledge-based view theory.

In the next chapter, the researcher discusses the theoretical models and propositions of SCM and logistics, which culminate in the formulation of an SCI framework for public hospital pharmacies in Kenya.

CHAPTER FOUR

CONSTRUCTING A FRAMEWORK FOR SUPPLY CHAIN INTEGRATION IN PUBLIC HOSPITAL PHARMACIES

4.1 INTRODUCTION

In Chapter Three, the researcher discussed SCM and SC integration. It was observed that organisations are facing increased competition to improve not only their immediate business operations but also their SC operations, recognising the increasing importance of establishing the best process and SC in creating value for the end customer. The interdependencies among suppliers, manufacturers and distributors and between the SC process elements are complex and need to be closely coordinated (Cohen et al., 2010; Fawcett, 2013).

Supply Chains support the entire healthcare system and are critical for providing consistent availability of affordable, high quality diagnostic and treatment products in geographically dispersed healthcare facilities to reach the final customer. In addition, SCs carry information about supply and demand for products back to planners and policy makers and handle financial flows so that the system is adequately resourced. A malfunctioning healthcare SC can cripple the health system and undermine positive healthcare outcomes (Fawcett, 2013).

A public healthcare SC consists of organisations and individuals who plan, source, fund and distribute products and manage associated information and finances from manufacturers through intermediate warehouses and resellers to dispensing and healthcare service delivery points (Cohen et al., 2010).

There are a number of actors involved in making SCs work: donors and funders, government policy makers, procurement agents, programme managers, regulators, suppliers, distributors and dispensing staff from the public sector. Throughout this process many activities are carried out including product registration, forecasting, procurement, importation, warehousing, distribution and retailing. These activities occur at the different stages within the SC. The present study restricts itself to the activities from the time KEMSA procures medical supplies to the final customer (patient) delivery at the public hospital pharmacy (Wafula, Abuya, Amin and Goodman, 2013).

The widespread use of internet globally has led to increasing interdependency of global economies and the healthcare sector has not been left behind. This has resulted in the flow of raw materials, components and finished goods, with manufacturers sourcing components from low cost centres all around the world and similarly distributing their products to world markets. The recent challenges of a weakening economy, product proliferation on a global scale, rapidly changing technologies and the battle for market share and increasing pressure to improve customer value are forcing organisations to realign their business and SCM strategies in order to remain competitive (Validi, Bhattacharya, and Byrne 2015).

KEMSA could benefit more by changing its strategy in this ever-changing competitive environment to effectively deliver on its mandate. This has become even more critical with the introduction of semi-autonomous county governments in Kenya that are not bound to procure medical supplies from KEMSA only (Wafula et al., 2013). The present study aims at formulating an SCI framework that can be adopted by KEMSA to increase efficiency and effectiveness and make sure customers in public healthcare facilities get right products at the right time where they need them.

In this chapter, the researcher presents the theoretical models of SCM and logistics. In addition, the researcher formulates and expounds on an SCI framework for hospital pharmacies. In this chapter, the researcher also covers the study hypotheses formulated from the SCI framework for public hospital pharmacies in Kenya and is substantiated by secondary sources.

4.2 SYSTEMS THEORY

According to Hugo, Badenhorst-Weiss and Van Biljon (2004), SCM is a management philosophy aimed at integrating a network of upstream linkages (source of supply), internal linkages inside an organisation and downstream linkages (distribution and ultimate customers) in performing specific processes and activities that would ultimately create and optimise value for the customer in the form of products and services which are specifically aimed at satisfying customer demands. In support of this view, Leenders, Fearon, Flynn and Johnson (2002) confirm that SCM is a systems approach to managing the entire information flow, materials and services from the raw materials suppliers, through the manufacturers, warehouses to the end consumers (Mele, Pels and Polese, 2010). Therefore, this study uses the systems theory to explain the interdependences and linkages within the public hospital pharmacy SC.

Systems theory has been discussed by several authors notably Luhmann (1994), Senge (1990) and Mele, Pels and Polese (2010). These authors view the society as a complete functioning system that is self-sufficient. This system operates with interdependent subsystems working in harmony for the whole to operate effectively (Kitto, 2014). Society therefore depends on the functioning of the subsystems since failure of one subsystem would mean failure or partial failure of society. Parsons (1963) and Haralambos and Heald (1985) recognised the main functions of a system as depicted in Table 4.1.

Table 4.1: Functions of a system

Functions	Contents
Pattern maintenance	Involves preservation and reproduction of systems' essential characteristics.
Goal attainment	Involves the need for setting goals towards which activities are directed.
Integration	Encompasses coordination and mutual adjustment of the parts of the system to achieve adjustment of conflict.
Adaptation	Involves mechanisms aimed at restoration of equilibrium in a distorted system.

Source: Adapted from Parsons (1963) and Haralambos and Heald (1985)

As can be seen in Table 4.1, the main functions of a system include pattern maintenance, which encompasses preservation and reproduction of systems' essential characteristics and goal attainment. A functioning system is further focused on the need for setting goals towards which activities are directed, integration, which involves coordination and mutual adjustment of the parts of the system to achieve adjustment of conflict and adaptation, which involves mechanisms aimed at restoration of a distorted equilibrium (Rullani, 2011).

The system dynamics recognise that the structure of any system involving the many circular, interlocking, sometimes time-delayed relationships among its components are often just as important in determining its behaviour as the individual components themselves (Mele, Pels and Polese, 2010). This is precisely what an SC faces with its many intricate subsystems all aimed at serving the system as a whole.

Systems can be viewed using various approaches. A first approach by Kanji (2002) describes a system in terms of "process" and "system" representing a collection of various activities or tasks within the SC. However, this view does not capture the complexity of many organisational systems but simply suggested a direct linear relationship with no interdependencies or interactions.

The second approach, which is widely applied in many organisational systems, is by Schiefer (2002) who view systems as aligned subsystems of inputs from supplier, manufacturer, distributor and even the end user as in the case of SC. This approach partitions an organisation into subsystems that contain strategic, technological, human, cultural, structural and management elements that are in dynamic interaction with each other as well as the associated external surroundings that serve it (that is, suppliers and customers). In support of this approach, Ballou (2004) adds that changes in one subsystem are likely to spill over and affect the behaviour of other subsystems. This has direct consequences for the SC and the ability of the subsystems to act together (Golinelli, 2010; Rullani, 2011).

The systems approach, given by Schiefer (2002), fits in well with the hospitals pharmacy SC system. This approach according to Agarwal and Sumit (2004) consists of an integrated collection of personnel, knowledge, abilities, motivations, equipment, machinery, methods, measures, processes and task activities which in turn are linked to the suppliers and manufacturers as well as the consumers or the end users. The system interdependence requires the subsystems to fit together to optimise the larger system as described by Schiefer (2002) and as shown in Figure 4.1.

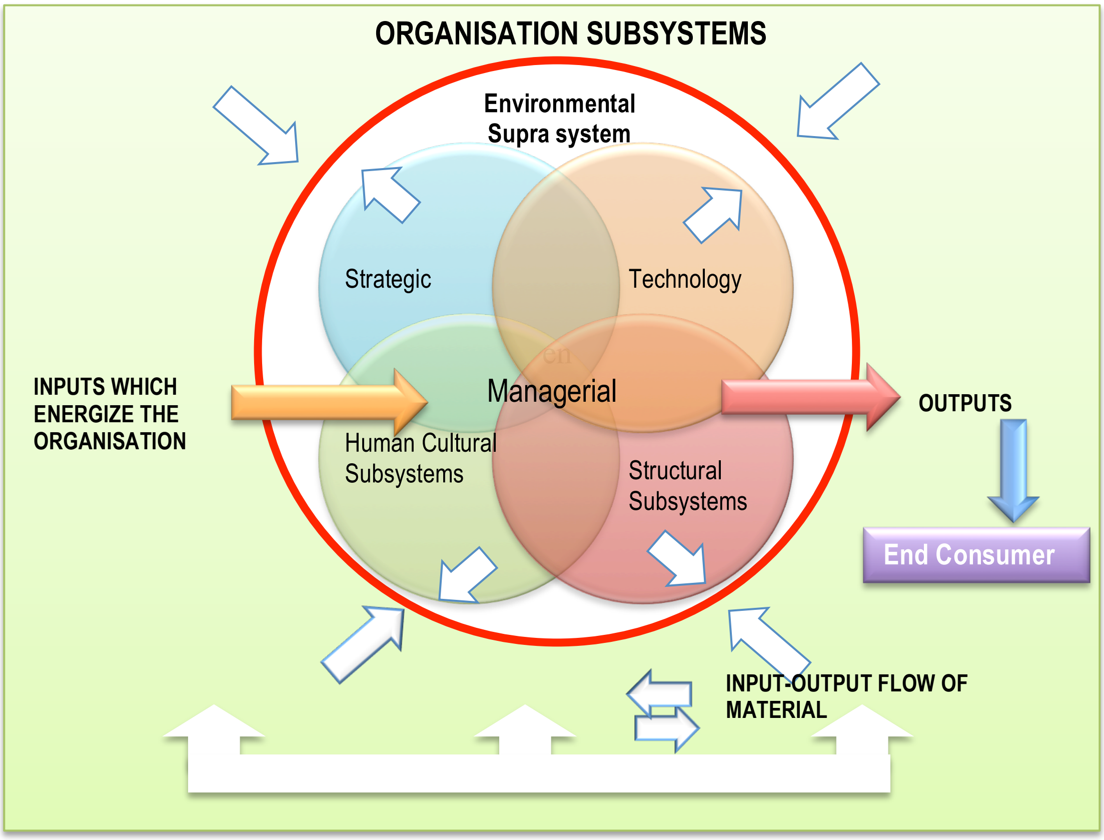

Figure 4.1: Organisational subsystems in system theory

Source: Adapted from Schiefer (2002: 198)

As can be seen in Figure 4.1, all units are interrelated and there is interdependence within the system. From an SC perspective, Holmberg (2006) concedes that horizontal workflows view the SC in terms of flow of inputs from the manufacturer, distributor and supplier and the subsequent output of the organisation to the end users. Horizontal workflow therefore maps the flow of work and resources and helps overcome the human tendency to focus on snapshots of isolated parts of the system without understanding their interrelatedness. Schiefer (2002) advises that when the SC is viewed as “one large open system”, managers are able to address how to integrate horizontal and vertical flows of work and information. In addition, Harley-Urquhart (2006) is of the view that the customer value strategy developed by strategic leaders must be communicated properly throughout all levels of the SC to ensure adaptability.

According to systems theory, a focus that is only directed on one or a few parts of the SC rather than on all of them would lead to systems failure. In addition to this, managers need to view the SC as a dynamic, constantly changing and evolving entity. Thus, a critical focus on the whole SC system (and all its elements) could lead to improved efficiency and appropriate outcomes of service in the hospital pharmacies both in the short and long-term.

4.3 VALUE CHAIN MODEL

The Value Chain model was first put forward by Porter (1985). He created a model of the various operations of an organisation that are all aimed at creating value for an organisation (see Figure 4.2). The important aspect of the value chain is that each phase in the chain may create and add value to the product (Porter, 1985). It is this aspect of value addition that differentiates the value chain from the simple movement of goods from one company to another. The value chain concept is therefore directly related to systems theory and process integration.

Porter subdivided the model into two major elements. The primary activities are those that create the primary product value and flows (inbound logistics, operations, outbound logistics, sales and marketing and after-sales service). The support activities are equally important to the overall competitive advantage or “value add” of the organisation, consisting of financials, human resource planning, technology or IT and procurement (Breiter and Huchzermeier, 2014). The value chain system as a whole cannot function without these subsystems. The model has also been thought of as a cost basis model and as such the primary activities equate to the production costs and the support activities can be construed as coordination or overhead costs (Anandarajan, Anandarajan and Wen, 1998).

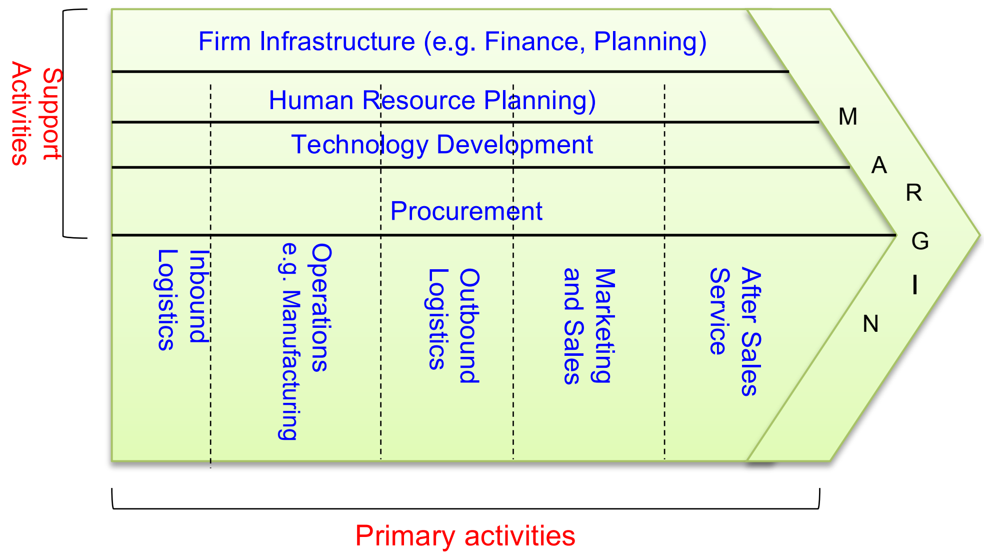

Figure 4.2: Porter's value chain model

Source: Porter (1985: 36)

The size and importance of the various aspects could change from organisation to organisation. Porter (1985) notes that an organisation is more than the sum of its activities and that its value chain is an independent system or network of activities. Whilst it is clear that the value chain is focused on the internal aspects of an organisation's operations, the organisation does not operate in isolation from others in an economy.

Porter extended the idea of the value chain by the use of what he calls the value system as shown in Figure 4.3. The value system highlights the interaction of a company with other organisations in order to provide a product or service to a potential buyer.

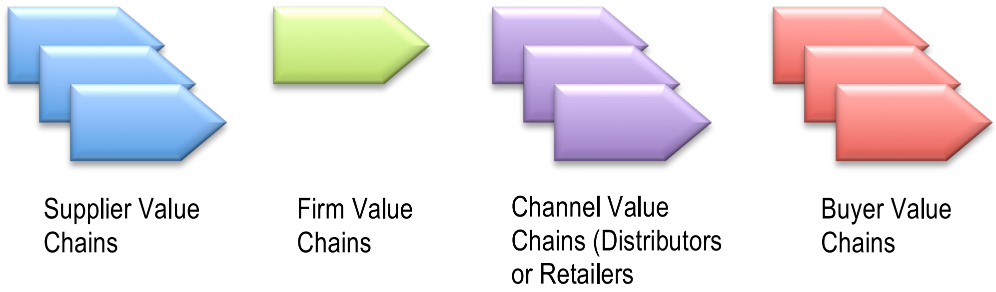

Figure 4.3: Porter's value system

Source: Adapted from Porter (1985: 35)

The value network is a system where the interrelationships between organisations are more fluid than those in a value chain (Johnson, Leenders and Flynn, 2011). Pitta and Laric (2004) provide a model of the healthcare value chains and SCs as they exist in many practical situations. Figure 4.4 illustrates that this value chain is not linear or sequential in nature but closely follows the flow of information through the system. The success or value created is linked to the transfer of quality information as the medical care received by customers relies heavily on information processing.

The first two groups interacting in this network are the customers and physicians. This stage of the process is generally initiated by the customer and provides valuable information necessary to adequately address whatever needs they might have. This research showed that individuals are much more likely to share very personal information with their healthcare providers when they believe this information is needed for medical purposes and when they trust the confidential nature of the patient-doctor relationship. The addition of pharmacists and other providers of medical equipment and services create the next link in the chain. In this stage the pharmacist creates value by further investigating the medical history, specifically as it relates to medications, of patients to determine any potential risks or interactions that may result from the addition of new, prescribed drugs. This is a very important step in customer service and patient care.

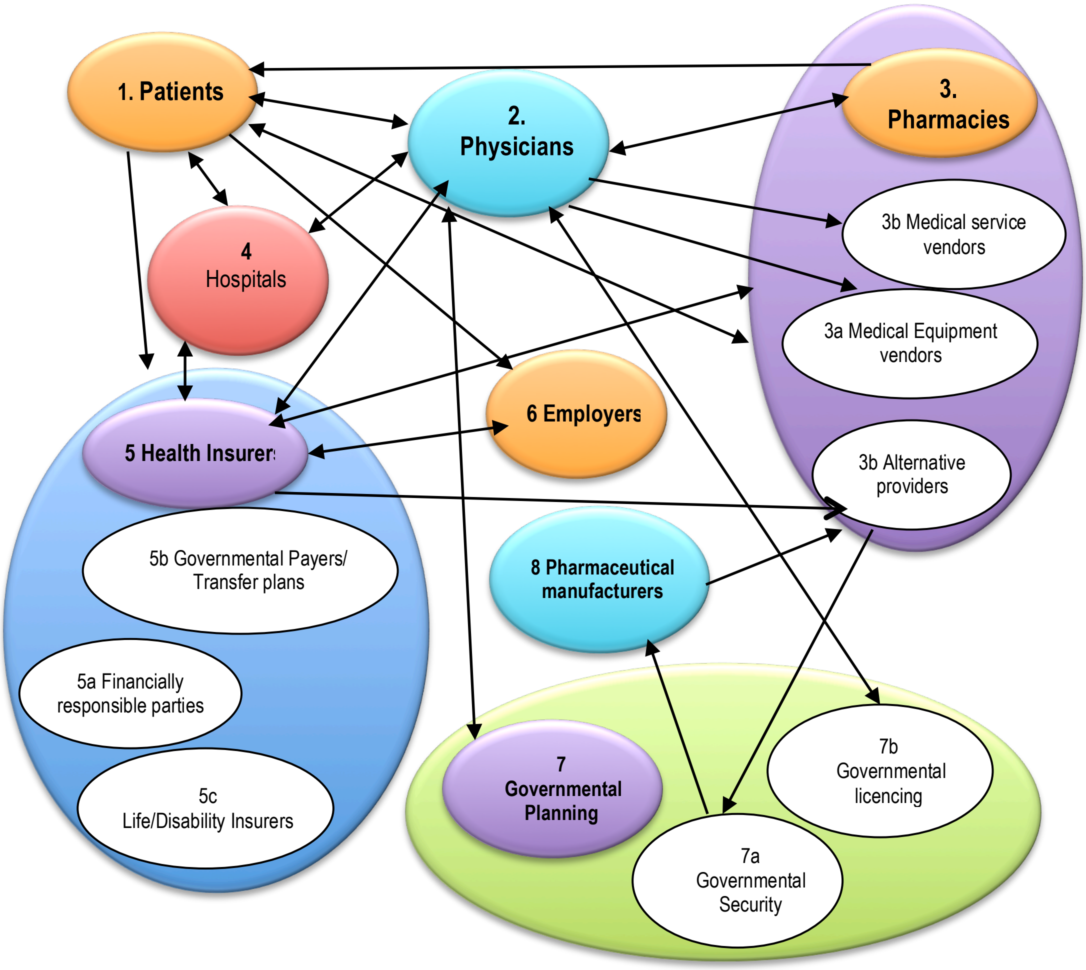

Figure 4.4: Stakeholders in healthcare value chain

Source: Adapted from Pitta and Laric (2004: 106)

What the model does not do is identify the various organisations' contribution to the value chain. The model does not highlight whether the organisations have a strategic or objective setting responsibility or whether they have operational responsibilities in delivering a service to the end user or patient as in this case. The model also does not identify organisations that are central to the overall value chain, nor does it ascertain whether there are scale-free or hub aspects to the organisations listed.

Hearn and Pace (2006) suggest that the chain metaphor creates a number of limitations. They postulate that it is a single linear process with one stage leading to another and that it does not recognise the fact that the value chain creation may be a competitive as well as a cooperative process. They suggest that a chain exists in isolation and ignores the environment as well as the effect of other processes or factors.

4.4 VALUE ECOLOGY

Although it is very convenient to draw the value chain as a simple linear diagram as in Figure 4.3, this does not reflect real-life situations. Pitta and Laric (2004) evaluated the value chain for the health-care market and they drew the connections in a manner that reflected better the logical flow and connections between entities and organisations as shown in Figure 4.4. However, as they point out: "*the service chain can be very complex, forming a network of relationships, rather than a sequence customarily associated with the value chain…these value chains are neither linear nor sequential and they could be circular or iterative*" (Pitta and Laric, 2004: 106).

There is a distinct focus on next-generation business systems of value creating ecologies (Hearn and Pace, 2006). These authors points out that there is a shift in thinking from:

⇒ Consumers to co-creators of value;

⇒ Value chains to value networks;

⇒ Product value to network value;

⇒ Cooperation and competition to complex "co-opetition"; and

⇒ Individual organisation's strategy to value ecology as a whole.

Therefore, the concept of a value chain is useful as a framework but it is limiting in that it does not reflect the dynamic nature of the participants and goals. Hearn and Pace (2006), postulate that the value ecology model is a dynamic, multi-directional cluster of networks and that these networks facilitate rapid information transfer across institutional boundaries to put people in direct contact with each other. They also point out that the new value creation is achieved with the manipulation of data and with the characteristics of information from ordinary goods (Mele, Pels and Polese, 2010).

The question for the research is how much the patient is treated as the end-point of the value chain; or, specifically, is the patient accessing medication from public hospital pharmacies, at any geographical location, involved in value ecology, given that they are customer, consumer and participant possibly all at the same time (Pitta and Laric, 2004: 106).

4.4.1 Value Chain and ERP integration

In section 3.8.4, Enterprise Resource Planning (ERP) was introduced and discussed. Figure 4.5 illustrates the updated value chain and the associated ERP modules. This is the basic value chain of Porter (1985) overlaid with the ERP modules. The modules in red (and underlined) are the areas identified as the common modules for the purposes of this research. The ERP module consists of sales and marketing (including membership/customer registration), e-business, financial, manufacturing, scheduling and logistics, among other modules (Alzahrani, Stahl, and Prior, 2012).

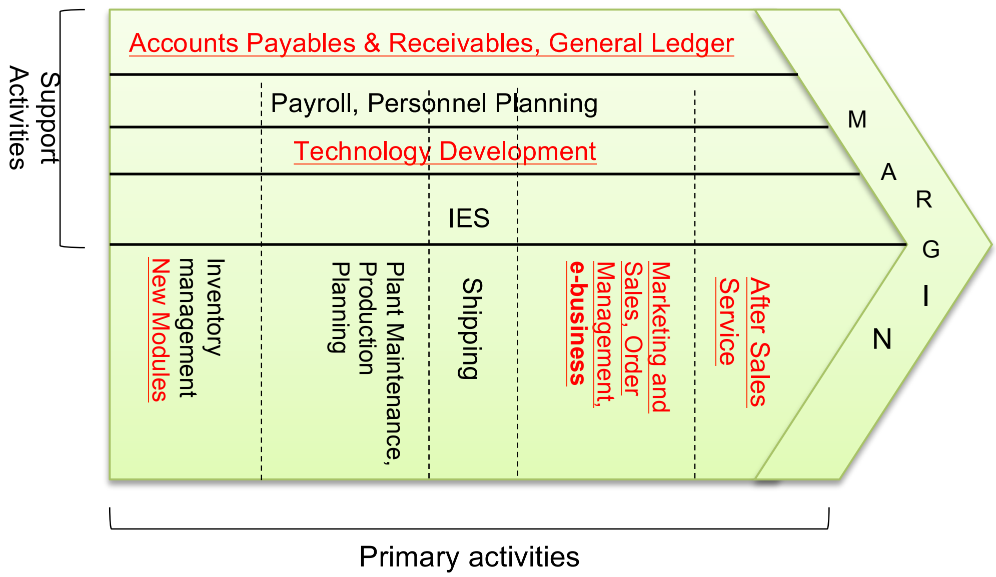

Figure 4.5: Amended value chain module

Source: Adapted from Porter (2005: 36)

Value Chain systems are highly dependent on availability of real-time information systems such as internet and have greatly contributed to the use and growth of the internet (Davenport, T. 1998). Online ordering and payment used by online stores like *eBay* and *Amazon* demonstrate the extent of the capabilities of systems both to support thousands of users at any one time and to store many millions of item descriptions (Lu, 2011; Mele, Pels and Polese, 2010).

A Sector Report by the Communications Commission of Kenya (CCK) indicates that 44.12% of the population have access to the internet with majority accessing the internet through mobile phones (CCK, 2012). The report however indicates the bandwidths in Kenya are underutilised. According to the CCK, international available bandwidth has increased more than twenty-five-fold, from 202,720.02 Mbps from December 2010 to 5,261,919 Mbps in December 2011. The usage levels remain low with only 1.01% utilisation. *"This indicates that a lot of potential still lies in this subsector and initiatives towards formulating policies and projects that encourage the uptake of this capacity are required,*" (CCK, 2012: 5). This illustrates the opportunities associated with integration of drug and medicine SCs in Kenya.

Technology has made great strides in the field of large-scale integrated systems and in the hardware and infrastructure required to run the system (Barr, 2010). The extensive use of tablets, laptops and bandwidth in the Kenya means that a fresh approach can be taken to delivering systems that have a large-scale public user base in order to improve the information and functions available to KEMSA, the public hospitals and logistics organisations in the SCI.

4.5 SUPPLY CHAIN INTEGRATION FRAMEWORK FOR PUBLIC HOSPITAL PHARMACIES IN KENYA

The study proposes a framework that illustrates interconnection between the various players in the public hospital pharmacies SC. In addition, the model depicts key variables that play a crucial role in the public hospital pharmacies SC. These variables are classified as independent and dependent variables. Figure 4.6 depicts this conceptualisation of the SCI conceptual framework and the associated variables.

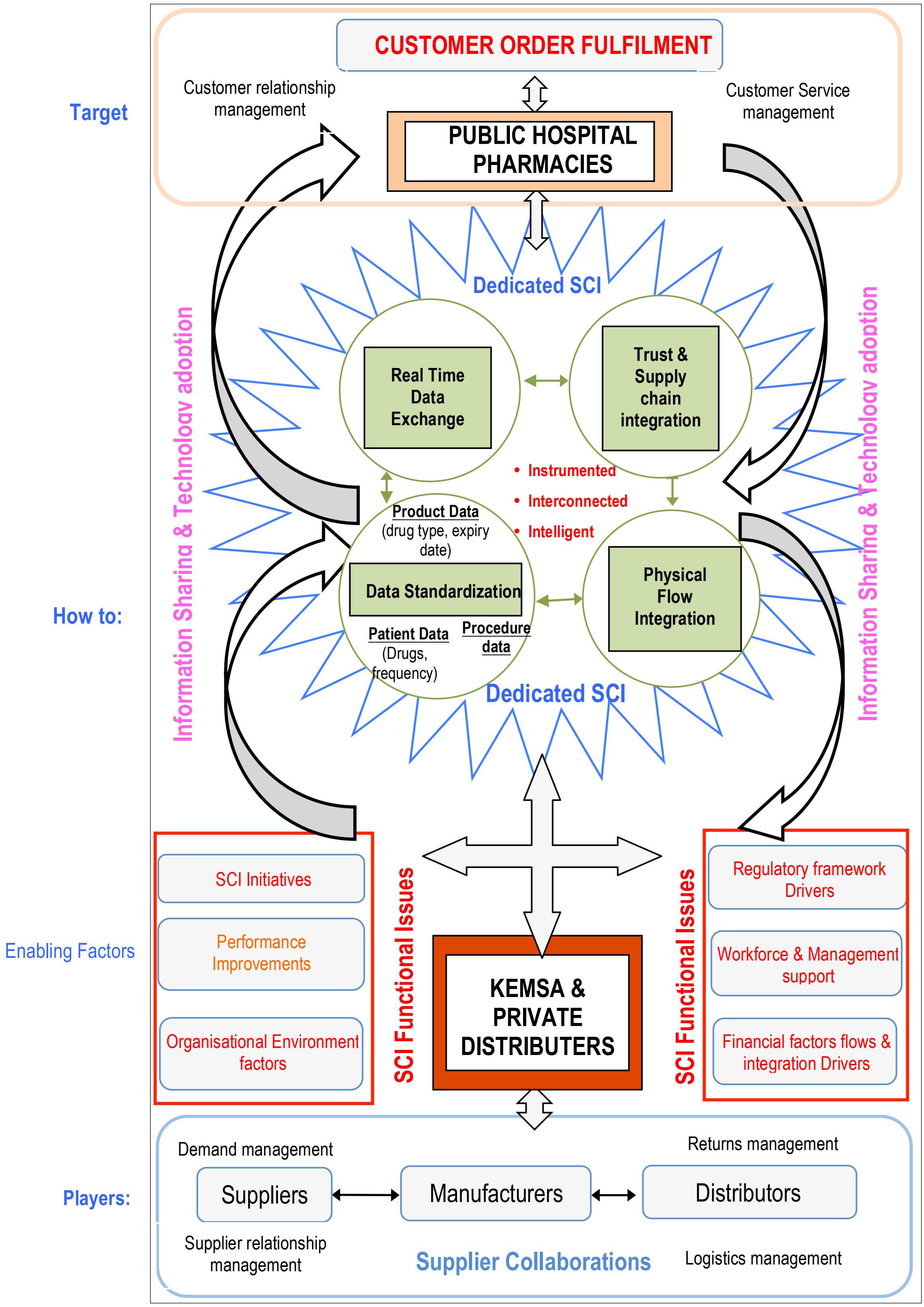

Figure 4.6: Proposed SCI framework for public hospital pharmacies in Kenya

Source: Researcher's compilation based on Kritchanchai (2012: 111)

The dependent variable for this study is SCI while independent variables are:

- ⇒ SCI initiatives;
- ⇒ Performance improvement drivers;
- ⇒ Organisation environmental forces;
- ⇒ Regulatory framework;
- ⇒ Workforce and management support;
- ⇒ Financial factors, flow and integration; and
- ⇒ Information sharing and technology adoption.

These factors are discussed and operationalised in the sections that follow. In addition, the study hypotheses are also formulated at the end of each sub-section.

4.6 OPERATIONALISATION OF CONCEPTUAL FRAMEWORK

The constructs, based on the research model structure in section 4.5, are grouped into four categories namely:

- ⇒ Supplier collaborations;
- ⇒ SCI functional issues;
- ⇒ Information sharing and technology adoption; and
- ⇒ Customer order fulfilment.

These constructs are discussed next.

4.7 SUPPLIER COLLABORATIONS

The GSCF model reviewed in section 3.4.3 emphasises the significance of using a process method, in which all functions and processes in an SC are harmonised. It is important for businesses to keep close collaborations with key clients and suppliers. Functional SC collaborations are not easy to create and are even harder to maintain, as they require high levels of trust, commitment and a shared common vision among SC partners (Fawcett, S., Fawcett, A., Watson, and Magnan, (2012).

In this study, the construct supplier collaborations refer to the type of business relationships existing between SC partners. It involves working together in harmony to achieve a common goal. The type of collaboration may differ from one value chain to another and from business to business. The Kenyan public healthcare SC needs logistics operational collaboration where the aim is to reduce logistics lead-time and cost.

Collaboration between partner organisations in an SC helps them share complementary resources and information between them, consequently, avoiding unnecessary replication of the capital-intensive resources. Information, intellectual properties, knowledge and customer intelligence are also commonly shared when organisations collaborate (Fawcett et al., 2012).

In order for collaboration to be beneficial, KEMSA should evaluate its potential partners from such aspects as quality, delivery, cost, technical and support for timely response to customer needs in all healthcare facilities in Kenya. Supplier collaboration is therefore a critical aspect in the proposed SCI framework.

4.7.1 Supplier relationship management process

Integrative approaches to value creation require not only trust, but also that the firm fosters a culture which promotes equitable treatment and collaboration with external actors (Miles and Snow, 1978). Supplier relationship management defines how the organisation manages its relationships with suppliers. Improvements in buyer-supplier relationships contribute to better product delivery practices and lowering supply risks. In addition well-functioned relationships could help to overcome variety of organisational barriers and develop internal technical capabilities (Fawcett et al., 2012).

A well-functioning relationship with suppliers fosters sharing across the SC so organisations become more cost effective, more efficient, more agile, more responsive to market and SC changes and more innovative (Thongrattana, and Perera, 2010). Timely information exchanges within and between organisations in an SC help develop trust and make product delivery process more stable and reliable. It is also a great step forward towards creating a favourable environment for integration (Fawcett et al., 2012).

Integration among KEMSA SC partners could create a close link between manufacturing and distribution processes to deliver healthcare products in a timely and effective manner in public hospitals across the country (Ojwando and Rotich, 2013). Efficient supplier process integration allows manufacturers to speed up product delivery processes, improve production planning and reduce inventory obsolescence using accurate information about customer demands and preferences (Thongrattana, and Perera, 2010).

In the proposed SCI framework, KEMSA should seek out the best performing suppliers and establish on-going, mutually beneficial, close relationships with these suppliers in order to meet cost, quality and/or customer service objectives for key materials, commodities and products.

4.7.2 Demand management process

The demand management is the communication of the projected market demand as a critical component of the success of the SC according to Simchi-Levi, Kaminsky and Simchi-Levi (2004: 200). The demand management process balances customer’s order with the organisation’s output capabilities. Demand management activities include forecasting demand and then utilising techniques to vary capacity and demand within the purchasing, production, marketing and distribution functions (Ragatz, Handfield and Petersen, 2002).

Managing demand is one of the key aspects that SCs compete with in the market place. The performance of an SC should be viewed by the end-customer on how the consumer demand is managed, fulfilled and satisfied. In the proposed SCI framework, demand management should not just be a matter of goodwill or customer-minded attitude by the SC partners, but rather about timely and cost effective fulfilment of the customer order (Thongrattana, and Perera, 2010; Lu, 2011). How well KEMSA is able to manage the demand and demand related information such as forecasting and market signals is also revealed in the way it views and manages its collaborations with buyers and suppliers in the healthcare SC.

Real-time collaboration and responses are highly desirable for effective customer order fulfilment. In the SCI framework, collaboration within a demand management context should start with comprehension and acknowledgment of the concept, followed by a shared commitment amongst the managers and the entire KEMSA workforce. Regular meetings and reviews between the SC partners should be intertwined in all demand management processes. Documented standard operating procedures, supplier's manuals and guidelines could provide a critical starting point.

4.7.3 Returns management process

Product returns management processes involve the return of products from a customer to an organisation. Product returns have often been viewed by organisations as a necessary evil - a painful process, a cost centre and an area of potential customer dissatisfaction (Thongrattana, and Perera, 2010). However, KEMSA should realise that an effective product returns strategy could provide a number of benefits, such as improved customer service and customer knowledge, effective inventory management and product disposal (Fawcett et al., 2012).

Communication with the customers during the return process is a great opportunity to turn a bad situation into a potential customer for life. Even if it is an uncontrollable return, an organisation can learn valuable information for product or service improvement. Many times, a clarification about the use of a product or service can remedy the return (Lu, 2011; Fawcett et al., 2012).

Although the nature of product returns differs considerably from organisation to organisation due to type of industry, product, market and other factors, top management at KEMSA must recognise that full-time administration of the product returns process should be prioritised since it has potential of increased cost savings, revenue enhancements, service level improvements and sustainable competitive advantage (Ojwando and Rotich, 2013).

4.7.4 Logistics management

Logistics management is the portion of the SCM process that plans, implements and controls the efficient, effective forward and reverse flow and storage of products, services and related information between the point of origin and the point of consumption in order to meet customers' requirements. It involves the integration of information, transportation, inventory, warehousing, material handling and packaging (Mutingi, 2014).

Logistics in an organisation are considered as a continuation of marketing. Logistics plays a critical role in each of the three key elements of the marketing concept namely customer satisfaction, integrated effort/systems approach and profit. Selecting a good logistics strategy may yield a competitive advantage. It must not been seen as a less creative process than developing the corporate strategy (Mentzer, 2004).

It is proposed that KEMSA’s logistics design strategy needs to link the logistics or distribution plan directly with the corporate strategy. This is best achieved by ensuring that logistics is an integrated part of the KEMSA strategic plan. This strategy should include all of those information-related factors that are vital to support the processes and the physical structure of the operation. It is essential to appreciate that there are many organisation-wide information systems, for instance ERP, which may support logistics process and network design (Chorafas, 2001).

The logistics effectiveness function is crucial to the success of the KEMSA’s SC. KEMSA should adopt a logistics model based on quick order-to-delivery system where once a product procured, there adequate distribution structure to facilitate timely delivery to the final customer (Mbindyo, Okello and Kimani, 2010).

In the SCI framework, it is proposed that public hospital SC in Kenya should adopt an integrated operation, warehousing and transportation services that can be scaled and customised to customer’s needs based on market conditions and the demands and service delivery requirements for their products and materials.

4.8 SCI FUNCTIONAL ISSUES

The successful SCI in an organisation is determined by the way management views the SCI functional issues, which can potentially affect its capacity to effectively realise SCI. SCI functional issues involves the organisation's activities that have potential of improving SCI in an organisation. The concept of structural integration in an organisation can be said to be the extent to which various co-dependent organisational processes form a united whole (Lummus and Vokurka, K 2008).

The functional SCI issues, such as SCI initiatives, performance improvement, organisational environmental forces, regulatory framework drivers, workforce and management support and financial factors flows and integration drivers are discussed in the following sections.

4.8.1 SCI initiatives

The aim of most organisations, including KEMSA, is to deliver products and services that their customers require, where and when they need, at a surplus. All business processes within the organisation must have these objectives as underlying purpose of their existence. All processes in the organisation must focus directly or indirectly on fulfilling this goal (Msimangira, 2010).

SCI is a performance-improving method that cultivates seamless linkages between the various actors, levels and functions within a given SC to maximise customer service. The purposes of SCI are to improve efficiency and reduce redundancy, thus improving product availability and, often, reducing costs. Performance-enhancing measures can take many forms namely the structuring of logistics management units, joint strategic plans, information sharing mechanisms and technical working groups (Lu, 2011).

Through routine meetings and information sharing, the SC partners foster trust, which in turn, improves forecasting and timely procurement and minimise stock outs. The end result is improved efficiency and better customer service (Msimangira, 2010).

An integrated hospital SC would coordinate order fulfilment to match actual consumption at the public hospital pharmacy and synchronise the supplies from KEMSA to facilitate timely delivery of the products to the right place at the right time and with the right price. KEMSA should incorporate an ERP with Point of Sales (POS) at each of the public hospital pharmacy. These integrated POS' should share inventory data including sales and stocking data with KEMSA as their key supplier.

Tracking daily consumption could enable KEMSA to identify popular from slow-moving items and to respond quickly either to replenish or to discontinue the items in the warehouse. Tight coordination is needed between public hospital pharmacies across Kenya and KEMSA as their key supplier could dramatically increase product availability and reduce inventory costs to the benefit of the final customer (Lo and Power, 2010).

4.8.2 Performance improvement and SCI

In the perspective of a dynamic SC, continuous performance improvement is critical for suppliers, logistics organisations and distributors to gain and sustain competitiveness. Performance measurement is critical for companies to improve the SCs effectiveness and efficiency (Krishnapriya, and Baral, 2014).

SC performance improvement should be viewed as continuous processes that involve analytical performance measurement system and a mechanism to initiate steps for realising Key Performance Indicator (KPI) goals. KPI goals connect planning and execution and creates avenues for realisation of performance goals into regular daily work (Li, 2007).

Measuring SC performance requires a set of variables that capture the impact of actual functioning of SCs in terms of profits and expenses of the entire system. These variables, as drivers of SC performance, are always derived from SCM practices. After identifying KPIs, managers have to achieve improvement in them through continuous planning, monitoring and process execution (Leonard and McAdam, 2003).

4.8.3 Organisational environmental forces

The business environment consists of a set of elements existing both inside and outside the organisation's boundaries that have influence on its operations and that can potentially have both a positive and a negative impact on the business (Laaksonen, Jarimo, Kulmala, 2008).

The internal business environment includes factors within the organisation that impact the approach and success of its operations. The external environment consists of a variety of factors outside the organisation boundaries that an organisation does not have much control over. Managing the strengths of the internal operations and recognising potential opportunities and threats outside of the organisation's operations are keys to business success (Park, and Koh, 2013). Various external environmental forces, including sociocultural, technological, economic, political-legal and global forces, affect the general operating environment (Msimangira, 2010).

The contextual challenges facing healthcare are so complex that they defy simple solutions. Understanding the nature of the healthcare environment, the relationship of the organisation to its environment and the often-conflicting interests of internal functional departments and services require a broad conceptual paradigm (Krishnapriya, and Baral, 2014).

In order to survive in this volatile environment, KEMSA should collaborate with SC partners, to form strategic alliances, adopt organisational learning and come up with innovative strategies as a strategic response to environmental changes. In addition, the KEMSA management needs to take action towards specifically and visibly enhancing efficiency in product and services delivery. Independent county governments that are not obliged to only buy from KEMSA, threaten KEMSA'S very existence.

4.8.4 Regulatory framework

The legal frameworks provide a very important foundation upon which the operations including the mandate of an organisation are anchored. The frameworks define the scope of mandate including functions, the organisational structure and composition among others. The legal and regulatory framework governs the relationships between parties, businesses and organisations. It provides a general platform within which two or more parties can legally operate and transact (Delloitte, 2013).

In Kenya, the Public Procurement and Disposal Act (PPDA) controls and guides public procurement. The PPDA applies to all procurement of goods, works and services, as well as the disposal of assets by public entities like KEMSA, who procure healthcare goods and services utilising public funds. This Act does not directly seek to regulate the private sector, though it does regulate its interaction with public entities. Therefore, all KEMSA suppliers are indirectly controlled by the PPDA and must therefore comply with procurement procedures established under the Act (KEMSA, 2013; Delloitte, 2013).

The PPDA establishes the procurement methods to be applied, advertising rules and the time limits, the content of tender documents and technical specifications, tender evaluation and award criteria, procedures for submission, receipt and opening of tenders and the complaints system structure and sequence.

The Government has adapted a new regulation, which stipulates that all public procurement would be made online under the Integrated Financial Management Information System (IFMIS) platform. The shift from manual to e-procurement would enhance transparency and credibility in the management of the public finances and tendering process through the IFMIS (Barnes, 2010). The IFMIS system enables monitoring of all transactions during the procurement process and provides functionalities such as the approval hierarchy, which is an end-to-end process that facilitates the procurement process from planning to payment (Yeganeh and Alghyani, 2015).

IFMIS could go a long way in facilitating the SCI in the public hospital’s SC in Kenya. KEMSA should move with speed to implement IFMIS as it would strengthen the supplier relationships by streamlining the procurement procedures, provide easy access and sharing of information and documents and ultimately ensure cost savings.

4.8.5 Workforce and management support

Operating an effective and efficient integrated SC requires a skilled and adequately motivated workforce (Haynes and Luke, 2012). The health SC workforce ranges from caregivers (for example, doctors, nurses, clinical officers, pharmacists) to laboratory technicians, managerial personnel and other staff (cleaners, medical records officers, health economists) with the latter group not delivering any services to patients directly, but they are still vital to the proper functioning of the SC (Lu, 2011; Akyuz and Gursoy, 2014).

It is important for the workforce to be sufficiently motivated and involved in the crafting of the strategic direction the organisation intends to take. The management, as leaders, provide direction to the workforce as they pursue a common mission within the organisation. Effective leadership is critical during SC implementation and requires participation by all groups and individuals involved in the supply network (Pandey, Bhattacharyya, and Kaur, 2012). Effective adoption and implementation of the integrated SC calls for proper leadership, which is enhanced through training, people oriented thinking and upholding of organisational, community and social ethics. All these elements are important ingredients of realising desired output in the SC (Msimangira 2010).

Healthcare workforce is at the core of healthcare systems everywhere in the world. Where there are healthcare worker shortcomings, healthcare systems suffer, resulting in insurmountable preventable deaths and disease. KEMSA should aim at having a robust workforce that is sufficiently motivated to facilitate implementation of the integrated SC system. Effective SC integration requires an organisation to have the right people in the right number at the location where they are required. It is critical to continuously train the workforce as part of the SCI implementation process to make sure they have the right skills and information (Krishnapriya, and Baral, 2014).

The driving force behind the public hospital SCI framework proposed in the present study is to remove inefficiencies, excess costs and inventories from the SC, which extends from the customer back through KEMSA and through its suppliers' suppliers. The final customer at the public hospital drives this integrated system. With the support of KEMSA management and the entire workforce, it is hoped that inefficiencies in the SC would be significantly eliminated.

4.8.6 Financial factors, flows and integration drivers

Organisations need to have sufficient funds and enough time to support the implementation of the SCI. True costs are estimated and identified. True costs include realistic time commitment from staff to achieve a SCI goal, a clear identification of costs of SCI implementation and cost arising from epidemics and medical emergencies, which arise unexpectedly (Bhaskaran, and Krishnan, (2009). This calls for proper budgeting of the available resources and seek for ways to close financial gaps. Gains in SCI can only be realised when there is a rational and equitable resource allocation to facilitate implementation (KPMG, 2013).

Effective resource allocation ensures that activities in the SC are well funded and that there would be no deficit budgeting during implementation. In order to attain financial sustainability, it is necessary to identify alternative sources of funding to reduce dependency on government allocation alone (Jones and Riley, 1987). In Kenya, the financial allocation to the healthcare sector has been on the decline. Reviews of public expenditure and budgets in Kenya show that total healthcare spending constitutes 8.6% of total government expenditure which remains far below the World Health Organisation’s recommended levels (GOK, 2006).

KEMSA sells products to public hospitals through the county governments. There is an urgent need for streamlining the collection of revenues and associated accounting of medical supplies. This should be complemented by structural changes that would make sure that resources are allocated to specific processes and operations that are critical to the success of the SCI (Deloitte, 2013).

An integrated financial system in an SC creates efficiencies through automation, openness, standards and communication across the SC from source to use, rather than simply passing data on and out of sight (Jones and Riley, 1987; Adabi Omrani, 2015; Abdullah, Uli and Tari 2009).

4.9 INFORMATION SHARING AND TECHNOLOGY ADOPTION

In the context of SC, one of the most important factors is the use of modern technologies or adoption of technology. The advent of the internet and electronic communication has enabled companies to be more responsive to their customers than ever before (Dobrzykowski and Vonderembse, 2009). As a result of advancement in IT, digital and physical infrastructures are converging. Thanks to the improved reliability of sensor technologies, practically any activity or process can now be measured and tracked. Objects can communicate and collaborate directly, without human intervention. Entire systems can be connected; not just SCs with other SCs, but also with transportation systems, financial markets and electric power grids and even natural systems like rivers and weather patterns (Parthasarathy, 2010).

Every insight derived from a world of objects can lead to action-and more value. With so much embedded intelligence, SCM can progress from decision support to decision delegation and, ultimately, to a predictive capability (Dixon, Freeman and Toman, 2010). KEMSA should embrace an SC that is hinged on three core characteristics: instrumented, interconnected and intelligent. These elements are discussed next.

4.9.1 IT-enabled tracking

Innovations enabled by advancement in IT are creating new ways for organisations to manage SC relationships. These organisations are using IT to coordinate processes along their SCs, including upstream procurement, internal production and downstream sales and customer services, as well as overall information sharing along the SC (Lahiri, 2006).

Sensors, RFID tags, meters, actuators, GPS and other devices and systems are creating SC information previously generated manually by people (Lancioni, Smith, and Schau, 2003). In this environment, SC relies more on online systems and less on labour-based tracking and monitoring for objects like shipping containers, trucks and products (Ma and Davidrajuh, 2005). Nowadays, there are dashboards on computer monitors that display the real-time status of plans, commitments, sources of supply, pipeline inventories and customer order fulfilment requirements (Lu, 2011). This system if adapted by KEMSA could facilitate SCI and enhance efficiencies.

4.9.2 Virtual interconnecting

The ability for an organisation to share information and knowledge across department, company and global boundaries is a competitive advantage for many organisations in the twenty-first century marketplace (McAfee, 2002). In the SCI framework, public hospital SC should embrace enhanced levels of interaction; not only with customers, suppliers and IT systems in general, but also among IT systems that are monitoring or even flowing through the SC to facilitate flawless interconnectivity. Besides creating a more holistic view of the SC, this extensive interconnectivity also facilitates collaboration on a huge scale.

4.9.3 Intelligent interactive systems

It is now possible to engage an IT system capable of monitoring the SC and taking necessary corrective actions as required, without human involvement. The system might even reconfigure SC networks when disruptions occur. This intelligent system can be used not only to make real-time decisions, but also to predict future scenarios (Bode and Wagner, 2015). Equipped with sophisticated modelling and simulation capabilities, the SCI framework is required to move past sense-and-respond to predict-and-act.

In order to integrate with partners via Intranet there is need to have standardised systems, integrate physical flows, share data real-time and cultivate mutual trust across the entire chain. These elements are discussed next.

4.9.4 Data standardisation

This area is focused on the unique codification system for all material and information flows in the chain. The codification of date would be directed at product, patient and procedure data (Memari, Rahim, and Ahmad, 2015). The objective is to achieve the identification and traceability of drug, medical device, procedure treated in the chain, patient and other materials and information that flows from the suppliers, manufacturers, distributors, healthcare providers and involved government players to the end customer. At this level, it requires all players to implement the same data standard and system so that they can speak the same electronic language (Mendes, 2010).

4.9.5 Physical flow integration

Physical flow integration facilitates process visibility and transparency so that the chain players from both the demand and supply side can see into the chain through real time data interchange (Memari et al., 2015).

One benefit of physical flow integration is the network's ability to identify and track the physical flow of the products across the chain. This is facilitated by online tracking technologies including when the materials are on the move. A careful analysis of the physical flow would highlight the bottlenecks in the SC (Mendes, 2010).

Physical flow Integration can help identify problems as well as solutions ahead of time, facilitate outsourcing and improve communication and information exchange between companies. This results in overall efficiency and responsiveness on SC activities and processes (Msimangira, 2010).

4.9.6 Trust and supply chain integration

A key element of analysis aimed at understanding SCM dynamics is trust, which determines that kind and type of relationship between organisations. Relationships can be defined in a number of ways and include several key components, including collaboration and integration among involved participants. Some of the challenges of these relationships include trust and information sharing (Arvan, Tavakoli-Moghadam and Abdollahi, 2015).

Significantly integrated and collaborative relationships require a long-term commitment between the involved parties and, at this level of collaboration, organisations share strategic and vital information (Lu, 2011). Furthermore, while it seems primary to suggest that organisations be open with one another and share data across organisational boundaries, it is easier said than done.

Information sharing can potentially result in both a loss of information control and a decreased level of information security within participating organisations. The SCI framework assumes a high level of trust among SC partners for privacy and security of data is of considerable importance, as SC partners would be dealing with sensitive or confidential data regarding their partner (Arvin et al., 2015).

4.10 CUSTOMER'S ORDER FULFILMENT

Order fulfilment is a key process in managing the SC. It is the customers' orders that put the SC in motion and filling them efficiently and effectively is the first step in providing customer service. The order fulfilment process entails generating, filling, delivering and servicing customer orders (Msimangira, 2010; Lu, 2011). It should be noted that the order fulfilment process involves more than just filling orders. It is about designing networks and processes that facilitates the organisation to meet customer requests while maximising financial returns (Croxton, 2003). This involves more than logistics and it needs to be implemented cross-functionally and with the coordination of key suppliers and customers.

At the operational level, the order fulfilment process is centred on transactions and is mainly accomplished within the logistics function but at the strategic level, the organisation should concentrate on achieving desired results on the processes that stimulates performance for both its customers and its suppliers (Lambert, 2008). This process necessitates integration of all the critical functions and is enhanced through collaboration and coordination with major suppliers and customers.

The order fulfilment process must integrate diligently with demand management, customer relationship management, customer service management, supplier relationship management, returns management and directly with key suppliers and customers to ensure that customer requirements are being met, customer service levels are being maintained, suppliers are helping to minimise order cycle times and customers are getting undamaged, high-quality products on time (Yeganeh and Alghyani, 2015).

4.10.1 Customer service and relationship management process

Customer satisfaction is absolutely essential for staying abreast of competition and responding to environmental changes. The customer service management process provides information to customers while also providing on-going management of any product and service agreements between the organisation and its customers. Information can be provided through a number of communication channels, including websites, group interactions, information system linkages and printed media (Arvin et al., 2015).

The SCI framework is developed to facilitate the timely distribution of products and services to customers/patients in order to adequately respond to product and delivery failures and complaints. The public healthcare SCI process must include methods for monitoring and reporting customer service performance, which allow SC partners to understand the extent their efforts are achieving integration objectives. External integration elements include the gathering of customer satisfaction feedback, the methods used for information dissemination and the adequate and long-term solutions to customer problems and complaints.

4.11 DEDICATED SUPPLY CHAIN INTEGRATION

In the literature reviewed, several definitions of SCI were noted but sadly, it is observed that management behavioural issues are not included in the definitions (Schoenherr and Swink, 2012). The strategic approach and conduct of the top management in an organisation like KEMSA have significant impact on its ability to integrate and in creating a corporate culture that supports efficiency.

The present study contends that human capabilities and behaviours are paramount in facilitating and consistently supporting internal and external SCI. It is therefore critical that integration should be measured to determine the critical management behavioural factors enhancing SC efficiency. To achieve the supply chain effectiveness and efficiency, four key elements discussed above must be considered: supplier collaborations, SCI functional issues, information sharing and technology adoption and customer order fulfilment.

When all the four elements are interconnected and then they are interwoven with a supportive management and capable staff, it creates a well-coordinated, supportive and dynamic integrated supply chain referred to in this study as ”Dedicated Supply Chain Integration” system.

4.12 OPERATIONALISATION OF THE RESEARCH HYPOTHESES

This section discusses the various variables that affect the SCI in detail as depicted in the SCI framework (Figure 4.7). In addition, directional research hypotheses were formulated and substantiated by secondary sources.

Figure 4.7 depicts this conceptualisation of the SCI framework and the associated variables. The dependent variable for this study is SCI, which is categorised into the following three subsets of factors: customer order fulfilment, supplier collaborations and dedicated SCI. The independent variables include SCI initiatives, performance improvement drivers, organisation environmental forces, regulatory framework, workforce and management support, financial factors, flow and integration and information sharing and technology adoption. The relationships included in the hypothesis are illustrated in Figure 4.7.

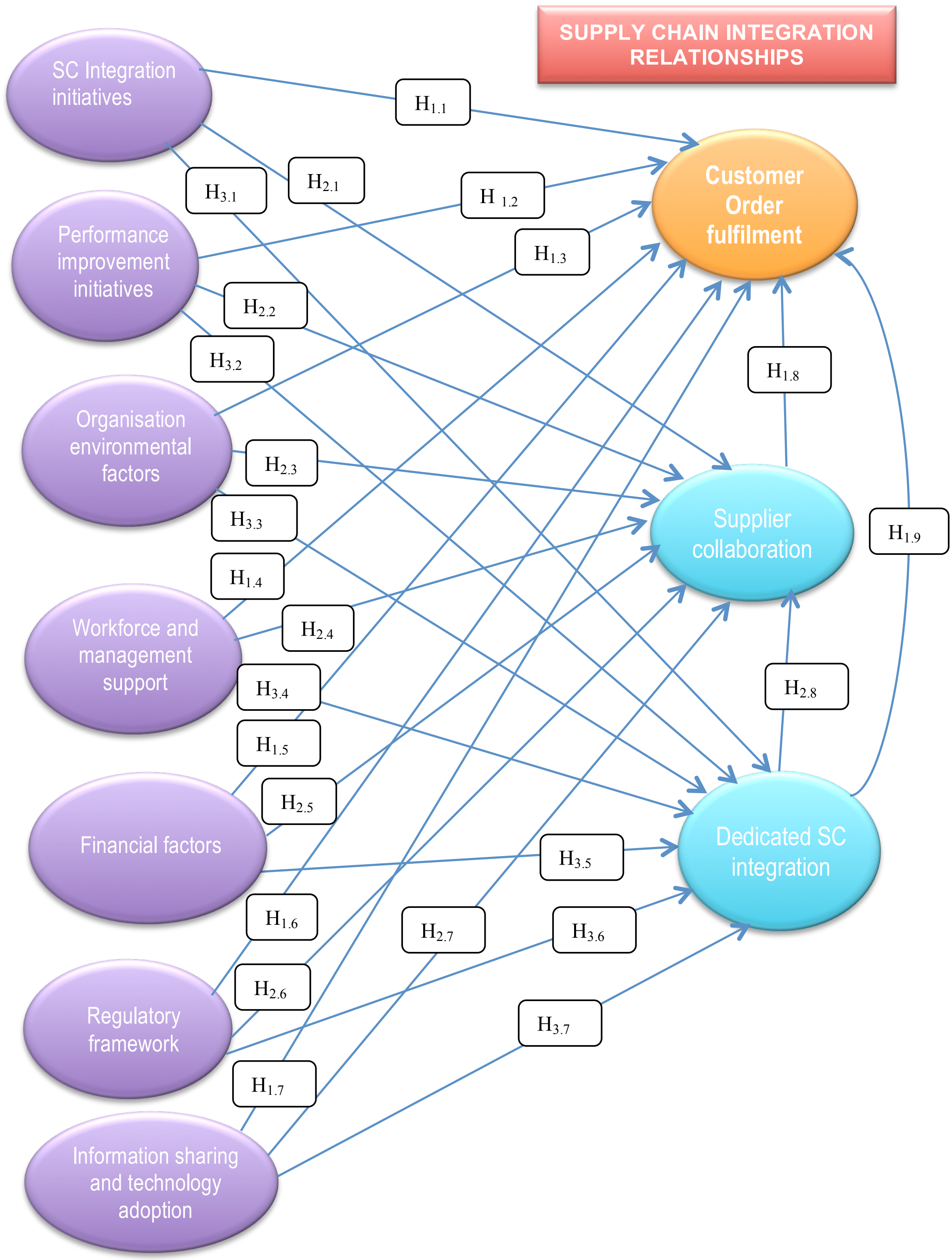

Figure 4.7: Hypothesised relationships in the study

Source: Researcher's own construct

4.12.1 Relationship between independent variables and customer order fulfilment

A robust SCI needs to take into account an organisation's resource capabilities and external environments. Improved customer satisfaction can be achieved through good integration of functional activities. To improve efficiency and effectiveness in managing business processes that produce and deliver goods and services requires the integration of operations management and information systems, both within the organisation and with the SC partners.

A study on achieving world-class SC alignment conducted by Fawcett and Magnan (2002) highlights the following functional issues which are adopted in the current study: SCI initiatives, organisation strategy and SCI drivers, performance improvement and SCI, organisation environment forces and barriers to SCI. In summary, based on the previous studies in the literature, it is shown that integration of functions can improve order fulfilment in an organisation. However, little is known concerning the impact of SCI functional issues on order fulfilment in the public hospitals. This leads to the following hypotheses:

$H0_{1.1}$: There is no relationship between SCI initiatives and customer order fulfilment;

$H_{1.1}$: There is a positive relationship between SCI initiatives and customer order fulfilment;

$H0_{1.2}$: There is no relationship between performance improvement initiatives and customer's order fulfilment;

$H_{1.2}$: There is a positive relationship between performance improvement initiatives and customer's order fulfilment;

$H0_{1.3}$: There is no relationship between organisational environmental factors and customer order fulfilment;

$H_{1.3}$: There is a positive relationship between organisational environmental factors and customer order fulfilment;

$H0_{1.4}$: There is no relationship between workforce and management support and customer order fulfilment;

$H_{1.4}$: There is a positive relationship between workforce and management support and customer order fulfilment;

$H0_{1.5}$: There is no relationship between financial factors flow and integration and customer's order fulfilment;

$H_{1.5}$: There is a positive relationship between financial factors flow and integration and customer's order fulfilment;

$H0_{1.6}$: There is no relationship between regulatory framework and customer order fulfilment;

$H_{1.6}$: There is a positive relationship between regulatory framework and customer order fulfilment;

$H0_{1.7}$: There is no relationship between information sharing and technology adoption and customer order fulfilment;

$H_{1.7}$: There is a positive relationship between information sharing and technology adoption and customer order fulfilment;

$H0_{1.8}$: There is no relationship between supplier collaborations and customer order fulfilment;

$H_{1.8}$: There is a positive relationship between supplier collaborations and customer order fulfilment;

$H0_{1.9}$: There is no relationship between dedicated SCI and customer order fulfilment; and

$H_{1.9}$: There is a positive relationship between dedicated SCI and customer order fulfilment.

4.12.2 Relationship between independent variables and supplier collaborations

Active organisations are responsive to customer expectations and build strong relationships with suppliers who can meet their requirements and share similar performance objectives. Previous studies (Fawcett et al., 2013; Lu, 2011: Msimangira 2010; Fawcett and Magnan 2002) have emphasised the importance of good relationships between a buyer and a supplier. However, less attention has been paid to the impact of supply collaborations and relationships on SCI.

The impact of SCI functional issues on supply relationships in public hospitals is unknown. Therefore, there is a need to investigate SCI functional factors that have significant impact on supply collaborations. Thus, the following key hypotheses are considered:

$H0_{2.1}$: There is no relationship between SCI initiatives and supplier collaborations;

$H_{2.1}$: There is a positive relationship between SCI initiatives and supplier collaborations;

$H0_{2.2}$: There is no relationship between performance improvement initiatives and supplier collaborations;

$H_{2.2}$: There is a positive relationship between performance improvement initiatives and supplier collaborations;

$H0_{2.3}$: There is no relationship between organisational environmental factors and supplier collaborations; and

$H_{2.3}$: There is a positive relationship between organisational environmental factors and supplier collaborations.

Healthcare is a growing industry in Kenya and indeed in many African countries. Most of the poor service quality connected with healthcare is related to a highly fragmented delivery system that lacks even rudimentary clinical information capabilities resulting in unnecessary duplication of services, long waiting times and delays (Fadlalla and Wickramsinghe, 2004).

The escalating costs of healthcare, advancements in science, IT, political and economic changes and increased customer awareness and expectations call for increased efficiency and effectiveness by hospitals and healthcare providers (Barnett, Perkins and Powell, 2001). Simultaneously with complex ethical issues there is a need for well-trained and functioning healthcare workers. Based on these arguments, this study hypothesised as follows:

$H0_{2.4}$: There is no relationship between workforce and management support on supplier collaborations; and

$H_{2.4}$: There is a positive relationship between workforce and management support on supplier collaborations.

According to GOK, (2006) low government budgetary allocation to key ministries has led to negative effect on the quality of services offered by the government facilities. This study hypothesised as follows:

$H_{2.5}$: There is a positive relationship between financial factors flow and integration and supplier collaborations.

The regulatory framework provides a general platform and operating environment within which two or more parties can legally operate and transact. A rigid or skewed framework may not only constrain the operations of the organisations but also could expose them to operating risks detrimental to their functioning and long term survival (Delloitte, 2013). Based on these arguments, this study hypothesised as follows:

$H0_{2.6}$: There is no relationship between regulatory framework and supplier collaborations; and

$H_{2.6}$: There is a positive relationship between regulatory framework and supplier collaborations

Information systems were viewed as providing infrastructural support to the value chain and having an indirect impact on the competitiveness of a product. Organisations were able to reduce costs through information systems but the benefits were not typically apparent to customers (Chin, Tat and Sulaiman, 2015).

Therefore, this study hypothesised as follows:

$H0_{2.7}$: There is no relationship between information sharing and technology adoption and supplier collaborations; and

$H_{2.7}$: There is a positive relationship between information sharing and technology adoption and supplier collaborations.

Having a dedicated SC utilising information systems and a shared SC database can enable the organisation to identify optimal inventory levels, reduce warehouse space and increase inventory turnover (Basnet and Wisner, 2012). Past research studies have shown that organisations can achieve economies of scale by establishing a long-term strategic alliance or network relationship with suppliers for stable and continuous procurement (Coleman, Bhattacharya and Brace, 2005; Goldhar and Lei, 2004; Tilanus 1997).

According to Gattorna, (2006), for the SC to be efficient, the various network structures need to be properly linked and coordinated. He emphasises the need to integrate the various structures in the SC with a key focus on core competencies within an organisation with the ultimate objective of satisfying customers' demand while reducing management controls on daily logistics operations. Based on these arguments, this study hypothesised as follows:

$H0_{2.8}$: There is no relationship between dedicated SCI on supplier collaborations; and

$H_{2.8}$: There is a positive relationship between dedicated SCI on supplier collaborations.

4.12.3 Relationship between independent variables and dedicated SCI

Section 3.9 has analysed the issue of dedicated SCI in detail. Order fulfilment can have an influence on dedicated SCI. Sharing point-of-sale demand information with the SC helps the producer (and all other chain members) to improve product forecasts and reduce total inventory costs (Bode and Wagner, 2015).

The benefits of dedicated SCI and their relationships to customer order fulfilment are discussed in the literature reviewed. However, the studies reviewed do not focus on the impact of dedicated SCI on order fulfilment. This research therefore, hypothesises that dedicated SCI has a positive impact on customer order fulfilment.

The following hypotheses aims to fill the gap in the application of the literature:

$H0_{3.1}$: There is no relationship between SCI initiatives and dedicated SCI;

$H_{3.1}$: There is a positive relationship between SCI initiatives and dedicated SCI;

$H0_{3.2}$: There is no relationship between performance improvement initiatives and dedicated SCI;

$H_{3.2}$: There is a positive relationship between performance improvement initiatives and dedicated SCI;

$H0_{3.3}$: There is no relationship between organisational environmental factors and dedicated SCI;

$H_{3.3}$: There is a positive relationship between organisational environmental factors and dedicated SCI;

$H0_{3.4}$: There is no relationship between workforce and management support and dedicated SCI;

$H_{3.4}$: There is a positive relationship between workforce and management support and dedicated SCI;

$H0_{3.5}$: There is no relationship between financial factors flow and integration and dedicated SCI;

$H_{3.5}$: There is a positive relationship between financial factors flow and integration and dedicated SCI;

$H0_{3.6}$: There is no relationship between regulatory framework and dedicated SCI;

$H_{3.6}$: There is a positive relationship between regulatory framework and dedicated SCI;

$H0_{3.7}$: There is no relationship between information sharing and technology adoption and dedicated SCI; and

$H_{3.7}$: There is a positive relationship between information sharing and technology adoption and dedicated SCI.

4.13 SUMMARY

The SCI framework is a performance-improving model that creates seamless linkages between the partners, levels and functions within an SC to optimise customer order fulfilment. The objectives of the SCI framework are to improve efficiency and reduce redundancy while also enhancing product availability when and where required by the customer. The model aims to better link customer demand with supply, improved customer service and lower costs.

The model is based on the trend of increased interdependency in economies, systems and SCs and this spurs enormous demand for mobility and inter-system communication. This in turn, promotes the optimised flow of raw materials, components and finished goods, with manufacturers sourcing components from low cost centres all around the world and similarly distributing their products to world markets. The survival of businesses and operations in the current volatile environment call for flexibility, speed and productivity all driven by the need to fulfil customer demand.

The SCI framework proposed in this research study recognises the power of instrumented, interconnected intelligent and optimised integrated SC. An efficient SC is in reality, the value chain of the flows of goods and flows of real-time information exchange. Revolution in IT and advances in technology, particularly in warehousing and logistics sectors have transformed the entire SC into a critical business value chain. Currently, technology allows firms to track complex flows of materials and products to achieve cost-effective services. The SCI framework interlinks the various functions in an effort to facilitate real-time connectivity that allows the flow of product and information throughout the network of SC partners through to final customers.

The SCI framework aims to improve linkages between supply side and demand side. Improved information on customer demand can result in better planning across the SC. Enhanced information on supply can assist forecasting, budget planning and resource allocation. Regular and timely information sharing among chain partners regarding demand and supply can enhance SC transparency and encourage collaborative planning through sharing forecasting results.

Ultimately, the outcome of an integrated SC is seamless linkages that connect demand and supply throughout the SC to better fulfil customer order requirements. While different players within the SC may have diverse competing priorities and motivating factors, the SCI framework could facilitate gathering and sharing of accurate information about demand and supply and ensure that it flows to the right SC partner in a timely manner so that decisions are fully and consistently informed for enhanced efficiency.

CHAPTER FIVE

RESEARCH DESIGN AND METHODOLOGY

5.1 INTRODUCTION

One of the major tasks of research is to determine the kind of evidence needed to confirm or reject the stated hypotheses and secondly to design methods to ascertain and quantify the evidence (Cooper and Schindler, 2011). The survey research method was adopted as the data collection method for this study. A critical component of any scientific method is the provision of clearly defined variables, methods and procedures (Pedhazur and Schmelkin 1991; Wahyuni, 2012).

The first step in developing valid scientific measures is pegged to indicating the domain of the construct, which starts with literature review (Wahyuni, 2012). A comprehensive literature review as conducted in the last two chapters where numerous construct definitions and theoretical perspectives relating to the area under study were discussed.

In an attempt to further develop and refine research instruments, interviews with three pharmaceutical SC experts having sufficient domain knowledge were conducted as part of the experience survey. This enhanced the content validity of the instrument. The structured interviews began with the researcher reviewing a standard set of instructions with the SC practitioners. Their views were incorporated in the reviewed research instruments to facilitate outcome accuracy.

In this chapter, the researcher discusses the research design and methodology adopted for the study. In this chapter, the researcher discusses research philosophy, research paradigms, research design, research approaches, research problem, Study design, data collection procedures, reliability and validity of measuring instrument and ethical considerations of the research amongst others.

5.2 RESEARCH PHILOSOPHY

A research philosophy refers to the set of beliefs concerning the nature of the reality being investigated (Bryman, 2012). It is the fundamental definition of the nature of knowledge. The assumptions generated by a research philosophy justify the way the research would be conducted (Flick, 2009). Research philosophies can differ on the research goals and on the best way that could be used to accomplish these goals (Goddard and Melville, 2004). These do not necessarily conflict with each other but the selection of research philosophy is defined by the nature of knowledge being investigated in the research project (May, 2011). Therefore, comprehending the research philosophy being adopted can help clarify the fundamental assumptions in the research process and the way this fits the methodology being used.

There are two main ontological frameworks that inform the research process namely positivism and constructionism (Monette, Sullivan and Dejong, 2005). These frameworks might be described differently (such as empiricism and interpretivism) but the underlying assumptions are broadly similar (Bryman, 2012). Positivism assumes that reality exists independently of the "thing" being studied.

In practice this means that the meaning of phenomena is consistent between subjects (Neuman, 2011). Conversely, constructionism theory suggests that the inherent meaning of social phenomena is created by each observer or group (Ostlund, Kidd, Wengstrom and Rowa-Dewar*,* 2011). In this philosophy, one can never presume that what is observed is interpreted in the same way between participants and the key approach is to examine differences and nuances in the respondents' understanding (Weathington, Cunningham, and Pittenger, 2012).

Despite the inherent differences between these two practices, it is not necessarily the case that they form an inherent belief by the researcher that is then applied to all research contexts. One philosophy is not inherently better than the other, although researchers may favour one over the other (Podsakoff et al., 2012). The philosophy simply provides the justification for the research methodology. The methodology should be informed by the nature of the phenomena being observed.

To summarise, the ontological position of this study is that reality exists outside a researcher's mind. This research is based on the belief that there exists a real physical world beyond our knowledge and comprehension. Moreover, there also exists a social world that is being constructed, shaped and influenced by our life experiences, knowledge and desire. Thus, this study positions itself on "critical realism" perspective, hence taking the position that one can only understand reality to a limited extent; no one can obtain the entire picture of a studied phenomenon. Therefore, reality can be studied to a certain extent and generalisations can be made with a degree of probability.

5.3 RESEARCH PARADIGMS

A research paradigm is a set of fundamental assumptions and beliefs as to how the world is perceived which then serves as a thinking framework that guides the behaviour of the researcher (Jonker and Pennink, 2010). Research paradigms help a researcher to determine the methodology appropriate for a particular study. Thus, a paradigm picked has implications on the selection of research methodology. Research paradigms address the philosophical dimensions of social sciences.

Although the philosophical backgrounds in many instances remain implied in most research, they affect the practice of research. Some writers (for example Berry and Otley, 2004; Creswell, 2009; Saunders, Lewis and Thornhill, 2009; Neuman, 2011) emphasise that it is critical at the beginning of the research to question the research paradigm to be used in carrying out research since it significantly impacts how one undertakes a social study (from framing and understanding social phenomena). Following this proposition, various research paradigms are discussed below in order to highlight the theoretical assumptions and fundamental beliefs underpinning a social research.

The two main philosophical dimensions to differentiate existing research paradigms are *ontology* and *epistemology* (Laughlin 1995; Kalof, Dan and Dietz, 2008; Saunders et al., 2009). They relate to the nature of knowledge and the advancement of that knowledge, respectively. Ontology is the interpretation of how one perceives a reality.

In terms of social research, ontologically one can perceive that the existence of reality is external and independent of social actors and their interpretations of it, termed objectivist (Saunders et al, 2009) or realist (Neuman, 2011). On the other hand, subjectivist or nominalist adopter theory believes that reality is dependent on social actors and assumes that individuals contribute to social phenomena.

The second paradigm, epistemology, is the beliefs on how to generate, understand and use the knowledge that are deemed to be acceptable and valid. In addition to these two fundamental philosophies, two basic beliefs that affect the way to investigate reality are *axiology* and *methodology*. The former is concerned with ethics, encompassing the roles of values in the research and the researcher’s stance in relation to the subject studied. The latter refers to a model for undertaking a research process in the context of particular paradigm. These basic beliefs as they relate to research paradigms are outlined in Table 5.1.

The first two paradigms in Table 5.1, *positivism* and *post-positivism*, both apply the view of natural science to social science. Ontologically, share a common view that social reality is external and objective. Therefore, axiologically maintain the separation of the researcher from the researched by taking the stance of the etic approach or the outsider perspective (Wahyuni, 2012). Epistemologically, advocate the use of a scientific approach by developing numeric measures to generate acceptable knowledge (Neuman, 2011). It commences with the test of theory in the form of hypotheses and involves statistical tests in the research process. However, it uses different philosophical assumptions.

Table 5.1: Research paradigms in social sciences

	Research Paradigms			
Fundamental Beliefs	**Positivism (Naive realism)**	**Post-positivism (Critical Realism)**	**Interpretivism (Constructivism)**	**Pragmatism**
Ontology: the position on the nature of reality	External, objective and independent of social actors	Objective, exist independently of human thoughts and beliefs or knowledge of their existence, but is interpreted through social conditioning (critical realist)	Socially constructed, subjective, may change, multiple	External, multiple, view chosen to best achieve an answer to the research question
Epistemology: the view on what constitutes acceptable knowledge	Only observable phenomena can provide credible data, facts. Focus on causality and law-like generalisations, reducing phenomena to simplest elements	Only observable phenomena can provide credible data, facts. Focus on explaining within a context or context	Subjective meanings and social phenomena. Focus upon the details of situation, the reality behind these details, subjective meanings and motivating actions	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data
Axiology: the role of values in research and the researcher's stance	***Value-free and etic*** Research is undertaken in a value-free way, the researcher is independent of the data and maintains an objective stance	***Value-laden and etic*** Research is value laden; the researcher is biased by world views, cultural experiences and upbringing	***Value-bond and emic*** Research is value bond, the researcher is part of what is being researched, cannot be separated and so will be subjective	***Value-bond and etic-emic*** Values play a large role in interpreting the results, the researcher adopting both objective and subjective points of view
Research Methodology: the model behind the research process	Quantitative	Quantitative or qualitative	Qualitative	Quantitative and qualitative (mixed or multi- method design)

Source: Adapted from Wahyuni (2012: 70)

5.4 RESEARCH DESIGN

Research purpose and research questions are the recommended starting points to develop a research design as they provide important indicators about the matter that a researcher aims to evaluate (Berry and Otley, 2004; Saunders et al., 2012).

Research methodology is a body of knowledge that enables researchers to explain and analyse methods indicating their limitations and resources; identifying their presuppositions and consequences; and relating their potentialities to research advances (Miller, 1982). Donaldson Christie and Mark (2009), note that a research design is the structure of the research, it is the ‘‘glue’’ that holds all the elements in a research project together. This design describes *inter alia* the relationships that exist between the independent and dependent variables, (Kothari, 2004).

Research design underpins the types of questions that can be addressed and the nature of the evidence that is generated (Clark, Lotto and Astuto, 1984). Selecting between research paradigms, type of data and collection methods has significant implications for the research findings (Bryman, 2012). Research design provides overall guidance to the collection and analysis of data of a study (Wahyuni, 2012). The importance of research design stems from its role as a critical link between the theory and argument that informed the research and the empirical data collected (Nachmias and Nachmias, 2008).

A choice of research design “*reflects decisions about the priority being given to a range of dimensions of the research process”* (Bryman and Bell, 2003: 40) and this has a significant influence on lower-level methodological procedures such as sampling and statistical packages. A blueprint enables researchers to find answers to the questions being studied. Along with a clear research plan, it provides, constraints and ethical issues that a study would inevitably encounter and which must also be taken into account (Saunders et al., 2009).

5.4.1 Research process onion

Saunders et al. (2009) developed the research onion. This framework illustrates the steps that should be followed in designing a research strategy. Figure 5.1 depicts the research onion consisting of different layers and approaches must be consistently employed when conducting research.

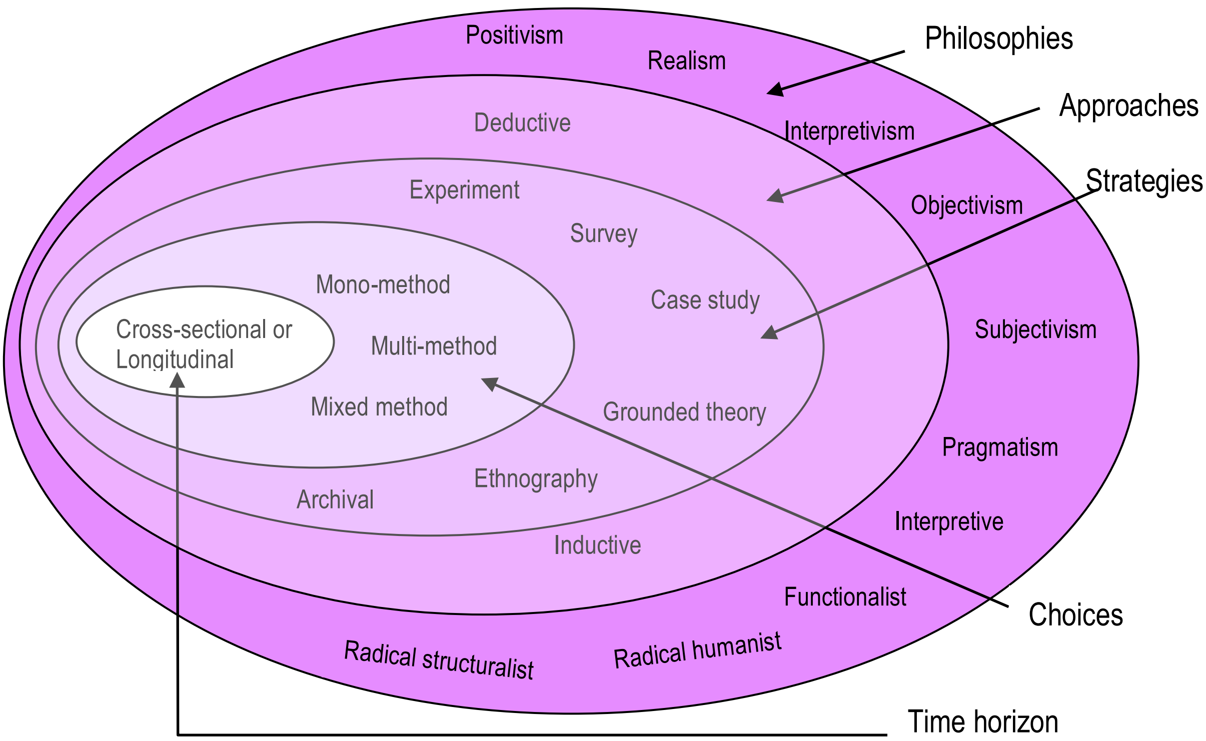

Figure 5.1: Research Onion

Source: Saunders and Tosey (2012: 59)

As can be observed from Figure 5.1, the first layer of the research onion illustrates the research philosophy representing *inter alia* positivism, realism and interpretivism styles, the second layer shows the two research approaches namely inductive or deductive research logic, third layer illustrates research strategies such as experiment, survey, case study, grounded theory, ethnography and action research, the fourth layer highlights time horizons like cross-sectional and longitudinal methods, the fifth layer indicates various primary and secondary data collection methods and finally, reliability and validity of the research is measured.

The research onion describes stages through which a researcher must pass when formulating an effective methodology. Firstly, the research philosophy needs to be defined, which marks the first step of the appropriate research design. In the second step, the applicable research approach is adopted. In the third step, the research strategy is adopted and the fourth layer defines the duration of the research. The fifth step indicates the stage at which the data collection methodology is identified.

The research onion is important as it creates a rational series of stages under which the different methods of data collection can be understood and illustrates the steps by which a methodological study can be described (Yin, 2012). Its utility lies in its adaptability for nearly all types of research methodology and can be employed in wide range of contexts (Bryman, 2012).

5.5 RESEARCH APPROACHES

Two types of approaches are outlined in this section namely the deductive and the inductive approach. In addition, two research techniques are reviewed namely qualitative and quantitative research techniques.

5.5.1 Deductive approach

The deductive approach develops the hypothesis or hypotheses upon a pre-existing theory and then formulates the research approach to test it (Alzahrani, Stahl and Prior, 2012; Silverman, 2013). This approach is best suited to contexts where the research project is concerned with examining whether the observed phenomena fit with expectation based upon previous research (Wiles, Crow and Pain, 2011).

The deductive approach thus might be considered particularly suited to the post-positivist approach, which permits the formulation of hypotheses and the statistical testing of expected results to an accepted level of probability (Snieder and Larner, 2009). However, a deductive approach could also be used with qualitative research techniques, though in such cases the expectations formed by pre-existing research would be formulated differently than through hypothesis testing (Saunders et al., 2009; Silverman, 2011). The deductive approach is characterised as the development from general to particular. The general theory and knowledge base is first established and the specific knowledge gained from the research process is then tested against it (Kothari, 2004).

5.5.2 Inductive approach

The inductive approach is characterised as a move from the specific to the general (Bryman and Bell, 2003). In this approach, the observations are the starting point for the researcher and patterns are looked for in the data. When using this methodology, there is no framework that initially informs the data collection and the research focus can thus be formed after the data has been collected (Flick, 2011). Although this may be seen as the point at which new theories are generated, it is also true that as the data is analysed it may be found to fit into an existing theory (Bryman and Bell, 2003).

This method is more commonly used in qualitative research, where the absence of a theory informing the research process may be of benefit by reducing the potential for researcher bias in the data collection stage (Bryman and Bell, 2003). Interviews are carried out concerning specific phenomena and then the data may be examined for patterns between respondents (Flick, 2011). However, this approach may also be used effectively within post-positivist methodologies, where the data is analysed first and significant patterns are used to inform the generation of results (Silverman, 2011).

5.5.3 Quantitative Research Technique

As the name suggests, this technique is concerned with quantitative data (Flick, 2011; Silverman, 2011). It holds a number of accepted statistical standards for the validity of the approach, such as the number of respondents that are required to establish a statistically significant result (Goddard and Melville, 2004). Although this research approach is informed by a post-positivism philosophy, it can be used to investigate a wide range of social phenomena, including feelings and subjective viewpoints (Parker, 2012). The quantitative approach can be most effectively used for situations, where there are a large number of respondents available, where the data can be effectively measured using quantitative techniques and where statistical methods of analysis can be used (May, 2011).

5.5.4 Qualitative research technique

The qualitative approach is drawn from the constructivist paradigm (Bryman and Allen, 2011). This approach requires the researcher to avoid imposing their own perception of the meaning of social phenomena upon the respondent (Banister et al., 2011). The aim is to investigate how the respondent interprets his or her own reality (Bryman and Allen, 2011). This presents the challenge of creating a methodology that is framed by the respondent rather than by the researcher (Weathington, Cunningham, and Pittenger, 2012). An effective means by which to do this is through interviews, or texts, where the response to a question can be open (Silverman, 2013).

Furthermore, the researcher can develop the questions throughout the process in order to ensure that the respondent further expands upon the information provided (Parker, 2012). Qualitative research is usually used for examining the meaning of social phenomena, rather than seeking a causative relationship between established variables (Feilzer, 2010).

In this research study, in order to discover the major factors that affect SCI, which is a focus of customer order fulfilment in the public hospital pharmacies in Kenya, the post-positivism philosophy is adopted. Deductive logic is used complemented by the utilisation of quantitative techniques.

5.6 ANALYSIS OF RESEARCH PROBLEM

This research addresses the following research question (see Section 1.4):

> *What are the critical factors that influence SCI and how do they impact on supplier collaboration, dedicated SCI and customer order fulfilment in the public hospital pharmacies in Kenya?*

In order to address the above problem, it is essential to identify SCI functional issues, supply relationships and customer's order fulfilment factors. The overall objective of the research is to develop an empirical understanding of the critical functional factors influencing the SCI and their impact on supply relationships and customer's order fulfilment in the Kenya public hospital pharmacies. The main feature of this problem is complexity.

The nature of the research problem dictates its approach to solution (Tookey, 1998, as cited in Shakantu, 2005: 159), the methodological framework and methods of research. In addition, research methods are grounded in philosophical traditions that originate from the researcher's paradigm or basic set of beliefs that guides research (Guba and Lincoln, 2005). The beliefs and philosophical traditions guide a researcher on how to obtain knowledge. Therefore, it is important to determine the best philosophical position for the research.

5.7 UNIT OF ANALYSIS

As indicated in Chapter One, the unit of analysis for this study is public hospital pharmacies in Kenya. In this study, there are three dependent variables that influence SCI:

a) Customer's Order Fulfilment (order process, patient safety, supply efficiency customer input, inventory and demand management);
b) Supply Collaborations (role of logistics, supplier relationships, supplier participation in planning and design); and
c) Dedicated SCI (dedicated SC, data standardization, real time data exchange, performance improvement).

This study investigated the nature of SCI as perceived by the KEMSA staff and the staff in the public district hospitals in Kenya. The respondents were the personnel directly involved with the activities of purchasing, warehousing and supply at KEMSA and the pharmacists and clinicians who are at the near tail end of pharmaceutical products SC.

These personnel have the necessary knowledge to complete the survey questionnaire. The primary respondents for this study therefore were the procurement officers, doctors and the senior management of the district and county and national referral hospitals in the country. In addition, KEMSA and pharmaceutical SC practitioners in Kenya also formed the pool of primary respondents as shown in Table 5.2.

Table 5.2: Targeted sample

Region	National, County & District Hospitals	30% sample	Number of Target Hospitals	Respondents per hospital	Survey Sample size
Rift Valley	39	15.6	16	5	80
Western	15	6	6	5	30
North Eastern	11	4.4	4	5	20
Nyanza	26	10.4	10	5	50
Eastern	28	11.2	11	5	55
Nairobi	7	2.8	3	5	15
Central	12	4.8	5	5	25
Coast	16	6.4	6	5	30
Stakeholders					
KEMSA					20
Total	**154**	**61.6**	**62**		**325**

Source: Researcher's own construct

In the present study, research assistants (see section 5.9.6) helped with data collection by administering research instruments. In order to facility the data collection, the researcher first contacted respondents to book the appointments then arranged travel plans for the research assistants.

5.8 STUDY DESIGN

The study design is used to address the research questions of any research study (Saunders et al., 2009).

5.8.1 Selection of questionnaire survey method

Grounded theory comprises various data collection stages, data refinement and observing interrelationship of different categories of collected data (Creswell, 2009: 14). The researcher attempts to come up with a theory from data gathered. The fundamental nature of grounded theory is the continuous interaction between data collection and data analysis (Myers, 1999). The grounded theory strategy is not appropriate for the present research study since grounded theory requires more time for data collection as data needs to be collected many times and the researcher has a limited timeframe, so this was not a suitable option and was therefore not adopted for this research (Sreejesh, Mohapatra, and Anusree 2013).

In ethnography, it is obligatory for an ethnographer to devote more time in the field. Ethnographers engage themselves in people lives they study (Lewis and Weigert, 1985: 380). This data collection method is evidently more time consuming and due to time and financial limitations, it was not possible for the researcher to adopt this option in the research study.

In action research, if the problem is explored in depth, then necessary changes are made. This process is repeated many times until the problem is resolved (Garson, 2008). Just like in ethnography, action researches are time consuming and expensive to carry out, which restrains the researcher from using this option.

Case study research is a methodical probe into an occurrence or a set of related occurrences, which aims to explain and expound the phenomenon of interest (Bromley, 1990: 302). The use of case studies is widespread in management research (Yin, 2012).

In surveys, researchers collect data from a sample of a population; for example, one may study Nelson Mandela Metropolitan University's Business students, or all the public hospitals in Kenya. Since the populations in the cited illustrations are too large it is not possible for a researcher to study the entire population. Researchers therefore revert to questionnaire surveys of samples and these samples are selected according to specified criteria.

Based on the above arguments, the researcher in this study used the questionnaire survey method to obtain data from targeted respondents in KEMSA as well as in public hospital pharmacies in Kenya according to the sampling criteria shown in Table 5.2.

The researcher used close-ended questions on a 5-Point Likert Scale. The researcher used research assistants to deliver and administer questionnaires to reach the targeted 325 respondents from public hospitals and from KEMSA. Possible options were given to respondents in this questionnaire. The researcher also added open-ended questions asking respondent's to make comments/suggestions in order to explore further options that may not have been included in the questionnaire. This improves questionnaire effectiveness and research reliability (Boeije, 2010).

The researcher selected the questionnaire survey method. Aaker, Kumar and Day (2008), indicates that the selection of a questionnaire survey method depends on the nature of the research study and its purpose. The selection of a questionnaire survey method also depends on the type of questions posed to respondents; in the case of this study, it extends to customers, healthcare personnel and resources involved in customer order fulfilment. Working with research assistants, the researcher adopted the personally administered questionnaire method due to the following factors:

⇒ Respondents from hospitals would be able to ask for clarification of questions on the spot. Due to misunderstandings, respondents may give incorrect responses making it important to clarify any question asked in the questionnaire in order to convey correct understanding of the questions asked in the questionnaire. The present study adopts post-positivist approach where multiple measures and observations are applied each of which may have different types of error;

⇒ Respondents from hospitals are more interested in giving their responses due to the presence of research assistants;

⇒ All the questionnaires were returned immediately after completion and no questionnaires went missing; and

⇒ The research assistants persuaded respondents that the information provided by them would be used for academic purposes only.

In the questionnaire survey, the researcher asked the respondents about their age, academic qualification and number of years worked.

5.8.2 Study area description

This study was based in Kenya with a specific focus on public district and county hospital pharmacies countrywide.

5.8.3 Study population

A population consists of all elements- individuals, items, or objects- being studied. The population under investigation is also called the target population (Mann, 1995).

The population for the survey is 154 public district hospital pharmacies and eight KEMSA warehouses in Kenya. According to Kothari (2004), an optimum sample is the one that fulfils the requirements of efficiency, representativeness, reliability and flexibility. This sample should be in a range of 10%-30% of the total population. In this study, a representative sample of 30% was drawn from each of the categories and region to satisfy these requirements of optimality and representativeness.

A probability sampling technique was applied using a stratified sampling methodology. The study stratified the population into seven regions from which to select the public health facility to target. Simple random sampling was used to select the specific public health facility to be sampled based on the 30% sampling percentage (Mugenda and Mugenda, 2010), while purposive sampling was used to select specific respondents from the selected healthcare facility who had the required information sought in the study.

Using these sampling techniques, the study targeted the procurement officers, doctors and the senior management of the district and county and national referral hospitals in the country. In addition, KEMSA staff were also targeted resulting in an overall sample size of 325 respondents as shown in Table 5.2.

5.8.4 Sample size determination and formula used

A sample is a representative segment of a larger population (Bryman, 2012).

In quantitative research, the sample size and how it is selected can be used to establish the reliability of the results of the study. In qualitative research, the sample characteristics are also important, but much smaller samples tend to be used. The sample size represents the number of respondents selected from the overall population that are used in the research (Neuman, 2011).

In quantitative research, the size of the sample is essential in determining the reliability of the results of a study (Parker, 2012). Sample sizes of much less than 30% could lead to skewed results (Mugenda and Mugenda, 2010). Generally, the larger the sample size the more reliable would be the results. In qualitative research, the size of the sample is less important and the concept of representativeness is not as strong a guideline for the validity of the research (Sreejesh, Mohapatra, and Anusree 2013).

The target population includes the procurement officers, medical doctors and the senior management of the public district hospital pharmacies. In addition to this, key stakeholders in the healthcare procurement SC, namely KEMSA staff were also targeted. These personnel groups had the necessary knowledge to complete the survey questionnaire.

5.8.5 Sampling technique

Sampling techniques are the ways in which an appropriate sample size is selected for the wider study (Bryman, 2012). There are a number of accepted techniques that can be used:

- ⇒ A random sample represents individuals within a larger population who are chosen at random. However, this can result in random distribution, which can mean significant skewing resulting from the random nature of sample selection (Neuman, 2011; Wahyuni, 2012). For example, a random sample may result in more males than females being represented in a sample or an unequal distribution across ages.
- ⇒ A stratified sample may then be used to make sure that the representatives of the population in the sample reflect the significant characteristics of the wider population, such as making sure that the

demographic characteristics of age and gender are reflected in the sample (Neuman, 2011).

⇒ A convenience sample is where the sample is taken from an existing framework, such as a hospital, given that the ways in which respondents may be recruited is relatively straightforward. This may be appropriate if a study is concerned with healthcare providers' views and it proved convenient to sample a few healthcare institutions. It may be considered unlikely that significant variation in healthcare providers' characteristics would occur between institutions or that those characteristics could have a significant effect on the results of a study.

In this research study, purposive sampling was used to select the targeted respondents. The sample was then stratified to include all the targeted hospitals and stakeholders mentioned in the targeted populations above. Five respondents from each district hospital in each of the listed eight regions in Kenya were targeted and they included hospital administrator/manager, nursing officer in-charge/matron, medical superintendent, pharmacist and procurement specialist in charge. In addition, 20 KEMSA staff, namely warehouse officers, procurement officers, customer care officers, logistics officers and IT officers were targeted. This translated into a sample size of 325 respondents for the study as disaggregated in Table 5.2.

5.8.6 Recruitment and consenting procedures

This study only collected data from the participants upon getting consent from the participant themselves as study respondents. As a criterion, eligibility to participate in the study was restricted to those who are over 18 years old as per the legal consent requirement in Kenya. Before the study commenced, the Office of Research Director at NMMU wrote (Annexure D) to the Kenyatta National Hospital/University of Nairobi Ethical and Research Committee (KNH/UON ERC) seeking permission for the researcher to conduct the study in Kenya.

As the person responsible for conducting the study, the researcher presented research instruments namely the introductory letter with informed consent form (Annexure A) and the survey questionnaire (Annexure B). Prior to data collection, both the NMMU Faculty Research Technology and Innovation (RTI) Committee in South Africa (Annexure F) and the KNH/UON-ERC (Annexure E) duly approved the research instrument. The researcher used the approved research instrument to collect data from the respondents. As part of obtaining informed consent, the researcher presented a signed introductory letter (Annexure A) explaining the purpose of the study.

The NMMU RTI and KNH/UON-ERC approvals to conduct research were delivered to the target respondents together with a copy of the approved survey questionnaire together with introductory letter. This letter informed the respondents that their participation was entirely voluntary and that the respondents had a right to withdraw from study at any stage. In addition, the respondents were assured of confidentiality and anonymity and that their participation indicated verbal consent. The introductory letter also acted as a cover letter to the research questionnaire.

5.9 DATA COLLECTION PROCEDURES

This section outlines some of the key steps used during data collection process. A standardised procedure was employed to provide consistency, reduce bias and improve validity and reliability.

5.9.1 Desk review

The researcher analysed the secondary data collected from documents and reports such as Ministry of Health Strategic Plans, Journals released by the Pharmacy and Poisons Board, Ministry of Health Reports, World Bank Reports, Deloitte Reports, WHO reports, KEMSA reports, USAID reports, relevant websites as well as observations. This assisted the researcher to identify patterns and themes from the data collected.

5.9.2 Research questionnaire

Both primary and secondary research methods were used to collect data relevant to the study. Primary data was collected using questionnaires that contain both open and closed ended questions. According to Collis and

Hussey (2003: 173) "*questionnaire comprises a list of carefully structured questions, chosen after considerable testing, with a view to eliciting reliable responses from a chosen sample"*.

The questionnaire used for this research is divided into two main sections. The first section of the questionnaire deals with the general information of the respondent such as gender, age, position, duration of employment and educational level amongst others.

The second section contains close-ended statements relating to the hypotheses. The section also contain text-based questions where respondents were requested to give their opinions/perceptions based on a five-point Likert scale anchored from strongly agree (5) to strongly disagree (1). The five-point Likert scale was used in the present study. This scale was preferred since studies show that it is easier for respondents to interpret the five-point scale compared to a seven-point scale (Leedy and Ormrod, 2005).

5.9.3 Development of survey questionnaire

The process of questionnaire development is based on the approach recommended by Churchill and Lacobucci (2002) and they recommend a nine-step approach as shown in Figure 5.2

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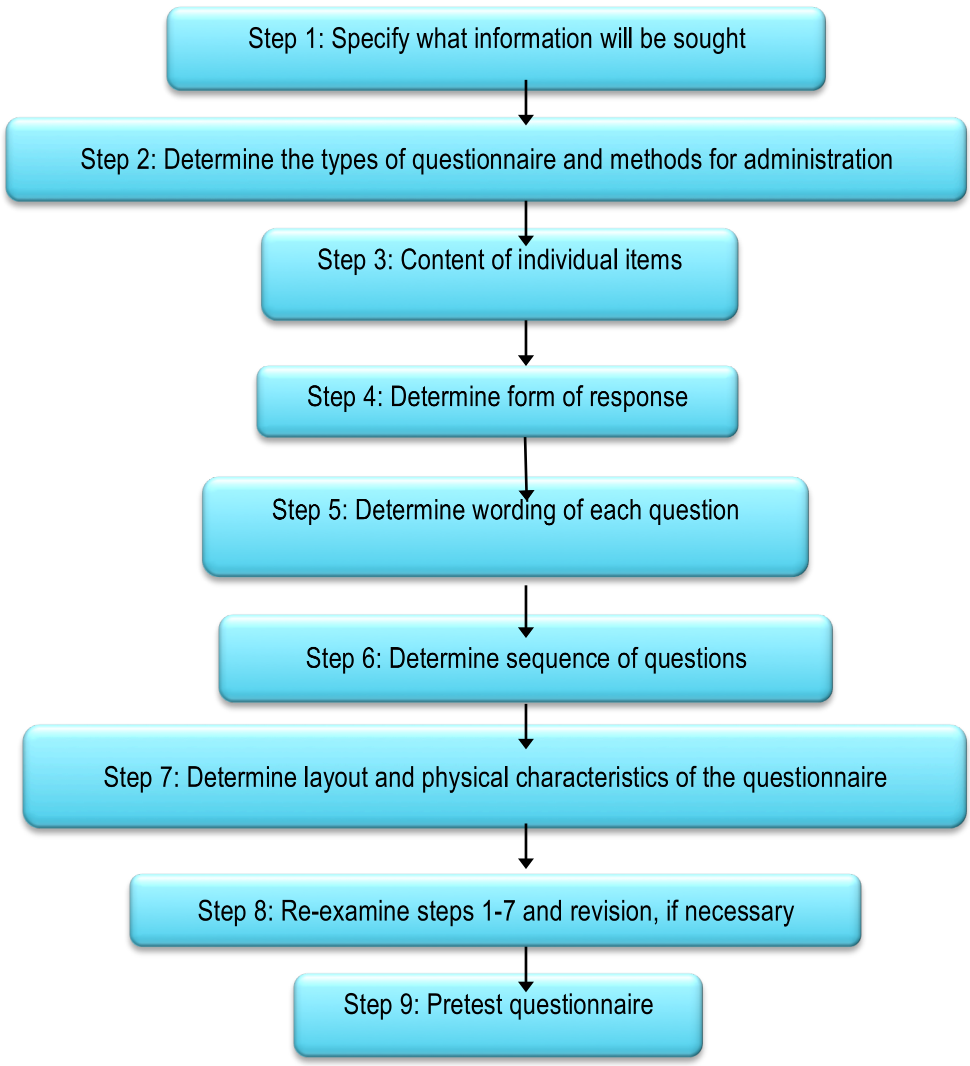

Figure 5.2: Questionnaire development process

Source: Adapted from Churchill and Lacobucci (2002: 315)

Figure 5.2 illustrates a systematic procedure, used as a guideline for developing the questionnaire employed in this study.

5.9.4 Questionnaire response methods

Four different data levels or measurement scale types were used and are called (in ascending form from the lowest to the highest level) nominal, ordinal, interval or ratio type data. These data levels influence the methods of response for questionnaire items.

Nominal data serves only to identify (for instance, male or female) and can therefore only be counted (Diamantopoulos and Schlegelmilch, 1999: 24). Ordinal data can provide an ordered relationship (for example from bad to worse) but is limited in being unable to explain how much better or worse the respondent feels about technologies.

Interval scales are numeric scales in which the researcher knows not only the order, but also the exact differences between the values. Interval data such as time is a good example of an interval scale in which the increments are known, consistent and measurable. Interval scales provide information about order and also possess equal intervals. A metre represents the same underlying amount of length, regardless of where it occurs on the measurement scale. Interval scales are important in statistical analysis, for example, in getting the *central tendency* measured by mode, median, or mean or calculating standard deviation. However, interval data lack a true zero point, which is a characteristic of ratio data according to Diamantopoulos and Schlegelmilch (1997) and Cooper and Schindler (2011). An example of ratio data would be age in years, which requires a true zero since no person or computer system can have negative number of years in existence (Cooper and Schindler, 2011).

The data being collected by a research instrument can have different measuring levels as noted by Cooper and Schindler, (2011) and Zikmund, (2003). The authors concur that the individual questions on the research instrument can also be formatted according to different scale formats. Scale formats are useful when trying to measure abstract constructs, such as customer attitudes, for which no standardised scale exists (Cooper and Schindler, 2011).

The questionnaire used in the present study therefore, had to provide the respondents with different response types for example to make a selection from a checklist or to rank options directly by selecting a specific point on the scale (Cooper and Schindler, 2011, Diamantopoulos and Schlegelmilch, 1997). The choice of selecting different scale formats depends on the type of research problem, the respondent groups and the construct characteristics to be measured (Hennink, Hutter and Bailey, 2011).

The questionnaire was used to link the hypothesis, variables and individual questions in a structure according to the aims determined by the five research objectives discussed earlier and as shown in Table 5.3. Hypothesised relationship are shown in Figure 4.7.

Table 5.3: The research questions and concomitant hypotheses

Research question	Hypothesis
What factors would improve customer order fulfilment?	$H0_{1.1}$, $H_{1.1}$, $H0_{1.2}$, $H_{1.2}$, $H0_{1.3;}$ $H_{1.3}$, $H0_{1.4}$, $H_{1.4}$, $H0_{1.5}$, $H_{1.5}$, $H0_{1.6}$, $H_{1.6}$, $H0_{1.7}$, $H_{1.7}$, $H0_{1.8}$, $H_{1.8}$, $H0_{1.9}$ and $H_{1.9}$
What factors would improve dedicated SCI?	$H0_{3.1}$, $H_{3.1}$, $H0_{3.2}$, $H_{3.2}$, $H0_{3.3;}$ $H_{3.3}$, $H0_{3.4}$, $H_{3.4}$, $H0_{3.5}$, $H_{3.5}$, $H0_{3.6}$, $H_{3.6}$, $H0_{3.7}$, $H_{3.7}$
What factors would improve supplier collaborations?	$H0_{2.1}$, $H_{2.1}$, $H0_{2.2}$, $H_{2.2}$, $H0_{2.3;}$ $H_{2.3}$, $H0_{2.4}$, $H_{2.4}$, $H0_{2.5}$, $H_{2.5}$, $H0_{2.6}$, $H_{2.6}$, $H0_{2.7}$, $H_{2.7,}$ $H0_{2.8}$, $H_{2.8}$

Source: Researcher's own construct

5.9.5 Tool pretesting

The initial survey questionnaire was reviewed by academics and practitioners in purchasing and supplies for content, clarity and ease of understanding. The review was conducted by three academics - two were research supervisors and one an academician from Kenyatta University in Kenya. In addition, one pharmaceutical SC practitioner and one senior pharmacist in public hospital also reviewed the survey tool.

The modified survey questionnaire has multiple items, which were used to determine whether there is internal consistency, discriminant and convergent validity. After obtaining approval from the ethics review committees, a pilot study was conducted using the modified survey questionnaire.

5.9.6 Training of research assistants

Research assistants were tasked with collecting data by administering research instruments. The researcher contacted respondents to book the appointments then prepared a travel plan for each of the research assistants.

The research assistants were given sufficient background knowledge about the study. They were informed about how and why certain data are being collected, i.e. the ultimate aim or the specific information the questionnaire provides. This was done by taking the research assistants through training sessions before they went into the field for data collection. The training made sure that before going out for data collection, assistants understood the topic as well as the research questions.

By the end of the training the research assistants were able to:

- ⇒ Explain the purpose of research;
- ⇒ Conduct interviews question by question using the interview schedule;
- ⇒ Clarify words/understanding of concepts, especially those of a technical nature;
- ⇒ Explain words/ concepts to respondents; and
- ⇒ Clarify and explain the ethical considerations associated with the interview.

Pilot testing of the research instrument was conducted before administering it to the selected sample. The research instrument was subjected to prior testing to evaluate the validity and reliability of the scales.

5.10 PILOT STUDY

Many researchers have suggested the use of different combinations of the pre-test or pilot study methods (for instance, Blair and Presser, 1992; Malhotra, 2003). The pre-test methods used in this thesis are interviews, expert input (academics) and the survey. The pilot study was divided into two parts.

First, interviews were held with the purchasing and supply personnel in the public hospital pharmacies and the results used to improve the questionnaire and the hypotheses generated from the literature (see section 5.9.4). In addition, purchasing and supply personnel and academics advised on the clarity of the instructions and validity of the questionnaire. A total of 97 items were developed to measure constructs of the SCI framework for the study.

Secondly, the survey questionnaire was sent to 50 purchasing and supplies personnel of KEMSA and public hospital pharmacies. In order to ensure that none of the respondents in the pilot study were again selected for the main survey, the hospitals that were used for the pilot study were removed from the list that was used in the main study.

Only the procurement (purchasing and supply) managers, procurement specialists at KEMSA as well as hospital pharmacists were selected for the pilot study. A total of 45 usable responses were returned (90% response rate). The sample was sufficient for rigorous statistical testing and the responses received were sufficient to determine useful questions for the main survey.

In the section that follows, the researcher discusses the results of statistical testing of the pilot study.

5.10.1 Results of pilot study

All 45 responses received were usable and the Cronbach Alpha coefficients for reliability measurements were computed for these responses. The high response rate is assumed to be due to the initial interview preparation and the follow up done by the researcher before the data collection started in earnest. The results of the pilot study are presented in Table 5.4.

The results in Table 5.4 indicate that all the variables produced acceptable reliability scores at the pilot study stage. The highest Cronbach alpha value for the pilot study was 0.898 for dedicated SCI and the lowest was 0.638 for regulatory framework. This indicates that all the Cronbach alpha values exceeded the minimum value of 0.60, which is regarded as satisfactory (George and Mallery, 2003).

Table 5.4: The Cronbach alpha values coefficients for pilot study

Variable Codes	Variables	Cronbach alpha values for the pilot study
FUNC	SCI Initiatives	0.762
PERF	Performance Improvement Drivers	0.823
ENVI	Organisation Environmental Forces	0.690
REGU	Regulatory Framework	0.638
WORK	Workforce and Management Support	0.792
FINA	Financial Factors, Flow and Integration	0.804
TECHN	Information Sharing and Technology Adoption	0.810
ORDE	Customer order fulfilment	0.721
COLL	Supplier collaborations	0.822
DEDI	Dedicated SCI	0.898

Based on the feedback from the respondents in pilot study, improvements were made to the survey questionnaire. The improved questionnaire (see Annexure A) was used in the data collection for the main study.

5.11 MAIN STUDY

The main study was conducted using a revised survey questionnaire (Annexure B), which was sent to population of 325 procurement officers, doctors and the senior management of the district and county and national referral hospitals in the country. In addition, KEMSA staff was also targeted as disaggregated in Table 5.2.

The questionnaires were delivered to respondents in 62 sampled public hospitals (see Annexure C) listed on the Ministry of Health's Master Health Facility List (MFL) website. The researcher jointly with the research assistants (see section 5.13.2 for their training procedure) first contacted the respondent to seek appointment for completion of the questionnaire. The results of the main study are presented in Chapter Six.

5.12 MEASUREMENT OF CONSTRUCTS AND SCALE DEVELOPMENT

The empirical study was conducted to test the theoretical model and hypothesised relationships based on a survey questionnaire completed by five respondents from each of the targeted 154 district hospitals and 20 staff from KEMSA staff.

The steps used in designing and validating the survey, are discussed in the sections below. The initial step in designing the survey was to generate a comprehensive list of measurement items and survey questions from the literature based on the research constructs contained in the SCI framework. The measurement items concerning SCI integration issues were mainly adapted from the study on SC alignment by Fawcett and Magnan (2002) of the Arizona Advanced Centre for Purchasing Studies as well as from the study by Msimangira (2010) on SCI in New Zealand.

5.13 VALIDITY AND RELIABILITY OF THE RESEARCH INSTRUMENT

In research design, reliability and validity of research instruments is of significant importance to reduce chances of getting incorrect responses (Saunders et al., 2009; Wynn Jr and Williams, 2012). In this study, the researcher has used Cronbach coefficient alpha to evaluate the different measures of the research instrument. Cronbach coefficient alpha for research instrument should be 0.60 or higher if it is reliable (Hair et al., 2006; Fraenkel, 2014).

5.13.1 Reliability

Reliability in a research study deals with the consistency of measurement; the more reliable an instrument is, the more consistent is the measurement (Fraenkel, 2014). Table 5.5 presents four threats to reliability of any research.

Creating rapport with SC staff by persuading them that the present study is for academic purposes reduced subject error in this research. Further, the respondents were assured that their names would remain anonymous even on the questionnaire they use to respond.

Table 5.5: Threats to reliability

Threat	Description
Subject error	Generally, time selection for taking questionnaire response from the hospital SC staff for research study is inappropriate; like asking hospital SC staff to fill questionnaires during early or near to closing timings of hospital
Subject bias	In some situations, SC staff respond to what others ask them to say instead of what they really want to say
Observer error	Improving structure of the questionnaire can reduce this error
Observer bias	This concerns with how the researcher interprets data

Source: Adapted from Robson (1993)

In this research study, the Cronbach's Alpha value of all constructs is higher than 0.60 that indicates reliability of the research instrument.

5.13.2 Validity

Validity is a critical consideration in a research instrument development and it refers to the degree that the instrument measures what it claims to measure (DeVaus, 1995).

Validity is concerned with the integrity of the conclusions that are generated from a piece of research. There are three methods used to evaluate the validity of an instrument:

⇒ Construct validity;

⇒ Criterion validity;

⇒ Content validity; and

⇒ Scale validity.

These validity concepts are briefly discussed next.

5.13.2.1 Construct validity

Construct validity refers to the extent to which the instrument measures a theoretical trait (Schneider, White and Paul, 1998). Construct validity is established by looking at numerous studies that use the test being evaluated. This type of validity is difficult to accomplish and the researcher did not have any well-established studies associated with SCI suitable for this research. Construct validity was therefore not used in this study.

5.13.2.2 Criterion validity

The criterion validity method compares a new research tool developed for a study to an existing well-accepted instrument that measures the same concept (DeVaus, 1995; Schneider et al., 1998). In this study, since no other instrument could be found in the literature reviewed, this approach could not be used to test the rigor of the instrument of the present study.

5.13.2.3 Content validity

Content validity refers to the ability of the instrument’s items to represent the content of the given construct (Schneider et al., 1998). When the researcher was developing the instrument, the concern was whether the measurement tool and the items it contained were representative of general SC knowledge, which was what the researcher intended to measure.

To tackle the issues of content validity, the researcher tested the draft questionnaire with pharmaceutical SC practitioners and experts as well as KEMSA senior staff for them to examine the questionnaire’s content. The researcher wished to ensure that the tool focused on fundamental and essential public hospital SC concepts (DeVaus, 1995).

5.13.2.4 Scale Validity

Apart from the open-ended questions, a scale ranging from 1 to 5 was used to give respondents a suitable range in the assessments. Although the literature mainly supports the use of a large range in the Likert scale (for example, 1 – 7), Gupta and Somers (1992) argue that respondents would not be able to distinguish the differences in a range of scales beyond 5. Cavana, Delahaye and Sekaran (2001: 206) state "*research indicates that a five-point scale is as good as any and that an increase from five to seven or nine points on a rating scale does not improve the reliability of ratings*."

In order to minimise response bias, it was necessary to reverse some items, especially the items influenced by positive or negative responses (Alreck and Settle 2014). As sometimes respondents show a positive response to all items in scale. Schmitt and Klimoski (1991) suggest that some items must have positive or negative responses to minimise response bias. For example, a five point Likert scale was used with the scale range from 1 (strongly disagree) to 5 (strongly agree). Initial validation of the item measures was achieved during initial development of the survey. The development of the survey questionnaire was based on an interview with key persons in charge of purchasing and supply in KEMSA and public hospitals at national headquarters.

The next step was to revise/edit the survey questionnaire for the pilot study. The sample for the pilot study was selected randomly from purchasing and supply personnel in public hospitals and KEMSA regional sites. During the pilot study, 50 respondents were asked to complete the survey.

Final validation of the scales was achieved by conducting a large-scale study with a sample size of 325 purchasing and supply personnel in KEMSA and in public hospitals as disaggregated in Table 5.2. Multiple items/questions were identified for each latent variable to achieve a high level of reliability, discriminant and convergent validity.

In classical testing, reliability is defined as the ratio of the true to the observed variance and the higher the ratio, the greater the reliability of the measure (Carmines, 1979). However, Hair, et al. (2006) state that high reliability does not guarantee that a construct is representing what it is supposed to represent though it is a necessary condition for validity.

The internal consistency method is one of the most used reliability measure that estimates the reliability of a construct. The most popular measure of reliability is that proposed by Cronbach in 1951 (Carmines, 1979). Cronbach's alpha was used to determine each construct's reliability. Values of more than 0.60 are normally considered acceptable for the scales. The values greater than or equal to 0.60 are used for newly developed scales (Nunnally and Bernstein, 1978).

Convergent validity is tested by determining whether items in a scale converge in a single construct (Garver and Mentzer, 1999). Convergent validity is measured by examining the individual scale item loadings on the construct they are required to measure. Hair et al. (2006: 137) define convergent validity as "*the degree to which two measures of the same concept are correlated*".

Discriminant validity is determined by showing that the measure does not correlate highly with another measure from which it should differ (Campbell 1997). Furthermore, Hair et al. (2006: 137) define discriminant validity as "*the degree to which two conceptually similar concepts are distinct*". Two methods of discriminant validity were used in this thesis. The first method considers the estimated correlations between the factors not greater than 0.85 and the items that indicate a lack of discriminant validity are deleted (Kline, 2014).

The correlation matrix was used for discriminant validity. The second method that was used in this research to assess discriminant validity considers pattern structure coefficient to determine whether factors in measurement models are empirically distinguishable (Thomson, 1997). Pattern coefficient is the standardised factor loading obtained from multiple regression analysis. Results related to construct validity are discussed in Chapter Six.

5.14 ETHICAL CONSIDERATION

Issues of respondents' confidentiality were observed in the study. Ethical consideration in research should be an integral part of the research planning and implementation process, not viewed as an afterthought or a burden. There should be increased consciousness of the need for strict ethical guidelines for researchers. Some of the ethical issues touch on deception and invasion of privacy (Frankel et. al, 2000).

The researcher sought permission from the ethical board of Nelson Mandela Metropolitan University (NMMU) in South Africa as well as from the Ethical Review committee of University of Nairobi/Kenyatta National Hospital (UoN/KNH) in Kenya. The copies of NMMU and UoN/KNH research approvals are annexed to this research. Additionally, permission was sought from specific target hospitals as well as informed consent from the respondents. Participation in the study was purely voluntary. The study ensured transparency and truthfulness with all respondents throughout the study and that all information sourced during the research was kept confidential. Finally, the study ensured that data collected and names of respondents remain anonymous.

5.15 DATA MANAGEMENT AND STATISTICAL ANALYSIS PLANS

The research investigated and analysed how the independent variables influence SCI in public hospital pharmacies in Kenya (dependent variables). In order to achieve this, the opinions of stakeholders and other respondents were canvassed and statistically analysed.

The data was subjected to a exploratory factor analysis to assess the discriminant validity of the measuring instruments. Items that did not load to a significant extent (loadings > 0.40) and on a unique factor were deleted. This was followed by an assessment of the reliability of the research instrument by means of an internal consistency measure (Cronbach alpha reliability coefficients). Statistica 10 (2010) and Statistical Package for Social Sciences (SPSS) Version 18 statistical software were used to analyse the data.

The data was then subjected to quantitative analysis whereby descriptive statistics such as percentages, means, standard deviations and frequencies as well as inferential statistics such as Analysis of Variance (ANOVA), Multiple Linear Regression and Correlation analysis were utilised.

5.16 SUMMARY

In this chapter, the researcher discussed the research methodology and the philosophical position adopted in the study. This study used a survey research approach. This study is based on the process-based management theory and the post-positivism paradigm assumptions (theoretical perspectives). The research is aimed at determining the SCI factors in the public hospital pharmacies in Kenya and their impact on supplier relationships, dedicated SCI and customer's order fulfilment at the tail end of the chain.

The pilot questionnaires were analysed using cross-case analysis. The responses to the pilot data was initially analysed statistically to assess the reliability of the measuring instrument. The values of Cronbach's alpha coefficients were computed for all the variables and were found to be significantly high (that is, above 0.60). The main study responses were analysed using SPSS version 18 and Statistica 10 (2010) whereby exploratory factor analysis, multiple regression analysis and the correlation matrix among other statistical test were performed.

During data collection, the researcher faced different problems and some of these problems were unexpected. For instance, some respondents were not willing to fill questionnaire saying they needed authority from their superiors. However the ethical board approval letter from UoN together with the letter of introduction from NMMU greatly helped allay the fears they initially had. In addition, the researcher was able to explain to them that the data collected was purely for academic purposes and sources would remain anonymous in the final report.

It was observed that most of the respondents were constrained since most of them were running functional sections alone. They requested additional time to fill the questionnaire due to interruptions by clients waiting to be served. This resulted in two extra weeks for data collection but it resulted in a high response rate. In one KEMSA facility, the staff flatly refused to respond to the questionnaires saying that they deal with critical data and can only respond when they get express authority from KEMSA's Chief Executive Officer.

These were only a few and did not affect the overall sample.

The researcher highlights these data collection challenges for three reasons. Firstly, the researcher wishes to highlight the practical challenges experienced during data collection. Secondly, other researchers may learn from these experiences. Thirdly, it is important for those preparing to conduct research to always allow for extra time to cater for any unforeseen circumstances.

In Chapter Six, the researcher presents data analysis and the results of this study.

CHAPTER SIX

DATA ANALYSIS, EMPIRICAL FINDINGS AND DISCUSSIONS

6.1 INTRODUCTION

In the previous chapter, the researcher discussed the research design and methodology adopted. This chapter presents the data analysis techniques used in the study, findings and results. The study sought to assess the factors affecting SCI in public hospital pharmacies in Kenya.

In this chapter, the field data is presented, interpreted and discussed. In this chapter, the researcher reports on the response rate of the final sample, the description of the statistical procedures and the data analysis procedures adopted in the study. The results of the data normality testing and sampling adequacy are presented as well as the exploratory factor analysis for assessing validity of the constructs in the SCI framework. The results of factor analysis for regrouping of the items into the factors, the reliability of the measuring instrument as well as the multi-collinearity diagnostics testing results are outlined. Multiple regression analysis to determine the statistically significant relationships of the factors in the model is indicated.

Finally, in the chapter, the researcher presents the descriptive statistics, which outlines the mean scores, standard variations and variance of the factors as well as a demographic profile of the respondents.

6.2 RESPONSE RATE ASSESSMENT

In this section, the response rate achieved in the study is presented. Table 6.1 indicates the total number of the administered questionnaires, unusable, unreturned, disqualified, usable, fully filled-in questionnaires and the response rate attained in the study.

Table 6.1: Response rate assessment

Responses	Values	Percentages
Administered questionnaires	325	**100.0**
Unusable/unreturned/disqualified questionnaires	45	**13.8**
Usable/fully filled-in questionnaires	280	**86.2**
Response rate		**86.2%**

The findings in Table 6.1 show that a total of 325 questionnaires were administered to the respondents. Out of these, 45 questionnaires accounting for 13.8% were classified as unusable, unreturned or disqualified due to errors identified in the data cleaning process leaving a total of 280 as the usable questionnaires and this represents an 86.2% response rate.

The high response rate is mainly attributed to the use of research assistants to deliver and administer questionnaires as opposed to a self-administered approach of mailed questionnaires. Depending on the type and format of study, a minimum sample size of 30 to a maximum of 500 is considered sufficient and acceptable for a scientific investigation (Sekaran, 2007). It is important to note that those that refused to take part in the study and those who refused to sign the consent form were not included in the final tally as no questionnaire was administered to them.

The data cleaning and verification process ensures that the questionnaires with omissions and errors are disregarded in the final tally and that all quality standards are met (Kerlinger, 2004). According to Mugenda and Mugenda, (2010), data cleaning, screening and verification is a very important stage that ensures accuracy of the analysed data and involves data editing, removal of influential outliers and missing responses. However, Lei and Lomax (2005) are of the view that significant missing data could lead to biased parameter estimates, convergence failure and inflated fit indices hence the need for proper data cleaning and verification.

6.3 PROCEDURE FOR DATA ANALYSIS

The dependent variable for this study was SCI, which was categorised into the following three subsets of factors:

⇒ Customer order fulfilment;

⇒ Supplier collaborations; and

⇒ Dedicated SCI.

A statistical computer package, named Statistica 10 (2010) was used to process the results. The analysis process comprised the following phases:

⇒ An assessment of the study response rate;

⇒ Analysis of demographic profile of respondents;

⇒ An assessment of sampling adequacy using KMO test as well as Barlett's sphericity test to make sure that the data set does not conform to an identity matrix;

⇒ Normality testing using Z-Statistic test;

⇒ The psychometric properties of the measuring instruments were assessed using two main techniques. Firstly, exploratory factor analysis to assess discriminant validity with a cut-off point set at 0.4 and above for significant factor loadings. Secondly, Cronbach's alpha coefficients for measuring reliability of the research instrument to verify the consistency of the inter-item reliability;

⇒ Diagnostics test for multi-collinearity to confirm whether collinearity problems existed between variables of the study;

⇒ Multiple regression to determine the independent variables to be retained in the model as having a statistically significant relationship with the dependent variable; and

⇒ Descriptive statistics to indicate the mean scores, standard variation and variance of the factors.

6.4 ANALYSIS OF BIOGRAPHIC DATA

In this section, the researcher discusses the biographic data of the respondents as well as background information on procurement of medical supplies in public hospitals. The biographical data provides the information of the respondents under: gender, age categories, education levels, area of career specialisation and duration of working.

6.4.1 Analysis of gender composition of the respondents

Figure 6.1 presents the results of the analysis of gender composition of the respondents of the sampled population.

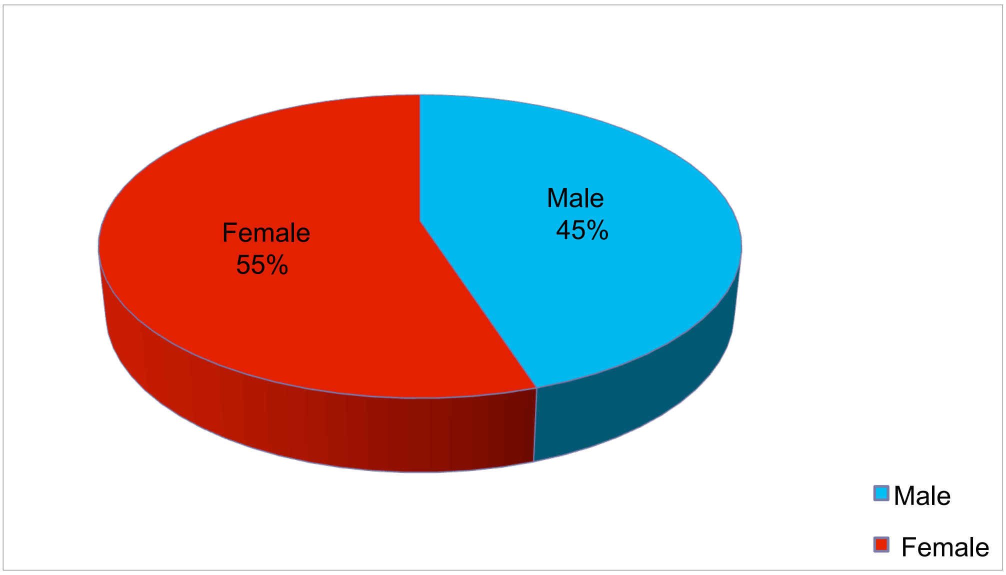

Figure 6.1: Gender composition of the respondents

Figure 6.1 indicates that based on gender composition, the majority of the respondents were female (55%) while male respondents accounted for 45%. This shows that the study was representative of both sexes.

6.4.2 Analysis of age categories of the respondents

Figure 6.2 presents the results of the analysis of the age categories of the respondents in the sampled population.

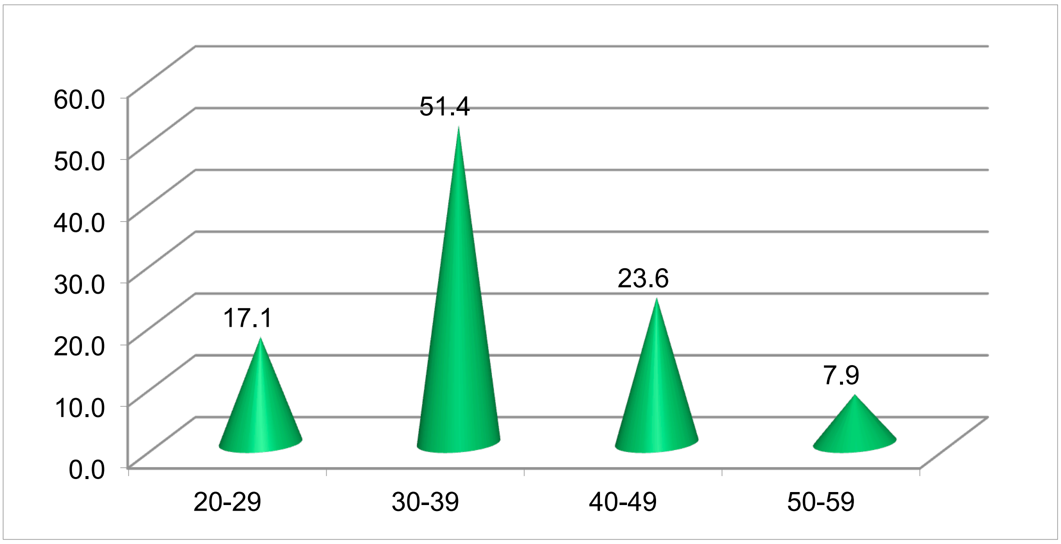

Figure 6.2: Age of the Respondents

Figure 6.2 indicates that more than half of the respondents were in 30-39 years age bracket as accounted for by 51.4%. The age brackets of 20-29 years accounted for 17.1% while 40-49 years accounted for 23.6%. Those in the age category of 50-59 years accounted for 7.9%. This shows that most public hospitals had relatively young managers whose potential can be harnessed to the benefit of the organisation.

6.4.3 Analysis of education levels of the respondents

Table 6.2 presents the results of the analysis of the education level of the respondents of the sampled population.

Table 6.1: Education levels of the respondents

Education levels	Frequency (n)	Per cent (%)
O level Certificate or equivalent	24	8.6
National or Advanced National Diploma	16	5.7
Bachelor's Degree	81	28.9
Bachelor's Degree and Postgraduate diploma	158	56.4
Master's degree and above	1	0.4
Totals (N)	**280**	**100.0**

Table 6.2 shows that more than half of the respondents (56.4%) had Bachelor's Degrees and Post-graduate diplomas while 28.9% of the respondents only had Bachelor's Degrees. The O-level Certificate or equivalent as well as National or Advanced National Diploma accounted for 8.6% and 5.7% respectively while Master's degree and above accounted for only 0.4%. This implies that most of the managers managing the hospital SC are very well educated.

This generally indicates high levels of education in the management of the hospital SCI in Kenya. However, it is not clear what their knowledge of SCI and SCM would be. It does, however, provide a very good platform for further skills growth in SCM. Eltanawy (2005) emphasises that employee skills contribute to value creation in a firm. As noted above, the study indicates that most respondents (56.4%) are well skilled and trained.

This finding is in alignment with Giunipero and Handfield (2004) who indicates that the value of inventory management skills is dependent upon their potential to contribute to the competitive advantage of the firm and are considered valuable as they support the firm in formulating and implementing strategies that improve its efficiency or effectiveness.

6.4.4 Area of career specialisation of the respondents

Figure 6.3 presents the results of the analysis of the area of career specialisation of the respondents of the sampled population.

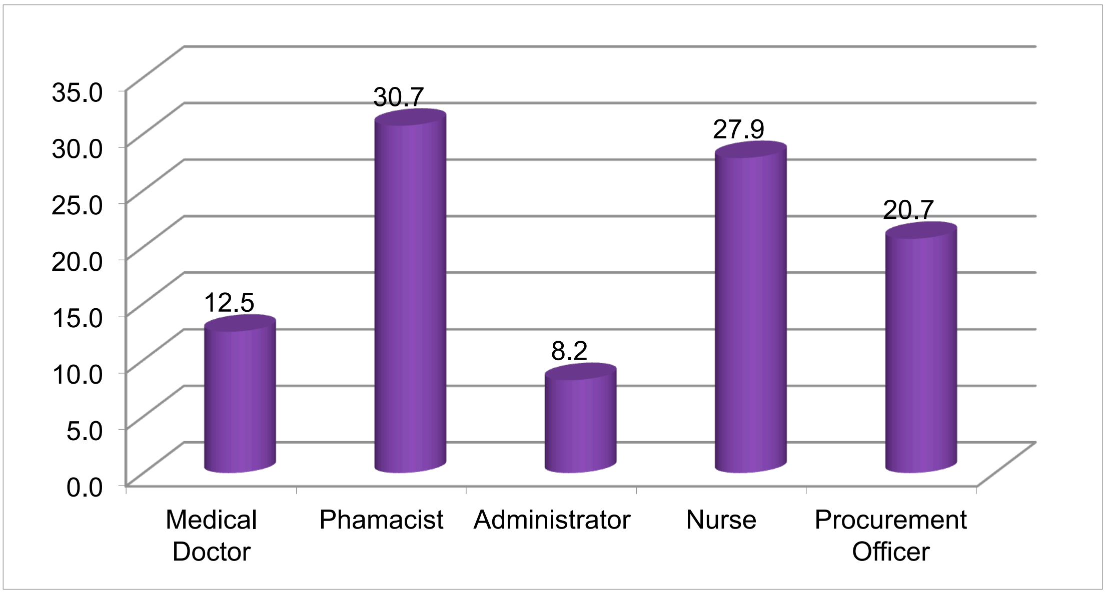

Figure 6.3: Results of the area of career specialisation

In terms of career specialisation, Figure 6.3 indicates that most of the respondents were Pharmacists (30.7%) who were closely followed by nurses at 27.9%. Procurement officer and medical doctor accounted for 20.7% and 2.5% respectively while administrator accounted for 8.2%. This shows that the study captured all the main professionals in the hospital SC. The existence of professionals in the hospital SC provides a good platform for skills and knowledge impartation in relation to SCI and SCM.

6.4.5 Working experience of the respondents

Figure 6.4 presents the results of the analysis of working experience of the respondents of the sampled population.

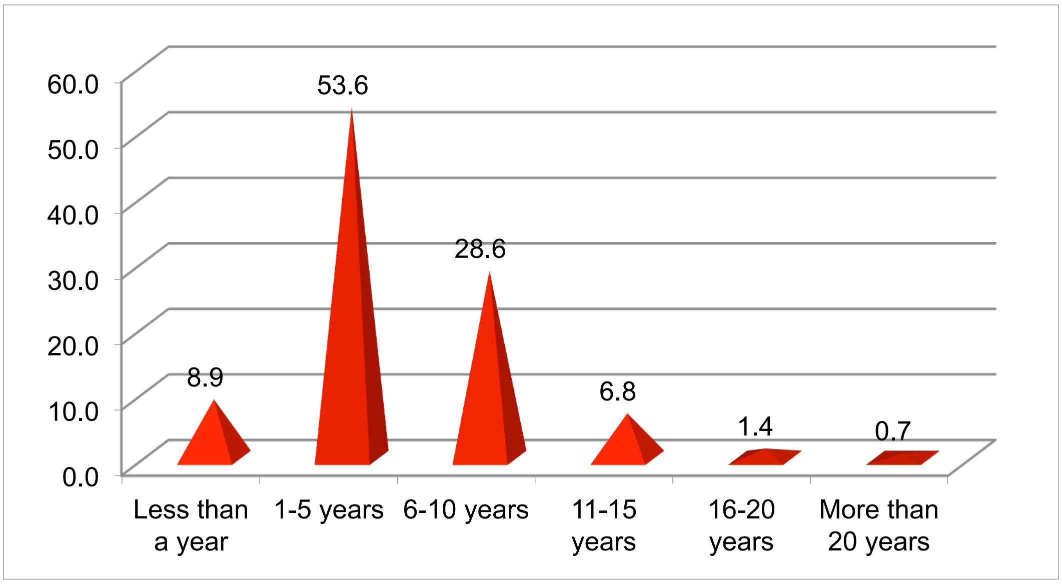

Figure 6.4: Working experience of the respondents

Figure 6.4 show that many respondents (53.6%) had worked in their respective workstations for a period of 1-5 years while 28.6% had worked for 6-10 years. Those who had worked for 11-15 years, 16-20 years and more than 20 years accounted for 6.8%, 1.4% and 0.7% respectively. A few (8.9%) had been employed for less than a year. This shows that most respondents had worked in their respective work stations for a relatively short duration but should be fairly conversant with the operations of the hospitals SC. The duration of work experience would also explain why most of the respondents fall into the 30-39 age group as indicated earlier. It is a relatively young, well-educated and probably ambitious group of individuals.

6.4.6 Background information on procurement of medical supplies

In this section, the background information on procurement of medical supplies in public hospitals is discussed. Table 6.3 provides the information of the procurement of medical supplies under procurement responsibility, number of staff in purchasing and supply department and purchases of products and services.

Table 6.2: Background information

Background information		Frequency (n)	Per cent (%)
Procurement responsibility	General requirements	138	49.3
	Pharmaceutical requirements	142	50.7
Number of staff in purchasing and supply department	5 and below	164	58.6
	6-10	72	25.7
	11-15	28	10.0
	16-20	12	4.3
	Above 20	4	1.4
Purchases of products and services	Direct from the external supplier	116	41.4
	Through agents	59	21.1
	External suppliers & Agents	105	37.5
Overall Total (N)		**280**	**100.0**

Table 6.3 presents the results of the analysis of the background information on procurement of medical supplies. The findings show that more than half of the procurement responsibility was mainly pharmaceutical requirements (50.7%) while general requirements accounted for 49.3%. This implies that most of the procurement requirements were mainly pharmaceutical-based hence the need for proper SCI to provide efficient pharmaceutical products to patient medication.

In terms of staffing of the purchasing and supply department, more than half of the hospital pharmacies had less than five staff as accounted by 58.6%. Those with 6-10, 11-15 and 16-20 accounted for 25.7%, 10.0% and 4.3 respectively. Very few had over 20 staff (1.4%). Based on the high numbers of patients that seek medical attention in the public hospital, the staffing level in the purchasing and supply department need to be proportional with this high demand in order to effectively implement SCI in their departments.

The findings show that most of the hospital pharmacies purchased their products and services directly from external suppliers as accounted for by

41.4%. The purchases through agents accounted for 21.1% while those who purchased from both external supplier and agents accounted for 37.5%.

This shows that most of the hospital pharmacies purchased their products and services directly from the external suppliers. This is advantageous since it avoids the intermediaries who make the products and service costly. It should also allow for improved training directly from the source. This would assist attempts at improvement of SC collaboration and integration. The shorter and more compressed the SC, the easier it would be to facilitate integration of material and information flow.

6.5 ASSESSMENT OF SAMPLING ADEQUACY AND SPHERICITY

In order to ascertain that the data collected was adequate and appropriate for inferential statistical testing, two main tests were performed namely the KMO test and Barlett's test. According to Field (2009), for a data set to be regarded as adequate and appropriate for statistical analysis, the value of KMO statistic should be greater than 0.5 while for Barlett's test, the Chi-square statistic should be significant (that is, $p < 0.05$). The findings for KMO and Barlett's test are presented in Table 6.4 and Table 6.5 for independent and dependent variables respectively.

Table 6.4: KMO and Bartlett's tests for independent variables

Nature of the test		Statistics	Deductions
KMO measure of sampling adequacy	KMO statistic	.856	Significant
Bartlett's test of sphericity	Chi-Square statistic	7968.866	Significant
	df	903	
	Sig. (p-Value)	.000	

The findings in Table 6.4 show significantly high values of the KMO statistic, that is, 0.856 greater than the critical level of significance of the test of 0.5 (Field, 2009). This indicates that the sample collected was adequate for further statistical computations. In addition to these high levels of KMO test, the Barlett's test of Sphericity was also significantly high (Chi-square of 7968.866 with 903 degree of freedom, with p< 0.05). These results of the Barlett's test show that the data set does not conform to an identity matrix hence the justification for further statistical analysis.

Table 6.5: KMO and Bartlett's tests for dependent variable

Nature of the test		Statistics	Deductions
KMO measure of sampling adequacy	KMO statistic	.859	Significant
Bartlett's test of sphericity	Chi-Square statistic	8538.480	Significant
	df	1485	
	Sig. (p-Value)	.000	

The findings in Table 6.5 also show that the KMO statistic was significantly high at 0.859 and much higher than the critical level of significance of the test that is set at 0.5 (Field, 2009). The Barlett's test of sphericity is also found to be significant (Chi-square of 8538.480 with 1485 degree of freedom, (at p<0.05) indicating that the data set does not conform to an identity matrix. The above results imply that the data collected was adequate and appropriate for further statistical analysis.

6.6 NORMALITY TESTING USING Z-STATISTIC

According to Lei and Lomax (2005), many model estimation methods are based on an assumption of normality since non-normal data may result in inflated statistics and underestimated standard errors. Kolmogorov-Smirnov test (Z-Statistic) was used in this study to test for normality of the data. The data was screened for influential outliers, which are linked to normality or non-normality of data.

The screening was done by way of assessing the distributional characteristics of the data (Hair *et al.* 2006). According to Norusis, (2007), for a data set to be normally distributed, the Z-Statistic significance level should be greater than 0.05 (p>0.05).

The results of the Z-Statistic test for normality are shown in Table 6.6

Table 6.6: Z-Statistic test for normality testing

Variables	Nature of the test	
	Kolmogorov-Smirnov (Z-Statistic)	**Sig. level (p-value)**
Customer order fulfilment	1.912	.061
Supplier collaborations	1.530	.091
Dedicated SCI	1.502	.072
SCI initiatives	1.214	.105
Performance improvement drivers	1.194	.115
Organisation environmental forces	2.235	.080
Regulatory framework	1.712	.068
Workforce and management support	1.821	.063
Financial factors, flow and integration	1.998	.071
Information sharing and technology adoption	1.603	.062

As can be seen in Table 6.6, the Z-Statistic for all the variables measured namely customer order fulfilment, supplier collaborations, dedicated SCI, SCI initiatives, performance improvement drivers, organisation environmental forces, regulatory framework, workforce and management support, financial factors, flow and integration and information sharing and technology adoption variables were all significant since all their p-values were greater that 0.05 (Norusis, 2007). This implies that the data set for these variables is normally distributed and therefore, it is free from inflated statistics and underestimated standard errors.

In the next section, the researcher presents the results of assessment of the psychometric properties namely the validity and reliability of the measuring instruments.

6.7 PSYCHOMETRIC PROPERTIES OF MEASURING INSTRUMENTS

A stringent testing of the psychometric properties of the measuring instruments is required to make sure that the instrument is well suited to measure what it was intended to measure accurately. In this regard, both validity and reliability of the measuring instruments were assessed. In the next sections, the results on the validity and reliability characteristics of the measuring instruments are presented.

6.7.1 Validity of measuring instrument

According to Golafshani (2003), validity involves ascertaining whether the means of measurement are accurate and whether they are actually capturing the variables they are supposed to measure. Construct validity was utilised to assess the convergent and discriminant validity of the measuring instruments. For this purpose, exploratory factor analysis was conducted. In the exploratory factor analysis, principal axis factoring (PAF) was specified as the method of factor extraction while Varimax rotation was specified as the method of factor rotation. The factors that did not meet the minimum loading threshold of 0.4 were eliminated from the factor structure (Hair et al*.* 2006).

The factor loading coefficients matrixes is presented in Table 6.7 and Table 6.8. This study adopted the minimum loading of 0.4 since loading coefficients of 0.4 are regarded as more significant (Hair et al*.* 2006). The items that loaded less than 0.4 were eliminated from the component factor matrix.

6.7.2 Exploratory factor analysis and factor extraction for independent variables

In the hypothesised model, seven independent variables were identified, namely SCI initiatives, performance improvement drivers, organisation environmental forces, regulatory framework, workforce and management support, financial factors, flow and integration and information sharing and technology adoption. The data for these variables were subjected to exploratory factor analysis (EFA). Factor analysis is a statistical procedure that enables the underlying dimensions of variables to be determined. It facilitates the identification of measuring items referred to as factors that have a high correlation among them. The items, which comprise the factors help determine the structure of the construct being measured (Field, 2009).

Table 6.7: Factor loading matrix for independent variables

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
	FUNC	PERF	ENVI	REGU	WORK	FINA	TECHN			
1	0.437									
2	0.649									
3	0.678									
4	0.710									
5		0.543								
6		0.482								
7	0.433									
8		0.432								
9		0.682						0.421		
10		0.639								
11		0.676								
12		0.771								
13		0.718								
14		0.646	0.404							
15		0.673	0.449							
16										
17	0.548									
18									0.568	
19									0.669	
20										
21			0.661							0.451
22			0.599							
23			0.723							
24			0.660							
25			0.410							
26				0.798						
27	0.795									
28	0.714									
29					0.424					
30					0.773				0.440	
31					0.757					

32	0.717				0.414					
33	0.421	0.441			0.699					
34					0.534					
35						0.689				
36										
37						0.540				
38								0.595		
39						0.887				
40						0.495				
41						0.469				
42						0.614				
43						0.461				
44							0.627			
45							0.641			
46							0.566			
47							0.747		0.423	
48							0.718			
49							0.551			
	Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalisation.									

Red indicates non-significant cross-loading while bold indicate significant loading for items

Key: FUNC (Factor 1) = SCI initiatives; PERF (Factor 2) = Performance Improvement Drivers; ENVI (Factor 3) = organisation environmental forces; REGU (Factor 4) = regulatory framework; WORK (Factor 5) = workforce and management support; FINA (Factor 6) = financial factors, flow and integration; TECHN (Factor 7) = information sharing and technology adoption.

During factor analysis, PAF was specified as the method of factor extraction while Varimax rotation with Kaiser Normalisation specified as the method of factor rotation. Table 6.7 presents the factor coefficient-loading matrix for all the independent variables of the study.

In the table, the results of the factor analysis for independent variables are presented. Table shows the coefficients factor loading for items constituting the independent variables. The significant loading for the items was set at the minimum threshold of 0.4. Due to this reason items number 16 and 20 in Table 6.6 did not load significantly for any factor hence they were deleted from further analysis. A factor is considered weak and unstable if less than three items are retained (Costello and Osborne, 2005).

According to Statswiki (2012), where cross loadings exist they should differ by more than 0.2 for an item to be significant. The findings show that the factor matrix loaded a total of ten factors whose Eigen values were greater than 1. Factors 1 to 7 comprised the independent variables while factors 8, 9 and 10 were new factors that loaded onto the factor matrix.

As shown in the factor matrix, Factor 8 had only one significant factor loading on item 38 and a cross loading on item 9 whose cross loading was higher on factor one. This factor lacked three significant item loading hence, the factor was deleted.

In addition, Factor 9 was a new factor that loaded onto the factor matrix. It had two significant factor loadings on item 18 and 19. It also had a cross loading on items 30 and 47 but these items also loaded highest for factor 5 and 7 respectively. Since only two items loaded significantly, this factor was thereby deleted.

Factor 10 had only one cross loading on item 21 which was significant for factor 3. Therefore, this factor was also deleted. An interpretation of the results of the exploratory factor component matrix for each of the independent variables, as seen in Table 6.7, is presented in the sections below.

6.7.2.1 Factor 1: SCI initiatives (FUNC)

Items 1, 2, 3, 4, 7, 17, 27 and 28 only loaded onto Factor 1. Items 32 and 33 had a cross loading where by item 32 were retained in factor 1 since it had the highest cross loading in factor 1 and the difference in the cross loading differ by 0.2. Convergent validity has been confirmed for this scale. A total of 9 items were thus retained for this factor.

6.7.2.2 Factor 2: Performance improvement drivers (PERF)

Items 5, 6, 8, 9, 10, 11, 12 and 13 only loaded onto Factor 2. Items 14 and 15 had a cross factor loadings, which was highest for this factor and the difference within the other loading differ by 0.2. Items 33 had a cross factor loadings that was not significant for this factor hence it was considered for another factor. Convergent validity has been confirmed for this scale. In this factor, a total of ten items were retained.

6.7.2.3 Factor 3: Organisation environmental forces (ENVI)

Items 22, 23, 24 and 25 only loaded on factor 3. Item 21 was also retained in factor 3 since it exceeded the 0.4 threshold for loadings and having the highest cross factor loading that differ by at least 0.2 as compared to other factors. Items 14 and 15 that cross-loaded on this factor were disregarded for this factor as they had higher cross loading values into another factor. Convergent validity has however been confirmed for this scale. A total of five items were retained in this factor.

6.7.2.4 Factor 4: Regulatory framework (REGU)

Only one Item, that is, item 21 loaded onto Factor 4. According to Costello and Osborne (2005), a factor is considered weak and unstable if less than three items are retained. Therefore, this resulted in the deletion of this factor from subsequent analysis.

6.7.2.5 Factor 5: Workforce and management support (WORK)

Items 29, 31 and 34 only loaded onto Factor 5. Items 30 and 33 were also retained on this factor since they had a cross factor loadings, which was highest for this factor and the difference with the other loading differ, by 0.2. Items 32 had a cross factor loadings whose value was higher in another factor hence it was not considered for this factor. Convergent validity has been confirmed for this scale. A total of five items were retained in this factor.

6.7.2.6 Factor 6: Financial factors, flow and integration (FINA)

Items 35, 37, 39, 40, 41, 42 and 43 only loaded onto Factor 6. This factor had no cross factor loadings hence only these items were considered for this factor. Convergent validity has been confirmed for this scale. In this factor, a total of seven items were retained.

6.7.2.7 Factor 7: Information sharing and technology adoption (TECHN)

Items 44, 45, 46, 48 and 49 only loaded onto Factor 7. Items 47 had a cross factor loadings, which was highest for this factor and the difference within the other loading differ by 0.2. Convergent validity has been confirmed for this scale. A total of six items were retained in this factor.

6.7.3 Exploratory factor analysis and factor extraction for dependent variables

As stated before, the dependent variable of the study comprise of three components, namely Customer order fulfilment, supplier collaborations and dedicated SCI. The data for these components were subjected to exploratory factor analysis (EFA) whereby Principal Axis Factoring (PAF) was specified as the method of factor extraction while Varimax rotation with Kaiser Normalisation specified as the method of factor rotation.

Table 6.8 presents the factor coefficient-loading matrix for the dependent variable components.

Table 6.8 show that the factor matrix loaded a total of six factors whose Eigen values were greater than one. Factor 1, 2 and 3 comprised the dependent variable component, namely supplier collaborations, dedicated SCI and customer order fulfilment. Factors 4, 5 and 6 were new factors that loaded on the factor matrix.

Table 6.8: Rotated factor loading matrix for dependent variables

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6
	COLL	DEDI	ORDE			
50	**0.785**					
51	**0.692**					
52	**0.676**					0.442
53	**0.748**				0.402	
54	**0.527**					
55						**0.499**
56	**0.614**			0.424		0.417
57	**0.697**			0.416		
58						
59				**0.667**		
60						
61	**0.426**					
62	**0.606**					
63	**0.572**					
64			**0.686**		0.426	
65				**0.637**		
66						**0.408**
67		**0.613**				
68		**0.650**				
69	0.414	**0.745**		0.419		
70		**0.530**				
71		**0.598**				
72		**0.739**			0.475	
73		**0.647**				
74		**0.651**				
75		**0.547**				
76					**0.495**	
77	**0.605**					
78		**0.638**				
79		**0.757**				
80		**0.689**				
81	0.408	**0.763**				
82			**0.474**			
83			**0.622**			0.412
84			**0.480**			
85			**0.738**			
86			**0.639**			
87			**0.522**			

88			**0.738**		0.404	
89			**0.643**			
90			**0.564**			
91			**0.554**			
92	**0.462**					
93			**0.748**			
94			**0.667**		0.410	
95			**0.735**			
96			**0.639**			
97			**0.705**			
	EXTRACTION METHOD: PRINCIPAL AXIS FACTORING. ROTATION METHOD: VARIMAX WITH KAISER NORMALISATION.					

Red indicates non-significant cross-loading while bold indicate significant loading for items.
Key: Factor 1 (COLL) = Supplier Collaborations; Factor 2 (DEDI) = Dedicated Supply Chain Integration; Factor 3 (ORDE) =Customer Order Fulfilment

In factors 4, two items 59 and 65 loaded only onto it. Items 56, 57 and 69 cross-loaded on factor 4 but their loading was disregarded because they loaded higher in other factors. Since only two items were retained, this factor was deleted. A minimum of three items is supposed to be retained in a factor for it to be considered strong and stable (Costello and Osborne, 2005).

In addition, factors 5 had one item retained, that is; item 76. Items 53, 64, 72 and 88 had cross loading onto factor 5 but were disregarded since their loading was higher in other factors. Since only one item was retained, this factor was deleted.

Factors 6 had Items 55 and 66 only loading onto it. Items 52, 56 and 83 had a cross loading onto factor six but their loading was higher in other factors. As a result, this factor was also deleted. Table 6.8 also show that the items 58 and 60 did not load significantly for any factor hence they were deleted from the factor matrix.

6.7.3.1 Factor 1 (COLL): Supplier collaborations

Items 50, 51, 54, 61, 62, 63, 77 and 92 only loaded onto Factor 1. Items 52, 53 and 57 were also retained on this factor since they had a cross factor loadings which was highest for this factor and the difference with the other loading differ by 0.2. Items 69 and 81 had a cross factor loadings whose value was higher in another factor hence it was not considered for this factor. Convergent validity has been confirmed for this scale. A total of twelve items were retained in this factor.

6.7.3.2 Factor 2 (DEDI): Dedicated supply chain

Items 67, 68, 70, 71, 73, 74, 75, 78, 79 and 80 only loaded onto Factor 2. Items 69 and 81 were also retained on this factor since they had cross factor loadings, which was highest for this factor and the difference with the other loading differ by 0.2. Convergent validity has been confirmed for this scale. A total of thirteen items were retained in this factor.

6.7.3.3 Factor 3 (ORDE): Customer order fulfilment

Items 82, 84, 85, 86, 87, 89, 90, 91, 93, 95, 96 and 97 only loaded onto Factor 3. Items 64, 83, 88 and 94 had the highest cross factor loadings for this factor and differed with the other loading by more than 0.2. These items were also considered for this factor. Convergent validity has been confirmed for this scale. A total of sixteen items were retained in this factor.

6.7.4 Summary of items retained, regrouped and renamed in factor analysis

Table 6.9 provides a summary of the items regrouping and factors retained in the analysis.

Table 6.9 depicts the results of the retained and regrouped factors. In the SC improvement model, seven variables were identified as independent variables however after factor loading and regrouping, only six variables were retained. Three new factors also emerged on the factor matrix but to cross factor loading, they were not retained.

Table 6.9: Summary of factors retained and regrouped

Variables codes	Retained factors	Items
FUNC	SCI initiatives	FUNC 1, 2, 3, 4, 7, 17, 27, 28, 32
PERF	Performance Improvement Drivers	PERF 5, 6, 8, 9, 10, 11,12, 13, 14 and 15
ENVI	Organisation environmental forces	ENVI 21, 22, 23, 24 and 25
WORK	Workforce and management support	WORK 29,30, 31, 33 and 34
FINA	Financial factors, flow and integration	FINA 35, 37, 39, 40, 41, 42 and 43
TECHN	Information sharing and technology adoption	TECHN 44, 45, 46, 47, 48, and 49
COLL	Supplier collaborations	COLL 50, 51, 53, 54, 57, 61, 62, 63, 77 and 92
DEDI	Dedicated SCI	DEDI 67, 68, 69, 70, 71, 72, 73, 74, 75, 78, 79, 80 and 81
ORDE	Customer order fulfilment	ORDE 64, 82, 84, 85, 86, 87, 88, 89, 90, 91, 93, 94, 95, 96 and 97

Regarding the dependent variables, three factors had been identified in the SCI framework and were all retained in the factor matrix. However, three new factors on the dependent variables emerged but due to cross factor loadings, they were not retained. A total of six independent factors and three dependent variable components were retained in the model and subjected to further statistical testing.

6.8 RELIABILITY ASSESSMENT OF MEASURING INSTRUMENT

Kasomo (2010) admits that reliability is the extent to which measures yield consistent results. According to Mugenda and Mugenda (2010), a research instrument is considered reliable if the results of a study can be reproduced under a similar situations and methodology. In addition, Trochim (2006) argues that for a measuring instrument to be considered reliable it must be free from errors and the results or observations must be replicable or repeatable. Furthermore, Mugenda and Mugenda (2010) are of the view that the consistency or reliability implied in the research instrument relates to three issues namely:

- ⇒ The degree to which a measurement, given repeatedly, remains the same;
- ⇒ Stability of a measurement over time; and
- ⇒ Similarity of measurements within a given time period.

Further, Hair et al. (2006) concede that reliability of a measuring instrument is established by determining the association between the scores obtained from administrations of the instrument. An instrument is considered reliable if the degree of association is high. In this study, the Cronbach alpha coefficient was used to measure the internal consistency (reliability) of the measuring scales. It is argued that Cronbach alpha is a better method for reliability assessment since it can produce a reliability estimate with a single administration (Trochim, 2006).

The study assessed the reliability of the data collected to measure the variables of the study. The purpose of reliability assessment was to assess the internal consistency of the data collected by the research questionnaire. In order to measure this, Cronbach alpha was computed to assess the reliability of the data collected. According to Leedy and Ormrod (2005), a Cronbach Alpha value greater than 0.60 is regarded satisfactory for reliability assessment.

Firstly, a pilot study was conducted to identify errors in the questionnaire. The pilot questionnaire was administered to 45 respondents and the Cronbach alpha coefficients for reliability measurements were computed for these responses. Further, the pilot Cronbach alpha values were compared to those of the actual study and the findings were as shown in Table 6.10.

Table 6.10: Cronbach alpha reliability coefficients for main study

Variable Codes	Variables	Cronbach alpha values for the pilot study	Cronbach alpha values for the actual study
FUNC	SCI Initiatives	0.762	0.764
PERF	Performance improvement drivers	0.823	0.874
ENVI	Organisation environmental forces	0.690	0.736
REGU	Regulatory framework	0.638	-
WORK	Workforce and management support	0.792	0.822
FINA	Financial factors, flow and integration	0.804	0.841
TECHN	Information sharing and technology adoption	0.810	0.906
ORDE	Customer order fulfilment	0.721	0.838
COLL	Supplier collaborations	0.822	0.890
DEDI	Dedicated SCI	0.898	0.918

The Table presents the reliability scores for the main study. The results of the pilot study were also presented in Chapter Five and as shown above all the variables produced acceptable reliability scores at the pilot. The highest Cronbach alpha value for the pilot study was 0.898 for dedicated SCI and the lowest was 0.638 for regulatory framework.

After the data collection process for the main study, the raw data was also assessed for reliability. It is important to note that the reliability assessment for regulatory framework was not done since it was eliminated at the factor analysis stage during validity testing.

The findings in Table 6.10 show that the Cronbach alpha value ranges from 0.918 to 0.734 for dedicated SCI and organisation environmental forces respectively. This indicates that all the Cronbach alpha values computed for all the variables are above 0.70, which was higher than the acceptable value of 0.60 according to George and Mallery (2003). This is an improvement in the reliability of the measuring instruments from the pilot study. This demonstrates a greater internal consistency for all the retained variables. It was therefore concluded that the data collected for the retained variables was reliable for the subsequent stages of analysis.

Based on the validity and reliability results, the hypothetical model was revised as discussed in the next section.

6.9 REVISED HYPOTHETICAL MODEL

Based on the retention, deletion and regrouping of the items into factors, it was deemed necessary to revise the relationships model and the hypotheses. Furthermore, it was found that some factors such as regulatory frameworks did not have enough valid items to be retained for further analysis. These were excluded from further analysis.

Based on the results of factor analyses, the original hypothesised model illustrated in Figure 1.3 and the hypotheses stated in Chapter One and substantiated by secondary sources in Chapter Four were revised. As can be seen in the revised model in Figure 6.6, the hypothesised relationships were classified into three categories, namely:

- ⇒ Relationship between independent variables and customer order fulfilment;
- ⇒ Relationship between independent variables and supplier collaboration; and
- ⇒ Relationship between independent variables and dedicated SCI.

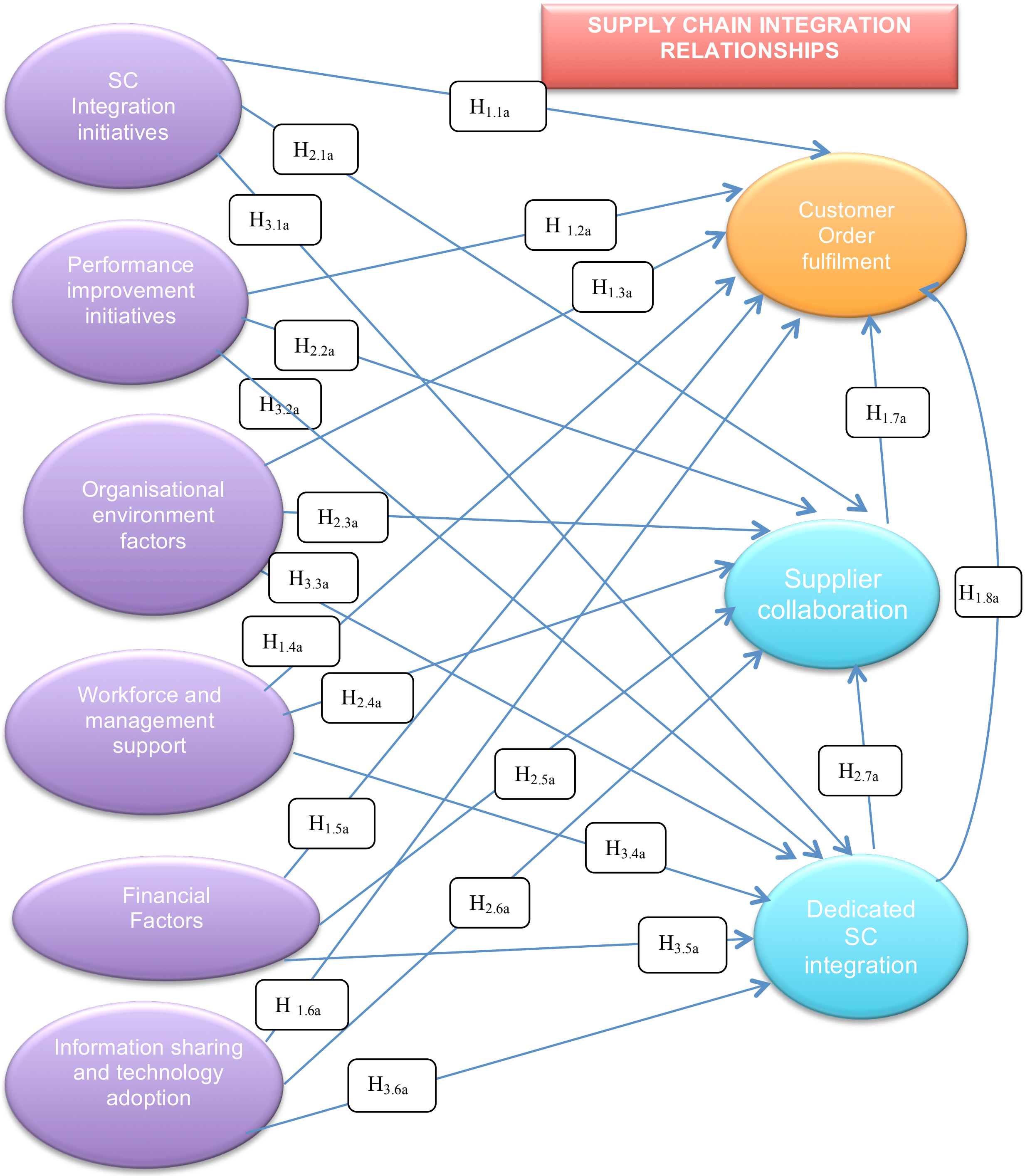

Figure 6.5: Revised hypothesised relationships

Source: Researcher's own construct

6.9.1 Relationship between independent variables and customer order fulfilment

$H_{1.1a}$: There is a positive relationship between *SCI initiatives* and *customer order fulfilment*.

$H_{1.2a}$: There is a positive relationship between *performance improvement initiatives* and *customer's order fulfilment*

$H_{1.3a}$: There is a positive relationship between *organisational environmental factors* and *customer order fulfilment*.

$H_{1.4a}$: There is a positive relationship between *workforce and management support* and *customer order fulfilment*

$H_{1.5a}$: There is a positive relationship between *financial factors flow and integration* and *customer's order fulfilment*.

$H_{1.6a}$: There is a positive relationship between *information sharing and technology adoption* and *customer order fulfilment*.

$H_{1.7a}$: There is a positive relationship between *supplier collaborations* and *customer order fulfilment*

$H_{1.8a}$: There is a positive relationship between *dedicated SCI* and *customer order fulfilment*.

6.9.2 Relationship between independent variables and supplier collaboration

$H_{2.1a}$: There is a positive relationship between *SCI initiatives* and *supplier collaborations*.

$H_{2.2a}$: There is a positive relationship between *performance improvement initiatives* and *supplier collaborations*.

$H_{2.3a}$: There is a positive relationship between *organisational environmental factors* and *supplier collaborations*.

$H_{2.4a}$: There is a positive relationship between *workforce and management support* and *supplier collaborations*.

$H_{2.5a}$: There is a positive relationship between *financial factors flow and integration* on *supplier collaborations*.

$H_{2.6a}$: There is a positive relationship between *information sharing and technology adoption* and *supplier collaborations*.

$H_{2.7a}$: There is a positive relationship between *dedicated SCI* and *supplier collaborations*.

6.9.3 Relationship between independent variables and dedicated SCI

$H_{3.1a}$: There is a positive relationship between *SCI initiatives* and *dedicated SCI*

$H_{3.2a}$: There is a positive relationship between *performance improvement initiatives* and *dedicated SCI*.

$H_{3.3a}$: There is a positive relationship between *organisational environmental factors* and *dedicated SCI*.

$H_{3.4}$: There is a positive relationship between *workforce and management support* and *dedicated SCI*.

$H_{3.5a}$: There is a positive relationship between *financial factors flow and integration and* dedicated SCI.

$H_{3.6a}$: There is a positive relationship between *information sharing and technology adoption* and *dedicated SCI*.

The revised hypothesised model, depicted in Figure 6.3 and subsequent hypotheses revised are subjected to further analysis in the rest of the study. Roux and Ben-Zion (2013) argue that if two or more variables are highly correlated, they produce errors and therefore are not good measures of different theoretical concepts. Based on this, it was necessary to assess if the study variables were highly correlated with each other to ensure all variables were designed to measure different theoretical concepts. This was assessed using multi-collinearity diagnostics test discussed next.

6.10 MULTI-COLINEARITY DIAGNOSTICS

According to Trochim (2006), multi-collinearity exists when two or more variables are highly correlated with each other. In addition, Roux and Ben-Zion (2013) concede that proper multi-collinearity diagnostics is necessary since highly correlated variables designed to test different concepts usually measure the same theoretical concepts. Therefore, multi-collinearity diagnostics analysis facilitates the identification of measuring items or variables that have a high correlation among them.

According to Campbell and Fiske (2009), when multi-collinearity exists within the data set, it can negatively affect the parameters of measurement especially in multiple regression model and hence produce misleading results. During multi-collinearity diagnostics analysis, the tolerance value of less than 0.1 indicates a serious collinearity problem while the significant Variance Inflated Factor (VIF) values should be less that 10 (Field, 2009). Table 6.11 presents the results of the multi-collinearity diagnostics analysis test performed.

Table 6.11: Multi-collinearity diagnostics test

Variables	Colinearity Statistics	
	Tolerance	**VIF**
SCI Initiatives	0.313	3.198
Performance Improvement Drivers	0.493	2.029
Organisation Environmental Forces	0.733	1.365
Workforce and Management Support	0.446	2.243
Financial Factors, Flow and Integration	0.611	1.636
Information sharing and Technology adoption	0.523	1.911

As indicated in Table 6.11, the tolerance values were 0.313, 0.493, 0.733, 0.446, 0.611 and 0.523 for SCI Initiatives, performance improvement drivers, organisation environmental forces, workforce and management support, financial factors, flow and integration, information sharing and technology adoption respectively which was higher than the acceptable limit of 0.1. In addition, Variance Inflated Factor (VIF) values for all these variables were all less than 10. This means that the variables were not highly correlated among themselves hence the tested data was free from multi-collinearity problem.

6.11 ASSESSMENT OF HYPETHESISED RELATIONSHIPS

In this section, the researcher seeks to test the relationships among the various variables that affect the SCI as depicted in the SCI framework (Figure 4.8). The revised relationship hypothesised in the hypothesis is illustrated in Figure 6.5. The hypothesised model was assessed in three main stages:

- ⇒ Assessment of relationship between independent variables and customer order fulfilment;
- ⇒ Assessment of relationship between independent variable and supplier collaborations; and
- ⇒ Assessment of relationship between independent variable and dedicated SCI.

These three stages are discussed in the sections that follow.

6.11.1 Assessment of relationship between independent variables and customer order fulfilment

In this stage, the variables comprising of SCI Initiatives (FUNC), Performance Improvement Drivers (PERF), Organisation Environmental Forces (ENVI), Workforce and Management Support (WORK), Financial Factors, Flow and Integration (FINA), Information sharing and Technology adoption (TECHN) as well as Supplier Collaborations (COLL) and Dedicated SCI (DEDI) were regressed against customer Order fulfilment.

The hypotheses tested in this stage are presented in section 6.9.1.

6.11.2 Assessment of relationship between independent variable and supplier collaborations

In this stage, the variables comprising of SCI Initiatives (FUNC), Performance Improvement Drivers (PERF), Organisation Environmental Forces (ENVI), Workforce and Management Support (WORK), Financial Factors, Flow and Integration (FINA), Information sharing and Technology adoption (TECHN) as well as Supplier Collaborations (COLL) and Dedicated SCI (DEDI) were regressed against the supplier collaborations.

The hypotheses tested in this stage are presented in section 6.9.2.

6.11.3 Assessment of relationship between independent variable and dedicated SCI

At this stage, the variables comprising of SCI Initiatives (FUNC), Performance Improvement Drivers (PERF), Organisation Environmental Forces (ENVI), Workforce and Management Support (WORK), Financial Factors, Flow and Integration (FINA), Information sharing and Technology adoption (TECHN) as well as Supplier Collaborations (COLL) and Dedicated SCI (DEDI) were regressed against the dedicated SCI.

6.12 REGRESSION ANALYSIS AND TESTING OF SIGNIFICANT RELATIONSHIPS

According to Mugenda and Mugenda (2010), a regression model measures the causal relationship between the independent and dependent variables. Abdullah, Uli and Tari (2009) concur with this view and argue that multiple regression assesses whether a group of independent variables together predict a given dependent variable and, if not, which of the independent variable(s) would be retained in the model as significantly influencing the dependent variable. Further, the multiple regression analysis assesses the relative importance of the individual dimensions of factors.

As noted before, the dependent variable for this study is comprised of three components, namely Customer order fulfilment (ORDE), supplier collaborations (COLL) and dedicated SCI (DEDI). Each of the independent variables was regressed against these three variables. Analysis of Variance

(ANOVA) test was first performed to test the model fit and the results were as shown next.

The results of ANOVA test for measurement of model fit with customer order fulfilment as dependent variable is presented in the next subsections.

6.12.1 Results of ANOVA test for measurement of model fit with customer order fulfilment as dependent variable

Table 6.12 presents the results of the ANOVA test for measurement of model fit in the hypothesised relationship with customer order fulfilment as dependent variable.

Table 6.12: ANOVA Test for Measurement of Model Fit With Customer Order Fulfilment as Dependent Variable

	Sum of Squares	**Df**	**Mean Square**	**F-statistic**	**Sig. (p-value)**
Regression	13.908	6	2.318	25.773	.000**
Residual	22.485	250	.090		

Dependent Variable: Customer Order Fulfilment
** $p < 0.001$

The results in Table 6.12 show an F-statistic of 25.773, which is significantly high (that is, $p<0.05$). This shows that the hypothesised variables namely SCI initiatives, performance improvement drivers, organisation environmental forces, workforce and management support, financial factors, flow and integration, information sharing and technology adoption as well as supplier collaborations and dedicated SCI explain a large portion of the variance in customer order fulfilment, the dependent variable. This provided justification for further multiple-regression analyses. The results of these analyses are reported in the next subsection.

6.12.2 Hypothesised relationships with customer order fulfilment as dependent variable

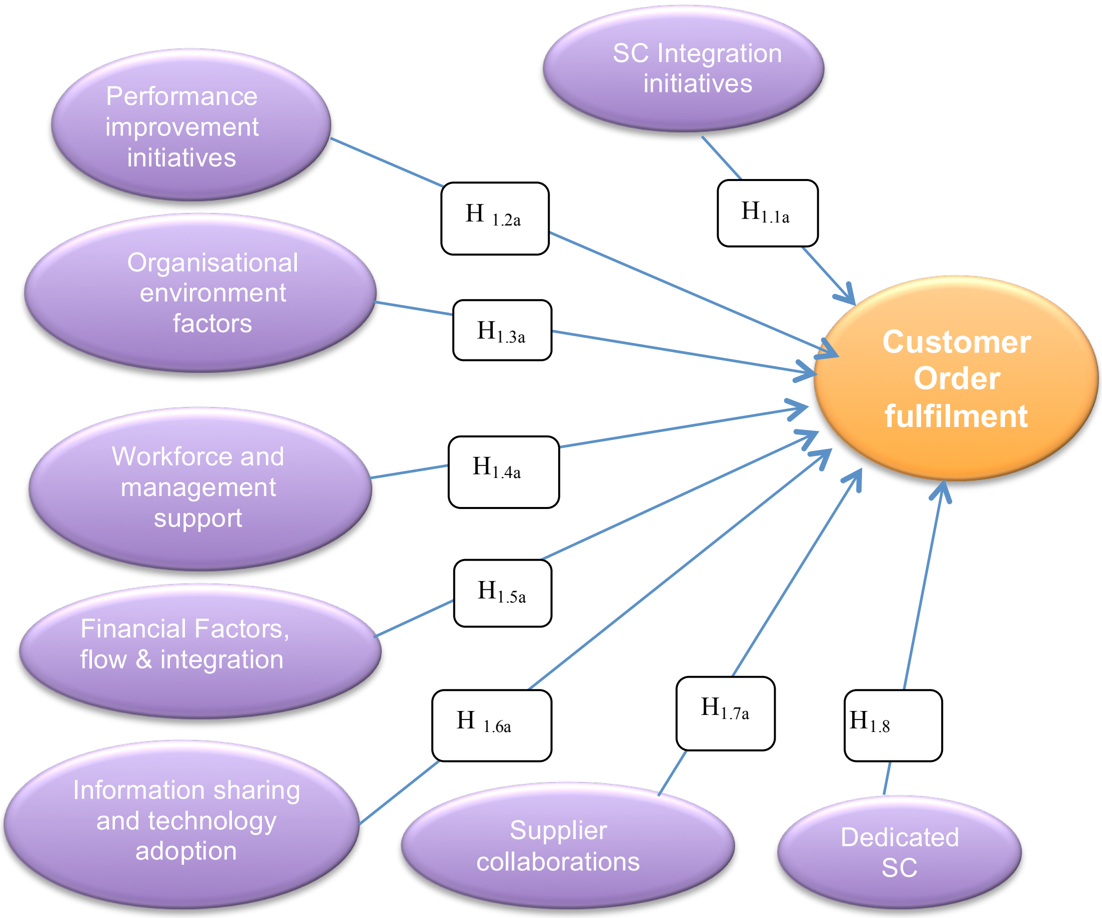

Figure 6.6: Hypothesised relationships with customer order fulfilment as dependent variable

Source: Researcher's own construct

Figure 6.4 shows the hypothesised relationships between the selected independent variables and customer order fulfilment as the dependent variable, while Table 6.13 shows the empirical results that emerged from the multiple regression analyses of these relationships.

The R^2 of 0.38 in Table 6.14 reveals that the eight independent variables together explain 38% in the movement of customer order fulfilment. This is an indication that these independent variables play an important role in achieving effective customer order fulfilment.

Table 6.13: Measurement of relationships between various variables; customer order fulfilment as dependent variable

Variables	Beta	T-values	Sig. (*p*)	Hypothesis Number	Hypothesis
SCI Initiatives	-.087	.971	.332	$H_{1.1}$	Not Supported
Performance Improvement Drivers	.050	.683	.495	$H_{1.2}$	Not Supported
Organisation Environmental Forces	.118	1.649	.100	$H_{1.3}$	Not Supported
Workforce and Management Support	.224	2.975	.003**	$H_{1.4}$	Supported
Financial Factors, Flow and Integration	.105	2.001	.044*	$H_{1.5}$	Supported
Information sharing and Technology adoption	.364	5.184	.000**	$H_{1.6}$	Supported
Supplier Collaborations	.344	4.489	.000**	$H_{1.7}$	Supported
Dedicated SCI	.393	5.123	.000**	$H_{1.8}$	Supported

Dependent Variable: Customer Order Fulfilment. $R^2 = 0.38$
** $p < 0.001$ * $p < 0.05$

6.12.2.1 The relationship between SCI initiatives and customer order fulfilment

The results in Table 6.13 show that there was not a significant relationship between SCI initiatives and customer order fulfilment. Therefore, SCI initiatives do not significantly influence customer order fulfilment. This means that the null hypothesis $H0_{1.1}$ was supported by this empirical result, while the alternative hypothesis $H_{1.1}$ was not supported.

6.12.2.2 The relationship between performance improvement initiatives and customer's order fulfilment

The results in Table 6.13 show that there was not a significant relationship between performance improvement initiatives and customer order fulfilment. In other words, performance improvement initiatives do not exert a significant influence on customer order fulfilment. This means that the null hypothesis $H0_{1.2}$ was supported by this empirical result, while the alternative hypothesis $H_{1.2}$ was not.

6.12.2.3 The relationship between organisational environmental factors and customer order fulfilment

Table 6.13 reveals that organisational environmental factors were not significantly related to customer order fulfilment. This means that organisational environmental factors do not significantly influence customer order fulfilment. It also means that the empirical results supported the null hypothesis $H0_{1.3}$, while they did not support the alternative hypothesis $H_{1.3}$.

6.12.2.4 The relationship between workforce and management support and customer order fulfilment

Table 6.13 shows that workforce and management support was significantly related ($r = 0.22$, $p < 0.05$) to customer order fulfilment. This means that the more workforce and management support is provided by the organisation, the more customer order fulfilment will be achieved. This results means that null hypothesis $H0_{1.4}$, was not supported, while the alternative hypothesis $H_{1.4}$ was.

6.12.2.5 The relationship between financial factors flow and integration and customer order fulfilment

Table 6.13 indicate that there was significant relationships ($r = 0.10$, $p = 0.04$) between financial factors flow and customer order fulfilment. This reveals that that the more financial factors flow and integration are provided the more customer order fulfilment be achieved. The t-value (2.001) for this construct exceeds critical value of 1.96, consequently, the null hypothesis $H0_{1.5}$, was not supported, while the alternative hypothesis $H_{1.5}$ was. The path coefficients (Beta values) are positive but the magnitude of the paths is relatively weak (0.105).

6.12.2.6 Information sharing and technology adoption on customer order fulfilment

Table 6.13 shows that information sharing and technology adoption was significantly related to customer order fulfilment. This indicates that enhancing information sharing and technology adoption leads to greater achievement of customer order fulfilment. It also means that the empirical results did not support the null hypothesis $H0_{1.6}$, while they supported the alternative hypothesis $H_{1.6}$.

6.12.2.7 Supplier collaborations on customer order fulfilment

Table 6.13 indicates that there was significant statistical relationship between supplier collaborations and the customer order fulfilment. This indicates that improving supplier collaborations leads to more customer order fulfilment being achieved. This results means that null hypothesis $H0_{1.7}$, was not supported, while the alternative hypothesis $H_{1.7}$ was. The t-value (4.489) for this construct far exceeds critical value of 1.96, consequently, hypothesis $H_{1.7}$, is strongly supported.

6.12.2.8 Dedicated supply chain integration on customer order fulfilment

Table 6.13 indicates that dedicated SCI was significantly (p=0.001) related to the customer order fulfilment. This means that the more dedicated SCI is supported by the organisation, the more customer order fulfilment will be achieved. This results means that null hypothesis $H0_{1.8}$, was not supported, while the alternative hypothesis $H_{1.8}$ was.

The results of ANOVA test for measurement of model fit with supplier collaborations as the dependent variable are presented in the next subsection.

6.12.3 Results of ANOVA test for measurement of model fit with supplier collaborations as dependent variable

The results of ANOVA test for measurement of model fit is presented in the Table 6.14.

Table 6.14: ANOVA test for independent variables and suppliers' collaboration

	Sum of Squares	df	Mean Square	F-statistic	Sig. (p-value)
Regression	53.771	7	7.682	73.040	0.000**
Residual	21.454	204	0.105		

Dependent Variable: suppliers' collaboration.
** p < 0.001

The results in Table 6.14 show an F-statistic of 73.040 that is highly significant (that is, $p<0.05$). This indicates that the hypothesised variables namely SCI initiatives, performance improvement drivers, organisation environmental forces, workforce and management support, financial factors, flow and integration, information sharing and technology adoption as well as dedicated SCI explain a large portion of the variance in supplier collaborations, the dependent variable. This provided justification for further multiple regressions analysis. The results of analysis are reported in the next subsections.

6.12.4 Hypothesised relationship between various variables and supplier collaborations

Figure 6.6 presents the hypothesised relationship between the selected independent variables and supplier collaborations as the dependent variable , while Table 6.15 shows the empirical results that emerged from the multiple regression analyses of these relationships.

The R^2 of 0.71 in Table 6.15 reveals that the seven independent variables together explain 71% in the movement of supplier collaborations. This is an indication that these independent variables play an important role in achieving effective supplier collaborations. This also means other variables not measured in this study explain the remaining 29% of the movement in the supplier collaborations variable.

Figure 6.7 presents a diagrammatic representation of the hypothesised

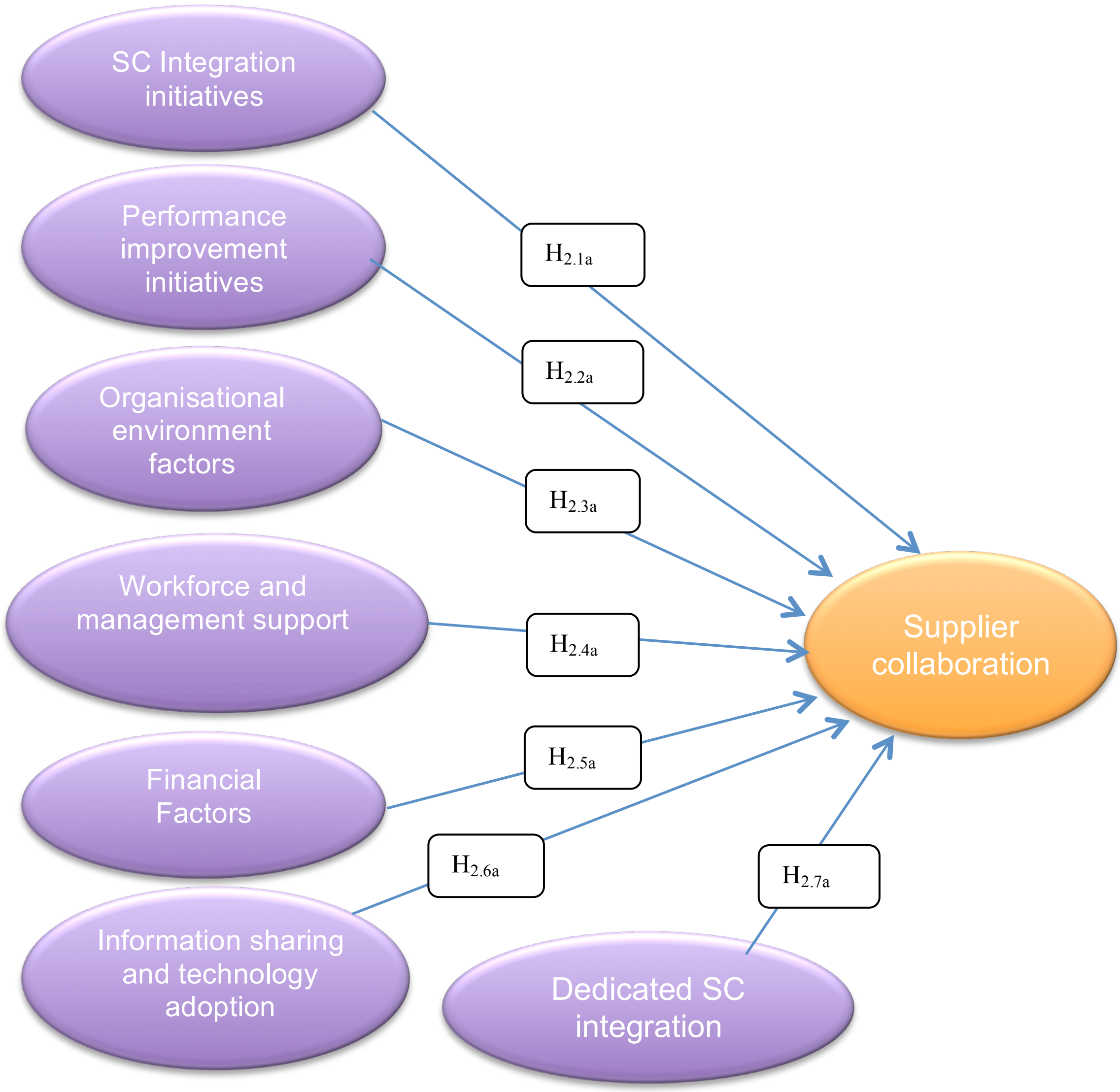

Figure 6.7: Hypothesised relationship between various variables and suppliers collaborations

Source: Researcher’s construct

Table 6.15 presents the multiple regression results of the various variables on supplier collaborations.

Table 6.15: Measurement of relationship between various variables and suppliers collaborations as dependent variable

Variables	Beta	T-statistic	Sig.	Hypothesis number	Hypothesis
SCI Initiatives	.038	5.690	.016*	$H_{2.1}$	Supported
Performance improvement drivers	.383	6.753	.000**	$H_{2.2}$	Supported
Organisation environmental forces	-.048	-1.061	.290	$H_{2.3}$	Not Supported
Workforce and management support	.009	2.864	.015*	$H_{2.4}$	Supported
Financial factors, flow and integration	.043	2.726	.038*	$H_{2.5}$	Supported
Information sharing and Technology adoption	.157	1.975	.021*	$H_{2.6}$	Supported
Dedicated SCI	.450	4.877	.000**	$H_{2.7}$	Supported

Dependent Variable: supplier collaborations. $R^2 = 0.71$
** $p < 0.001$ * $p < 0.05$

6.12.4.1 Relationship between SCI initiatives and supplier collaborations

The results in Table 6.15 show there exist statistically significant (*p*=0.016) relationship between SCI initiatives and supplier collaborations. This means that the more SCI initiatives are adopted and supported by the organisation, the more supplier collaborations will be achieved. This results means that null hypothesis $H0_{2.1}$, was not supported, while the alternative hypothesis $H_{2.1}$ was. The magnitude of the significant path coefficient is relatively weak (0.38). However, although weak, the path coefficient of the statistically significant relationships is positive.

6.12.4.2 Relationship between performance improvement initiatives on supplier collaborations

Table 6.15 indicates performance improvement initiatives was significantly ($p<0.01$) related to supplier collaborations. This indicates that enhancing performance improvement initiatives leads to greater achievement of supplier collaborations. It also means that the empirical results did not support the null hypothesis $H0_{2.2}$, while they supported the alternative hypothesis $H_{2.2}$.

6.12.4.3 Relationship between organisational environmental factors on supplier collaborations

Table 6.15 shows there is no statistically significant relationships ($p>0.05$) between organisational environmental factors and supplier collaborations. This means that organisational environmental factors do not significantly influence or predict supplier collaborations. It also means that the empirical results supported the null hypothesis $H0_{2.3}$, while they did not support the alternative hypothesis $H_{2.3}$.

6.12.4.4 Relationship between workforce and management support on supplier collaborations

Table 6.15 indicates workforce and management support was significantly related ($r = 0.005$, $p < 0.15$) to supplier collaborations. This means that the more workforce and management support is offered by the organisation, the more supplier collaborations will be realised. This results means that null hypothesis $H0_{2.4}$, was not supported, while the alternative hypothesis $H_{2.4}$ was

6.12.4.5 Relationship between financial factors flow and integration on supplier collaborations

Table 6.15 indicates that there was significant relationships ($r = 0.04$, $p = 0.038$) between financial factors flow and supplier collaborations. This reveals that that the more financial factors flow and integration are provided the more supplier collaborations will be achieved. The t-value (2.001) for this construct exceeds critical value of 1.96, and implying that financial factors flow and integration strongly predict supplier collaborations as the dependent variable.

Consequently the null hypothesis $H0_{2.5}$, was not supported, while the alternative hypothesis $H_{2.5}$ was.

6.12.4.6 Relationship between information sharing and technology adoption on supplier collaborations

Table 6.15 shows there exist statistically significant relationships (*p*=0.021) between information sharing and technology adoption and supplier collaborations*.* This indicates that increasing information sharing and technology adoption leads to greater supplier collaborations. This is also evident from the t-test results (1.975) as the value exceeds the critical value of 1.96 and implying that information sharing and technology adoption predicts supplier collaborations as the dependent variable. Consequently, the empirical results did not support the null hypothesis $H0_{2.6}$, while they supported the alternative hypothesis $H_{2.6}$. The magnitude of the significant path coefficient is fairly strong and positive (0.157).

6.12.4.7 Relationship between dedicated SCI on supplier collaborations

Table 6.15 shows there exist statistically significant relationships (*p*=0.001) between dedicated SCI and supplier collaborations. This means that the more dedicated SCI is adopted and supported by the organisation, the more supplier collaborations will be enhanced. This results means that null hypothesis $H0_{2.7}$, was not supported, while the alternative hypothesis $H_{2.7}$ was. The magnitude of the significant path coefficient is fairly strong and positive (0.450).

The results in this cluster seem to indicate that managers do not think that the organisational environmental forces have a major influence on supplier collaborations within the hospital pharmacies. This finding contradicts observation by Mullins (2009) who noted that environmental forces influence the functioning of organisations and managers must consider how they achieve internal and external balance in order to adapt to changes in their environment demands. This contradiction in managers' perception can be explained by the fact that there is a tight control by the Kenyan government on public hospitals and public procurement processes resulting in mitigating the adverse effects the external environment has on the public hospitals and pharmacies.

ANOVA test for Measurement of model fit between various variables and dedicated SC is presented next.

6.12.5 ANOVA Test for independent variables and dedicated SCI.

The results of ANOVA test for measurement of model fit is presented in the Table 6.16.

Table 6.16: ANOVA test for variables and dedicated SCI

Model	Sum of Squares	df	Mean Square	F- statistic	Sig. (*P*-value)
Regression	69.121	6	11.520	180.192	0.000
Residual	13.298	208	0.064		

Dependent Variable: Dedicated Supply Chain Integration
$p < 0.001$

The results in Table 6.16 show an F-statistic of 180.192, which was highly significant (that is, $p<0.05$). This show that the hypothesised variables namely SCI initiatives, performance improvement drivers, organisation environmental forces, workforce and management support, financial factors, flow and integration, information sharing and technology adoption as well as dedicated SCI fit well in the model with the dependent variable as dedicated SCI. This provided justification for further multiple regressions testing.

The result of the hypothesised relationships between the independent variables and the dedicated SCI is presented in the next sub-section.

6.12.6 Relationship between independent variables and dedicated SCI

Figure 6.8 presents the hypothesised relationship between the selected independent variables and dedicated SCI as the dependent variable, while Table 6.17 shows the empirical results that emerged from the multiple regression analyses of these relationships.

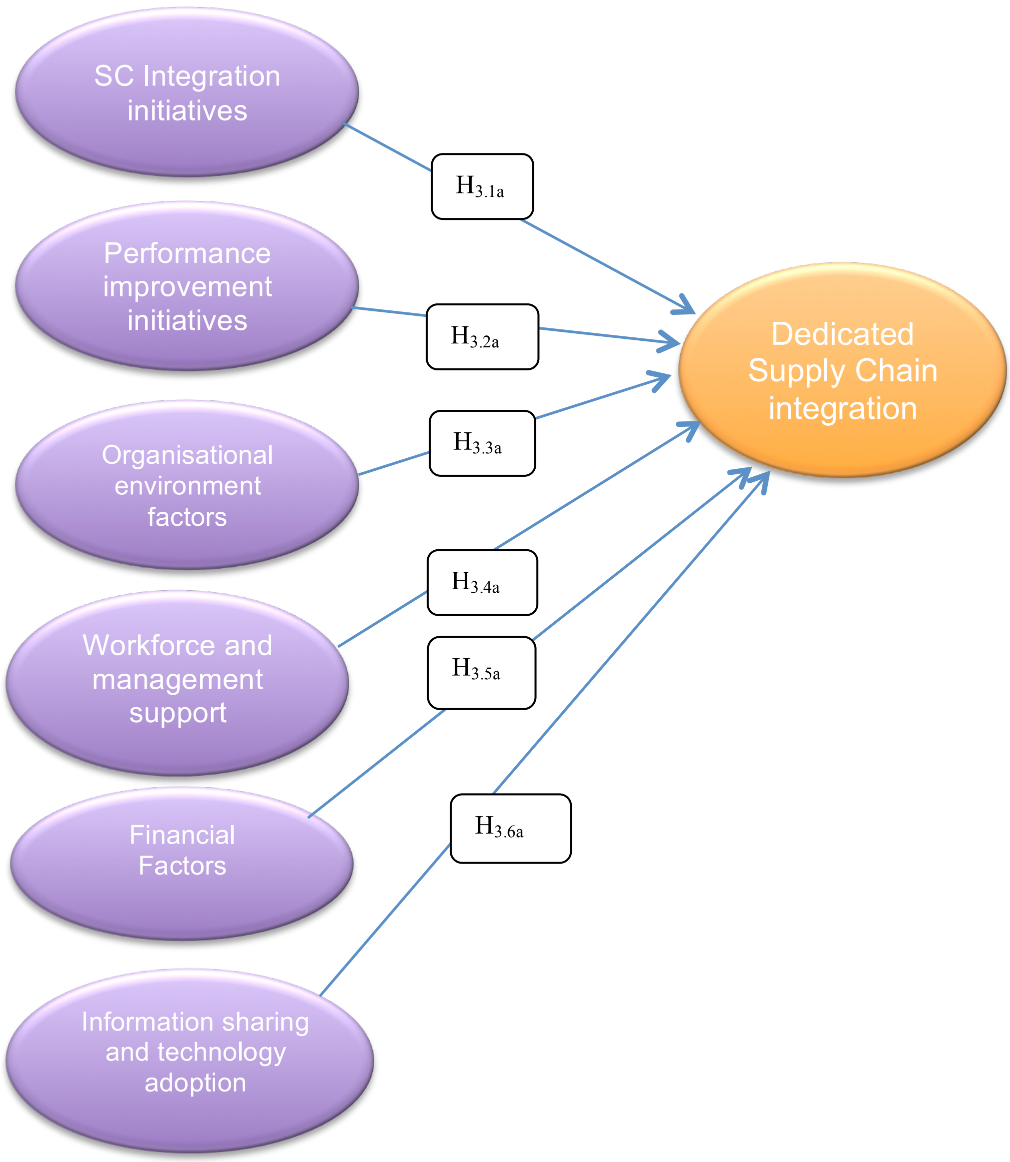

Figure 6.8: Hypothesised relationship between independent variables and dedicated SCI

Source: Researcher's own construct

The R2 of 0.84 in Table 6.17 reveals that the six independent variables together explain 84% in the movement of dedicated SCI. This is an indication that these independent variables play an important role in achieving effective dedicated SCI. Figure 6.8 presents a diagrammatic representation of the hypothesised relationship extracted from the SCI framework.

The hypothesised relationships are tested next.

6.12.7 Results of multiple regression of independent variables on dedicated SCI

Table 6.17 presents the multiple regression results of the various variables on dedicated SCI.

Table 6.17: Results of relationship between independent variables and dedicated SCI

	Beta	T-statistic	Sig. (P-value)	Hypothesis number	Hypothesis
SCI Initiatives	.174	4.354	.000**	$H_{3.1}$	Supported
Performance Improvement Drivers	.211	.411	.682	$H_{3.2}$	Not Supported
Organisation Environmental Forces	.143	.324	.578	$H_{3.3}$	Not Supported
Workforce and Management Support	.212	5.156	.000**	$H_{3.4}$	Supported
Financial Factors, Flow and Integration	.123	3.468	.001*	$H_{3.5}$	Supported
Information sharing and Technology adoption	.714	18.685	.000**	$H_{3.6}$	Supported

Dependent Variable: Dedicated SCI. $R^2 = 0.84$
** $p < 0.001$ * $p < 0.05$

6.12.7.1 Relationship between SCI initiatives on dedicated SCI

The results in Table 6.17 show that there was sufficient evidence of significant statistical relationships (p=0.000) between SCI initiatives and dedicated SCI. Therefore, SCI initiatives significantly influence dedicated SCI. This means that the more SCI initiatives are adopted, the more dedicated SCI will be achieved. This means that the null hypothesis $H0_{3.1}$ was not supported by this empirical result, while the alternative hypothesis $H_{3.1}$ was supported. The t-values (4.354) for this significant variable also exceed the critical table value 1.96 implying that the variable SCI initiatives, highly predicts the dependent variable, the dedicated SCI. The path coefficients of these two variables were positive but weak (0.174).

6.12.7.2 Relationship between performance improvement initiatives on dedicated SCI

Table 6.17 indicates that there does not exist sufficient statistical evidence of significant relationships (p>0.05) between performance improvement initiatives and dedicated SCI. This means performance improvement initiatives do not predict dedicated SCI. It also indicates that the empirical results supported the null hypothesis $H0_{3.2}$, while the alternative hypothesis $H_{3.2}$ was not supported. The path coefficients of these two variables were positive but weak (0.211).

6.12.7.3 Relationship between organisational environmental factors on dedicated SCI

Table 6.17 shows there was no statistically significant relationship (p>0.05) between organisational environmental factors and dedicated SCI. This means that organisational environmental factors do not significantly influence or predict dedicated SCI. It also means that the empirical results supported the null hypothesis $H0_{3.3}$, while they did not support the alternative hypothesis $H_{3.3}$. The path coefficients of these two variables were positive but weak (0.212).

6.12.7.4 Relationship between workforce and management support on dedicated SCI

Table 6.17 shows workforce and management support was significantly related ($p < 0.05$) to dedicated SCI. This means that the more workforce and management support is offered by the organisation, the more dedicated SCI will be realised. This results means that null hypothesis $H0_{3.4}$, was not supported, while the alternative hypothesis $H_{3.4}$ was The t-value (5.156) for this significant variable also exceeds the critical table value 1.96 implying that the variable workforce and management support, highly predicts the dependent variable, the dedicated SCI. The path coefficients of these two variables were positive but weak (0.212).

6.12.7.5 Relationship between financial factors flow and integration on dedicated SCI

Table 6.17 indicates that there was significant relationships ($p<0.05$) between financial factors flow and integration between dedicated SCI. This reveals that that the more financial factors flow and integration are provided the more dedicated SCI will be achieved. It also indicate that the empirical results did not support the null hypothesis $H0_{2.5}$, while the alternative hypothesis $H_{2.5}$ was.

6.12.7.6 Relationship between information sharing and technology adoption on dedicated SCI

Table 6.17 shows there was statistically significant relationships (p=0.005) between information sharing and technology adoption and dedicated SCI. This indicates that enhancing information sharing and technology adoption leads to achievement of dedicated SCI. This means that the empirical results did not support the null hypothesis $H0_{3.6}$, while they supported the alternative hypothesis $H_{3.6}$. The path coefficients of these two variables were positive but weak (0.714).

The results in this cluster suggest that the managers do not regard the organisation environmental forces and performance improvement drivers crucial in influencing dedicated SCI in hospital pharmacies.

6.12.8 Summary results of multiple regression of independent variables on dependent variables

Table 6.18 presents a summary of the significant multiple regression results depicted in Tables 6.22, 6.23 and 6.24. The dependent variables included customer order fulfilment, supplier collaborations and dedicated SCI. The independent variables included SCI initiatives, performance improvement drivers, organisation environmental forces, workforce and management support, financial factors, flow and integration as well as information sharing and technology adoption.

Table 6.18: Summary of significant multiple regression results

Dependent: Customer order fulfilment	Beta	T-value	Sig. (*p*)	Hypothesis number	Hypothesis
SCI initiatives	-.087	-.971	.332	$H_{1.1}$	Not supported
Performance improvement drivers	.050	.683	.495	$H_{1.2}$	Not supported
Organisation environmental forces	.118	1.649	.100	$H_{1.3}$	Not supported
Workforce and management support	.224	2.975	.003**	$H_{1.4}$	Supported
Financial factors, flow and integration	.105	2.001	.044*	$H_{1.5}$	Supported
Information sharing and technology	.364	5.184	.000**	$H_{1.6}$	Supported
Supplier collaborations	.344	4.489	.000**	$H_{1.7}$	Supported
Dedicated SCI	.393	5.123	.000**	$H_{1.8}$	Supported
Dependent: suppliers collaborations					
SCI initiatives	.038	5.690	.016*	$H_{2.1}$	Supported
Performance improvement drivers	.383	6.753	.000**	$H_{2.2}$	Supported
Organisation environmental forces	-.048	-1.061	.290	$H_{2.3}$	Not supported
Workforce and management support	.009	2.864	.015*	$H_{2.4}$	Supported
Financial factors, flow and integration	.043	2.726	.038*	$H_{2.5}$	Supported
Information sharing	.157	1.975	.021*	$H_{2.6}$	Supported
Dedicated SCI	.450	4.877	.000**	$H_{2.7}$	Supported
Dependent: dedicated SCI					

SCI initiatives	-.174	-4.354	.000**	$H_{3.1}$	Supported
Performance improvement drivers	.211	.411	.682	$H_{3.2}$	Not supported
Organisation environmental forces	.143	.324	.578	$H_{3.3}$	Not supported
Workforce and management support	.212	5.156	.000**	$H_{3.4}$	Supported
Financial factors, flow and integration	.123	3.468	.001*	$H_{3.5}$	Supported
Information sharing and technology adoption	.714	18.685	.000**	$H_{3.6}$	Supported

*p <0 .001 **p <0 .05

As can be observed from Table 6.18, fifteen statistically significant relationships were found. The first set of relationships is between customer order fulfilment and workforce and management support, financial factors, flow and integration, information sharing and technology adoption, supplier collaborations as well as dedicated SCI.

The second set of relationships is between supplier collaborations and SCI Initiatives, performance improvement drivers, workforce and management support, financial factors, flow and integration and information sharing and technology adoption while the third set of relationship is between dedicated SCI and SCI initiatives, workforce and management support, financial factors, flow and integration as well as Information sharing and technology adoption.

However, six non-significant relationships were also observed. The first set of non-significant relationships was between customer order fulfilment and SCI initiatives, performance improvement drivers and organisation environmental forces. The second set of non-significant relationships was between supplier collaborations and organisation environmental forces while the third set of relationship were between dedicated SCI and performance improvement drivers and organisation environmental forces.

6.13 RESULTS OF DESCRIPTIVE STATISTICS

The raw data were analysed to assess the general responses to the questionnaire statements on the variables as they were originally defined for the study. A five-point Likert scale consisting of strongly agree, agree, undecided/neutral, disagree and strongly disagree was used. The questionnaire statements were subjected to descriptive statistics whereby Mean, Standard Deviation and Variances were computed to assess the level of agreement of the respondents on the stated options. The statements in the questionnaire were based on the five-point Likert scale which varied from strongly disagree (SA) = 1 to strongly agree (SD) = 5.

In the next section, the researcher presents the results of the descriptive statistics on the individual items used to measure the SCI initiatives variable of the study.

6.13.1 Descriptive statistics for SCI initiatives

Table 6.19 presents the results of the descriptive statistics on the individual items used to measure the SCI initiatives variable.

Table 6.19: Results of descriptive statistics of SCI initiatives

SCI initiative	Mean	Std. Deviation	Variance
Inter-departmental process integration within the pharmacy	3.42	.868	.754
Integration with valued first-tier customers	3.14	.944	.892
Integration with important first-tier suppliers	3.43	.865	.748
Complete customers and suppliers SCI	3.39	.962	.926
The pharmacy promotes integration through use of information technology	3.10	1.002	1.005
Ability to handle expected challenges	3.73	.949	.901
Presence of good organisational culture that supports SCI	3.28	.822	.676

Table 6.19 indicates that the variable produced a mean score, which ranged from 3.10 to 3.73 on a 5-point scale. This indicates that the responses tends towards neutral response however, the ability to handle expected challenges rated highest on the Likert scale with a mean of 3.73 which indicate that the respondent tends toward agreeing that this variable has an influence on the dependent variable. The variance scores were relatively low and mainly below one except for the question that *"pharmacy promotes integration through use of information technology*" which was 1.005. These results indicate that there was not much variability around the mean scores.

6.13.2 Descriptive statistics for performance improvement drivers

Table 6.20 shows the results of the descriptive statistics of performance improvement drivers.

Table 6.20: Descriptive statistics of performance improvement drivers

Performance improvement driver	Mean	Std. Deviation	Variance
The pharmacy has explicitly strategy on SCI	3.34	.857	.734
My pharmacy has a central procurement unit	3.49	.973	.946
Efficiency in order fulfilment is a core driver of our SCI	3.35	.887	.787
Cost reduction is another core driver of our SCI	3.49	.880	.774
Product delivery cycle time	3.34	.955	.912
Timeliness of after sales service	3.30	.971	.943
Productivity improvements such as assets, operating costs, labour costs	3.43	.840	.705
Increasing sales of existing products	3.25	.991	.982
Finding new revenue streams such as new products, new markets	3.18	.959	.919
Strong and continuous bond with customers	3.52	.965	.931

As can be seen in Table 6.20, the responses tend towards neutral (rating 3) regarding whether the various items affect the dependent variable. The lowest mean score being 3.18 for finding new revenue streams such as new products, new markets and the highest being strong and continuous bond with customers rating 3.52 on the Likert scale indicating that the respondents were unsure of the relationship between the various items of the performance improvement drivers on the dependent variable. The variance scores were relatively low and mostly below one, indicating not much variability around the mean scores.

6.13.3 Descriptive statistics on organisation environmental forces

Table 6.21 show the results of the descriptive statistics of the various items comprising the organisation environmental forces.

Table 6.21 indicates that the responses tend towards agree (rating 4) on the 5-point Likert scale with the lowest being 3.59 for government initiated integration efforts and the highest being 3.93 for desire to improve customer satisfaction. This indicates that the respondents agree on the various items to influence the SCI process. The variance scores were relatively low and mostly below one, indicating not much variability around the mean scores.

Table 6.21: Descriptive statistics of organisation environmental forces

Organisation environmental force	Mean	Std. Deviation	Variance
Government initiated integration efforts	3.59	.771	.594
Desire to improve customer satisfaction	3.93	.676	.457
Desire to lower supply chain costs	3.85	.713	.508
Desire to focus on core competence in services	3.71	.790	.624
Opportunity to build the best team of supply chain partners	3.60	.751	.563

6.13.4 Descriptive statistics for workforce and management support

Table 6.22 show the results of the descriptive statistics of the various questionnaire items for workforce and management support.

Table 6.22: Descriptive statistics for workforce and management support

Workforce and management support	Mean	Std. Deviation	Variance
We have adequate staff to support supply chain demands	2.82	.909	.826
Staff are well trained and equipped on SC demands	3.29	.883	.780
Top management is committed to SCI process	3.41	.923	.852
Staff value SCM	3.46	.747	.557
The organisation is structured for internal SCI	3.45	.841	.707

As can be seen in Table 6.22, the responses tend towards neutral (rating 3) on the Likert scale with the lowest being 2.82 for adequate staff to support supply chain demands and the highest being 3.46 staff value SCM. However, a mean of 2.82 (which tends towards 3 – neutral) for adequate staff to support SC demands indicates that the respondents are indifferent on adequacy of staff to support SC demands. The variance scores were relatively low and mostly below one, indicating not much variability around the mean scores.

6.13.5 Descriptive statistics financial factors, flow and integration

Table 6.23 presents the results of the descriptive statistics of the various questionnaire items comprising the financial factors, flow and integration.

As can be observed from Table 6.23, the responses tend towards agree (rating 4) on the 5-point Likert scale. The lowest was 3.37 for the use of activity based costing for key SC processes such as inventory, storage, transportation and the highest being 4.29 for Pharmacy has a capacity to project future supply demands and budget accordingly. This indicates that the respondents agree on the various items to influence the SCI process. The variance scores were relatively low and mostly below one, indicating not much variability around the mean scores.

Table 6.23: Descriptive statistics of financial factors, flow and integration

Financial factors, flow and integration	Mean	Std. Deviation	Variance
Pharmacy has sufficient funds to procure drugs demanded by customer	3.94	1.042	1.086
Pharmacy has a capacity to project future supply demands and budget accordingly	4.29	.855	.731
Government allocates full amount to meet all financial requirements as requested through annual budgets	3.74	.932	.869
Capital efficiency, working and fixed, is maximised across the pharmacy's SC	4.15	.809	.654
The pharmacy's account receivables processes are automatically triggered when we ship to our customers	4.03	.902	.813
Account payable processes are automatically triggered when we receive supplies from our suppliers	4.19	.905	.818
Use of activity based costing for key SC processes such as inventory, storage, transportation	3.37	.775	.600

6.13.6 Descriptive statistics for information sharing and technology adoption

Table 6.24 presents the results of the descriptive statistics of the various questionnaire items for information sharing and technology adoption.

Table 6.24: Results of descriptive statistics of information sharing and technology adoption

Information sharing & technology adoption	Mean	Std. Deviation	Variance
Procurement and delivery schedules are shared across the SC	3.48	.842	.709
Performance metrics are shared across the SC	4.33	.872	.760
SC members collaborate in arriving at demand forecasts	4.38	.794	.630
Our downstream partners such as distributors, wholesalers, retailers share their actual sales data with us	4.15	.920	.847
Inventory data are visible at all steps across the SC	3.36	.974	.948
Order fulfilment and shipment status are tracked at each step across the SC	4.40	.941	.885

The findings in Table 6.24 reveals that the responses tend towards agree (rating 4) on the 5-point Likert scale with the lowest being 3.36 for Inventory data are visible at all steps across the SC and the highest being 4.40 for order fulfilment and shipment status are tracked at each step across the SC. This indicates that the respondents agree on the various items to influence the SCI process. The variance scores were relatively low and mostly below one, indicating not much variability around the mean scores.

6.14 SUMMARY

In this chapter, the researcher analyses the empirical data and presents the survey results. Data collected from the survey was statistically analysed and interpreted. The variables influencing SCI have also been identified and discussed. Firstly, it has been shown that the study achieved 86.2% response rate, which is a high rate. The success is mainly attributed to the use of research assistants to deliver questionnaires to the respondents as opposed to mailing. Secondly, in the chapter, the researcher presented data cleaning and verification process with Z-Statistic Test done to assess the data for normal distribution.

The measure of Sampling Adequacy and Sphericity was done using Kaiser-Meyer-Olkin (KMO test) and Barlett's Test respectively which confirmed that the data set was adequate and did not conform to an identity matrix. Exploratory factor analysis was done for validity assessment whereby principal axis factoring was specified as the method for factor extraction while Varimax rotation with Kaiser Normalisation was specified as the method of factor rotation. The minimum loading threshold was set at 0.4 for all the factors.

In addition, the Cronbach alpha coefficients were computed to assess the reliability data collected and were compared with those of the pilot study. However, a significant improvement in Cronbach alpha values were noted from the pilot study results. The VIF and tolerance statistics were computed to test for multi-collinearity diagnostics and were found to be highly significant. In addition, the correlation analysis among the study variables was also done. The hypothesised relationships were revised based on the results of the validity and reliability assessment. The revised hypotheses were then tested whereby significant variables were extracted using multiple linear regression analysis.

CHAPTER SEVEN

INTERPRETATION OF EMPIRICAL FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

In the previous Chapter, the field data was analysed and the empirical findings presented and discussed. In Chapter Six, the researcher outlined the preliminary analysis, which includes an assessment of the response rate, KMO test, Barlett's tests, sample size and the demographic information. In that chapter, the reliability and validity of the measuring instrument was assessed using Factor Analysis and Cronbach Alpha computations respectively which resulted in the revision of the hypothesised relationships model. The revised SC model was subjected to statistical testing whereby Analysis of Variance (ANOVA), Z-Statistic test, multi-collinearity diagnostics and Multiple Linear Regression analysis among other statistical tests were utilised. The sets of hypotheses were also re-formulated and tested alongside the revised hypothetical model whereby significant variables were extracted.

In this chapter, the researcher interprets the empirical findings, presents a summary of the study, draws conclusions and makes recommendations providing a framework for SCI. The main aim of this study is to assess ways of improving SCI in public hospital pharmacies in Kenya. More specifically, the study explored the factors affecting SCI in public hospital pharmacies with special focus on customer order fulfilment, supplier collaboration and dedicated SCI. In the next section, discussions on how the objectives of the study were met are presented.

7.2 HOW THE OBJECTIVES OF THE STUDY WERE MET

The primary objective of this study was to assess the factors affecting SCI in public hospital pharmacies in Kenya. This objective was achieved by seeking the perceptions of SC practitioners and managers in public hospitals and in pharmacies. The secondary objectives of the study included:

- ⇒ To undertake a detailed theoretical investigation into the factors affecting SCI in public hospital pharmacies in Kenya;
- ⇒ To propose a SCI framework regarding the implementation of SCI in public hospital pharmacies in Kenya;
- ⇒ To test the proposed model empirically by assessing the factors affecting SCI in public hospital pharmacies in Kenya;
- ⇒ To provide guidelines for effective implementation of SCI in public hospital pharmacies in Kenya; and
- ⇒ To formulate policy recommendations, strategies and solutions aimed at addressing the various inefficiencies experienced in the public hospital pharmacies integrated SC in Kenya.

The statistically significant variables that managers should pay attention to for improvement of SCI were presented in the research findings in Chapter Six. Table 7.1 indicates how the secondary objectives in this study were met.

As can be seen in Table 7.1, the first objective sought to undertake a detailed theoretical investigation into the factors affecting SCI in public hospital pharmacies in Kenya. This was met in Chapters Two, Three and Four. In Chapter Two, the issues of SC and the healthcare sector framework were addressed. The framework for the healthcare sector SC, healthcare financing in Kenya and the Kenyan pharmaceutical market were reviewed. Additionally in this Chapter, the healthcare sector policy and regulatory framework in Kenya, the SCs in the Kenyan health sector and role of KEMSA in the medical SC in Kenya were discussed. Additionally, studies on healthcare SC in Kenya as well as challenges in the healthcare sector are reviewed here.

In Chapter Three, literature on SCM and SCI was reviewed. The researcher explored the global overview of SCM and integration as well as the role of logistics in SCI. Other issues addressed in the chapter include SCM in hospitals and pharmacies, inventory management approaches in hospitals as well as inefficiencies encountered within the SC.

Table 7.1: How secondary objectives were met

Objectives of the study	How and where it was achieved
To undertake a detailed theoretical investigation into the factors affecting SCI in public hospital pharmacies in Kenya.	This objective was achieved in the literature review and the detailed discussion contained in Chapters Two, Three and Four. These chapters involved a contextualisation of the healthcare sector in Kenya, review of literature and identification and interpretation of SCM and SCI theories, with the aim of determining the foundations of the SCI framework.
To propose an SCI framework regarding the implementation of SCI in public hospital pharmacies in Kenya.	This has been achieved by using the constructs identified in the literature to construct a SCI framework. The proposed framework was further used to develop the logical framework that depicted the hypothesised relationships as shown in section 4.5.
To analyse the proposed model empirically by assessing the relationships of factors affecting SCI in public hospital pharmacies in Kenya.	This objective has been achieved in Chapter Six where statistically significant variables were extracted using various statistical techniques as discussed in that chapter.
To provide guidelines for effective implementation of SCI in public hospital pharmacies in Kenya.	This objective is achieved in section 7.6 where the researcher presents a framework and guidelines for effective implementation of SCI in public hospital pharmacies in Kenya.
To formulate policy recommendations, strategies and solutions aimed at addressing the various inefficiencies experienced in the public hospital pharmacies SC in Kenya.	This is achieved in section 7.4, where the researcher presents recommendations for each of the identified factors influencing SCI in public hospital pharmacies.

As indicated in Table 7.1, Chapter Four, the theoretical models and propositions were discussed. The researcher presented the theoretical models of SCM and logistics as based on the literature reviewed and presented the proposed SCI framework for hospital pharmacies in Kenya. In the chapter the researcher also covered the study hypotheses formulated from the SCI framework for public hospital pharmacies in Kenya as substantiated by secondary sources.

The second objective sought to propose an SCI framework regarding the implementation of SCI in public hospital pharmacies in Kenya. This has been achieved by development of an SCI framework based on the reviewed theoretical constructs. A questionnaire was developed covering issues of the identified constructs in the hypothesised relationships model. This questionnaire was used to collect data from respondents and is presented in Annexure B.

The third objective sought to analyse the proposed model empirically by assessing the relationships of factors affecting SCI in public hospital pharmacies in Kenya. This has been achieved in Chapter Six where managers' perceptions regarding SCI and management were presented. Statistically significant variables were extracted using various statistical techniques as discussed in Chapter Six. The Multiple Linear Regression was used to test whether the hypothesised relationships were significant.

The fourth objective sought to provide guidelines for effective implementation of SCI in public hospital pharmacies in Kenya. This objective has been achieved in this section 7.6. In that section, the researcher outlined the framework and the guidelines for effective implementation of SCI and SCM in public hospital pharmacies in Kenya.

The fifth objective sought to formulate policy recommendations, strategies and solutions aimed at addressing the various inefficiencies experienced in the public hospital pharmacies SC in Kenya. This objective has been achieved in section 7.4 where the recommendations are presented for each of the identified factors influencing SCI in public hospital pharmacies.

7.3 CONCLUSIONS AND RECOMMENDATIONS ON STATISTICALLY SIGNIFICANT RELATIONSHIPS

In the next sections, the conclusions and recommendations of the statistically significant relationships categorised under customer order fulfilment, supply collaborations and dedicated SC factors are presented.

7.3.1 Conclusions and recommendations on customer order fulfilment

Five statistically significant relationships were found between customer order fulfilment, workforce and management support, financial factors, flow and integration, information sharing and technology, supplier collaborations and dedicated SCI.

7.3.1.1 Workforce and management support

Workforce and management support ($H_{1.4}$) provides sufficient evidence of statistically significant relationships ($p<0.05$) between the workforce and management support and customer order fulfilment. This shows that the managers of public hospital pharmacies believe that the existing human resources and management competencies within the public pharmacies positively influence the customer order fulfilment in the public hospital pharmacies in Kenya.

This finding supports the observation by Helms et al., 2000, that the management of the organisation provides direction to workers as they pursue a common mission within the organisation. The perceptions of managers in public hospital pharmacies in Kenya are that the top management is committed to SCI process and that the organisation is structured for internal SCI.

The managers of public hospital pharmacies in Kenya agree that SC efficiency through the information sharing and timely customer order fulfilment can significantly reduce costs of healthcare delivery as well as increase the quality of life through the efficient healthcare services. This observation is in line with Sundarraj and Talluri (2003) who found that sharing and coordination of information across the SC at the right time are major factors to improving the SCI.

These results are consistent with Wang and Shyu (2009) who argued that highly trained, skilled and motivated employees are likely to contribute positively to SCI. Qualified top management that is committed to their work can tap into the human potential which can enhance the SCI process. Similar views were expressed by Rao (2009) who argued that staff with the relevant knowledge, skills, abilities and creativity could be used by the organisation to correctly deal with specific challenges facing organisations, thereby increasing efficiency in SCI.

It is recommended that Kenyan public hospital managers:

- ⇒ Should make sure that staff are adequately trained and equipped on SC demands. This would prepare them to handle all issues affecting SCI to ensure it fully meets all the demands of the end users (customers). This is particularly important given that many of them are technical specialists (nurses, doctors and pharmacists); and
- ⇒ Should make sure that the staff have adequate knowledge on value of SCM.

This would ensure they add value to SCI.

7.3.1.2 Financial factors, flow and integration

Financial factors, flow and integration ($H_{1.5}$) provide sufficient evidence of statistically significant relationships ($p<0.05$) between the financial factors, flow and integration and customer order fulfilment. This indicates that the managers of public hospital pharmacies believe that the financial factors, flow and integration play a critical role in ensuring customer order fulfilment.

These findings are consistent with David (2007) who argued that financial resources play a key role in the management of SC and emphasised the need for a thorough audit to make sure accountability of all financial resources allocated for specific tasks in the SC. According to Salmi and Hauptman

(2006), failure by an organisation to properly control and audit the use of the finances can result in ineffective SC and overall poor delivery of services to the end users. The findings also concur with Thompson, Strickland and Gamble (2008), who emphasise the importance of adequate financing in all stages of the SC to enhance efficient coordination and flow of resources throughout the chain.

It is recommended that Kenyan public hospital managers:

- ⇒ Should source for alternative funding to supplement government funding. This would ensure that the pharmacies have sufficient funds to procure drugs demanded by customer at all-time hence cushioning the pharmacy against possible drugs stocks outs. Cost savings in the SC would also contribute to better management of cash flow in the SC. This would actually free up cash to use for systems improvement;
- ⇒ Make sure that the pharmacy has an efficient integration of processes and information interchange that has a capacity to project future supply demands for proper coordination;
- ⇒ Properly liaise with the government to make sure it allocates and timeously releases full amount requested through annual budgets to facilitate the public pharmacies procure all planned supplies; and
- ⇒ Need to adopt effective use of activity based planning and costing for key SC processes such as inventory, storage and transportation. This would ensure early detection of any inefficiency and correct it before affecting the entire SC.

7.3.1.3 Information sharing and technology adoption

This study demonstrated that information sharing and technology adoption ($H_{1.6}$) was statistically significant and therefore had a positive relationship with customer order fulfilment. This depicts that managers of public hospital pharmacies in Kenya agree that information sharing and technology adoption is related to customer order fulfilment. Information systems were viewed as providing infrastructural support to the value chain and having an indirect impact on the competitiveness and efficient customer order fulfilment.

This finding is in line with Gattorna (2006), Rushton (2010) and Williams, Harrison and Jordan (2004), who found that with intensification of competition, firms started to utilise information systems to directly influence the processes comprising the value chain for efficient service delivery. Similar findings were obtained by Lee et al. (1997) who argued that the order fulfilment and transportation status should be electronically tracked at each step across the SC and that the downstream partners such as distributors, wholesalers, retailers need to share their actual sales data with the hospital pharmacies to avoid bullwhip effect in the SC.

In addition, managers believe that public hospital pharmacies tend to implement information technology in order to facilitate product quantification and sending product order information to the KEMSA central stores. This calls for implementation of Enterprise Resource Planning (ERP) system across all public hospital pharmacies in Kenya. ERP systems should be a sector-wide, enterprise-wide information system designed to coordinate all the resources, information and activities needed to complete SC processes such as order fulfilment (Wieder et al., 2006).

Benefits gained from information technology as a key SC facilitation tool are enormous since it enhances competitive advantage by enabling traceability and contributing to improvements in efficient and safe customer order fulfilment. This supports the finding by Fink and Holden (2005) and Phan (2003) who observed that the ability for a firm to share information and knowledge across department, company and global boundaries is a competitive advantage for many organisations in the twenty-first century marketplace. In addition, the finding supports the conclusion by Fawcett (2013) that an efficient SCM is, in reality, the management of flow of goods and flows of real-time information.

It is recommended that Kenyan public hospital managers should:

⇒ Make sure that procurement and delivery schedules are shared across the SC. This would ensure that all players within the pharmacy SC are aware of the pharmacy orders and requirements in order plan to satisfy them in good time;

⇒ Ensure that the upstream partners such as distributors, wholesalers and retailers share their actual sales data with the hospital pharmacies;

⇒ Collaborate with the Government through Ministry of Health to develop uniform product identification across all public hospital pharmacies in Kenya. This would involve developing unique national product identification standards for the healthcare industry in Kenya, as well as adopt the existing global standard;

⇒ Share the inventory data across the SC and make sure it is visible at all steps across the SC to enhance proper and transparent integration of processes;

⇒ Collaborate with the all the SC players in arriving at demand forecasts to eliminate wastage; and

⇒ The Government should deploy an online Enterprise Resource Planning (ERP) as a key SCI facilitator. The ERP is aimed at sharing and visualising all the data related to all materials and information moved within the integrated supply across the country.

7.3.1.4 Supplier collaborations

Supplier collaborations ($H_{1.7}$) provide sufficient evidence of statistically significant relationships ($p<0.05$) between the supplier collaborations and customer order fulfilment. This indicates that the managers of public hospital pharmacies believe that supplier collaborations positively influence customer order fulfilment.

These results are consistent with Lambert (1998) who argued that the nature of the relationship between the suppliers and customer is critical if the two parties are to survive and co-exist together. Further, he argued that partnership relationships should exist between the suppliers and the customers. This view was shared by Sorce and Edwards (2004) who argued that suppliers need to emphasise on the structured and documented relationships with the SC which are key to their understanding of each other for their mutual benefits.

It is recommended that Kenyan public hospital managers should:

- ⇒ Collaborate and forge reliable partnership with upstream partners such as suppliers, distributors and retailers among others. This would make sure that they receive procured goods and services timely and in good conditions;
- ⇒ Partner with key suppliers and ensure they get competitive price bargains to guarantee they receive products and services at fair prices, which ultimately would reduce the cost of administering the services to the end users;
- ⇒ Strive to maintain good and constant communication with upstream and downstream players such as manufacturers, suppliers, distributors and consumers to facilitate free flow of information within the SC; and
- ⇒ Use Key Performance Indicators (KPIs) in selecting and judging reliable upstream partners such as manufacturers, distributors and suppliers among others as well as use service level agreements or contracts to help maintain the healthy relationships among SC parties.

7.3.1.5 Dedicated supply chain integration

This study demonstrated that dedicated SCI ($H_{1.8}$) was statistically significant and therefore had a positive relationship with customer order fulfilment ($p<0.05$). This implies that managers of public hospital pharmacies in Kenya agree that dedicated SCI is related to customer order fulfilment. Dedicated SCI encompasses the management behavioural issues, which may have impact on organisation's ability to integrate management processes in the hospitals. It also denotes the nature of management orientation towards the customers and suppliers.

The results indicate that managers of public hospital pharmacies in Kenya believe that standard product specification and nomenclature ensures order consolidation and timely re-ordering at central KEMSA stores and that the requisitioned drugs are timely delivered to public hospital pharmacies. Through the utilisation of information systems, organisations are able to integrate similar functions spread over different geographical areas as well as eliminate unnecessary activities and processes, thereby improving their capability to cope with the complex needs of their customers. This finding supports the observation by Fawcett et al., (2012) that getting the right product, at the right price and at the right time to the consumer is not only critical to competitive success but also key to organisation's survival. In addition, Droodchy and Nick-Mehr (2008) concede that in a SC, efficiency and responsiveness of partners depend on accuracy and amount of information sharing with each other.

It is recommended that Kenyan public hospital managers should:

⇒ Ensure that the pharmacies have standardised key data elements (such as customer, order, part number) in line with those across the SC. This would make sure that all the suppliers know when to supplied products and services stock outs are recorded;

⇒ Improve on the traceability of the products along the SC. This can be done by increasing and enhancing the automatic data capture systems and use the latest technology such as bar code reader, fingerprint technology among others for ease of product management and authentication across the SC;

⇒ Need to collaborate with the upstream partners to ensure that consistent storage of same data (such as order status) in different databases across the SC to avoid confusion of the orders. To enhance this corroboration, the public hospital pharmacies must develop mutual trust and share information with all the players involved in the SC;

⇒ Coordinate the manufacturer, distributors, suppliers and logistics partners to deliver products and materials just in time. This would make sure that inventory holdings is minimised across the SC to avoid wastage;

⇒ Ensure that in key partner relationships, trust and goodwill have the same or greater, significance as formal contracts and that the information about procedures and cost structures are shared. To achieve this the distribution networks need to be configured to minimise total supply-chain-wide inventory costs; and

⇒ Adopt technology systems such as RFID system (tags, meters and readers), Global Positioning System (GPS) and other devices would increasingly generate on demand SC information.

7.3.2 Conclusions on supplier collaborations

The results showed that a total of six statistically significant relationships exist between the supplier collaborations and SCI initiatives, performance improvement drivers, workforce and management support, financial factors, flow and integration, information sharing and technology adoption as well as dedicated SCI.

Specifically, the study demonstrated that the SCI Initiatives ($H_{2.1}$) was statistically significant and therefore had a positive relationship with supplier collaborations ($p<0.05$). This implies that managers of public hospital pharmacies in Kenya agree that SCI Initiatives is directly related to supplier collaborations.

The performance improvement drivers ($H_{2.2}$) were also found to have a statistically significant relationship with supplier collaborations ($p<0.05$). This indicates that performance improvement drivers positively influenced supplier collaborations public hospital pharmacies in Kenya. This implies that the managers of public hospitals and pharmacies in Kenya believe that performance improvement drivers directly influence supplier collaborations of public hospital pharmacies in Kenya. This finding is further supported by Goyal and Joshi (2003), who noted that collaboration and sharing of vital resources between suppliers and other downstream players is becoming increasingly crucial with the rising competition and globalisation. Collaboration includes creation and sharing resources such as knowledge and facilities.

The study further demonstrated that the workforce and management support ($H_{2.3}$) had a statistically significant relationship with supplier collaborations ($p<0.05$). This shows that the managers of public hospitals and pharmacies in Kenya agree that workforce and management support positively influence supplier collaborations public hospital pharmacies in Kenya.

This finding supports the argument by Crook and Combs (2007), that stronger managerial collaboration among chain partners result in the use of their bargaining power when task interdependence is low but refrain its use when task interdependence is high. Pfeffer and Salancik (1978) are of the view that although having adequate skilled human resources in some chain partners may give rise to non-interdependencies, constructive interactions between the SC partners may result in stronger linkages and great bargaining powers.

Further, financial factors, flow and integration ($H_{2.5}$) had a statistically significant relationship with supplier collaborations ($p<0.05$). This indicates that the managers of public hospitals and pharmacies in Kenya believe that financial factors, flow and integration could significantly affect supplier collaborations. In addition, information sharing and technology adoption ($H_{2.6}$) was found to have a statistically significant relationship with supplier collaborations ($p<0.05$) which show that managers of public hospitals and pharmacies in Kenya agree that information sharing and technology adoption could influence supplier collaborations in Kenya's public hospital pharmacies.

The managers of public hospital pharmacies believe that the information should be shared on real-time by all SC partners facilitated by Internet. These findings concur with Zhu and Kraemer (2005) who conceded that organisations that are fast in adopting the use of technology in their SC networks have a competitive advantage over non-technology adopters. Combe, (2006) support this view and posit that technology has provided new channels of communication and transaction between suppliers, organisation, customers and other players in the SC. However new technologies require new work patterns, incentive systems, occupational mobility and fresh attitudes to acceptance of change.

Finally, the study showed that dedicated SCI ($H_{2.7}$) had a statistically significant relationship with supplier collaborations ($p<0.05$). This shows a direct linear association between dedicated SCI and supplier collaborations. This shows that the managers of public hospitals and pharmacies in Kenya believe that dedicated SC significantly influence supplier collaborations Kenya’s public hospital pharmacies. This implies that the managers of public hospitals and pharmacies in Kenya agree that proper guideline on product coding standardisation and health facility geo-mapping is crucial since it could enhance faster distribution of pharmaceutical products across the country.

It is recommended that Kenyan public hospital managers should:

⇒ Collaborate with the Government to deploy an online Enterprise Resource Planning (ERP) as a key SCI facilitator. The ERP should be aimed at sharing and visualising all the data related to all materials and information moved within the integrated supply across the country;

⇒ Fast track the implementation of medical products standard code and shared online system to enable health facilities and KEMSA to identify and track medical products along the SC. This intervention would make sure correct products are ordered and delivered to correct locations, leading to an efficient in the SC operations; and

⇒ Facilitate data standardisation which encompasses the unique codification system for all materials and information flow in the chain. These include product data, customer data and procedure data. This would enhance the identifications and traceability of medical products in the SC and other materials and information flow from the suppliers, manufacturers, distributors, healthcare providers and involved government players in the chain. All SC partners must implement the same data standard and system so that they can speak the same electronic language.

7.3.3 Conclusions on dedicated supply chain

Four statistically significant relationships were found between the dedicated SC and SCI initiatives, workforce and management support, financial factors, flow and integration, information sharing and technology adoption.

Specifically, the findings showed that SCI initiatives ($H_{3.1}$) had a statistically significant relationship with dedicated SC which implied that the managers of public hospitals and pharmacies in Kenya believe that SCI initiatives positive influence dedicated SC. The findings agree with Lummus, Vokurka and Krumwiede, (2008) who argued that once the product has been manufactured, it is very important that there should be an adequate plan to distribute it to the customers. In supporting this view, Srivastava and Srivastava (2006) proposed a hierarchy for the relationship between logistics and SCM to facilitate organisations to be more responsive to customers' needs.

The workforce and management support ($H_{3.4}$) was also found to have a statistically significant relationship with dedicated SC. This indicates that the managers of public hospitals and pharmacies in Kenya agree that workforce and management support directly influence dedicated SC in public hospital pharmacies in Kenya. These findings are similar to Yang (2011) who argued that managers within the SC get crucial information from employees and that employees play an important role by adding value to all tasks within the SC. The employees are the resource that facilitates timely operations within the SC.

In addition, financial factors, flow and integration ($H_{3.5}$) had a statistically significant relationship with dedicated SC. This implied that the managers of public hospitals and pharmacies in Kenya fully agree that financial factors, flow and integration could influence the dedicated SCI. This agrees with Meade and Sarkis (2002) argument that the managers in the SC should manage product returns in a reverse logistics by focusing on product ownership data, average life cycle of products, past sales and forecasted demand. This approach helps to meet the customer demands in a timely manner.

Further, information sharing and technology adoption ($H_{3.6}$) had a statistically significant relationship with dedicated SC. This indicates that the managers of public hospitals and pharmacies in Kenya fully acknowledge that information sharing and technology adoption was positively influencing dedicated SC. These finding agree with Dutrenit (2004) who concedes that information sharing capability contributes to SCI value and performance because it facilitates fast response to the dynamic customer needs. In addition, Kinsey (2005) argued that technological adoptions could help to improve the effectiveness of the SC process with a resultant effect of increased customer satisfaction. Further, information sharing and technology adoption enhances effective communication, which is critical to avoid delays in procurement and distribution processes within the SC. In addition, the findings support assertion by Rahman and Afsar (2008) that timely information sharing is one of the basic capabilities of the SC process.

Information needs to be shared in an interactive system among SC partners and networks. KEMSA and MOH must embrace technology systems such as RFID system (tags, meters and readers); Global Positioning System (GPS) and other devices. This would increasingly generate on demand SC information and reduce need for human interface which is prone to errors.

In the next section, the conclusions and recommendations on the statistically insignificant relationships are presented.

7.4 CONCLUSIONS AND RECOMMENDATIONS ON STATISTICALLY INSIGNIFICANT RELATIONSHIPS

A total of six factors showed no statistically significant relationships with customer order fulfilment, supplier collaborations or dedicated SCI. Specifically, three factors showed no statistically significant relationship with customer order fulfilment and only one factor showed no statistically significant relationship with supplier collaborations while two factors showed no statistically significant relationship with dedicated SCI.

In relation to customer order fulfilment, the study established statistically insignificant relationships for SCI initiatives, performance improvement drivers and organisation environmental forces. This implies that the managers of the public hospitals and pharmacies do not believe that SCI Initiatives, performance improvement drivers and organisation environmental forces could significantly influence customer order fulfilment within the hospital pharmacies. These findings disagree with Danese, Romano and Vinelli (2006) who stated that external inadequacies drive organisations to seek out integration and that external fit influences the type of SCM initiatives to be launched by an organisation. Similar views were expressed by Pieter Van Donk and Akkerman (2008), who claimed that uncertainties and complex business conditions increases the need for integration.

Based on the supplier collaborations, the study established that only organisation environmental forces ($H_{2.3}$) had statistically insignificant relationship. The results seem to indicate that managers of public hospitals and pharmacies do not think that the organisation environmental forces have a major influence on supplier collaborations within the hospital pharmacies. These findings disagree with Rai, Patnayakuni and Seth (2006) who considered environmental forces as a critical aspect that influences the success of a given SC.

Rai et al., (2006) argued that some of the organisation environmental forces can be mitigated by adoption of an integrated information technology infrastructure that enables partners within the SC to develop the higher-order capacity of SC process integration. In supporting this view, Aguirre and Goudge, (2014) emphasised that managerial initiatives should be directed at developing an integrated IT infrastructure and leveraging it to create process capabilities for the integration of resource flows between an organisation and its SC partners. Further, Morrell and Ezingeard (2002) proposed the use of inter-organisational information systems in order to improve SC performance.

In relation to dedicated SCI, organisation environmental forces ($H_{3.2}$) and performance improvement drivers ($H_{3.3}$) were found to have statistically insignificant relationships. This implies that organisation environmental forces and performance improvement drivers did not significantly influence dedicated SCI within the public hospital pharmacies. These results suggest that the managers of the public hospitals and pharmacies do not regard the organisation environmental forces and performance improvement drivers crucial in influencing dedicated SCI in hospital pharmacies.

These findings disagree with Kim (2002) who argued that organisation environmental forces *play a more critical role for sustainable performance improvement in small organisations while, in large organisations, the close interrelationship between the level of SCM practices and competition capability may have more significant effect on performance improvement.* Similar views were expressed by Frohlich and Westbrook (2001) who conceded that performance improvement was key to achieving long-term strong association between both suppliers and customers. In addition, Stratman (2007) proposed that organisations that are seeking SC performance improvements must first establish a foundation of internal functional performance improvement before customer satisfaction and SC benefits can be realised. Therefore, despite that there were no statistically significant relationships for organisation environmental forces and performance improvement drivers with dedicated SCI, the theory has demonstrated existence of such relationships. The recommendations based on these relationships are outlined next.

7.5 FRAMEWORK FOR IMPROVING SUPPLY CHAIN INTEGRATION IN PUBLIC HOSPITAL PHARMACIES IN KENYA

This research study developed an SCI framework that improves understanding of the SCI factors in the public hospital pharmacies in Kenya and their influence on supplier collaborations and customer order fulfilment. The new intervening variable of dedicated SCI was examined.

7.5.1 Recommendation based on dependent variables

The dependent variables of the study were categorised in three main areas as earlier stated, namely: Customer order fulfilment; Supply collaborations; and Dedicated SCI.

Table 7.2: Guidelines for improving customer order fulfilment in public hospital pharmacies in Kenya

No.	The public hospitals and pharmacies managers in Kenya should
a)	Ensure they have good relationship/trust with their third party buyers
b)	Classify inventories according to their importance (critical, important and non-critical)
c)	Adopt collaborative planning, forecasting and replenishment (CPFR)
d)	Make effort to control ordering costs
e)	Engage suppliers with capacity to meet high demand in timely manner
f)	Engage suppliers with capacity to respond to demand fluctuations
g)	Ensure that they reduce order fulfilment lead time
h)	Have an inventory policy for important items
i)	Have inventory policy for all items
j)	Implement a supplier-buyer integrated order planning
k)	Ensure deliveries from suppliers are on time and in right quantities
l)	Stress to suppliers need for accuracy and efficiency of order fulfilment
m)	Continuously improve supplier performance using order fulfilment metrics (measures)
n)	Work towards having a high stock turn (products are not spending a long time in storage)
o)	Maintain high levels of emergency supplies

Table 7.3: Guidelines for improving supply collaborations in public hospital pharmacies in Kenya

No.	The public hospital pharmacies' managers in Kenya should
a)	Promote partnership with reliable suppliers dedicated to their work
b)	Have good process integration between suppliers, customers and the KEMSA
c)	Facilitate joint or collaborative planning with the suppliers
d)	Conduct effective negotiations with suppliers
e)	Have good communication with suppliers
f)	Ensure good collaboration with suppliers who have power that can impact on SC relationships
g)	Use key performance indicators (KPIs) in judging their suppliers
h)	Have service level agreement with our suppliers
i)	Conduct continuous improvement programmes with their suppliers
j)	Ensure that distribution networks are configured to minimise total supply chain-wide inventory costs
k)	Integrate their inventories with that of their suppliers (vendors)

In Table 7.3 supply collaborations guidelines are provided on issues that managers of public hospital pharmacies should observe when implementing SCI.

Table 7.4: Guidelines for improving dedicated SCI in public hospital pharmacies in Kenya

No.	The public hospital pharmacies' managers in Kenya should
a)	Ensure that the public hospital pharmacies have standardised key data elements (such as customer, order, part number) in line with those across the SC
b)	Make sure that automatic data capture systems are used (such as bar code) across the SC
c)	Ensure that same data (such as order status) is stored in different databases across the SC is consistent
d)	Ensure that public hospital pharmacies minimise on need for same data to be re-entered in the computer at each step in the SC
e)	Ensure that public hospital pharmacies have standardised key data elements (such as customer order, item number) in line with those across the supply chain
f)	Make sure that public hospital pharmacies implement automatic data capture systems (such as bar code) that are used across the SC
g)	Ensure that the same data (such as order status) stored in different databases is consistent across the SC
h)	Ensure that the public hospital pharmacies eliminate the need for same data being re-entered in the computer at each step in the SC
i)	Make sure that public hospital pharmacies have responsive internal customer relationship management system
j)	Ensure that the public hospital pharmacies establish long-term relationships with suppliers/key partners
k)	Ensure that in key partner relationships, trust and goodwill have the same, or greater significance as formal contracts
l)	Ensure that players both sides in the SC partnership do not make any demands that can hurt their relationship
m)	Make sure that the public hospital pharmacies share information about procedures and cost structures with key SC partners

Table 7.4 contains guidelines for improving dedicated SCI in public hospital pharmacies in Kenya in order to successfully implement supply chain integration.

7.5.2 Recommendation based on independent variables

The SCI framework developed in this thesis comprises of six independent variables namely: SCI initiatives, performance improvement drivers, organisation environmental forces, workforce and management support, financial factors, flow and integration, information sharing and technology. In order to enhance SCI in public hospital pharmacies in Kenya, the following are the recommendations of each of these variables after the exploratory factor analysis.

Table 7.5: Guidelines for improving SCI initiatives

No	The public hospital pharmacies' managers in Kenya should
a)	Implement inter-departmental process integration
b)	Implement integration with valued first-tier customers
c)	Implement integration with important first-tier suppliers
d)	Implement complete SCI of customers and suppliers
e)	Adopt IT as an facilitator
f)	Proactively design ways to handle expected SC challenges
g)	Adopt a national SCI policy
h)	Implement an internal service integration policy
i)	Create a culture that supports supply chain integration

Table 7.5 contains guidelines for improving SCI initiatives in public hospital pharmacies in Kenya in order to successfully implement supply chain integration.

Table 7.6: Guidelines for enhancing performance improvement drivers

	The public hospital pharmacies' managers in Kenya should
a)	Have an explicit strategy on supply chain integration
b)	Create a central procurement unit
c)	Have efficiency in customer order fulfilment as the core driver of SCI
d)	Regard cost reduction as a core driver of SCI
e)	Ensure all partners adhere to product delivery cycle time
f)	Ensure all SC partners adhere to timeliness of after sales service
g)	Implement productivity improvements (such as assets, operating costs, labour costs)
h)	Ensure increase in sales of existing products
i)	Find new revenue streams (such as new products, new markets)
j)	Maintain strong and continuous bond with customers

Table 7.6 contains guidelines for enhancing performance improvement drivers in public hospital pharmacies in Kenya in order to successfully implement supply chain integration.

Table 7.7: Guidelines for improving organisation environmental forces

	The public hospital pharmacies' managers in Kenya should
a)	Ensure pharmacies adhere to government initiated integration efforts
b)	Have intra-organisational desires to improve customer satisfaction
c)	Have intra-organisational desires to lower supply chain costs
d)	Have intra-organisational desires to focus on core competence in service provision
e)	Have intra-organisational opportunity to build the best team of supply chain partners

Table 7.7 contains guidelines for improving organisation environmental forces in public hospital pharmacies in Kenya in order to successfully implement supply chain integration.

Table 7.8: Guidelines for improving workforce and management support

	The public hospital pharmacies' managers in Kenya should
a)	Ensure there is adequate staff support to SC demands
b)	Make sure that staff are well trained/equipped on SC demands
c)	Be committed to SCI process
d)	Ensure that public hospital pharmacies staff value SCM
e)	Ensure pharmacies are structured in a way that facilitates internal SCI

Table 7.8 contains guidelines improving workforce and management support in public hospital pharmacies in Kenya in order to successfully implement supply chain integration.

Table 7.9: Guidelines for improving financial factors, flow and integration

	The public hospital pharmacies' managers in Kenya should
a)	Have sufficient funds to procure drugs demanded by customer
b)	Have capacity to project future supply demands and budget accordingly for funds allocation by government
c)	Allocate full amount to meet all financial requirements as requested by the public hospital pharmacies through annual budgets
d)	Be capital efficiency, working and fixed, should be maximised across the hospital pharmacies' supply chain
e)	Have account receivable processes are automatically triggered when they dispatch/sell to the customers
f)	Have account payable processes are automatically triggered when they receive supplies from the suppliers
g)	Use activity based costing for key supply chain processes (such as inventory, storage, transportation)

Table 7.9 contains guidelines improving financial factors, flow and integration in public hospital pharmacies in Kenya in order to successfully implement supply chain integration.

Table 7.10: Guidelines for improving information sharing and technology adoption

	The public hospital pharmacies' managers in Kenya should ensure
a)	Procurement and delivery schedules are shared across the SC
b)	Performance metrics are shared across the SC
c)	SC members collaborate in arriving at demand forecasts;
d)	Our downstream partners (such as distributors, wholesalers, retailers) share their actual sales data with us
e)	Inventory data are visible at all steps across the supply chain
f)	Order fulfilment and shipment status are tracked at each step across the supply chain

Table 7.10 contains guidelines improving information sharing and technology adoption in public hospital pharmacies in Kenya in order to successfully implement supply chain integration.

As can be seen in Tables 7.2 to 7.10, there are various business strategic guidelines that the public hospital managers can use to effectively implement SCI in Kenya.

7.6 CONTRIBUTIONS OF THE STUDY

This study has made important contributions not only to the public hospital pharmacies but also to the body of knowledge. The contributions are as follows:

⇒ The present research made contribution by identifying, examining, analysing and presenting the critical functional issues in SCI, supply relationships, dedicated SC and customer order fulfilment in the Kenya public hospitals;

⇒ This research has developed a SCI framework for public hospital pharmacies' SC, which integrates existing theory as well as explains the critical factors influencing SCI, their impact on supply relationships, dedicated SC and customer's order fulfilment in the public hospitals. This model has provided a framework in which the relationships between critical factors in SCI, supplier relationships and customer order fulfilment can each be tested separately using empirical data from public hospital pharmacies in Kenya;

⇒ This study has also made a contribution by developing a measuring instrument that is suitable to identify the factors influencing SCI. This instrument could be further developed to test more statements within these identified factors or by adding other factors which may influence SCI in public hospital pharmacies in Kenya. This instrument could also be used to identify factors influencing SCI in other sectors in other developing or developed countries;

⇒ The study has contributed in giving direction and assistance to other African countries facing similar challenges in the management of public hospital pharmacies SCI by becoming knowledgeable on how to address the factors affecting effective implementation of SCI in their respective countries;

⇒ The study has built a body of knowledge by identifying SCI functional factors that influence the supply collaborations, dedicated SC and customer order fulfilment in public hospital pharmacies in Kenya. The use of an advanced statistical computer package, named Statistica 10 (2010) to perform correlation and multiple regression analysis enabled the identification of highly significant variables which managers must observe in order to improve on SCI in public hospital pharmacies in Kenya;

⇒ This study is important for policy makers in the Government of Kenya and particularly the Ministry of Health. It will be useful during policy formulation processes and in the development of effective strategies aimed at achieving universal and affordable healthcare services to all citizens. The Government should embrace use of technology to improve service delivery through integrating order generation from individual hospital pharmacies across Kenya. The pharmacies should be linked to the central stores at KEMSA to trigger order fulfilment process when reordering levels are reached. This could also assist the Government in eliminating inefficiencies experienced in the public hospital pharmacies SC;

⇒ The findings of the study are useful to the management of public hospitals and pharmacies in Kenya since it has provided guidelines on how to mitigate challenges, barriers and inefficiencies experienced in the public hospital pharmacies SC; and

⇒ This study has also provided recommendations to the Kenyan government, the management of public hospitals and pharmacies and other stakeholders, to enable them to work in harmony for the success of the public hospital pharmacies' SCI.

In the next section, the limitations of the study are presented.

7.7 LIMITATIONS OF THE STUDY

In this study, all the objectives outlined in Chapter One were met. The current research has made contributions from both, a theoretical and practical point of view. However, a few limitations highlighted below need to be taken into account in relation to interpretations of the findings contained this study. These limitations are as follows:

⇒ In this research, individual respondents (pharmacists, procurement practitioners, doctors) in the public hospitals, pharmacies and at KEMSA were asked to respond to complex SCI issues which included SCI functional issues, supplier collaborations, dedicated SC and customer order fulfilment with all the participants along the SC, including upstream suppliers and downstream customers. However, no person in an organisation is in charge of the entire SC, for example, KEMSA managers are mainly responsible for procuring healthcare supplies and managing distribution and may not be in an appropriate position to answer all the supplier/customer-related questions. Getting respondents from several departments helped mitigate this drawback;

⇒ The study responses were drawn from purposively sampled managers who were perceived to have relevant information on SCI based on the position they held in their organisations. The assumption was that these managers could accurately gauge the perceptions in the relevant public hospital pharmacies;

⇒ Since permission had to be obtained from the relevant authorities prior to starting the empirical study and that respondent participation was purely on voluntary basis, the public hospitals where permission was not granted were replaced with others in the database and the respondent who refused to participate were also replaced. This helped to address the issue of representativeness and inclusiveness of both the healthcare facilities and the respondents; and

⇒ This limitation relates to the usefulness of Kenyan based findings to the international community. The organisational features and practices from a small target sample (of 325 respondents) of Kenya public hospital pharmacies may not have generalisability to the international community. Therefore, generalising the results of this study to international community should be done with some caution.

In spite of the above stated limitations of the study, which were largely out of the researcher's control, the study produced substantial results that can be depended upon to make valid conclusions and recommendations contained in this study. This study further presents future research possibilities as indicated in the next section.

7.8 RECOMMENDATIONS FOR FUTURE RESEARCH

Based on the results of this study, the following specific recommendations are made for future research:

- ⇒ The SCI framework for improving SCI may be tested in other sectors and industries to assess if similar factors apply;
- ⇒ Since this study was limited to KEMSA as the main public hospital supplier and distributor, other studies should focus on other firms specialising in supply and distribution of pharmaceutical products;
- ⇒ This study also recommends further studies on the effect of contracting on the distribution of pharmaceutical drugs in private hospitals in Kenya;
- ⇒ Future researchers need to explore the possibility of improving the research instruments to measure the variables included in the SCI framework;
- ⇒ To gain more insights, future research need to consider using a larger sample size that would provide higher reliability and enhance representativeness of the study population:
    - To carry out a comparative study of public and private hospital pharmacies and assess if similar variables apply in both; and
    - To carry out a comparative study of SCI in a developed and a developing country, such as Kenya.

7.9 SUMMARY

In this chapter, the researcher has interpreted the empirical findings, presented a summary of the study, has drawn conclusions and also made recommendations on providing a framework for SCI. In this chapter, it has demonstrated how the objectives of the study were met and presented the summary and conclusions of the research findings showing the specific the linkage between the research problems, objectives and the findings of the study. This is followed by discussion on the practical implications and limitation of the study. The recommendations and opportunities for further research are also presented here.

7.10 CONCLUDING REMARKS

Over the last three decades, there has been a steady trend of global market convergence. This is a phenomenon where indigenous markets start to congregate on a set of similar products or services across the world. As a consequence of this convergence, the organisations that have succeeded on their products or services have the entire world as their market and also to source for inputs.

The rationale of the global market convergence lies partially in the irreversible growth of the Internet and social media, which have opened up global physical borders to make the globe a truly a small global village. In this global village, one is easily able to know what someone else is doing and the market might demand the same product if it is perceived any good.

For organisations and their SCs, the logic of going global and embracing SCI is also clearly recognisable from an economic perspective. They are seeking growth opportunities by expanding their markets to wherever there are more potential for profit making and to wherever resources are cheaper in order to reduce the overall SC costs.

An integrated global SC is destined to be stronger than a local stand-alone SC because it takes advantage of the economies of scale and international division of labour through partnership. Specialisation and cooperation in the integrated SC produces higher level of economy than that of stand-alone SCs.

This study has provided guidelines that could be used to enhance the SCI both locally and internationally. Effective implementation of the recommendations made in this study and the guidelines proposed could play a critical role in promoting high quality products and efficient services to the customer (end user) who is at the tail end of the SC.

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ANNEXURES

ANNEXURE A: QUESTIONNAIRE INTRODUCTORY LETTER

Nelson Mandela
METROPOLITAN UNIVERSITY
Business School
Leaders for tomorrow

Dear Respondent

I am a doctoral student at Nelson Mandela Metropolitan University (NMMU), Port Elizabeth, South Africa. In fulfilment of the requirements for my Doctor in Business Administration degree, I am undertaking a research study on the factors affecting integrated supply chain management in public hospital pharmacies (in short, public pharmacies) in Kenya. I believe that my study will make an important contribution to the effective supply chain management in these pharmacies.

You are part of our selected sample of respondents whose views we seek on the above-mentioned matter. We would therefore appreciate it if you could answer a few questions. It should not take more than thirty minutes of your time and we want to thank you in advance for your co-operation.

There are no correct or incorrect answers. Please answer the questions as accurately as possible. For each statement, tick the number which best describes your experience or perception. For example, if you strongly agree with the statement, tick the number 5. If you strongly disagree with the statement, tick the number 1. **Tick only one answer for each statement and answer <u>all questions</u> please.** Please note that there are also questions that require you to write down your views on certain aspects of co-operatives. **<u>We guarantee your complete confidentiality and anonymity.</u>**

<u>Please note also that your participation in this study is entirely voluntary and that you have the right to withdraw from the study at any stage. Your participation in the study therefore indicates verbal consent.</u>

Your co-operation in this regard is highly appreciated.

Many thanks.

George Michugu Kamau

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ANNEXURE B: SURVEY QUESTIONNAIRE

Please answer the following questions in parts A to D using the definition of the "**supply chain integration**" to mean:

> "*An association of customers and suppliers who, using management techniques, work together to optimize their collective performance in the creation, distribution and support of an end product. Supply chain integration is a continuous process that can be optimized only when original equipment manufacturers (OEMs), customers and suppliers work together to improve their relationships and when all participants are aware of key activities at all levels in the chain*" (National Research Council, 2000, p. 27).

(This definition is also applicable to service organisations).

SECTION A: GENERAL INFORMATION

Please mark a cross (X) the box for each statement that reflects your profile (Please answer all questions)

1. Gender:

MALE		FEMALE	

2. Age Categories

20-29	30-39	40-49	50-59	60+

3. Place of work: Hospital _____ KEMSA _______
4. Education level:

Lower than O-level Certificate	O-level Certificate or equivalent	National and/or Advanced National Diploma	Bachelor's degree	Bachelors Degree/ Postgraduate diploma	Master's degree and above
1	2	3	4	5	6

5. Area of Career Specialisation:

Medical Doctor	Pharmacist	Administrator	Nurse	Procurement officer	Other
1	2	3	4	5	6

6. How long have you been working in your current position?

Less than 1 year	1-5 years	6-10 years	11-15 years	16-20 years	More than 20 years

7. Your procurement responsibility (tick the appropriate space):

_____General requirements

_____Pharmaceutical requirements

_____Both General requirements and Pharmaceutical requirements

8. The number of employees in your purchasing and supply department _________

9. Our facility/Hospital/organisation buys products and services (tick the appropriate space):

_______ Direct from the external supplier

_______ Through agents

_______ Both from external supplier and Through agents

SECTION B: SUPPLY CHAIN INTEGRATION FUNCTIONAL FACTORS

I. To what extent is your pharmacy actively engaged in the following supply chain integration initiatives? Rate as follows: (1) Very little, (2) Little, (3) Neutral, (4) A good deal and (5) A great deal

1) SCI INITIATIVES (FUNC)						
FUNC01	1. Inter-departmental process integration within your pharmacy	1	2	3	4	5
FUNC02	2. Integration with valued first-tier customers	1	2	3	4	5
FUNC03	3. Integration with important first-tier suppliers	1	2	3	4	5
FUNC04	4. Complete customers and suppliers supply chain integration.	1	2	3	4	5

II. Please tick the number that best reflects your agreement with the following statements concerning supply chain integration in your pharmacy.

Rate as follows: Strongly disagree, (2) Disagree, (3) Neutral, (4) Agree and (5) Strongly Agree

2) PERFORMANCE IMPROVEMENT DRIVERS (PERF)						
PERF01	5. The pharmacy has explicitly strategy on supply chain integration	1	2	3	4	5
PERF02	6. My pharmacy has a central procurement unit	1	2	3	4	5
PERF03	7. My Pharmacy promotes integration through use of information technology	1	2	3	4	5
PERF04	8. Efficiency in Order fulfilment is a core driver of our supply chain integration	1	2	3	4	5
PERF05	9. Cost reduction is another core driver of our supply chain integration	1	2	3	4	5

III. Please use the following scale to indicate the extent of your agreement with each statement below. Rate as follows:

(1) Strongly disagree, (2) Disagree, (3) Neutral, (4) Agree and (5) Strongly Agree

My pharmacy is continuously engaged in the following performance improvement initiatives:						
PERF06	10. Product delivery cycle time.	1	2	3	4	5
PERF07	11. Timeliness of after sales service.	1	2	3	4	5
PERF08	12. Productivity improvements (e.g. assets, operating costs, labour costs).	1	2	3	4	5
PERF09	13. Increasing sales of existing products.	1	2	3	4	5
PERF10	14. Finding new revenue streams (e.g. new products, new markets).	1	2	3	4	5
PERF11	15. Strong and continuous bond with customers.	1	2	3	4	5
PERF12	16. Precise knowledge of customer buying patterns	1	2	3	4	5
PERF13	17. Ability to handle expected challenges	1	2	3	4	5
PERF14	18. Order fulfilment lead times	1	2	3	4	5
PERF15	19. Overall customer satisfaction	1	2	3	4	5

IV. To what extent have the following factors regulated your pharmacy's move to seek greater supply chain integration? Rate as follows:
Strongly disagree, (2) Disagree, (3) Neutral, (4) Agree and (5) Strongly Agree

3) ORGANISATION ENVIRONMENTAL FORCES (ENVI)						
ENVI01	20. Suppliers have initiated integration effort	1	2	3	4	5
ENVI02	21. Government has initiated integration efforts	1	2	3	4	5
ENVI03	22. Desire to improve customer satisfaction	1	2	3	4	5
ENVI04	23. Desire to lower supply chain costs	1	2	3	4	5
ENVI05	24. Desire to focus on core competence in services	1	2	3	4	5
ENVI06	25. Opportunity to build the best team of supply chain partners	1	2	3	4	5

V. Please use the following scale to indicate the extent of your agreement with each statement below on regulatory framework within supply chain. Rate as follows: (1) Strongly disagree, (2) Disagree, (3) Neutral, (4) Agree and (5) Strongly Agree

4) REGULATORY FRAMEWORK (REGU)						
REGU01	26. My pharmacy follows national procurement policies and procedures	1	2	3	4	5
REGU02	27. My pharmacy has a national supply chain integration policy	1	2	3	4	5
REGU03	28. My pharmacy has a good internal service integration policy	1	2	3	4	5

VI. Please use the following scale to indicate the extent of your agreement with each statement below on workforce and management support in the supply chain of your pharmacy. Rate as follows:

(1) Strongly disagree, (2) Disagree, (3) Neutral, (4) Agree and (5) Strongly Agree

5) WORKFORCE AND MANAGEMENT SUPPORT (WORK)						
WORK01	29. We have adequate staff to support supply chain demands	1	2	3	4	5
WORK02	30. Staff are well trained/equipped on supply chain demands	1	2	3	4	5
WORK03	31. Top management is committed to supply chain integration process	1	2	3	4	5
WORK04	32. We have good organisational culture that supports supply chain integration	1	2	3	4	5
WORK05	33. Staff value supply chain management	1	2	3	4	5
WORK06	34. The organisation is structured for internal supply chain integration	1	2	3	4	5

VII. Please use the following scale to indicate the extent of your agreement with each statement below on financial factors and the integration of financial flow in the supply chain of your pharmacy.

	6) FINANCIAL FACTORS, FLOW AND INTEGRATION (FINA)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
FINA01	35. My pharmacy has sufficient funds to procure drugs demanded by customer	1	2	3	4	5
FINA02	36. We are able to clearly identify all supply chain expenses of the pharmacy	1	2	3	4	5
FINA03	37. My pharmacy has a capacity to project future supply demands and budget accordingly for funds allocation by government.	1	2	3	4	5

FINA04	38. My pharmacy runs into deficit budgeting during implementation period	1	2	3	4	5
FINA05	39. Government allocates full amount to meet all financial requirements as requested by my pharmacy through annual budgets	1	2	3	4	5
FINA06	40. Capital efficiency, working and fixed, is maximized across my pharmacy's supply chain.	1	2	3	4	5
FINA07	41. My pharmacy's account receivables processes are automatically triggered when we ship to our customers.	1	2	3	4	5
FINA08	42. Account payable processes are automatically triggered when we receive supplies from our suppliers.	1	2	3	4	5
FINA09	43. We use activity based costing for key supply chain processes (e.g. inventory, storage, transportation).	1	2	3	4	5

VIII. Please use the following scale to indicate the extent of your agreement with each statement below on information sharing and technology adoption within the supply chain of your pharmacy.

	7) **INFORMATION SHARING AND TECHNOLOGY ADOPTION (TECHN)**	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
TECHN01	44. Procurement and delivery schedules are shared across the supply chain.	1	2	3	4	5
TECHN02	45. Performance metrics are shared across the supply chain	1	2	3	4	5
TECHN03	46. Supply chain members collaborate in arriving at demand forecasts.	1	2	3	4	5

TECHN04	47. Our downstream partners (e.g. distributors, wholesalers, retailers) share their actual sales data with us.	1	2	3	4	5
TECHN05	48. Inventory data are visible at all steps across the supply chain.	1	2	3	4	5
TECHN06	49. Order fulfilment and shipment status are tracked at each step across the supply chain.	1	2	3	4	5

SECTION C: SUPPLIER COLLABORATIONS

IX. Please tick the number that best reflects your agreement with the following statements concerning supplier collaborations in your pharmacy.

	1) SUPPLIER COLLABORATIONS (COLL)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
COLL01	50. We have reliable suppliers	1	2	3	4	5
COLL02	51. We promote partnership with dedicated suppliers	1	2	3	4	5
COLL03	52. We have good process integration between suppliers, customers and the KEMSA	1	2	3	4	5
COLL04	53. We have joint or collaborative planning with our suppliers	1	2	3	4	5
COLL05	54. We conduct effective negotiations with suppliers	1	2	3	4	5
COLL06	55. We have increased level of strategic alliance with suppliers	1	2	3	4	5
COLL07	56. We have good communication with suppliers	1	2	3	4	5
COLL8	57. Power of our suppliers has impact on relationships with them	1	2	3	4	5
COLL9	58. Our suppliers prefer electronic	1	2	3	4	5

	purchasing					
COLL10	59. We conduct supplier development	1	2	3	4	5
COLL11	60. We value the importance of measuring relationships with our suppliers	1	2	3	4	5
COLL12	61. We use key performance indicators (KPIs) in judging our suppliers	1	2	3	4	5
COLL13	62. We have a service level agreement with our suppliers	1	2	3	4	5
COLL14	63. We conduct continuous improvement programmes with our suppliers	1	2	3	4	5
COLL15	64. We have good relationship/trust with our third party buyer	1	2	3	4	5
COLL16	65. We use a contract to maintain relationship with our suppliers	1	2	3	4	5
COLL17	66. We have single source relationships with our suppliers	1	2	3	4	5

SECTION D: DEDICATED SUPPLY CHAIN INTEGRATION

X. Please tick the number that best reflects your agreement with the following statements concerning data standardisation in your hospital/warehouse.

	2) DATA STANDARDISATION (DEDI)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
DEDI01	67. My pharmacy has standardised key data elements (e.g. customer, order, part number) in line with those across the supply chain.	1	2	3	4	5
DEDI02	68. Automatic data capture systems are used (e.g. bar code) across the supply chain.	1	2	3	4	5
DEDI03	69. Same data (e.g. order status) stored in different databases across the supply chain is consistent.	1	2	3	4	5
DEDI04	70. Same data needs to be re-entered in the computer at each step in the supply chain.	1	2	3	4	5

XI. Please tick the number that best reflects your agreement with the statements that in you organisation, following applications exist and that they communicate in real-time via internet.

	3) REAL TIME DATA EXCHANGE (DEDI)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
DEDI05	71. Supply chain planning applications (e.g. Demand planning, transportation planning, manufacturing planning).	1	2	3	4	5
DEDI06	72. Supply chain transaction applications (Order management, procurement, manufacturing and distribution).	1	2	3	4	5
DEDI07	73. Supply chain applications with internal applications of our organisation (such as enterprise resource planning).	1	2	3	4	5
DEDI08	74. Customer relationship applications with internal applications of our organisation.	1	2	3	4	5

XII. Please use the following scale to indicate the extent of your agreement with each statement below on integration of physical flow of goods in your pharmacy.

	4) PHYSICAL FLOW INTEGRATION (DEDI)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
DEDI09	75. Inventory holdings are minimised across the supply chain.	1	2	3	4	5
DEDI10	76. Suppliers and logistics partners deliver products and materials just in time.	1	2	3	4	5
DEDI11	77. Distribution networks are configured to minimise total supply chain-wide inventory costs	1	2	3	4	5

XIII. Please use the following scale to indicate the extent of your agreement with each statement below on level of trust within the supply chain of your pharmacy.

	5) TRUST AND SCI (DEDI)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
DEDI12	78. We have long-term relationships with suppliers/key partners.	1	2	3	4	5
DEDI13	79. In key partner relationships, trust and goodwill have the same, or greater, significance as formal contracts.	1	2	3	4	5
DEDI14	80. Both sides in the relationship do not make any demands that can hurt the relationship.	1	2	3	4	5
DEDI15	81. In key partner relationships, information about procedures and cost structures are shared.	1	2	3	4	5

SECTION E: PATIENT/CUSTOMER ORDER FULFILMENT

XIV. Please tick the number that best reflects your agreement with the following statements concerning customer's order fulfilment in your hospital/warehouse.

	6) CUSTOMER ORDER FULFILMENT	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
ORDE01	82. We classify inventories according to their importance (critical, important and non-critical).	1	2	3	4	5
ORDE02	83. We have collaborative planning, forecasting and replenishment (CPFR)	1	2	3	4	5
ORDE03	84. We make an effort to control ordering costs	1	2	3	4	5
ORDE04	85. Suppliers have capacity to meet the demand	1	2	3	4	5
ORDE05	86. We have capacity to respond to demand fluctuations	1	2	3	4	5
ORDE06	87. We have reduced order fulfilment lead	1	2	3	4	5

	time					
ORDE07	88. We have an inventory policy of maintaining high level of inventory for critical items only	1	2	3	4	5
ORDE08	89. We have an inventory policy for important items	1	2	3	4	5
ORDE09	90. We have inventory policy for all items	1	2	3	4	5
ORDE10	91. We have supplier-buyer integrated order planning	1	2	3	4	5
ORDE11	92. Suppliers (vendors) manage our inventory	1	2	3	4	5
ORDE12	93. Our deliveries from suppliers are on time and right quantity	1	2	3	4	5
ORDE13	94. We emphasize to suppliers that accuracy and efficiency of order fulfilment is important	1	2	3	4	5
ORDE14	95. We improve supplier performance using order fulfilment metrics (measures)	1	2	3	4	5
ORDE15	96. We have a high stock turn (products are not spending a long time in storage)	1	2	3	4	5
ORDE16	97. We maintain high levels of emergency supplies	1	2	3	4	5

XV. In your opinion, how important is it to enhance supplier-customer integration of public hospitals (customer) with KEMSA as the main hospital supplier?

Not sure	Not important	Important	Very important
1	2	3	4

XVI. How can public hospital pharmacies in Kenya enhance supply chain integration?

THANK YOU FOR YOUR TIME AND ASSISTANCE

ANNEXURE C: LIST OF PUBLIC HOSPITALS PER REGION

	Health Facility Name	MOH Facility Code	Region	County
1.	Karatina District Hospital	10485	Central	Nyeri
2.	Kerugoya District Hospital	10520	Central	Kirinyaga
3.	Mukurweini District Hospital	10763	Central	Nyeri
4.	Murang'a District Hospital	10777	Central	Murang'a
5.	Tigoni District Hospital	11104	Central	Kiambu
6.	Kiambu District Hospital	10539	Central	Kiambu
7.	Engineer District Hospital	10171	Central	Nyandarua
8.	Gatundu District Hospital	10233	Central	Kiambu
9.	Maragua District Hospital	10686	Central	Murang'a
10.	Thika Level 5 Hospital	11094	Central	Kiambu
11.	Nyeri Provincial General Hospital	10903	Central	Nyeri
12.	Moi District Hospital Voi	11641	Coast	Taita Taveta
13.	Msambweni District Hospital	11655	Coast	Kwale
14.	Wesu District Hospital	11906	Coast	Taita Taveta
15.	Kilifi District Hospital	11474	Coast	Kilifi
16.	Taveta District Hospital	11840	Coast	Taita Taveta
17.	Kinango Hospital	11480	Coast	Kwale
18.	Kwale District Hospital	11507	Coast	Kwale
19.	Lamu District Hospital	11512	Coast	Lamu
20.	Hola District Hospital	11411	Coast	Tana River
21.	Likoni District Hospital	11522	Coast	Mombasa
22.	Malindi District Hospital	11555	Coast	Kilifi
23.	Mariakani District Hospital	11566	Coast	Kilifi
24.	Ngao District Hospital	11711	Coast	Tana River
25.	Port Reitz District Hospital	11740	Coast	Mombasa
26.	Coast Province General Hospital	11289	Coast	Mombasa
27.	Isiolo District Hospital	12094	Eastern	Isiolo

	Health Facility Name	MOH Facility Code	Region	County
28.	Kangundo District Hospital	12177	Eastern	Machakos
29.	Kanyakine District Hospital	12181	Eastern	Meru
30.	Kathiani District Hospital	12230	Eastern	Machakos
31.	Miathene District Hospital	16234	Eastern	Meru
32.	Moyale District Hospital	12544	Eastern	Marsabit
33.	Runyenjes District Hospital	12719	Eastern	Embu
34.	Tharaka District Hospital	12795	Eastern	Tharaka Nithi
35.	Chuka District Hospital	11973	Eastern	Tharaka Nithi
36.	Kitui District Hospital	12366	Eastern	Kitui
37.	Kyuso District Hospital	12420	Eastern	Kitui
38.	Garbatulla District Hospital	12029	Eastern	Isiolo
39.	Githongo District Hospital	12041	Eastern	Meru
40.	Magutuni District Hospital	12445	Eastern	Tharaka Nithi
41.	Makindu District Hospital	12455	Eastern	Makueni
42.	Makueni District Hospital	12457	Eastern	Makueni
43.	Marsabit District Hospital	12472	Eastern	Marsabit
44.	Masinga Sub County Hospital	12476	Eastern	Machakos
45.	Matiliku District Hospital	12485	Eastern	Makueni
46.	Matuu District Hospital	12488	Eastern	Machakos
47.	Mbeere District Hospital	16467	Eastern	Embu
48.	Mbooni District Hospital	12508	Eastern	Makueni
49.	Meru District Hospital	12516	Eastern	Meru
50.	Mwala District Hospital	12618	Eastern	Machakos
51.	Mwingi District Hospital	12626	Eastern	Kitui
52.	Nyambene District Hospital	12684	Eastern	Meru
53.	Embu Provincial General Hospital	12004	Eastern	Embu
54.	Machakos Level 5 Hospital	12438	Eastern	Machakos
55.	Mama Lucy Kibaki Hospital-Embakasi	17411	Nairobi	Nairobi

	Health Facility Name	MOH Facility Code	Region	County
56.	Mathari Hospital	13076	Nairobi	Nairobi
57.	Mbagathi District Hospital	13080	Nairobi	Nairobi
58.	Kenyatta National Hospital	13023	Nairobi	Nairobi
59.	National Spinal Injury Hospital	13194	Nairobi	Nairobi
60.	Westlands Sub-County Hospital	13258	Nairobi	Nairobi
61.	Bahati Sub-County Hospital	12879	Nairobi	Nairobi
62.	Kahawa West Sub-County Hospital	12997	Nairobi	Nairobi
63.	Kamiti Prison Hospital	13000	Nairobi	Nairobi
64.	Pumwani Maternity Hospital	13156	Nairobi	Nairobi
65.	Mathare North Sub-County Hospital	13077	Nairobi	Nairobi
66.	Kayole II Sub-County Hospital	13016	Nairobi	Nairobi
67.	Modogashe Sub-County Hospital	13411	North Eastern	Garissa
68.	Wajir District Hospital	13452	North Eastern	Wajir
69.	Takaba District Hospital	13445	North Eastern	Mandera
70.	Elwak District Hospital	13335	North Eastern	Mandera
71.	Griftu District Hospital	13352	North Eastern	Wajir
72.	Habaswein District Hospital	13357	North Eastern	Wajir
73.	Ijara District Hospital-Masalani	13406	North Eastern	Garissa
74.	Mandera District Hospital	13402	North Eastern	Mandera
75.	Bura District Hospital	13339	North Eastern	Garissa
76.	Bute District Hospital	13314	North Eastern	Wajir
77.	Garissa Provincial General Hospital	13346	North Eastern	Garissa
78.	Iyabe District Hospital (Kisii South)	13631	Nyanza	Kisii
79.	Kegonga District Hospital	13663	Nyanza	Migori
80.	Kenyenya District Hospital	13673	Nyanza	Kisii
81.	Migori District Hospital	13805	Nyanza	Migori
82.	Rongo District Hospital	14058	Nyanza	Migori
83.	Siaya District Hospital	14080	Nyanza	Siaya
84.	Suba District Hospital	14130	Nyanza	Homa Bay

	Health Facility Name	MOH Facility Code	Region	County
85.	Kisii Hospital (Level 5)	13703	Nyanza	Kisii
86.	Kisumu District Hospital	13704	Nyanza	Kisumu
87.	Kombewa District Hospital	13714	Nyanza	Kisumu
88.	Kuria District Hospital	13726	Nyanza	Migori
89.	Gucha District Hospital	13594	Nyanza	Kisii
90.	Homa Bay District Hospital	13608	Nyanza	Homa Bay
91.	Manga District Hospital	13766	Nyanza	Nyamira
92.	Bondo District Hospital	13507	Nyanza	Siaya
93.	Marani District Hospital	13772	Nyanza	Kisii
94.	Masaba District Hospital	13678	Nyanza	Nyamira
95.	Mbita District Hospital	13798	Nyanza	Homa Bay
96.	Nduru District Hospital	13847	Nyanza	Kisii
97.	Nyamache District Hospital	13891	Nyanza	Kisii
98.	Nyamira District Hospital	13912	Nyanza	Nyamira
99.	Nyando District Hospital	13921	Nyanza	Kisumu
100.	Rachuonyo District Hospital	14022	Nyanza	Homa Bay
101.	Rangwe Sub-District Hospital	14036	Nyanza	Homa Bay
102.	Nyanza Provincial General Hospital	13939	Nyanza	Kisumu
103.	Iten District Hospital	14586	Rift Valley	Elgeyo Marakwet
104.	Kabarnet District Hospital	14607	Rift Valley	Baringo
105.	Kabartonjo District Hospital	14609	Rift Valley	Baringo
106.	Kacheliba District Hospital	14634	Rift Valley	West Pokot
107.	Kajiado District Hospital	14652	Rift Valley	Kajiado
108.	Kapenguria District Hospital	14701	Rift Valley	West Pokot
109.	Kapkatet District Hospital	14706	Rift Valley	Kericho
110.	Kapsabet District Hospital	14749	Rift Valley	Nandi
111.	Kapsara District Hospital	14753	Rift Valley	Trans Nzoia
112.	Katilu District Hospital	14818	Rift Valley	Turkana
113.	Kericho District Hospital	14831	Rift Valley	Kericho

	Health Facility Name	MOH Facility Code	Region	County
114.	Molo District Hospital	15212	Rift Valley	Nakuru
115.	Transmara District Hospital	15739	Rift Valley	Narok
116.	Uasin Gishu District Hospital	15758	Rift Valley	Uasin Gishu
117.	Rumuruti District Hospital	15502	Rift Valley	Laikipia
118.	Sigowet Sub-District Hospital	15568	Rift Valley	Kericho
119.	Eldama Ravine District Hospital	14432	Rift Valley	Baringo
120.	Endebess District Hospital	14455	Rift Valley	Trans Nzoia
121.	Kitale District Hospital	14947	Rift Valley	Trans Nzoia
122.	Huruma District Hospital	14555	Rift Valley	Uasin Gishu
123.	Lodwar District Hospital	15049	Rift Valley	Turkana
124.	Loitokitok District Hospital	15051	Rift Valley	Kajiado
125.	Lokitaung District Hospital	15062	Rift Valley	Turkana
126.	Londiani District Hospital	15074	Rift Valley	Kericho
127.	Longisa District Hospital	15077	Rift Valley	Bomet
128.	Bahati District Hospital	14224	Rift Valley	Nakuru
129.	Chebiemit District Hospital	14294	Rift Valley	Elgeyo Marakwet
130.	Chemolingot District Hospital	14321	Rift Valley	Baringo
131.	Maralal District Hospital	15126	Rift Valley	Samburu
132.	Naivasha District Hospital	15280	Rift Valley	Nakuru
133.	Nandi Hills District Hospital	14179	Rift Valley	Nandi
134.	Nanyuki District Hospital	15305	Rift Valley	Laikipia
135.	Narok District Hospital	15311	Rift Valley	Narok
136.	Nyahururu District Hospital	10890	Rift Valley	Laikipia
137.	Ololulunga District Hospital	15423	Rift Valley	Narok
138.	Moi Teaching Referral Hospital	15204	Rift Valley	Uasin Gishu
139.	Nakuru Provincial General Hospital	15288	Rift Valley	Nakuru
140.	Mt Elgon District Hospital	16025	Western	Bungoma
141.	Vihiga District Hospital	16157	Western	Vihiga
142.	Webuye Hospital	16161	Western	Bungoma

	Health Facility Name	MOH Facility Code	Region	County
143.	Khunyangu Sub-District Hospital	15939	Western	Busia
144.	Sio Port District Hospital	16128	Western	Busia
145.	Teso District Hospital	16150	Western	Busia
146.	Kimilili District Hospital	15950	Western	Bungoma
147.	Iguhu District Hospital	15899	Western	Kakamega
148.	Lumakanda District Hospital	15969	Western	Kakamega
149.	Malava District Hospital	15996	Western	Kakamega
150.	Bungoma District Hospital	15828	Western	Bungoma
151.	Busia District Hospital	15834	Western	Busia
152.	Butere District Hospital	15836	Western	Kakamega
153.	Port Victoria Hospital	16091	Western	Busia
154.	Kakamega Provincial General Hospital	15915	Western	Kakamega

ANNEXURE D: APPLICATION TO CONDUCT RESEARCH IN KENYA

Nelson Mandela
METROPOLITAN UNIVERSITY
Business School
Leaders for tomorrow

The Chair Person
KNH/UON-ERC
P. O. Box 20723 – 00200
NAIROBI 31 May 2014

Dear Sir/Madam/Doctor/Professor

APPLICATION FOR PERMISSION TO CONDUCT RESEARCH IN KENYAN PUBLIC HOSPITAL PHARMACIES

Mr George Kamau is a doctoral student at Nelson Mandela Metropolitan University (NMMU), Port Elizabeth, South Africa. In fulfillment of the requirements for his Doctor in Business Administration degree, he is undertaking a research study on the factors affecting integrated supply chain management in public hospital pharmacies in Kenya. We believe that his study will make an important contribution to the effective supply chain management in these pharmacies.

A purposive sample of procurement officers, medical doctors and senior managers of pharmacies will be drawn and their views sought on the above-mentioned matter. The confidentiality and anonymity of respondents and hospitals will be strictly protected. The participation of respondents is entirely voluntary and they have the right to withdraw from the study at any stage. We are also in the process of submitting the study for ethics clearance at the Nelson Mandela Metropolitan University.

Against the above-mentioned background, we hereby request your permission to conduct the study in the public hospital pharmacies in Kenya. We need this permission to complete the ethics clearance process in the Nelson Mandela Metropolitan University.

We sincerely hope that you will find the confidence in us to conduct this study with integrity and the required ethics.

The NMMU Business School: 20 Bird Street, Central, Port Elizabeth, South Africa | Tel: +27 (0)861 504 500 | E-mail: business.school@nmmu.ac.za
Main Campus and International Head Office: Port Elizabeth, South Africa | Affiliate Campuses and Satellite Offices: Pretoria, East London and George

Nelson Mandela
METROPOLITAN UNIVERSITY
Business School
Leaders for tomorrow

We thank you in advance.

Yours faithfully

Prof Cecil Arnolds

Primary Responsible Person for the study and Research Director of the NMMU Business School

My contact details are as follows: Telephone number +27 (0) 41-5043825 and e-mail address cecil.arnolds@nmmu.ac.za.

ANNEXURE E: APPROVAL BY KNH/UON ERC COMMITTEE

UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
(254-020) 2726300 Ext 44355

KNH/UON-ERC
Email: uonknh_erc@uonbi.ac.ke
Website: www.uonbi.ac.ke

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/312 Link:www.uonbi.ac.ke/activities/KNHUoN 10th September 2014

George Michugu Kamau
Principal investigator
Nelson Mandela Metropolitan University
South Africa

Dear Mr. Kamau

RESEARCH PROPOSAL: FACTORS AFFECTING INTEGRATED SUPPLY CHAIN MANAGEMENT IN PUBLIC HOSPITAL PHARMACIES IN KENYA (P381/06/2014)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 10th September 2014 to 9th September 2015.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
g) Submission of an *executive summary* report within 90 days upon completion of the study
This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website **www.uonbi.ac.ke/activities/KNHUoN.**

Protect to Discover

Yours sincerely

PROF.M.L. CHINDIA
SECRETARY, KNH/UON-ERC

c.c. The Principal, College of Health Sciences, UoN
The Deputy Director CS, KNH
The Chair, KNH/UoN-ERC
The Assistant Director, Health Information, KNH
Supervisors: Dr. Ernst Van Biljon, Prof. Cecil Arnolds, Dr. Ndinda Kusu

ANNEXURE F: APPROVAL BY NMMU FACULTY RTI COMMITTEE

Nelson Mandela Metropolitan University

for tomorrow

Ref: H14-BES-BUS-079 [Approved]

Chairperson: Faculty RTI Committee
Faculty of Business and Economics Sciences
Tel. +27 (0)41 504 2906

13 October 2014

Prof C Arnolds
NMMU
Graduate School
Second Avenue Campus

Dear Prof Arnolds

PROJECT PROPOSAL: FACTORS AFFECTING INTEGRATED SUPPLY CHAIN MANAGEMENT IN PUBLIC HOSPITAL PHARMACIES IN KENYA (DBA)

PRP: Prof C Arnolds
PI: Mr G Kamau

Your above-entitled application for ethics approval served at Fac RTI.

We take pleasure in informing you that the application was approved by the Committee. However, please note that the approval is on condition that permission to conduct the study is also obtained from the other relevant individuals, parties, organisations and/or role players to which the study pertains.

The ethics clearance reference number is **H14-BES-BUS-079**, and is valid for three years. Please inform the Faculty RTI Committee, via the faculty representative, if any changes (particularly in the methodology) occur during this time.

Please inform your co-investigators of the outcome.

Yours sincerely

Prof C Rootman
Faculty of Business and Economic Sciences