Cape Peninsula
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SUPPLY CHAIN PERFORMANCE MEASUREMENT AT A SELECTED HOSPITAL IN THE WESTERN CAPE, SOUTH AFRICA

by

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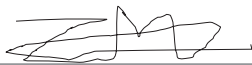
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DECLARATION

I, **Zukile Mfengu,** declare that the contents of this thesis represent my own unaided work, and that the thesis has not been previously submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

11 March 2020
Signed	**Date**

ABSTRACT

Performance measurement of supply chain in the healthcare environment has presented with a number of challenges, and studies exist to confirm this. These problems include rising costs, excessive demands, shortage of supply, and escalating level of customer dissatisfaction are the true reflection of supply chain issues faced by the hospitals. This study aims to find out an effective solution to measure supply chain performance within a hospital in Cape Town. The relation among trust, SCM/IT integration, firm's performance, and knowledge exchange were investigated.

A mixed research method (both qualitative and quantitative) was conducted involving five managers and 80 employees from the hospital. A number of interviews and a close-ended questionnaire were used for data collection. Content analysis was used for qualitative data and the descriptive results were generated through SPSS V25. Hospital and healthcare environment have been used interchangeable in this study.

The research findings showed that trust levels between the hospital and its suppliers has no direct impact on supplier integration, but that its influence is interceded by knowledge exchange. Knowledge exchange plays an important role in influencing supply chain performance in the hospital. IT integration and knowledge exchange have a positive impact on hospital–supplier logistical integration between the hospital and its suppliers. In addition, knowledge sharing in supply chain may subsequently build strong relationships among SCM partners and may automatically influence hospital performance. This study recommended that the hospital should develop an approach that facilitates the dynamics of the hospital in order to manage the buyer-supplier relationship. Further research can be done on factors that contribute to buyer/supplier trust development in the healthcare environment.

Keywords: Supply chain, supply chain performance, supply chain performance measurement.

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DEDICATION

This dissertation is dedicated to my mother **Nomisile Mfengu**, my sister **Nontombi Mfengu**, and my two beautiful daughters **Azuka** and **Amyoli.**

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LIST OF ABBREVIATIONS

SCM	Supply Chain Management
SC	Supply Chain
PSSCMR	Public Sector Supply Chain Management Review of South Africa
PMs	Performance Measures
IT	Information Technology
ICT	Information and Communication Technology
SPSS	Statistic Package for Social Sciences
GDP	Gross Domestic Product
CSCMP	Council of Supply Chain Management Professionals
RFID	Radio Frequency Identification
EOQ	Economic Order Quantity
SCI	Supply Chain Integration
EI	External Integration
PMS	Performance Measurement System
SCP	Supply Chain Performance
SCPIs	Supply Chain Performance Indicators
BSC	Balance Scorecard
LSC	Logistics Scorecard
HSCs	Hospital Supply Chains
SA	South Africa
DoH	Department of Health

DoE	Department of Education
PPPFA	Preferential Procurement Policy Framework Act
PFMA	Public Finance Management Act
DoHSC	Department of Health Supply Chain
ICRM	Ideal Clinic Realisation and Maintenance
HCSC	Healthcare Supply Chain
HIV	Human Immune Virus (HIV)
BEE	Black Economic Empowerment
BBBEEA	Broad Based Black Economic Empowerment
IPS	Integrated Procurement System
SCIS	Supply Chain Information Sharing
SCIHC	Supply Chin in healthcare
SCOHC	Supply Chain of healthcare
QTM	Total Quality Management
WCPDoH	Western Cape Province Department of Health
HCSCM	Healthcare Supply Chain Management
US	United States

CHAPTER ONE: SCOPE OF RESEARCH

1.1   INTRODUCTION

The steadily increase in customer demands along with customer expectations has created enormous pressure to organisations to revise their strategies. Meeting customer satisfaction and costs reduction in hospital can only be realised when improved supply chain performance is achieved (Mathur, Gupta, Meena & Dangayach, 2018). The literature shows that competition had become extremely intense for all organisations in all industries. Among others, healthcare sector is also one of the affected industries. The constant increasing number of people who need medical attention has caused major financial issues in healthcare environment. Globally, healthcare is facing radical increase in number of incurable diseases such as human immune virus (HIV) and AIDS.

It is known that the development of medicines and all other vaccines to stabilise these diseases is quite costly. Hence, healthcare supply chain management (HCSCM) has gained considerable interest of researchers around the globe. The research shows that, South Africa is one country that tops all other countries who are affected by the HIV epidemic. However, there is limited literature addressing HCSCM from a South African perspective. HCSM is more complex in nature than the Supply Chain Management (SCM) processes of other industries (Chen, Preston & Xia, 2013). As the result of its complexity, supply chain managers ought to devise strategies that will simplify it in order to make it more practical and effective. The success of SCM has turned out to be a potentially valuable means of developing a strong competitive advantage and enhancing organisational performance (Kosgei & Gitau, 2016).

The South African health system comprises of public and private hospitals in which public is estimated to service 84% of the South African (SA) population and private hospitals 16%, respectively (Fin24, 2017). However, according to the general household survey conducted by Stats SA (2017), the results show that seven in

every ten people (71. 2%) attested to making use of public health facilities such as public clinics and public hospitals. In addition, 27.4% of households reported that they are using private health facilities while 0.7% responded that they are using traditional healers when in need of medical attention Stats SA (2017). Each year the SA government allocates funds to all respective departments in order to deliver services to the people in SA. In the 2018/2019 financial year budget speech, the former Minister of Finance, Mr Malusi Gigaba, indicated that an amount of six hundred and sixty-eight billion rand was allocated to the health department.

The former South African Minister of Health, Dr Aaron Motsoaledi, in his 2018/2019 Health Department Budget Speech stated that for 2018/2019 financial year the National Treasurer allocated an additional sum of R4.2 billion to the department of health, mainly for the National Health Insurance, Health Planning and Systems Enablement programme (eNCA, 2018). Although the department of health needs more funds to address a litany of health challenges, the Minister assured the general public that a lot more was going to be achieved with the allocated funds, the unfavourable economic conditions and the limited budget allocation notwithstanding. This necessitates costs reduction in the health system.

There are number of issues in supply chain management that adversely affect hospital performance and these include communication issues as a result of lack of integration in SCM functions, lack of trust, lack of knowledge exchange, and excessive demands. The SCM success includes well coordination and integration of all parties involved in supply chain processes such as "suppliers, distributors, inbound and outbound transportation, third party logistic companies" (Lenin, 2014). The efficiency with which goods move from where they originate from to their final destination reduces problems in supply chain. The decrease of lead-time during logistical process is essential for both hospitals and their suppliers. Nowadays hospitals and all other businesses generally, have realised that for survival purposes in a challenging and a highly competitive business setting, a robust SCM system must be in place. Since Supply Chain (SC) involves a number of individual member companies, the contribution of each member ought to be determined through the measurement of their effectiveness.

According to Supeekit, Somboonwiwat and Kritchanchai (2016), measurement of Hospital Supply Chain Performance (HSCP) is needed for achieving performance goal of patient safety. In order to provide optimal care for patients, the Supply Chain Performance (SCP) ought to be at its best. Since public healthcare facilities service a bigger portion of a country's population, the main goal is to provide a quality service to the patients at an affordable value for all. These facilities need to ensure that this objective is met, and supply chain measures ought to be in place and be effective at all times.

The literature suggests that SCM's success is mostly influence by the following fundamentals; trust, knowledge exchange, integration, information technology (IT) and technical knowhow. One can say that, a strong correlation between the aforementioned fundamentals that influence SCP exists and is essential to be sustained. However, Dametew, Ebinger and Beshah (2018) discovered the existence of a link between performance management systems and supply chain practice, performance metrics, performance indicators and tools for performance measurement. For better understanding of this research work, this study includes the following sections; introduction, background, research objectives, research questions, statement of the problem, literature review, research design methodology, ethical consideration, significance of the study and assumptions, limitations and delimitations. Moreover, the chapter also provides the research outline.

1.2   BACKGROUND OF THE STUDY

According to Sillanpää (2015), measuring supply chain is a challenge. Despite the ever-growing interest and contribution of researchers in the field of SCM, issues surrounding SC still exist and have a significant influence on performance. For this reason, hospitals often experience problems in providing the best quality service to their patients. The healthcare industry is highly competitive and relies heavily on the interlinkage of companies that are working together to design, produce, distribute, and administer a numerous health and medical related products and services (Lenin, 2014). When one of these stakeholders is not performing or adhering to the rules, the whole hospital performance is bound to be affected.

Performance improvement within the supply chain of hospitals has become increasingly important as healthcare organisations seek to increase working efficiency and cost reduction (Chen *et al.,* 2013). Based on the research undertaken by Chen *et al.* (2013), industry experts postulate that SCM practices within the healthcare industry are a decade behind compared to other industries such as retail and manufacturing. The research shows that supply chain at present is significantly impacted by the inadequacy of hospital SCP systems that tend to focus on cost as a primary measure. Dametew *et al.* (2018) considered using cost as a primary measure to be a blunder as it is not inclusive, it often varies with the organisational goals and objectives, and it frequently disregards the effects of uncertainty. It is evident that focussing on cost is a traditional way of measuring performance and to date, it cannot be solely used as an effective measure. SCM nowadays is utilised as a tool to build and strengthen an organisation's competitive advantage in order to improve performance. The only way to determine whether performance is improving is for one to constantly measure the performance.

Performance measurement helps managers to successfully manage the SC in an efficient manner that is to give the support needed for improving performance (Bolstorff & Rosenbaum, 2007). Studies state that, using performance measurement as a tool can help an organisation to collect information within supply chain in order to make sound supply chain decisions. The need to improve SC efficiency has resulted in a number of models and methods being developed to measure supply chain efficiency (Goedhals-Gerber, 2016). However, these models and methods are not appropriately implemented and as a result, a high degree of deficiency is experienced. Besides numerous studies intensifying the problems concerning delay in paying suppliers, failure to renew tenders (Kachwee & Hartmann, 2013); SCM still suffers a great deal from other issues that affect the organisation's performance. Kachwee and Hartmann (2013) state that inefficiency and ineffectiveness of pharmaceutical operations are the cause of long queues, employee absenteeism, high shrinkage rates, and constant inventory stock-outs in numerous public hospitals' pharmacies. According to the Public Sector Supply Chain Management Review of South Africa (PSSCMR) and the South African National Treasury (2015), the country has many imperfections in its SCM systems. As a result, a high degree of irregular expenditure and corruption occurs. Supply

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chain performance is influenced by number of factors. In SCM, the idea is not to measure a single factor's performance but to measure the entire performance of all SCM factors in the chain (Erdogan & Çemberc, 2018). This is study focusses of key factors (i.e. IT integration, trust and knowledge exchange) that influence supply chain performance in one of the hospital in the Western Cape, South Africa. This case took place in the Western Cape in one of typical public hospital. Since this is a mini-thesis, the study did not include many hospitals in South Africa and in Western Cape, one typical hospital was sufficient and representative. This is the only study in Western Cape to address the influence of these factors on supply chain performance particularly at a hospital.

1.3   RESEARCH PROBLEM

Based on the above-mentioned background, the research problem statement is formulated as follows: The lack of performance measures in supply chain has posed enormous performance problems in the SCM of the hospitals. Gbadeyan, Boachie-Mensah and Osemene (2017) hospitals need to implement a system that will help them to address these challenges.

Researchers have developed numerous performance measures (PMs), models and frameworks through which they intend to fix the problems in SCM. It is evident that the models and frameworks developed are not used correctly to measure supply chain performance; this is proved by the continuity of these issues in SC. Though there is a vast of research conducted in supply chain performance measurement, still the literature does not instantaneously address the influence of supply chain fundamentals such as, IT integration, trust and knowledge exchange. This study addresses together the influence of the aforementioned SCM key factors and their impact on supply chain performance.

1.4   RESEARCH OBJECTIVES

To address the above-mentioned research problems, the research study has as its main objective, to provide an effective solution to measure supply chain

performance to improve the health performance within the selected hospital. In trying to achieve the primary research objective, the following investigative research objectives were formulated:

- To establish the impact of trust on supply chain performance of the hospital.
- To identify knowledge exchange level between the selected hospital and its suppliers in the supply chain.
- To identify IT integration between the hospital and its suppliers.
- To determine the best practice of supply chain in the health care environment.

1.5   RESEARCH QUESTIONS

Research questions were formulated to obtain necessary information that lead to the findings and recommendations of this research.

- How does trust affect supply chain performance in the health care environment?
- What is the level of knowledge exchange between the selected hospital and its suppliers in the supply chain?
- What is the level of IT integration between a hospital and its suppliers in the supply chain?
- What is the best practice of supply chain in the health care environment?

1.6   RESEARCH DESIGN AND METHODOLOGY

Interviews and questionnaires were used as research instruments for data collection. Interviews were used for qualitative data and questionnaires for quantitative data. The questionnaire contained a series of current valid instruments that were adjusted to this study. It contained questions about knowledge exchange, trust of the suppliers, integration, and supply chain performances. Questionnaires were disseminated amongst the employees of different departments within the hospital.

The interview included the following five participants from different departments:

- Two unit managers in wards;
- One procurement manager;
- One Stores manager; and
- One pharmacy staff member

1.7   SIGNIFICANCE OF THE STUDY

This study contributes greatly to the existing literature and it will help supply chain managers towards making informed decisions when it comes to SCM. It also contributes as a guideline to management of supply chain on how to measure and improve performance in the hospital supply chain. The findings of this study also provide supply chain managers with enhanced understanding of developing longstanding relationships with suppliers. This study results can help the hospital to improve its supply performance and help other hospitals in the Western, countrywide as well as nationwide. It can also enable SCM managers to highlight the importance of sharing knowledge and building strong relationships with suppliers. The role that trust plays in supply chain both internal and external will be better understood.

1.8   ETHICAL CONSIDERATION

Sekaran (2003) defines ethics as the acceptable norm of behaviour that is expected while conducting the research. The researcher was expected to behave in a certain way in order to avoid doing things that would cause harm to the organisation in which he undertook his research. The confidentiality of certain information on the research was taken into account. The data collection process abided by the organisation's rules and regulations. To comply with the ethical conduct of the research, names of individuals or the organisation were not mentioned on the research, this way anonymity was assured. Participation in the study was voluntary, meaning that a person had a choice not to be part of the research study and can, at any given time withdraw from participating. Prior the conduct of the study, the researcher obtained a consent letter (Refer to Appendix 1) from the institution in where data was collected.

1.9   ASSUMPTIONS, LIMITATIONS AND DELIMITATIONS

All the participants to the study were assumed to possess basic educational background and good understanding of supply chain performance, to enable them to answer the questionnaires appropriately. In order to obtain more accurate responses, a pilot study was undertaken. Limitations can be described as any phenomenon that can have a direct impact on the results of the study, moreover it can be said that it is anything that may bring issues and has a bearing on the data collection of the study.

The following limitations have been identified as events that may have direct impact on the research:
- The questionnaire was only completed by participants who understand English, and this reduced the number of potential participants.
- The time was very limited. The study only focussed on the SCM department in one of the central hospital in the Western Cape, South Africa.
- Only employees who are directly involved in the purchasing, storing, monitoring and distribution of the inventory were interviewed. Questionnaires were only distributed to a number of participants who were available at the workplace. Thus, the study does not include broad perspectives.

In dealing with these limitations, participants who experienced problems during completion of the questionnaire were informed to contact the researcher for clarity. To overcome the time constraint issue, participants were given a timeline wherein the expected time of completion was clearly stated.

Delimitations are described as choices made by the researcher to set boundaries of the study. The study focuses on the supply chain management of the hospital since these problems are seemingly hitting hard on the performance. Questionnaires were disseminated among SCM workers since they are knowledgeable about what is happening within their department. Research objectives stated on this paper were formulated with the purpose of highlighting considerations that management can take into account when making decisions.

The researcher collected data from the hospital since the study is solely focusing on hospital performance.

1.10   RESEARCH OUTLINE

This study is comprised of six chapters as outlined below:

Chapter One: This chapter is made up of an introduction and a background of SCM in the healthcare environment. It provides the research background in relation to the research problem, the research objectives, and research questions. It also expresses the study methodology, articulates the significance of the study, ethics consideration, and it addresses the limitations and assumption of the study.

Chapter Two: This chapter consists of an overview of the study and considers both the global and South African perspectives. It also touches on other SCM areas such as inventory management and logistics in the healthcare environment.

Chapter Three: This chapter focuses on the review of existing literature based on the main subject of the research study. It also provides a full discussion on the key factors that influence supply chain management performance within the healthcare environment.

Chapter Four: This chapter displays the research design and research methodology applied in this study. It also provides comprehensive details about the population and sample size of the study. In addition, the chapter also provides data collection tools, data collection methods and analysis, as well as reliability and validity of the study.

Chapter Five: This chapter offers the findings of the study and the discussion of the results attained from both the questionnaire and the interviews.

Chapter Six: This chapter revisits the research objectives and analyses each objective based on the results obtained. It also provides a set of recommendations and a conclusion.

1.11 CHAPTER SUMMARY

This chapter focuses on the introduction of SCM as a whole in the healthcare environment. It highlights the problems faced by the hospital as a resultant of poor implementation of performance measurements. The chapter also provides expected outcomes or benefits that can be gained by the hospital should proper implementation of performance measurement strategies be undertaken. The second section of this study (Chapter 2) provides a full scope of healthcare supply chain management in both the global and the local context.

CHAPTER 2: HOLISTIC OVERVIEW OF SUPPLY CHAIN MANAGEMENT IN THE HEALTHCARE ENVIRONMENT

2.1   INTRODUCTION

This chapter gives an overview of the research in the healthcare supply chain management (SCM) environment. This includes global perspectives of SCM such as America, European countries, Asian and Pacific regions, amongst others, and the South African perspectives are discussed thereafter. Literature was reviewed with the purpose of providing and gaining theoretical understanding of the study. According to Boon-itt, Wong and Wong (2017), currently, service sectors contribute between "30.4%-87.2% to the gross domestic productivity (GDP) across countries of both post– industrialised and emerging economies". The SCM needs 'concurrent enhancements of both customer service level and internal operating efficiencies in supply chain' for its effectiveness (Hugos, 2018: 5).

Due to increasing competition and the necessity to deliver quality service in the healthcare industry, organisations have started projects that will foster effectiveness and efficiency in patient logistics, clinical pathways, vertical integration, and data interchange (De Vries & Huijsman, 2011). This section will provide meanings for the terms used in supply chain. These include, supply chain management, logistics management in South African (SA) healthcare, inventory management, Radio Frequency Identification (RFID) in healthcare and supply chain integration in healthcare.

2.2   GLOBAL PERSPECTIVES OF SCM IN HEALTHCARE ENVIRONMENT

2.2.1 America

In the United States of America (USA), proper implementation of SCM in the healthcare sector is extremely important for affording US citizens optimal healthcare services at an affordable cost (Elmuti, Khoury & Abou-Zaid., 2013). Elmuti *et al*. (2013), postulate that SCM projects were implemented to reduce healthcare costs and also to respond to the market place and customer demands.

Excessive health expenditure has become a significant problem in the United States of America (Parsa, Jin, Eksioglu & Eksioglu., 2011). According to the report by Ascension, Australian Co Form Global Healthcare Supply Chain Org (2018), the largest non-profit health system called Ascension I US recently launched a global healthcare supply chain joint venture with Sydney and Ramsay Health Care Limited which is based in Australia. According to the report, this venture seeks to add efforts to reduce drug costs and all hospital supply chain expenses (Ascension, Australian Co Form Global Healthcare Supply Chain Org, 2018). This shows that hospital SCM needs more attention to enable hospitals to offer the best possible healthcare service to patients.

In the research conducted by Chen *et al.* (2013), wherein the study consisted of 1235 hospitals in the USA, it is postulated that Hospital Supply Chains (HSCs) are unlike other industry supply chains because, "clinical operations" need sufficient supplies that are also accurate, based on the varied patients' needs, and in addition, supplies in hospital are "mission critical" to the public health. Supply Chain 247, (2018) discovered a number of issues that have been confirmed to be the major and persisting concerns for healthcare SCM around the globe. These include, managing supply chain costs, regulatory incompliance, product damage, changing distribution, and go-to-market channels. These problems must be combated to ensure that medical facilities achieve their goals. Supply Chain Integration (SCI) is not only discussed in the South African healthcare perspective but other countries as well. SCI helps supply chain partners to share information, resources, products etc.

Figure 2.1 captioned "healthcare hospital supply chain framework", shows how the U.S supply chain is integrated with other supply chain partners in the healthcare environment. As shown on figure 2.1, healthcare supply chain has about three layers, namely: Inter layer, middle layer and outer layer (Chakraborty & Gonzalez, 2018). The inner layer includes all role-players within the hospital such as, nurses, patients and physicians, while middle layer consists of different suppliers who supply different products and services to the hospital. The external layer includes external role players such as government organisations and medical professional

organisations. It consists of the external entities who supply the hospital with goods and services for patient care (Chakraborty & Gonzalez, 2018).
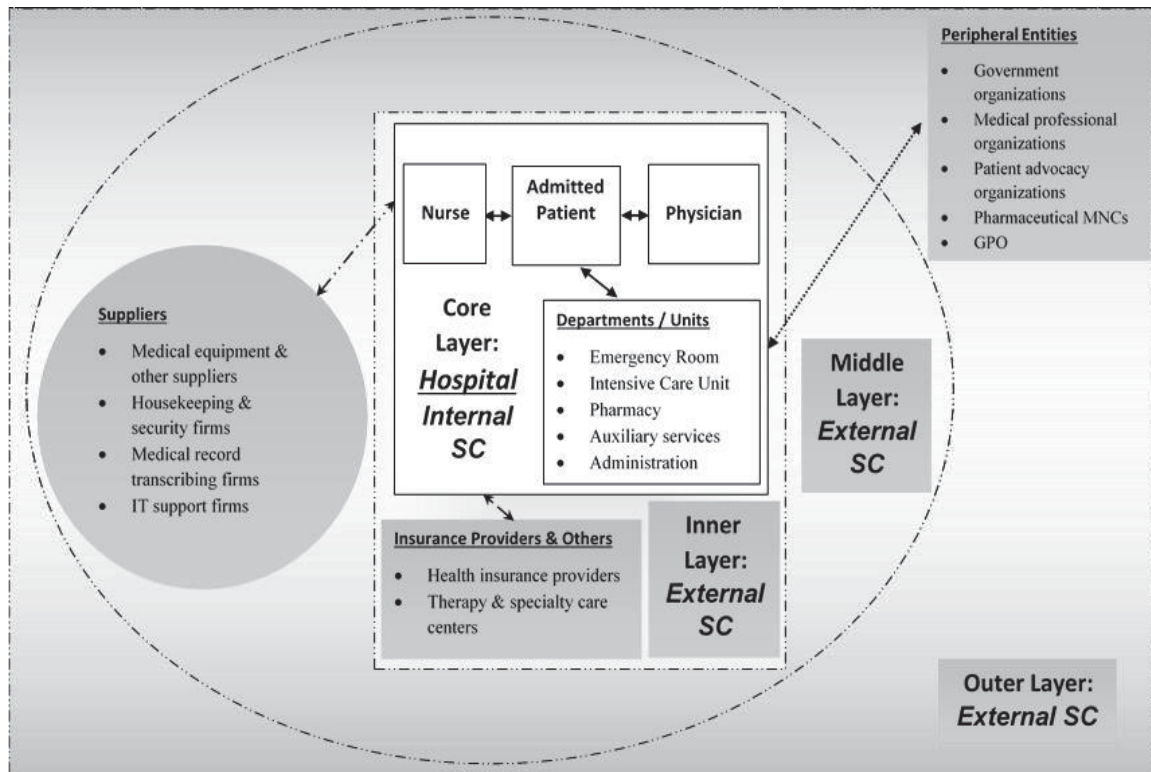
Figure 2.1 "healthcare hospital supply chain framework"
(*Source: Chakraborty & Gonzalez, 2018, p99*)

2.2.2 European Countries

In the research conducted by Settanni, Harrington & Srai (2017), it was discovered that the United Kingdom (UK) has problems concerning its healthcare system wherein its spending is ranked higher that the healthcare outcomes. This could have a detrimental effect on patients due to high costs. The study survey conducted by Pauwels, Simoens, Casteels and Huys. (2015) discovered that in European countries, drugs shortage is one of the supply chain's biggest issues that can potentially result in healthcare workers experiencing stress when providing surgery or emergency care. This issue may also negatively affect patients' lives.

2.2.3 Asian and Pacific countries

The study conducted in one of the Southern West Asia by Abdallah *et al.* (2016), states that healthcare SCM experiences a number of issues that include supply and demand issues, distribution factors, inventory issues and SCM interactive factors. From a worldwide perspective, the healthcare industry is experiencing a sharp rise in price in all its products and services (Mathew, John & Kuma, 2013). This leads to higher medical costs for patients in both private and public hospitals. Besides cost issues, the research shows that, global healthcare logistics is also facing other problems such as transportation and natural disasters. Moreover, healthcare organisations are in an extremely high competitive industry and need to provide a quality service to the constantly growing population. With changing needs and demands in the healthcare environment, hospitals and other health facilities are forced to make ways of cutting costs, increasing service satisfaction, and eradicating waste.

According to the World Health Organisation (WHO) (2014), public healthcare supply chain needs to be flexible in order to respond and adapt to the dynamic environments. Furthermore, the WHO (2014) states that change in SCM needs to be planned according to the demands of today and opportunities of tomorrow and risks. (Lenin, 2014) claims that the supply chain of the healthcare industry is not particularly different from other supply chains of other industries. The best performance of any supply chain is carried by the results of a well-functioning system. The below diagram shows exactly how a healthcare supply chain looks like.

The top four role players in the healthcare system are described as the components of healthcare SC. Based on this diagram the system begins with producers who are medical devices manufacturers, pharmaceutical manufacturers and medical/surgical manufacturers. However, there are other producers that are part of this system such as furniture manufacturing companies, electronics and all other producers who produce products or provide services that are eventually supplied to the hospitals. After producers, it goes to purchasers, then all the way to providers before getting to the final end users (patients).
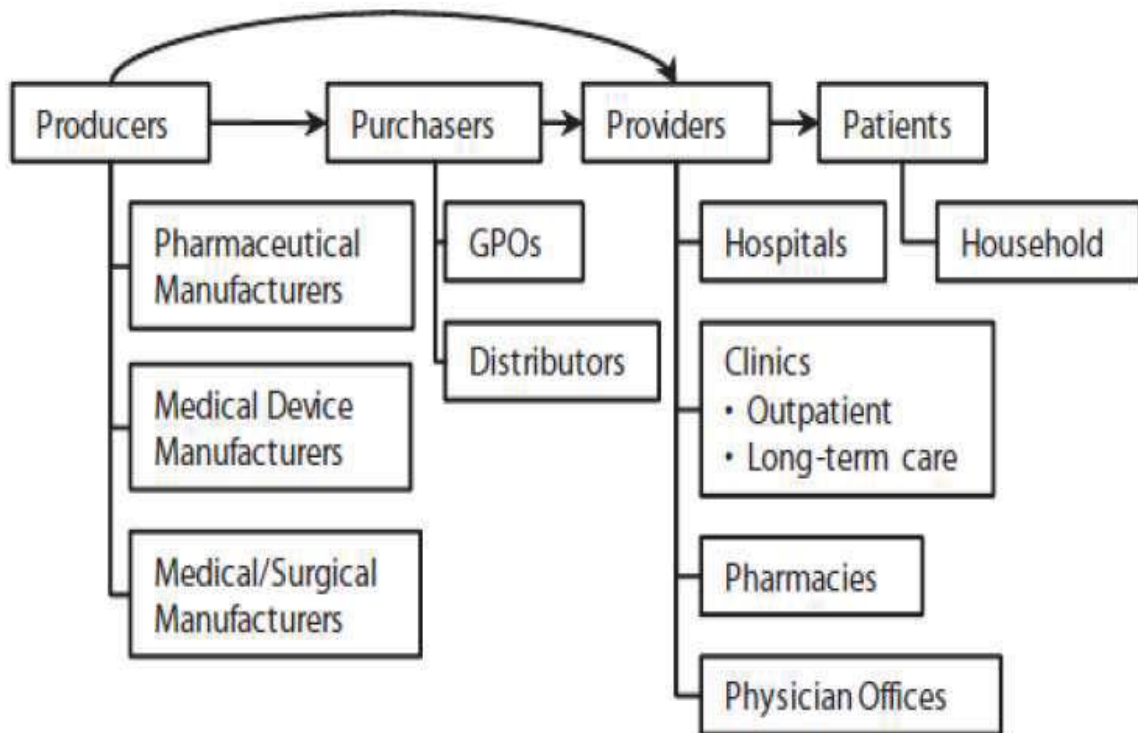
Figure 2.2: Healthcare systems supply chain

(Source: Smith et al., 2012, p4)

2.3   SOUTH AFRICAN PERSPECTIVES

This section focuses on different provinces in South Africa, more specifically the four major metropolitans, which are Gauteng, Western Cape, Eastern Cape and KwaZulu Natal. The South African National Department of Health is responsible for making policies, coordinating, and overseeing healthcare services in the country, while the provinces ensure delivery of services (UNICEF South Africa, Health Budget, 2017/18). In order for the department to realise its goals, the money allocated to it ought to be spent effectively and efficiently across all provinces.

The 1999 Public Finance Management Act (PFMA) and the 2000Treasurer Regulation and Preferential Procurement Policy Framework Act (PPPFA) regulate the Department of Health Supply Chain (DoHSC). These acts clearly state how public funds should be used to deliver services that will meet the needs of the citizens. In 2018/19 Budget Speech presented by Mr Malusi Gigaba, the DoH was presented as the second highest spending government department in SA after the

Department of Education (DoE) at six hundred and sixty-eight billion and seven hundred and ninety-two billion rand respectively. These funds were allocated to nine different provinces of SA. According to the research conducted by Stats SA (2017) under health section, the results show a number of dissimilarities between private and public health facilities. During this research, it was discovered that 71.2% of household members would prefer to first go to the public health facilities when they are not feeling well. It was also indicated that 27.4% would go to private facilities while 0.7% said they would go to traditional healers.

2.3.1 Gauteng Province

Statistics South Africa (Stats SA, 2017) shows that Gauteng Province (GP) had over fourteen million residents in 2017, making it the most populous province in SA. The table below indicates people's satisfaction levels with both private and public institutions.

Table 2.1: Level of satisfaction with public and private healthcare facilities by province, 2017

Level of satisfaction with the healthcare institution						Province				
	WC	EC	NC	FS	KZN	NW	GP	MP	LP	RSA
Public health care										
Very satisfied	48,3	59,1	49,7	48,1	46,9	46,7	55,8	62,3	75,1	55,1
Somewhat satisfied	22,1	30,2	28,8	23,0	34,0	27,6	26,8	24,2	14,9	26,7
Neither satisfied nor dissatisfied	11,3	4,6	7,6	10,9	12,5	7,2	8,7	5,3	4,2	8,4
Somewhat dissatisfied	6,8	3,8	4,8	9,5	3,2	6,4	3,9	4,3	4,1	4,5
Very dissatisfied	11,5	2,3	9,1	8,6	3,4	12,1	4,9	4,0	1,7	5,3
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Private health care										
Very satisfied	93,2	96,0	86,9	86,6	86,6	90,9	92,0	95,0	93,2	91,5
Somewhat satisfied	3,7	3,4	7,0	8,3	10,6	7,2	5,8	2,7	3,5	5,8
Neither satisfied nor dissatisfied	1,0	0,2	3,9	2,4	2,0	0,5	1,4	1,3	1,8	1,4
Somewhat dissatisfied	0,9	0,5	0,4	1,4	0,6	1,1	0,5	0,0	0,6	0,7
Very dissatisfied	1,3	0,0	1,7	1,3	0,3	0,3	0,4	1,0	0,9	0,6
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

(Source: StatsSA, 2017)

Based on the above table, the results show that 55.8% of GP population that attends public health care facilities was very satisfied with the service and only

4.9% was very dissatisfied. The results also show that in GP the portion of the province population who attends private facilities, 92% of them were very satisfied with the facilities. It is evident that people who attend private facilities are more satisfied that those who attend public facilities across all provinces.

2.3.2 Western Cape Province

According to Stats SA (2017), the Western Cape (WC) Province is the third largest province in South Africa with six million five hundred and ten thousand people living in it. It contains thirteen different departments. According to the 2018-2019 WC Annual Performance plan, the department of health is the only health department in the country that has achieved unqualified financial statements. As shown on Table 2.1 above, out of the people who are making use of public facilities in WC, 48.3% of them stated that they are very satisfied with the health care facilities. The results also show that 93.2% of the people who are using private healthcare facilities are very satisfied. According to the WC Minister of health, Dr Nomafrench Mbombo in the Annual Performance Plan 2018-2019financial year, she stated that the demand for healthcare is continuing to grow and this growth will not change considering the trends in the social determinants of health and wellbeing.

According to the DoH report, the South African (SA) government designed a programme called Ideal Clinic Realisation and Maintenance (ICRM) as a response to the apparent deficiencies in the quality of primary healthcare services. The South African National Department of Health (SANDoH) formulated a team that deals with unavailability of medicine in medical facilities. The appointed team has discovered a number of issues that are contributing to the non-availability of medicine such as; delays in intercontinental transport system, supply accounts not paid within 30 days, orders not received in time, and reports not supplying medicine as per the quantity ordered.

Globally, South Africa is considered the smallest contributor in the pharmaceutical market, contributing only two percent to the market (Barton, 2017). Besides the issue of strict government rules for pharmaceutical logistics, Barton (2017) also

highlights other additional problems such as the scarcity of storage capacity and quality storage facilities. In addition to the aforementioned issues, security risks are also a major issue that needs logistic managers' undivided attention. Logistics can be defined as movement of supplies from where they originate to their point of distribution. The Council of Supply Chain Management Professionals (CSCMP) (2016) defines logistics as one of SCM elements that includes "planning, implementation, and control of efficient and effective movement and storage of goods, services and information from the point of origin to the point of consumption". Hani (2013) proposed that since competition is now cost-conscious in the new healthcare environment, types of traditional distribution supply chain in the healthcare sector must be abandoned for the purpose of remaining viable and competitive. It is important that healthcare facilities move with the time in order to close the massive gap between HCSCM and other industries.

2.3.3 Kwa-Zulu Natal

According to Stats SA (2017), KwaZulu-Natal (KZN) is the second most populous province with more than 11 million people. Table 2.1 shows that about 46.9% of people making use of public facilities were very satisfied while 86.6% of people who were identified using private facilities were very satisfied. According to KwaZulu-Natal Department of Health, (2018) the department highlighted a number of achievements and challenges in its 2018 financial year. These challenges include shortage of human resources, extended waiting periods for patients, and lack of necessary equipment (TAC, 2018). Some of these issues have been in existence for a long time and were addressed by the MEC of the KZN Department of Health on the 2017 Standing Committee on Appropriation meeting. These challenges have a negative impact on the entire KZN health system and may have detrimental effects on the health of the people living in the province.

2.3.4 Eastern Cape

Eastern Cape Department of Health, located in the Eastern Cape Province, exists to provide public healthcare to the population of the Eastern Cape (EC). Based on the results received by Stats SA, (2017), EC is the fourth most populous province

in South Africa, with more than six million four hundred thousand people. According to the Stats SA report (2017), in EC, about 59.1% of the population that attends public facilities expressed that they are very satisfied with the service. However, the Treatment Action Campaign (TAC) (2018) provides a report that EC has been hovering on the edge of complete breakdown. Furthermore, TAC (2018) revealed the following issues/concerns at the department of health in EC:

- Shortage of human resources including doctors, nurses and community healthcare workers. As a result of these shortages, people who attend public health facilities often wait in long queues.
- Poor facility infrastructure and poor equipment. Waiting areas and toiles in other health facilities have been declared untidy.
- Poor and undignified treatment of people with mental health problems.
- Red alert on TB infection control at primary health facilities.
- HIV and TB responses are falling short.

These issues are a potential threat to the entire department and may adversely affect the lives of people who attend public hospitals. This would mean that about 80% of the EC population would be at risk. The following section will look at the inventory management practices in the SA healthcare environment.

2.4 INVENTORY MANAGEMENT PRACTICES IN THE SOUTH AFRICAN HEALTH CARE ENVIRONMENT

Stock-out as a result of poor inventory management in healthcare is more catastrophic when compared to other industries where stock-out only results in profit loss (Moons, Pintelon & Waeyenbergh, 2018). Ofori-Ayeh (2017) defines inventory management as careful management of materials in their raw state, parts, works currently under progress and finished products with purpose of ensuring that the capital invested is returned, and that the stock is available in order to avoid opportunity cost. Inventory management, also known as inventory control, can be defined as a method of controlling inventory with the purpose of satisfying customer needs and demands.

Hani (2013) opines that a shared major inventory challenge faced by hospitals is stock depletion over time. This therefore means that if management of inventory is not up to standard, things can become chaotic within an organisation. In hospitals, such occurrences can result in patients losing their lives. Inventory is also known as stock where it is described as central theme of managing materials. It is the key control in the realisation of efficiency upgrades which are, "reduce costs, waste, and the risk of product obsolescence" while sustaining healthcare services level (Moons *et al.*, 2018).

An effective logistics practice is helpful to hospitals for controlling and distributing hospital supplies to the patients (Moons *et al.*, 2018). High levels of inventory have an effect on increased carrying costs but lower the possibility of lost sales, which could be caused by stock-outs, and slowing production that can result from poor stocktaking (Kritchanchai & Meesamut, 2015).

Rachmania and Basri (2013) found that there are three main pharmaceutical issues that affect patients' service performance. These issues are listed below:

- Overstock
- Unjustified demand forecasting technique
- Lack of IT support

2.4.1 Economic Order Quantity (EOQ) Model

The basic and widely used model to determine the optimal order quantity is Economic Order Quantity (EOQ) model (Hani, 2013; Kritchanchai & Meesamut, 2015). EOQ is a purchasing model used with for purposes of reducing holding and ordering costs. It is evident that EOQ is useful in optimising resources and thus reduce purchase, delivery and storage costs (Agarwal, 2014). The other model that is used to support stock management is Pareto ABC method and its objective is to reduce complexity and increase efficiency of stock management (Kritchanchai & Meesamut, 2015). Inventory is generally classified into three categories namely; raw materials, partially completed goods, and finished goods.

However, some inventory management researchers also include service inventory and transportation. According to Ofori-Ayeh (2017), regardless of the sector in which the organisation falls under, inventory management is therefore there for the following objectives:

- Supporting the firm to attain economies of scale.
- Creating a balance between supply and demand because supply and demand cannot be perfectly synchronized due to reasons such as strikes, sickness, unplanned rapid request and seasonal materials.
- Providing assurance against unknown demand in order cycle
- Serving as a buffer within the channel of distribution.

2.4.2 Radio Frequency Identification Device (RFID) Technology

Managing inventory without an application of Radio Frequency Identification Device (RFID) technology is nearly impossible nowadays. The following section will tabulate the benefits of using RFID in SC. Radio Frequency Identification (RFID) is now seen as the technology that has found a new home in healthcare and has become necessary in various healthcare processes. The healthcare industry has been constantly investing more money on information technology (IT) to reduce operating costs and increase patients' safety (Wang *et al.*, 2006).

According to the latter, RFID is considered most valuable in any organisation to achieve the aforementioned organisational goals. After extensively reviewing the RFID literature, it can be concluded that in this day and age, organisations will struggle to function well without an application of RFID. Vilamovska, Hatziandreu, Schindler, Van Orange-Nessau, Krapels & de Vries, (2009), discovered what they call 'key mutually-exclusive RFID enabling functions'. These include tracking/tracing, identification and authentication, sensing, and automatic data collection and transfer. Moreover, they stated that these RFID enablers in healthcare could be used for the following purposes:

- Patient safety
- Pharmaceutical application

- Management of devices
- Healthcare provision support/management for patients

RFID can be seen as the most important element in all distinguished industries as it provides efficiency and effectiveness in an organisation. The results of the study conducted by Coustasse, Tomblin and Slack (2013), state that the application of RFD on medical equipment and tracking of supplies has increased hospital efficiency, reduced costs and improved quality. Apart from improving hospital efficiency and reducing costs, RFID can also improve hospital operations by reducing long waiting times for patients (Asamoah, Sharda, Rude & Doran, 2018). A survey conducted by Sarac, Absi and Dauzère-Pérès (2010) revealed that RFID technologies could offer numerous advantages in SCM.

2.5   LOGISTICS IN HEALTHCARE

The literature shows that logistics in the healthcare environment is neglected and management has not found means to optimise it. According to Know, Kim and Martin (2016), cost savings in logistics zone could be used in improving quality service for patients. Healthcare environment is lagging behind when it comes to logistics and this is a result of several factors such as regulations, obsolete Information Technology (IT) systems, poor inventory management and distribution, lack of management involvement and lack of process improvement culture (Moons *et al.*, 2018). Due to the continuity of changing needs of healthcare customers, logistics in healthcare has become a complex issue (Parsa *et al.*, 2011). This complexity has caused SCM researchers to come up with innovative ways of meeting customer needs, and realising costs-saving approaches. Other researchers focus on developing a framework and other ideas to find a better way of integrating logistics activities (Parsa *et al.*, 2011).

2.6   CHAPTER SUMMARY

This section of the study provides the background of the supply chain management in the healthcare environment. It considers healthcare SCM in both global and

local (South Africa) perspectives. The chapter also covers inventory management and logistics in the healthcare sector. In the next chapter of this research (chapter 3), the literature that is relevant to the study will be presented.

CHAPTER THREE: LITERATURE REVIEW

3.1   INTRODUCTION

This chapter provides review of the literature with an emphasis on the theoretical review of supply chain performance measurement in the healthcare environment. However, there is limited existing literature on this topic in the South African context; most literary writings on the subject are on international contexts. To expand the comprehension of SCM, this chapter provides quite a number of definitions of the SCM concept provided by different SCM researchers. It also explored the following key concepts: Supply chain performance measurement, trust of the suppliers in healthcare environment, level in which knowledge is exchanged between hospitals and suppliers, supply chain integration with information technology, and supplier integration with hospitals. The literature was reviewed in line with following research objectives.

- To investigate the impact of trust on SC performance of the hospital.
- To identify the level in which knowledge is exchanged between hospitals and their suppliers in supply chain.
- To identify the existence of IT integration amongst hospitals and their suppliers.
- To explore the best practice of supply chain in the healthcare environment.

3.2   DEFINITIONS OF SUPPLY CHAIN MANAGEMENT (SCM)

Since SCM has gained much attention from researchers, there are many descriptions provided by different researchers and authors regarding this topic. Reddy, Rao and Krishnanand (2018) described SCM as a series of integrated processes and activities involved from supplier to the end user. These activities and processes entail the movement of goods and services between suppliers and consumers. They entail the supplement of all activities from all stages of the product, from raw material up to the finished product desired by the end user (Erdogan & Çemberc, 2018). Accordind to Mathur *et al.* (2018), a complete chain is made of four distinctive players; producers, suppliers, distributors, and

consumers. However, Al-Saa'da *et al.* (2013) identified only three main players; producers, purchasers and healthcare service provides. Thus, SCM can be described as a process of acquiring raw material/ finished goods from the place of origin (suppliers or manufacturers) to the end user of the product or service. According to Council of Supply Chain Management Professionals (CSCMP) (2016), SCM consists of planning and managing all the activities undertaken in sourcing and procurement, convention, and all logistics management duties. CSCMP further stated that SCM also consists of coordination and collaboration of the cadres involved in SCM such as suppliers, intermediaries, third party providers (logistics companies), and customers. Felea and Albastroiu (2013) provided a number of supply chain management (SCM) definitions. Table 3.1 below presents the definitions that Felea & Albastroiu (2013) provided:

Table 3.1: Definitions of SCM

Definitions	Author (s)	Year of Publication
"SCM is a process of planning, implementing, and controlling the actions of the supply chain in order to fulfil customer requirements as efficiently as possible. SCM spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption."	Oliver & Webber	1982
"SCM includes materials/supply management from the supply of basic raw materials to final product. SCM focuses on how organisations use their suppliers' processes, technology and capability to enhance competitive advantage."	Tan, Kannan & Handfield	1998
"Supply chain (sometimes called the value chain or demand chain) management consists of firms collaborating to leverage strategic positioning and to improve operating efficiency. For each firm involved, the supply chain relationship reflects	Bowersox, Closs & Cooper	2002

Definitions	Author (s)	Year of Publication
strategic choice. A supply chain strategy is a channel arrangement based on acknowledged dependency and relationship management. Supply chain operations require managerial processes that span across functional areas within individual firms and link trading partners and customers across organizational boundaries."		
"SCM is the systemic, strategic coordination of the traditional business function and tactics across these business functions within a particular company and across business within the supply chain, for the purpose of improving the long term performance of the individual companies and the supply chain as a whole."	Sweeney	2007
"SCM comprises of developing a strategy to organise, control and motivate the resources involved in the flow of services and materials within the supply chain."	Krajewski, Ritzman & Malhotra	2007
"SCM is the active management of supply chain activities and relationships in order to maximize customer value and achieve a sustainable competitive advantage."	Bozarth & Handfield	2008
"SCM is a set of approaches used 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 reduce system extensive costs while satisfying service level requirements."	Simchi-Levi, Kaminsky & Simchi-Levi	2008

Definitions	Author (s)	Year of Publicatio n
"*SCM is the integration of trading partners' key business processes from initial raw material extraction to the final or end customer, including all intermediate processing, transportation and storage activities and final sale to the end product customer.*"	Wisner, Tan & Leong	2012

The definitions provided by authors all come into the same conclusion that SCM is a bond shared by the parties involved in the SC with the purpose of satisfying customer needs.

Du Toit and Vlok (2014), proposed a framework showed in Figure 3.1 that enables one to understand the holistic overview of SCM. In the proposed framework, an overview of distinguished components in supply chain is provided and a relationship of the components is shown.
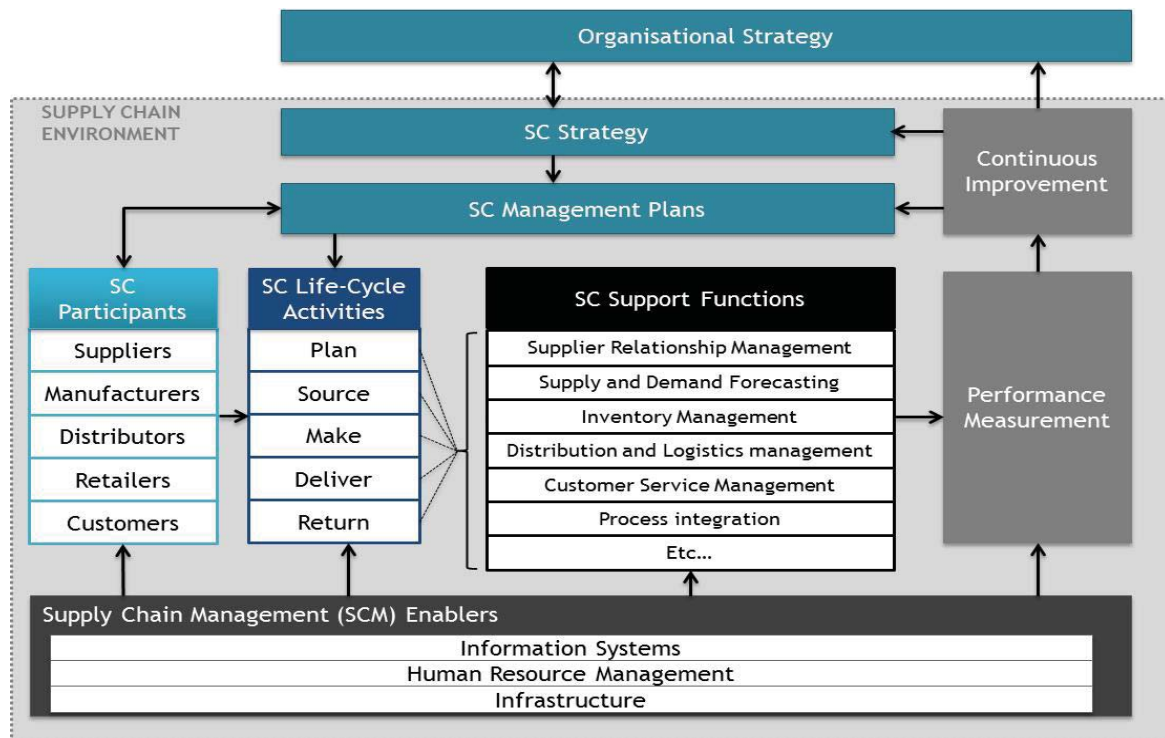
Figure: 3.1: Proposed supply chain management framework

(Source: Du Toit and Vlok, 2014)

Figure 3.1 shows the initial point of a holistic SCM. It provides a clear picture of how the SCM flows from the initial point, which in this framework is the organisational strategy to the bottom point. SC strategy is aligned with the organisational strategy and this alignment is important and critical in supply chain (Du Toit & Vlok, 2014). The next item of framework that is directly linked under SC strategy is SCM plans. SCM plans contain three components: SC participants, SC life-cycle activities, and SC support functions. Figure 3.1 shows participants who are directly involved in SC which include suppliers, manufacturers, distributors, retailers, and customers. In the case of hospital's supply chain, other players such as retailers and distributors do not form part of the chain, hospitals deal direct with suppliers. SC life-cycle is the second component and is made of these activities: plan, make, source, deliver and return. SC support functions as a third component on the framework, relies heavily on SC life-cycle activities. These SC functions include:

- Supplier Relationship Management (SRM), an inclusive approach to manage the organisation's relations with other firms that supply products and services to the organisation (Mettler & Rohner, 2009).);
- Supply and demand forecasting - a process of predicting future demand and supply
- Inventory management - a process of managing an organisation's stock;
- Distribution and logistics management - transportation of goods and services from one place to the other until they reach the end-user;
- Customer service management and process integration.

This framework is important in that it clearly state what needs to be considered for performance measurement purposes and continuous improvement. Infrastructure, information systems and management of human resource are enablers of SCM enablers. These enablers can be utilised as means for performance measurement and they can be vitalised especially in the hospital SC.

3.3   KEY FACTORS THAT INFLUENCE SUPPLY CHAIN PERFORMANCE

In this section, the research presents the relationship between these supply chain key factors: trust, integration and knowledge exchange within the healthcare environment. The literature seems to unanimously agree that a strong relationship exists between them.

3.3.1   Trust in Supply Chain

The research shows that there are several studies conducted in different industries relating to the importance of trust in supply chain. Studies show that there is interdependent between trust and organisational performance. Although there is still no unanimity regarding one definition of trust, Chang, Ouzrout, Nongaillard, Bouras and Juliu (2014), defined trust as a cooperative relationship amongst partners that indicates a great level of faith as well as fulfilment of promises. Moreover, (Erdogan & Çemberc, 2018), added that trust is a confidence that one party has towards the reliability and honesty of the other party. The effect of trust created in supply chain results in effective relationships amongst supply chain stakeholders (Sahin, Çemberci, Civelek & Uca, 2017). After a broad review of the literature, the researcher can conclude that an interconnection between trust and an organisation's performance exists. Following the thorough analysis conducted on the existing literature, conclusions were drawn that the connection amongst trust and performance can be explained better by the presence of a mediating variable (Abdallah *et al*., 2017). According to Judeh (2017), employee engagement is the mediating variable between organisational trust and performance.

A thriving relationship between an organisation and the suppliers is pivotal as it strengthens the trust between them. Improving supplier performance requires the establishment of a strong buyer-supplier relationship (Pooe, Mafini & Loury-Okoumba, 2015). Trust is an important rational capital for mitigating exchange risk between partners in the supply chain since it eliminates the uncertainties of a partner's action (Yu *et al*., 2017). According to the research conducted by Civelek and Uca (2017), trust has a significant influence on quality information sharing and thus provides relationships for supply chain allies.

Trust thus plays a significant role in the buyer and supplier relationships akin to very close associations and interactions in daily life (Sahin *et al.*, 2017). Regardless of its visible significance in effective supply chain management and an importance of body of research psychology, trust development between organisations is still not a fully understood process (Ian Stuart, Verville & Taskin, 2009).

Researchers are suggesting that businesses, instead of trying to make short-term profits, should be following a principle of building a long-lasting relationship with suppliers. Businesses develop trust by standing behind their promises (Kosgei & Gitau, 2016). Most certainly, "strategic relationships" with important suppliers ought to be known in order to exploit the value chain establishment opportunities in the supply chain (Kosgei & Gitau, 2016). Supplier relationships are mostly influenced by the four vital elements; trust, commitment, communication and mutual goals. It is evident that trust and integration have a mutual impact on performance. Trust facilitates Supply Chain Integration (SCI) and can be viewed as a significant element of enhancing supply chain performance (Abdullah *et al.*, 2017). Trust therefore influences quality of information sharing indirectly (Sahin *et al.*, 2017).

3.3.2 Supply Chain and IT Integration

SCM gives firms an opportunity to link technology with people and other supply chain partners in attempt to meet customer needs, (Marinagi, Trivellas, & Reklitis, 2015). Supply chain integration (SCI) is a point where strategic cooperation occurs between an organisation and other supply chain associates and managers, both internal and external for effectiveness and efficiency in the flow of information, products, services, money and decisions for the purpose of meeting customer needs (Lai *et al.*, 2012). Information Technology (IT) in healthcare is recognised as an instrumental factor to enhance staff performance, minimise medical errors, quality improvement, and improve cost efficiency (Spezial, 2015). For an organisation to develop a strong supply, an integration with suppliers is focal and

necessary. SCI is considered as the key in performance improvement and value creation (Yu, Zhang & Hou, 2017). A great degree of SC integration/collaboration can lead to high-improved performance (Liang, 2015). External and internal integration are both equally important in the development of both supply chain capabilities and performance (Cheung *et al.,* 2018).

Integration in supply chain is categorised into these three categories: SC internal integration, customer integration, and external integration (EI), also known as hospital-supplier integration in healthcare environment. Internal integration is referred to as a process in which all functions of different departments in the supply chain are incorporated to function as a unit. A healthy internal integration ought to provide excellent service to the clients and enhance organisational performance (Basnet, 2013). According to Moons *et al.* (2018), internal supply consists of purchasing, inventory, consumption and distribution. Customer integration diagnoses the importance of building a strong long-lasting, collaborative and close relationship (Lai *et al.*, 2012). External Integration (EI), contrary to internal integration and is also known as supplier integration, focusses on cooperating with external stakeholders for the purposes of smoothing supply chain functions. External integration may influence performance outcomes in miscellaneous ways (Yu *et al.*, 2017). Effectiveness and efficiency are key drivers of integration while ascertaining organisational goals are met based on the anticipated time. Integration between SCM stakeholders is crucial in order to create a strong relationship and easy flow of information and other important necessities.

Supply Chain Integration (SCI) is now a critical term that is widely discussed in all areas of SCM. Thanks to the Information Technology (IT) that enables organisations to integrate their systems with those of their suppliers. It is impossible to attain an effective SCM without IT since these two are complementary to each other (Harnowo, 2015). According to Alshahrani *et al.* (2016), Hospital-supplier integration in healthcare settings is composed of the main four factors that are logistics integration, IT integration, trust, and information sharing. The definition of supplier integration is more or less the same as other definitions given above on various forms of integration, given that integration is a

process in which an organisation acquires and shares operations, financial information, technical skills, and knowledge.

Researchers describe supplier integration (SI), as a buyer-supplier relationship that is constructed on trust and quality information sharing. Danese (2013), states that SI is conceptualised in many ways and can oftentimes be referred to; buyer-supplier relationship, supplier collaboration, or supplier involvement. In broader perspectives, it is known as external integration (EI) where integration is between the buyer and the suppliers. Alshahrani *et al.* (2016) argue that IT integration among a hospital and its suppliers has a direct and indirect influence on hospital-supplier integration and general HSCP.

Danese (2013), argues that the main aim of supplier integration is to smooth and optimise the process of procurement and production. SI helps the buyer to reduce a number of risks that may arise because of supplier unreliability. Literature highlights a number of SI advantages that benefit and strengthen the buyer-supplier relationship. These consist of reducing transaction costs, reducing lead-time, reducing contracting costs, eradicating uncertainties and reducing risks. Moreover, Alshahrani *et al.* (2016) also indicated some other benefits that they refer to as vertical integration (dependability, quality, planning and control). Shou, Park and Kang (2018), demonstrate the positive effect of SCI on operational performance. They have intensified a connection between information sharing, SCI and firm's performance. There are verified results that show the robust association between performance and the level of both internal and external integration (Abdo, 2017).

Dobrzykowski *et al.* (2014) highlighted the following five SCM areas that are critical to the health care environment: "IT and new technology in services, general aspects of strategy and objectives of operations in services, selection and design of the service delivery system, issues in strategic quality services and planning of capacity, scheduling and control".

Chen *et al.* (2013) investigated the HSCP through a relational view and empirical test in the health care environment. Their study results show the following important effects:

- IT integration and exchange of knowledge influence hospital supply chain performance.
- Trust and IT integration on hospital– and hospital supplier integration are imfluenced by knowledge exchange

Ellström (2015) demonstrates a number of characteristics that he believes best describe buyer-supplier relationship, these being:

- Materials exchange as well as exchange of information and knowledge.
- Supplier engagement and operations support and activities usually executed by the consumer.
- Arrange in a line the actions of supplier and buyer to achieve costs reduction and an increase in provided customer value;
- Both buyer and supplier can initiate supplier engagement and support in the operations and activities usually undertaken by the buyer.

Figure 3.2 below shows the channels through which information flows in supply chain management (Lambert, 2008:13). Information in SCM flows between supplier, distributors and customers. It also shows how organisations use the relationship between their customers and their suppliers to meet the demand of the customer by purchasing what customers want. There is an apparent intensified integration of information sharing starting from customer relations 'management, customer service management, demand management, order fulfilment, manufacturing flow management, procurement, and product development and commercialization returns'. Even though this framework appears as designed for businesses of other industries, it might have an impact on hospital supply chain performance.
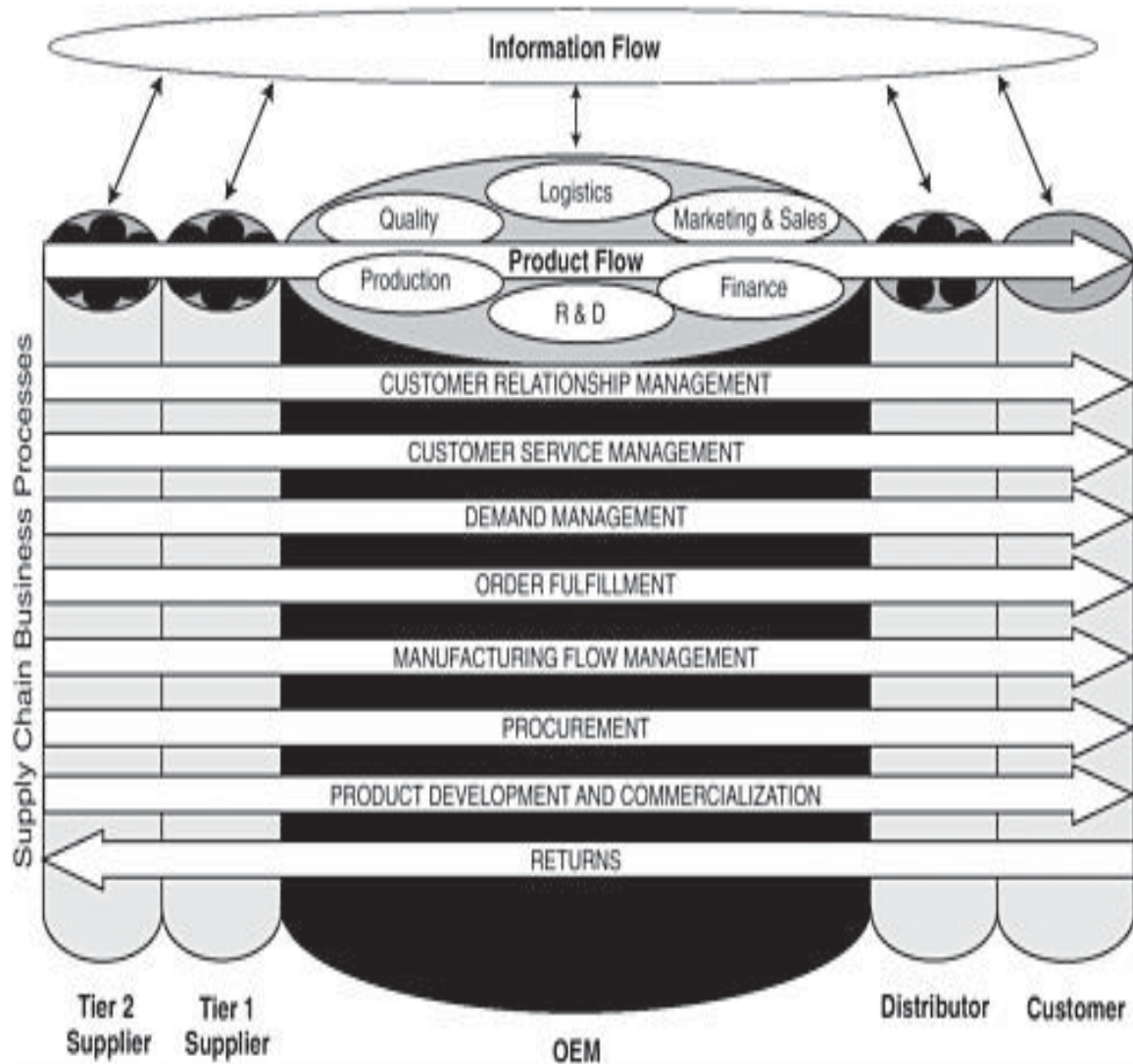
Figure 3.2: Information flows in supply chain management

(*Source: Lambert, 2008:13*)

Any delays or interruption of information along the process affects the entire operation of the SCM department. The hospital SCM is composed of the four following units: Main Stores, Procurement/purchasing, Finance and Asset Management Unit. An integrated system needs to be adopted in making sure that the aforementioned units work systematically to improve the supply chain. Integration of the internal and external hospital supply chain can reduce up to almost half of the costs involved in supply chain (Pervez, Mahmud & Bachar, 2016).

According to Agami *et al.* (2012), SCM has gained much consideration from a number of fields as a tool for helping organisations survive under the constant pressures of exceeding customer satisfaction. "Performance measurements systems" are imperative in SCM (Shaw, Grant & Mangan, 2010). Shaw *et al.* (2010) further stated that supply chain management measures have conventionally been orientated around cost, time and accuracy.

"Cultivating hospital supply chain nowadays is important to healthcare organisations as they strive to improve operation effectiveness and efficiency" (Chen & Gong, 2013). This means that hospitals and other health centres invest tons of resources and time into guaranteeing the smooth functioning of their supply chain management departments with the purpose of cutting costs. Measuring SCM is a need for purposes of reducing costs and maximising organisations' profit while ensuring customer satisfaction is optimum.

3.3.3 Knowledge Exchange in Supply Chain

The implementation of information and communication technology (ICT) in healthcare has been recognised as a way of ensuring that, health care activities and the economic services are effective, efficient, of high quality of health services, availing information instantly (Mettler & Rohner, 2009). Studies show that supply chain information sharing (SCIS) is critical in supply chain as it helps companies to improve their operational performance (Huo, 2014). SCIS provides a better partnership and enhances integration between supply chain partners (Kim & Chai, 2017)

Many researchers make very little distinction, if any, between knowledge and information. After reviewing the literature on knowledge and information definitions one can conclude that information is knowledge, but knowledge contains a lot more than mere information; it also includes skills (Cummings, 2004). Keeping open information sharing in real time can help to reduce complexity in HCSC. According to Pulakos, Dorsey and Borman (2003), knowledge sharing is the establishment of task information and as a way of helping others gain more understanding, enabling them to resolve issues, generate fresh ideas, or

implement organisational policies or procedures (Wang & Noe, 2010). Knowledge exchange can be seen as an integral element of creating interconnection between the buyer and the seller. Thus, knowledge exchange influences relationships and trust levels among supply chain cohorts. Information sharing and knowledge sharing between hospitals and hospital suppliers plays an important role in creating competitive advantage (Alshahrani *et al.*, 2016). Managers should of necessity, not only have technical and operational skills, but to also develop relationships that build the trust required to achieve knowledge exchange (Hernández *et al.*, 2008). The results of the study conducted by Chan, Surbramanian and Abdularahmn (2017), reveals that information exchange from downstream to upstream supply chain partners might contribute to the improvement of accuracy forecasting. Information sharing is considered as a critical method that leads to costs reduction and time saving and subsequently improve supply chain agility (Kim & Chai, 2017).

According to Prajogo and Olhager (2012), some research pays extra attention to supply chain relations with an aim to explore effects of collaboration on the supply chain integration, and results that show IT and information sharing is important for supply chain performance. It is apparent that there is a strong relationship between trust, knowledge sharing, integration and performance. However, (Ofori-Ayeh, 2017) states that some researchers (Zhang & Huo, 2013; Chen *et al.*, 2013 and Jin *et al.*, 2013) also highlight the commitment of top management and organisational culture as some of the factors that influence both SCI and SC performance. Supplier selection, utilisation of advanced technology, and strategic partnerships were also identified as factors influencing integration and performance.

3.4 SUPPLY CHAIN PERFORMANCE MEASUREMENTS

To be able to measure organisation's efficiency, it is essential to recognise the external and internal factors that affect the organisation's performance (Rogriguez, Figueroa, Alfaro-Saiz, & Verdecho, 2018). It is highly impossible to measure and improve performance unless the system is entirely analysed (Bhatti, Singh & Singh, 2015). As a process of fulfilling business objectives, organisations ought to

maintain, control and manage the processes of their supply chain (SC) that sometimes lengthen beyond organisation's boundaries (Maestrini, Ronchi, Caniato, Maccarrone & Luzzini, 2018). Performance improvement in the healthcare SC with low costs and maximum responsiveness is critical in hospitals (Turkyilmaz, Zaim & Bulak, 2015). According to Jakhar and Barua (2014), measuring supply performance in any organisation is necessary as it enables the organisation to detect changes and further to determine whether these changes are positive or negative.

The following are some of the approaches that Sillanpää (2015) discovered that are appropriate and mostly used in measuring SC capability. Different performance and quality measurement gurus propose these approaches. They include the below mentioned:

- Performance measure matrix
- Financial and non-financial metrics
- Six sigma approaches
- Green SC measurements
- Quality, cost, delivery and flexibility
- Performance measure questionnaire

An application of performance measure system (PMS) is vital in measuring supply chain performance (SCP). A well-measured SC contributes to both performance and competitive advantage of an organisation (Gbadeyan *et al.*, 2017). According to Maestrini *et al.* (*2018*), SCP is a collection of metrics, which are utilised for quantifying the efficiency and effectiveness of activities intended to support strategy implementation.

Performance measurement of the whole supply chain is considered to be important as it allows an organisation to track and trace the efficacy and efficiency failures and it also leads to more decisive decision-making regarding chain design (Hamid Abu Bakar, Lukman Hakim, Choy Chong, & Lin, 2009). Any improvements in supply chain can contribute immensely to inventory management, elevate patients' satisfaction, improve supplier relationship and increase the effectiveness

of hospital employees (Hani, 2013). There are many performance measures, models and matrix that have been introduced by researchers, for purposes of creating a highly performing, effective and efficient supply chain. According to Gbadeyan *et al.* (2017), previously, organisational performance was determined by financial metrics such as profit, market share, growth, and revenue. However, based on the study they conducted they concluded by indicating that financial indicators are solely measures of past performance and cannot be a good measure for future performance.

Supply Chain Performance measurement (SCPM) is outlined by the appropriate key performance indicators (KPIs) of the firm, (Gawankar, Kamble & Raut, 2016). Gawankar, Kamble and Raut (2016), argue that SCM can be measured on the basis of the following measurement; "cost efficiency, time responsiveness and a mixture of the two which is understood as the traditional and relationship or hard and soft parameters". According to Dametew *et al.* (2018), organisations in all distinguished industries normally use these supply chain performance measurement tools: balance scorecard (BSC) model, total quality management (QTM), logistics scorecard (LSC), supply chain operations reference (SCOR) model, Economic Value Added (EVA), and Activity-Based Costing (ABC).

Although Dametew *et al.* (2018) included QTM, it is evident that only a few SCM researchers that make use of this model, despite its usefulness in SCM. Turkyilmaz *et al.* (2015) also suggests that TQM has become an important tool for improving a firm's performance especially in the healthcare industry. Moreover, they stated that QTM is a powerful tool for predicting long-term survival through the influence on financial and non-financial performance metrics and is a future profitability-leading indicator (Turkyilmaz *et al.*, 2015).

However, each of the performance measurement tools present with their own advantages and disadvantages. Therefore, a firm ought to choose, based on its needs, a suitable tool to measure its performance in order to determine the areas that need improvement. Table 3.2 below showed the prioritisation of performance measurement that was created by Dametew *et al.* (2018). It includes the types of

performance measurements, functions and main components of each tool, and limitations of applying a certain tool (Dametew *et al.*, 2018).

Apart from these measures, Intrieri (2016) suggests that beyond costs reductions, there are three core metrics and ten soft metrics for measuring SCP. This study only focusses on the core metrics of measuring SCP. In what he regards as core metrics, Intrieri (2016) mentions inventory measurement, working capital, and time. These metrics are all used to measure both efficiency and effectiveness of an organisation and they are measured by the performance measurements. The metrics are presented and well explained in Table 3.2 below.

Table 3.2: Prioritisation of performance measurement

Types of Performance Measurements	Functions and Main Components	Limitations
SCOR	"Plan, Source, Make, Deliver, and Return"	"Does not evaluate quality issue on manufacturing firms"
ABC	"Assessing the financial intricacies like the total cost involved in engaging a particular customer or the metrics pertaining to a specific product in the supply chain that means. Assigning costs in a supply chain based on its activities rather than on the end deliverables".	"Only measure active cost of the project and process"
QMS/TQM	"Customer-oriented, leadership, strategic planning, employee responsibility, continuous improvement, cooperation, statistical methods, and training and education."	"This is not evaluating financial performance, logistics and related issues."
BSC	"Financial, Customer, Internal process perspective, The learning and growth or innovation perspective."	
LSC	"Logistics Financial Performance Measurement Logistics Productivity Measurement	

	Logistics Quality Measurement	
	Logistics Cycle Time Measurement"	

(Source: Dametew *et al.*, 2018)

The table above can be used to determine the best performance measure tool to be used in SCM. Many researchers postulate that use of SCOR – model is vital in determining the organisation's current state of performance. Moreover, Lillelund (2015) suggested that there are four crucial performance indicators in SC. These are storage space, order fill rate, on time deliver/shipment, and perfect order matrix.

Lega, Marsilio and Villa. (2013) have developed a framework to evaluate SCP in public healthcare sector. Their framework reduces some evaluation dimensions that are included on some models and add some performance indicators that are more relevant to the healthcare sector.
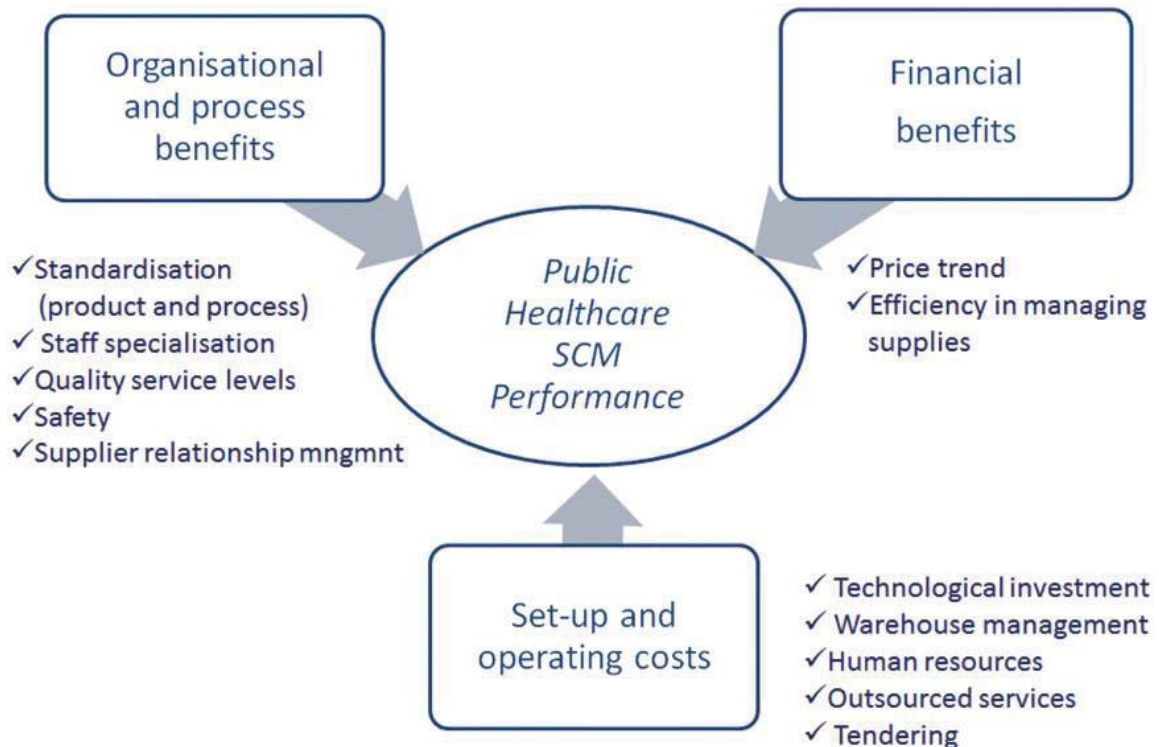
Figure 3.3: The framework for evaluating SCM in the public healthcare

(Source: Lega *et al.*, 2013)

This framework model contains three of what they call broad dimensions of supply chain evaluation model. These are organisational and process benefits, financial benefits, and set-up and operating costs. The framework is quite clear in areas that fall under each of these dimensions. Organisational and process benefits include these aspects: safety, quality services, staff specialisation, supplier relationship management and standardisation. This is a holistic overview of the organisational and process benefits that SC managers can look at as part of SCP evaluation. However, as comprehensive as this framework is, it is omitting other critical factors of supply chain such as the factors discussed in 3.3. On the other hand, financial benefits assist organisations to reduce purchasing prices and the volume of supplies stocked internally (either those stocked at central warehouses or those stocked at medical department warehouse) (Lega *et al.,* 2013). Set-up and operating costs is the third dimension of SC evaluation and literature shows that it is the bearer of cost drivers. These costs drivers include technology, human resources, warehouse management, outsourced services, and tendering. These drivers are mostly the main contributors in SCM efficiency and inefficiency.

3.5   THE BEST PRACTICE OF SUPPLY CHAIN IN HOSPITALS

The SCM focus of providing best practices is often based on difficult strategy of balancing efficiency and effectiveness (Kros, Krirchoff, & Falasca, 2018). Abdulsalam, Gopalakrishnan, Malts, and Schneller (2015), argue that healthcare SC differs from other normal CS of other industries; hence, a distinction between supply chain in healthcare (SCIHC) and supply chain of health care (SCOHC) became known. Healthcare organisations have shown a great experience in defining key performance indicators (KPIs) and decision making relying on the values of KPIs (Rodriguez, Figueroa, Alfaro-Saiz, & Verdecho, 2018). The use of KPIs to measure organisational performance is a very important step to begin with (Rodriguez *et al.*, 2018).

Effective practices in healthcare supply chain provide great results such as operation improvement and cost efficiencies that result in quality improvement (bin Megat Adnan & bin Sahroni). The overall growth in healthcare overheads costs and increases in competitive intensity, are putting healthcare supply chain costs under scrutiny than before (Dittmann, 2015). SCM plays a pivotal role in ensuring

that the best service is delivered by the hospital. SCM can be used as a tool, so that management effectiveness and efficiency can be achieved and it also serves to fulfil organisations' objectives (Gunasekaran & Tirtiroglu, 2001). In order to determine quality in healthcare services, waiting time for patient should be measured (bin Megat Adnan & bin Sahroni).

Efficiency and effectiveness of an organisation's SCM is the prerequisite of its supply chain optimisation (SCO). The existing literature shows that in order to improve efficiency and effectiveness, an organisation ought to optimise costs, mitigate risks, minimise working capital, and improve data analysis skills.

3.5.1 Strategy for SCM in Healthcare Environment

Strategy in healthcare environment is about optimising hospital efficiency and effectiveness while ensuring quality service is offered to the patients. According to Johnson (2016), developing a strategy is one of the 12 fundamental best practices of SCM. Healthcare SCM strategy development consists of enhanced partnership with suppliers, support of physicians, concentration on integration, systematising the supply chain, adopting more and better standards and using process improvement methods (Moons *et al.*, 2018). Strategic sourcing in SCM can be defined as a plan, pattern, position and perspective of how to connect with suppliers for purposes of purchasing (Mettler & Rohner, 2009). Strategic sourcing is perceived as a way of developing a strong relationship with suppliers with an aim to create advantage and consolidate power to discover affordable prices in the market.

3.5.2 Alignment of SCM between organisation and its suppliers

Aligning a SCM with suppliers means going horizontal (Mehra, 2014). In order to make the alignment possible, certain aspects ought to be implemented. For this purpose, Supply Chain Operations Reference (SCORE) Model seemed to be an enabler of an effective and efficient model to SCM alignment. According to Mehra (2014), there are seven integrative elements that connect the pieces of the

SCORE Model; these are "Strategy alignment", "Governance", "Core business processes", "Collaborative Organisation Structure", "Information Technology", "Standardisation of improvement strategies" and "Network Optimisation".

3.5.3 Inventory management in SCM

Organisations in healthcare often find it difficult to forecast correctly the inventory, due to rapid changes of technology and policies (Kroos *et al.*, 2018). Effective inventory management in SCM is about the alignment of both internal and external resources with company strategy to improve quality, value and cost which will give an organisation a competitive advantage (Ofori-Ayeh, 2017). This simple means that without an integrated SC, organisations cannot achieve the optimum results that they desire in terms of quality improvement, value chain, cost reduction and profit maximisation.

3.5.4 Cost efficiency in SCM

The literature explicitly recognises the importance of cost efficiency in SCM environment. SCM managers ought to find means to reduce costs and maximise profits. In line with the needs of organisations to control costs in healthcare, SCM has been recognised as an imperative phenomenon in achieving the goals set by organisations (Al-Saa'da, Taleb, Al Abdallat, Al-Mahasneh, Nimer & Al-Weshah, 2013). Addressing financial problems has become a necessity for hospitals to operate effectively under the recent economic downturn (Chen *et al.*, 2013). Ensuring saving in supply chain, area of physician preference cards and physician buy-in should be some of the first steps. Products that are more cost-effective must be purchased based on the agreement between a team of experts and sourcing stuff (Moons *et al.*, 2018).

3.5.4 Monitor and control in SCM

Johnson (2016) affirms that there are 12 fundamental best practices of supply chain management. Listed below are 12 fundamentals:

- Develop the strategy

- Align the supply chain organisation

- Establish key supplier alliances

- Recruit supply chain professionals

- Manage inventory

- Manage total cost of ownership

- Be dedicated to performance management

- Establish strategic sourcing strategy

- Manage distribution & logistics

- Establish & monitor controls

- Streamline the order-to-payment

- Develop supplier management processes

These fundamentals seem to be straightforward and effective in SCM but they cannot be fully effective without integration, trust and knowledge sharing. Mover, it would be satisfying to see supplier relationship management included in these fundamentals. In addition, when recruiting supply chain professionals it must be competent professionals because supply complications. Effective amount for best high quality service, efficiency equal to costs reduction and profit maximisation. "A penny saved is a penny invested somewhere else in healthcare" (Johnson, 2016).

3.6   Chapter Summary

In this chapter, the paper provided a review of the literature of supply chain in healthcare including the definition of SCM, factors influencing healthcare performance and best practice of SCM in hospitals. It is evident that there is no full attention paid to the factors that influence the performance and how these factors influence each other. The following section (Chapter 4) looks at the research methodology applied to this study.

CHAPTER 4: RESEARCH METHODOLOGY

4.1   INTRODUCTION

This section of the study provides an indication of how the research was conducted. This includes research design, target population and sampling, instruments, analysis, data validity and reliability, amongst others. The chapter also defines the data collection methods used in this study and lastly concludes the chapter with a summary.

4.2   Research Design

Research design can be described as a way of arranging a research project or programme from the start in order to achieve the probability of results that offer a definite answer to the research questions for a specified level of resources (Gorard, 2013). It is a plan, strategy, or structure of investigation with the purpose of obtaining answers to research questions or problems (Kumar, 2011).

The nature of the research for this study commands the use of multiple methods approach for data collection of this study; therefore, qualitative and quantitative approaches were applied. This phenomenon was achieved by means of in-depth interviews and questionnaires. The methods are discussed in the following section of this research.

4.2.1 Qualitative Methods

The qualitative approach helps the researcher to describe characteristics of people and events without having to measure or count (Thomas, 2003). The qualitative methods in this research seek to attain the perception of SCM employees of a certain hospital in the Western Cape relative to supply chain performance measurement. Qualitative methodology is described as descriptive data, generally the participant's viewpoint pertaining to their experiences or perceptions (Brynard, Hanekom & Brynard, 2014). This method produces fruitful data that is descriptive in nature, which requires interpretation by identifying and coding themes and

categories which will result in findings that will back up theoretical knowledge and pragmatic use (Boeije, 2010:11). For the purpose of this study, a qualitative research approach was deemed suitable for this study considering the fact that numbers alone rarely provide answers. The researcher found this design appropriate for this study since it involves feelings, attitudes, interests and concerns of the people who are directly involved in sourcing goods and services of the hospital. The data was collected through one-on-one interviews with the managers who are directly involved in the sourcing of goods and services for the hospital.

4.2.2 Quantitative Methods

"Quantitative research methods put emphasis on measuring and calculating (more and less, larger and smaller, often and seldom, similar and different of) the characteristics shown by the people and events that the researcher studies" (Thomas, 2003). It tests objectives by examining the relationship between variables (Creswell, 2009: 233). Furthermore, the variables could be measured classically on instruments, so that created numbered data can be analysed using statistical procedures (Creswell, 2009: 233). The study seeks to measure supply chain performance of the hospital, therefore since it is about "measuring" performance; a quantitative research method was also deemed appropriate since qualitative research is unable to answer some of the questions.

4.2.3 Combining qualitative and quantitative approaches

A method combining both qualitative and quantitative research methods is known as a mixed method and is often associated with a positivist paradigm. Creswell (2009: 231) describes mixed methods research as the approach to enquiry that combines both qualitative and quantitative approaches. Teddlie & Tashakkori, (2009: 33) postulate that mixed methods research approach has three areas that make it superior than a single method:

- It addresses simultaneously a variety of positive and exploratory questions with both qualitative and quantitative approaches.
- It gives (stronger inferences.
- It affords the opportunity for a better collection of different views.

For measuring supply chain management performance of the hospital, the mixed method approach was seen as a suitable method for this research because it involves numeric (quantitative) and people's views (qualitative).

4.3   Population and Sample

4.3.1 Population

According to Sekaran (2003), population can be described as a complete group of people, events, or things that the researcher wishes to research about. The target population of this study was 180 people who are directly involved in goods and services sourcing in one of the public hospitals in the Western Cape.

4.3.2 Sampling

According to Sekaran (2003), sampling is a method of choosing an acceptable number of elements from the population for purposes of creating a possibility of generalising the characteristics of the population elements. Kumar (2011:175) mentions that there are three types of sampling namely, 'random/probability sampling, non-random/non-probability sampling, and the 'mixed' sampling design'. It is not practical to study an entire population (Melville & Goddard, 1996). Therefore, a sample ought to be selected. However, a sample's size needs to be big enough in order to properly represent a population (Goddard & Melville, 2001). A sample of 120 people was selected using probability sampling, where every component within the population had the same chance of being selected for the sample. Non-probability sampling does not follow the theory of probability in the choice of selection; it is used when the number of elements in the population is maybe unknown or cannot be individually ascertained (Kumar, 2011:181). In this study, the purposive sampling technique was deemed key to research questions

and was deemed ideal for qualitative research. Purposive sampling is based on the judgement of the researcher to decide who can give the needed information to achieve the objectives of the study (Kumar, 2011: 339).

In a large number of managers within the hospital, a sample of five operational and middle managers of different departments were interviewed, and 120 questionnaires were distributed to the staff and middle managers in various departments within the hospital, and the participants returned only 80 questionnaires. Existing information within the hospital was also used in order to make conclusions of this research. The responses were analysed and quantified in order to draw up conclusions.

4.4 Research Instruments and Data Coding

Qualitative data was collected through unstructured interviews (n_1=5) where quantitative data was collected through a questionnaire (n_2=120). The participants were interviewed based on their respective functions. All the interviewees were given a written assurance of confidentiality and anonymity. The qualitative data was analysed through content analysis and quantitative data was analysed through Statistic Package for Social Sciences (SPSS) V24 programme. Finally, the conclusions were drawn based on both the qualitative and the quantitative findings. For the purpose of this study, interviews and questionnaires were used as research instruments of collecting both qualitative and quantitative data.

4.4.1 Interview

Interview can be described as a verbal interchange, normally conducted face to face, however the telephone may be utilised, this is where the interviewer is trying to obtain information based on the beliefs or opinions of another person' (Kumar, 2011). The interviewer has discretion when it comes to the structure and content of the questions to be asked, the wording and how questions will be asked (Kumar, 2011). For this reason, interviews were considered one of the most suitable tools for this study since questionnaire does not necessarily have a follow up question to the answers provided by the respondents. A number of managers from different

departments were selected to participate in the interviews. These departments included procurement, clinical engineering, general stores, and pharmacy. A total of five managers participated in the study from these departments.

4.4.2 Questionnaire

A questionnaire is known as a printed document with a list of questions which respondents are asked to answer (Melville & Goddard, 1996). The respondents answer questions using their own words and may not be forced to be totally honesty (Melville & Goddard, 1996). In this study, the questionnaire was designed to answer questions about; integration, trust, knowledge sharing and best SCM practices (see Appendix 2). A number of 120 questionnaire copies were disseminated to the respondents. Out of 120, a number of 80 (66.7%) questionnaires came back. The researcher explained everything to the participants before allowing them to complete the questionnaire (see Appendix 3).

4.4.3 Data Coding

Coding is described a process of classifying quantities of data with a short name that, at the same time provides a summary and an account for each piece of data (Boeije, 2010). Data coding in this research is used because it allows the researcher to summarise and synthesise the data process. Instead of using the whole phrase in discussing the results, the researcher opted to use data coding as shown on **Appendix 7** (Descriptive Codes). Data were coded as ST1 to ST28.

4.5 Reliability and validity

Reliability of a measure specifies the level in which it is not biased (error free), hence it guarantees constant measurement at all times, and also that all the other items are important (Sekaram, 2003: 203). A pilot study was conducted to enable the researcher to identify issues that could influence the process of attaining data. The results shown that the most of the employees of the hospital in the supply chain department have grade 12 and above. However, for better understating, the language used in the questionnaire had to be adjusted to best suit all different

levels of participants. The reason for the use of pilot study was to ensure that the research instrument/s captures data accurately for the purpose of content validity. Validity is the extent to which an instrument can measure what it is planned to measure (Kumar, 2011). The pilot study conducted was to ensure that validity and reliability is achieved. It permitted the researcher to adjust some questions in the questionnaire and in the interview guide. Terminology used on the questionnaire had to be adjusted on some questions before conducting the actual study.

4.6   Chapter Summary

This chapter covered the research design and methodology applied to this study and justified why it was necessary to apply the used methodology. It also provided a detailed discussion of the population and sampling applied to this study. Reliability and validity in this study were also defined. The following section (chapter 5) of this study presents the results and discusses the findings of the research.

CHAPTER 5: RESULTS AND DISCUSSION

5.1   INTRODUCTION

This chapter presents the results and the findings of the study based on both primary and secondary data. It gives a comprehensive overview of all the data collected and the characteristics of the respondents. The chapter displays both qualitative and quantitative results. A total number of 120 questionnaires were disseminated and 80 responses were received in July 2018. Due to the level of tasks that employees had at the time of questionnaire dissemination, 40 participants did not return the questionnaires at all; some staff members could not return their questionnaires on time. Some employees were on leave during this time. The research study states that a number of people were interviewed from various SCM departments, middle management in clinical engineering department, and hospital pharmacy. This chapter seeks to respond to the following objectives of this study:

- To establish the impact of trust on supply chain performance of the hospital.
- To identify the level in which knowledge is exchanged among hospital and its suppliers in the SC.
- To identify IT integration between hospitals and suppliers.
- To explore the best practice of supply chain in the health care environment.

5.2   QUANTITATIVE DATA PRESENTATION AND ANALYSIS

Quantitative results were presented in Figure 5.1 and were discussed based on the following categories:
- Trust in supply chain, (ST1 to ST3)
- Information and knowledge exchange in supply chain, (ST4 to ST12)
- Supply Chain integration, (ST13 to ST16)
- Hospital supply chain performance (ST17 to ST28)
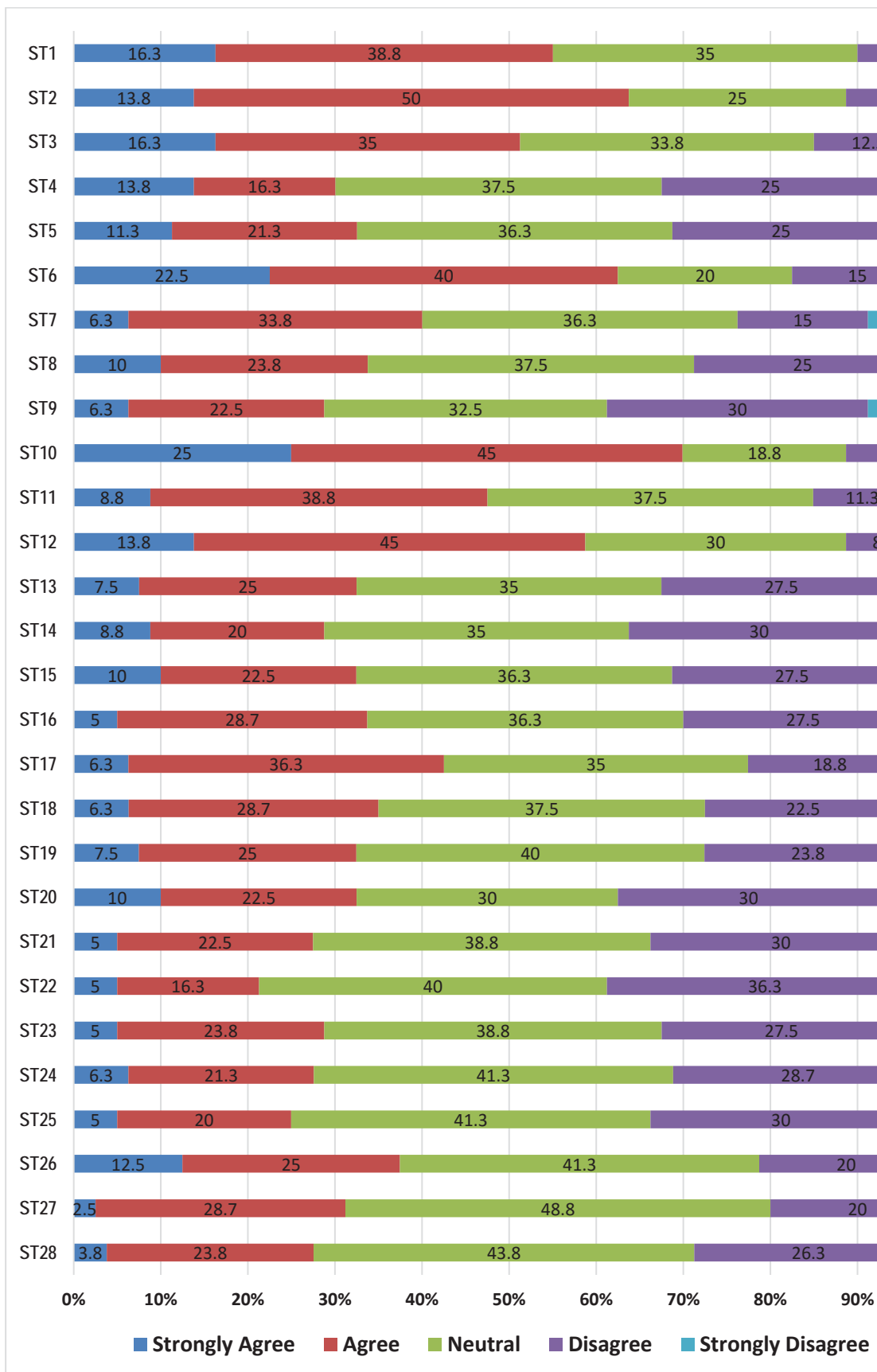
Figure 5.1: Responses from participants (%)

Displayed on Figure 5.1 above, **ST1** to **ST3** were variables used to measure the trust level between the hospital and the suppliers. Based on the results displayed in the aforementioned figure, the respondents indicated that there is an existence of trust (**ST1-3**) between the hospital and the suppliers. The results also displayed the level of hospital satisfaction on the competency and effectiveness of its suppliers. The results also showed that the hospital does believe that its suppliers would act in their best interest; this is signified by (**ST2**). Shown in the results, the respondents also characterised hospital suppliers as being honest (**ST3**). However, based on the numbers presented on the figure above, it is apparent that the level of trust is a bit low. Probably with time, the level will increase. Trust starts low and develops after some time (Abdallah *et al.*, 2017). Considering the percentage of undecided factor (33.8%) and disagreed (12%) participants under suppliers' honesty, one can see that these numbers are quite high and should be alarming to supply chain managers.

Knowledge exchange and information sharing in this study are signified by **ST4** to **ST12**. Considering **ST4** and **ST5**, the hospital does not contribute to the development of new products or make any suggestions on suppliers' tasks executions. The knowledge exchange levels between the hospital and its suppliers is quite low and that has a significant impact on trust development. When respondents were asked about sharing business knowledge with suppliers, the undecided fact had a higher percentage (36.3%) being the highest response to that variable (**ST7**).

Based on the analysis, the results showed that trust between the hospital and suppliers does not exclusively have a direct impact on supplier integration, but that the influence of trust requires the intervention of knowledge exchange (**ST4-12**) to subsequently influence supplier integration. However, it is shown that trust and knowledge exchange have influence on supplier integration. It was also found that trust (**ST1-3**) and IT integration (**ST13-16**), once paired together, have a great influence on knowledge exchange (**ST4-12**).

The results are showing that the hospital shares valuable information with its suppliers. According to Al-Abdallah *et al.* (2013), suppliers must be included and

technical information must be shared with the organisation in the new product development especially when new technology is being used and the organisation has little or no expertise in developing the product. Information sharing is considered as the effective factor of supply chain effectiveness (Zhang & Chen, 2013). The use of IT as an integrated component of the internet is important in order to successfully coordinate supply chain with the aim of increasing supply chain performance (Kochan, Nowicki, Sauser & Randall, 2018). The level of information sharing is not as great as it should be in order to serve as an effective factor in the performance of the hospital.

Pooe *et al.* (2015) state that information sharing plays an important role in helping SC stakeholders to collectively engage in mutual strategic duties and decision-making. The results also show that trust has a direct and positive influence on knowledge exchange (**ST11**) and thus positively impacting supplier integration. In a cohesive affiliation, supply chain stakeholders are willing to share and exchange information about their inventory, production, sales and logistics (Shou *et al.*, 2018). Based on the responses provided by the participants the hospital and suppliers exchange knowledge that contribute positively (**ST12**) to the success of the hospital. This means that the knowledge exchange has both direct and indirect impacts on the hospital performance (**ST17-28**).

5.3   QUALITATIVE DATA PRESENTATION AND ANALYSIS

Since this study applied both the quantitative and qualitative methods during data collection, the analyses will also include both the qualitative and quantitative data. The previous section presented the findings of the quantitative data method. This section now presents the data obtained from the interviews with five managers of different departments within the hospital. The following section is the description of the interviews with the five respondents that were interviewed. The first three questions were based on acquisition of products and services that are required for the hospital's operations.

Question 1: What is procurement and what does its process entails?

This question was only answered by one participant (PAR1).

The participant who answered this question was more knowledgeable about the term unlike other participate who opted not to attempt to answer this question.

PAR 1: First, procurement can be referred to as demand management, before an item can be purchased, the user must determine the need for that item. A signed requisition must be submitted to the demand management department. Thereafter the sourcing takes place and order placement occurs. Then last step will be the payment of the invoice.

Question 2: In a variety of suppliers supplying the same products or service, how do you get to see the best one?

This question was only answered by three participants who are directly involved in the supplier selection process.

PAR 1: *Actually, is not as easy as that, there is a procedure that needs to be followed. All suppliers are invited for quotation on the system called integration procurement solution (IPS); the supplier that quoted less than others and has high points gets selected. Suppliers gain points based on black economic empowerment (BBE) status, Preferential Procurement Policy Framework Act (PPPFA).*

PAR 2: *We have a database on which all suppliers register in order to pitch for government tenders. Selection of a supplier is determined by their compliance with conditions of the bid, compliance with specification, factors that might have an influence on the award of the bid, bids for completeness and technical correctness, all other registers for completeness and correctness, and, Supplier status on the Supplier Database(s).*

PAR 3: *Suppliers get invitations for price quotations based on the specifications of the required product/service. Any supplier that meets the specifications gets selected. Invitation can be either formal (written invitation) or informal*

(Telephonic). However, even if the invitation was done telephonically the accepted quote must be confirmed in writing.

Question 3: How would you describe the relationship and trust between hospital and its main suppliers?

All five participants have participated in this question giving different opinions regarding the issue of trust between hospital and the suppliers.

PAR1*: Well, we work with different suppliers almost every time. The supplier that previously got the job is not necessarily guaranteed to get a job when tender is issued out, they must pitch like anyone else. We do not have main suppliers.*

Par2: *Relationship with suppliers is actually temporal because it only exists for a short while. As I said, the relationship does not last long therefore; there is not enough time to build trust between our suppliers and us.*

PAR3: *To be honest often times we deal with many supplier of different sizes. Bigger suppliers are often reliable and small suppliers sometimes fail to deliver simple because they lack resources. In most cases, small suppliers do not have enough capacity to store a huge volume of goods, as a result of that they are unable to deliver a large volume of goods when they are required to do so.*

PAR4: *The hospital treats all its suppliers fairly, equally, equitably and reasonably. Relationship with suppliers is good even though it only last for the duration of the contract. Obviously, there are those suppliers who sometimes do not deliver on time or do not deliver at all.*

PAR5: *Since the hospital is expected to consider and attain the best purchasing price for the goods/services needed from the suppliers, the relationship and trust are weak.*

The respondents unanimously agree that the relationship with suppliers in not strong and that has an impact in how they conduct business. The study conducted by Ataseven & Nair (2017), highlights the important factors that are essential to support integration between supply chain stakeholders, and these factors include; sharing of information and collaboration in the design of process and products,

joint-making decision, and coordination. Furthermore, Ataseven & Nair (2017), state that both internal and external integration have shown different levels of impact in the supply chain performance. Mehmeti, Musabelliu & Xhoxhi, (2016) highlight supplier involvement as one of the factors that influence supply chain performance, which has the potential to minimise time of product development, enhance productivity and reduce costs.

Question 4: would you say the hospital is well integrated with its suppliers in terms of sharing knowledge and resources?

This question was only answer by two participants whom have a better understanding of integration between suppliers and the hospital.

PAR1: *Hospital enters into a contractual agreement with suppliers and the relationship is guided by the Accounting Officer System (AOS) therefore supplier activities are not integrated with ones of the hospital.*

PAR2: *If the hospital was sharing knowledge and resources, I am very certain that the suppliers would not be asking too much prices for the goods delivered or service rendered to the hospital. Suppliers are asking excessive prices and sometimes they deliver poor quality and some are often unreliable.*

The respondents agree that there is a lack of integration, knowledge and resource sharing between the hospital and its suppliers. According to Chan *et al.* (2017), the collaboration and transparent information exchange between SCs aim to reduce the uncertainty and avoid surplus inventory.

Question 5: In your understanding how do you think the supplier compliance or incompliance affect the hospital performance?

Four participants have given their respective opinions in relation to this posed question.

PAR1: *Obviously, when the supplier is playing according to the rules and procedures stated on the agreement contract, the hospital benefits and everyone is happy at the end of the day. Things get messy when the supplier does not follow the agreed upon standards then it becomes a huge problem for the hospital.*

PAR2: Remember this is a hospital, should one of us in the chain fails to deliver something, this can result in a person losing a life. The impact of someone failing to deliver within the healthcare industry is more detrimental compared to other industries. When everyone is playing his or her part in the process, we all benefit.

PAR3: Suppliers that comply with the Western Cape Government Health make it easy for the hospitals to perform their duties. Suppliers that fail to deliver often cost us a lot because our main goal is patient care, so when they do not deliver on time we are forced to go and borrow from other hospitals in order to provide effective care.

PAR4: 80% of the suppliers are reliable while the other 20% are not reliable. The 20% is mostly those who are favoured by the BBEA and they are small and often lack capital in order to deliver a large volume of goods.

5.4   QUALITATIVE DATA SUMMARY

The literature states that low hospital integration with suppliers negatively impact the hospital's performance. However, the results of the qualitative data prove that there is lack of trust, lack of integration and lack of knowledge sharing between the hospital and hospital suppliers. Improving hospital-supplier integration in big hospitals has been proven to be a key to an enhanced hospital performance (Alshahrani *et al.*, 2016).

5.5   Chapter Summary

The importance and effect of integration between the hospital and its suppliers were summarised. The study results revealed that IT integration (**ST13** to **ST16**) and knowledge exchange (**ST4** to **ST12**) between the hospital and suppliers result to better hospital–supplier logistical integration. The study also discovered that trust in healthcare environment plays a significant role between supply chain partners, and has an indirect impact on supplier integration. Trust and knowledge exchange together initiate a better supply chain integration among partners. Furthermore, the study revealed an existence of a strong link of trust, IT integration, hospital-supplier integration and knowledge exchange on hospital

performance (**ST17-28**). The following chapter will be concluding the overall research and making recommendations.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1   INTRODUCTION

This is the final chapter of this research project. The chapter offers a summary of the research findings, provides conclusions and also makes recommendations drawn from the study based on the research objectives. It will consider the relevance and contribution of this study with a specific emphasis on measuring supply chain performance in hospitals.

6.2   KEY FINDINGS

The key findings are discussed in line with the structure of the research questions and research objectives as described in Chapter 1.

6.2.1   Trust affect supply chain performance

How trust influences supply chain performance in the health care environment?

This question was posed with the intention of discovering the significance of trust in SCM within the SA healthcare environment. Despite the significance of trust in supply chain, there is still very few organisations that invest in trust-building activities, (Erdogan & Çemberc, 2018). However, literature demonstrates a significant relationship between trust, hospital performance and patient satisfaction; based on the results and findings of this research, trust is not as effective as it should be; therefore, performance is most likely to be affected. The study also discovered that, trust levels between the hospital and its suppliers has no direct impact on supplier integration, but that its influence is interceded by knowledge exchange.

6.2.2   Level of knowledge exchange between the hospital and its suppliers

What is the level of knowledge exchange between hospital and hospital suppliers in the supply chain?

This question was created to reveal the extent to which hospital exchanges knowledge with its suppliers. The research discovered the important role that knowledge exchange plays in influencing hospital supply chain performance. The quality of collaboration between buyers and suppliers has a great impact on the organisation's performance (Gupta, 2014).

6.2.3 Level of IT integration between a hospital and its suppliers

What is the level of IT integration between a hospital and its suppliers in the supply chain?

This question was a third question under research question section in chapter one. Its main purpose was to establish the level of IT integration between the hospital and suppliers as IT integration is perceived as one of the key factors that influence supply chain performance. The research revealed that an effective IT integration does influence SCP of the hospital. The research results also showed that IT integration and knowledge exchange have a positive impact on hospital–supplier logistical integration between the hospital and its suppliers. It is also found that hospital with a great level of logistical integration with the supply chain partner, that is, suppliers in this instance would produce better performance in its supply chain. Internal and external integration of business processes is a critical component of SCM (Kamal & Irani, 2014).

6.2.4 The best practice of supply chain in the health care environment

What is the best practice of supply chain in the health care environment?

This was the last question under research questions of this study in chapter one. The question was formed to provide results of supply chain best practices in the healthcare environment. Healthcare SCM's effectiveness relies heavily on other aspects of SCM, however, due to its complexity, the best practices question in the healthcare environment is still not answered.

6.3   RECOMMNEDATIONS

Based on the research findings, there are a number of issues related trust between the hospital and the suppliers, IT integration in supply chain, and knowledge exchange between supply chain of the hospitals and their suppliers.

6.3.1   Trust between hospital and its suppliers

Based on the research results, an existence of trust between the hospital and its suppliers is shown; however, the level of trust is proven to be very low. Trust between the buyer and the supplier ought to be strong in order for the parties to share most valuable information. Trust plays a pivotal role in facilitating deeper knowledge exchange (Cheng *et al.*, 2008). Trust is a very important factor that encourages commitment among supply chain partners (Kosgei & Gitau, 2016). Sahin *et al.* (2017) argue that when the suppliers do not fully trust retailers, they do not work to their full capacity.

The hospital should try to develop a long lasting relationship with medical supplies suppliers in order to share knowledge, resources and develop trust. A good relationship involving the buyer and the supplier contributes to the improvement of the supplier performance to honour the buyer-supplier agreement (Tarigan *et al.*). The literature shows that the existence of buyer-supplier relationship contributes greatly to the performance improvement of both the buyer and the supplier. Moreover, the hospital should develop an approach that facilitates the dynamics of the hospital in order to manage the buyer-supplier relationship. It is also of vital importance to design an effective supply engagement strategy and constantly measure its effectiveness.

6.3.2   IT Integration between hospital and its suppliers

Based on the research results, it is shown that the hospital's integration with its suppliers is lacking. This lack of integration influences the level of trust and knowledge exchange. IT integration is generally seen as a key component of hospital-supplier integration between the hospital and its suppliers (Alshahrani *et al.*, 2018). There is a lot of literature in this area, and all the studies have shown

the positive impact that the hospital-supplier relationship has on the hospital performance. Hospitals need to constantly measure suppliers' performance based on these following key supplier-measuring factors:

- Quality (order fulfilment process), this must include all the steps involved in sourcing the products or services.
- Speed (length and efficiency of the order fulfilment process and cycle time), this ought to ensure that goods and services are delivered on the agreed time, the right place and the right quantity.
- Cost of order fulfilment, and flexibility of order fulfilment, this is to ensure that all the costs involved in the sourcing process are constantly monitored.

Based on the research conducted by (Alshahrani *et al.,* 2018), there is an obvious existence of progressive and integral relationship between information technology, logistics integration, sharing of information and trust, and hospital-supplier integration. Thus, internal integration, customer integration, and supplier integration have an important impact on an organisation's performance (Ataseven & Nair, 2017). Moreover, the evaluation of RFID use and its success factors and sharing of RFID costs with supply chain partners is very important in pursuit of knowledge creation with supply chain process integration (del Rosario Perez-Salazar *et al.*,2017).

6.3.3 Knowledge Exchange between hospital and its suppliers

Knowledge exchange in healthcare is an important factor because of its distinctive benefits. When knowledge is effectively shared in SC, it stabilises the relationship between buyers and suppliers (Park & Lee, 2014). Knowledge sharing create more inventive solutions than it may create problems. Exchange of knowledge between the hospital and its suppliers enables supply chain stakeholders to improve cooperation on planning activities that may include inventory monitoring, ordering, and production (Chen *et al.*, 2013). Established by the research results, the levels at which knowledge is shared between the hospital and the suppliers is not adequate as the results show, full and effective integration and well-developed trust cannot be possible. Knowledge sharing in supply chain may subsequently

build strong relationships among SCM partners and may automatically influence hospital performance. To gain competitive success, information and knowledge sharing between hospitals and their suppliers is deemed a necessity (Alshahrani *et al.*, 2018).

6.4 AREAS OF FURTHER RESEARCH

Trust is one of the significant aspects in supply chain, further investigation may be conducted on how it influences the organisational performance and buyer-supplier relationship within the healthcare environment. Further research may also be done on factors that contribute to buyer/supplier trust development in the healthcare environment. An effective way of measuring healthcare sourcing strategy would also be ideal for the SA public sector.

6.5 CONCLUSION

The study has achieved its aim and objectives. The research emerged from the researcher's perception that there is an ineffective measurement of the supply engagement strategy/ sourcing strategy in the healthcare environment, especially within the central hospitals in the Western Cape Province. Based on the gap between the study findings and literature review the researcher concluded that there is an ineffective measurement performance in Western Cape hospitals. A constant measure of key suppliers' performance can help the hospital to easily realise SCM objectives and minimise costs while contributing to the overall organisation's performance.

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APPENDICES

Appendix 1: Consent Letter

Western Cape Government
Health

TYGERBERG HOSPITAL
REFERENCE:
Research Projects
ENQUIRIES: **Dr GG Marinus**
TELEPHONE:**021 938 5752**

Ethics Reference: **210020873**

TITLE: SUPPLY CHAIN PERFORMANCE MEASUREMENT AT A SELECTED HOSPITAL IN THE WESTERN CAPE.

Dear Zukile Mfengu

PERMISSION TO CONDUCT YOUR RESEARCH AT TYGERBERG HOSPITAL.

1. In accordance with the Provincial Research Policy and Tygerberg Hospital Notice No 40/2009, permission is hereby granted for you to conduct the above-mentioned research here at Tygerberg Hospital.

2. Researchers, in accessing Provincial health facilities, are expressing consent to provide the Department with an electronic copy of the final feedback within six months of completion of research. This can be submitted to the Provincial Research Co-Ordinator (Health.Research@westerncape.gov.za).

Dr. G.G. Marinus
MBChB,MPA,
DHM
MP0370865
Manager Medical Services

DR GG MARINUS
MANAGER: MEDICAL SERVICES
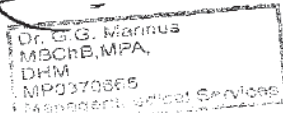
DR D ERASMUS
CHIEF EXECUTIVE OFFICER
Date: 18 May 2018

Administration Building, Francie van Zilj Avenue, Parow, 7500   Private Bag X3, Tygerberg, 7505
tel: +27 21 938-6267   fax: +27 21 938-4890   www.capegateway.go.v.za

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TYGERBERG HOSPITAL

Ethics Reference: **210020873**

TITLE: SUPPLY CHAIN PERFORMANCE MEASUREMENT AT A SELECTED
HOSPITAL IN THE WESTERN CAPE.

BY   _____

An authorized representative of Tygerberg Hospital

NAME   Dr DS Erasmus

TITLE   CEO

DATE   18 May 2018

Appendix 2: Questionnaire

Inventory Management Questionnaire

Please indicate the level of agreement on the bellow table by ticking on an appropriate box.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree				
1	2	3	4	5				

No	Statement	Decision option				
1	Our key suppliers are competent and effective in their interactions with our hospital.	1	2	3	4	5
2	We believe that our key suppliers would act in our best interest.	1	2	3	4	5
3	We would characterise our key suppliers as being honest.	1	2	3	4	5
4	We often contribute in the development of new product of our key suppliers.	1	2	3	4	5
5	Due to the level of trust our suppliers have on us; we even make suggestions on they can execute some tasks.	1	2	3	4	5
6	We inform our suppliers in advance of changing needs.	1	2	3	4	5
7	Our key suppliers share business knowledge of core business processes with us.	1	2	3	4	5
8	We and our key suppliers exchange information that helps establish our business planning.	1	2	3	4	5
9	We exchange information, share ideas, and resources with our suppliers.	1	2	3	4	5
10	We protect the knowledge that we received from our suppliers from inside and outside of the hospital.	1	2	3	4	5
11	The knowledge we share have a positive effect on our ability to make improvements to the hospital performance.	1	2	3	4	5
12	We exchange the knowledge with our suppliers that contribute positively to the success of our hospital.	1	2	3	4	5
13	Purchasing data are available once there is a need to be retrieved by our suppliers.	1	2	3	4	5
14	Our software applications are integrated with the product information of our key suppliers.	1	2	3	4	5

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree			
	1	2	3	4	5			
No	Statement				Decision option			
15	We have successfully integrated most of our software applications with our key suppliers.	1	2	3	4	5		
16	Most of our software applications work seamlessly across our key suppliers.	1	2	3	4	5		
17	The quality of the order fulfilment process in our hospital is getting better with time.	1	2	3	4	5		
18	We have seen an improvement in the quality of the order fulfilment process with time.	1	2	3	4	5		
19	Based on our knowledge of the order fulfilment process, we think it is of high quality.	1	2	3	4	5		
20	The length of the order fulfilment process in our hospital is getting shorter with time.	1	2	3	4	5		
21	We have seen an improvement in the cycle time of the order fulfilment process with time	1	2	3	4	5		
22	Based on our knowledge of the order fulfilment process, we think it is short and efficient.	1	2	3	4	5		
23	The cost associated with the order fulfilment process in our hospital is getting better with time	1	2	3	4	5		
24	We have seen an improvement in the cost associated with the order fulfilment process with time;	1	2	3	4	5		
25	Based on our knowledge of the order fulfilment process, we think it is cost efficient.	1	2	3	4	5		
26	The flexibility of the order fulfilment process in our hospital is getting better with time	1	2	3	4	5		
27	We have seen an improvement in the flexibility of the order fulfilment process with time.	1	2	3	4	5		
28	Based on our knowledge of the order fulfilment process, we think it is flexible.	1	2	3	4	5		

Thank you very much for your participation!

Appendix 3: Questionnaire Cover letter

Questionnaire Cover letter

07-September-2017

My name is Zukile Mfengu and I am a registered MTech student in Business Administration at Cape Peninsula University of Technology with student No: 210020873. For my final project in order to complete my MTech degree, I am scrutinizing ***Supply Chain performance measurement at a selected hospital in the Western Cape, South Africa***. I am inviting you to participate in this research study by completing the attached questionnaire.

The questionnaire will be required to be completed approximately in a space of 5 days starting from the day you receive it. Completing this questionnaire does not bear any risk and your participation will be completely anonymous. The copies of this project will be provided to my institution that is Cape Peninsula University of Technology. Should you agree to participate on this study you are required to answer all questions as honestly as possible and after completion please contact me on 0737996960/ 0219385153 or send an email to mfenguzukile@yahoo.com.

Thank you for taking time to play part in my education endeavours. The data collected will be of great value regarding supply chain management. If you need a copy of the summary of this questionnaire, send an email on the above provided email address.

Sincerely

Zukile Mfengu

Student No: 210020873

Dr Bingwen Yan (Supervisor)

Phone: 0219538478

Appendix 4: Statistical Results Frequencies

Our key suppliers are competent and effective in their interactions with our hospital.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	13	16.3	16.3	16.3
	Agree	31	38.8	38.8	55.0
	Neutral	28	35.0	35.0	90.0
	Disagree	6	7.5	7.5	97.5
	Strongly Disagree	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

We believe that our key suppliers would act in our best interest.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	11	13.8	13.8	13.8
	Agree	40	50.0	50.0	63.7
	Neutral	20	25.0	25.0	88.8
	Disagree	8	10.0	10.0	98.8
	Strongly Disagree	1	1.3	1.3	100.0
	Total	80	100.0	100.0	

We would characterise our key suppliers as being honest.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	13	16.3	16.3	16.3
	Agree	28	35.0	35.0	51.2
	Neutral	27	33.8	33.8	85.0
	Disagree	10	12.5	12.5	97.5
	Strongly Disagree	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

We often contribute in the development of new product of our key suppliers.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	11	13.8	13.8	13.8
	Agree	13	16.3	16.3	30.0
	Neutral	30	37.5	37.5	67.5
	Disagree	20	25.0	25.0	92.5
	Strongly Disagree	6	7.5	7.5	100.0
	Total	80	100.0	100.0	

Due to the level of trust our suppliers have on us; we even make suggestions on they can execute some tasks.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	9	11.3	11.3	11.3
	Agree	17	21.3	21.3	32.5
	Neutral	29	36.3	36.3	68.8
	Disagree	20	25.0	25.0	93.8
	Strongly Disagree	5	6.3	6.3	100.0
	Total	80	100.0	100.0	

We inform our suppliers in advance of changing needs.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	18	22.5	22.5	22.5
	Agree	32	40.0	40.0	62.5
	Neutral	16	20.0	20.0	82.5
	Disagree	12	15.0	15.0	97.5
	Strongly Disagree	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

Our key suppliers share business knowledge of core business processes with us.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	5	6.3	6.3	6.3
	Agree	27	33.8	33.8	40.0
	Neutral	29	36.3	36.3	76.3
	Disagree	12	15.0	15.0	91.3
	Strongly Disagree	7	8.8	8.8	100.0
	Total	80	100.0	100.0	

We and our key suppliers exchange information that helps establish our business planning.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	8	10.0	10.0	10.0
	Agree	19	23.8	23.8	33.8
	Neutral	30	37.5	37.5	71.3
	Disagree	20	25.0	25.0	96.3
	Strongly Disagree	3	3.8	3.8	100.0
	Total	80	100.0	100.0	

We exchange information, share ideas, and resources with our suppliers.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	5	6.3	6.3	6.3
	Agree	18	22.5	22.5	28.7
	Neutral	26	32.5	32.5	61.3
	Disagree	24	30.0	30.0	91.3
	Strongly Disagree	7	8.8	8.8	100.0
	Total	80	100.0	100.0	

We protect the knowledge that we received from our suppliers from inside and outside of the hospital.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	20	25.0	25.0	25.0
	Agree	36	45.0	45.0	70.0
	Neutral	15	18.8	18.8	88.8
	Disagree	9	11.3	11.3	100.0
	Total	80	100.0	100.0	

The knowledge we share have a positive effect on our ability to make improvements to the hospital performance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	7	8.8	8.8	8.8
	Agree	31	38.8	38.8	47.5
	Neutral	30	37.5	37.5	85.0
	Disagree	9	11.3	11.3	96.3
	Strongly Disagree	3	3.8	3.8	100.0
	Total	80	100.0	100.0	

We exchange the knowledge with our suppliers that contribute positively to the success of our hospital.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	11	13.8	13.8	13.8
	Agree	36	45.0	45.0	58.8
	Neutral	24	30.0	30.0	88.8
	Disagree	7	8.8	8.8	97.5
	Strongly Disagree	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

Purchasing data are available once there is a need to be retrieved by our suppliers.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	6	7.5	7.5	7.5
	Agree	20	25.0	25.0	32.5
	Neutral	28	35.0	35.0	67.5
	Disagree	22	27.5	27.5	95.0
	Strongly Disagree	4	5.0	5.0	100.0
	Total	80	100.0	100.0	

Our software applications are integrated with the product information of our key suppliers.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	7	8.8	8.8	8.8
	Agree	16	20.0	20.0	28.7
	Neutral	28	35.0	35.0	63.7
	Disagree	24	30.0	30.0	93.8
	Strongly Disagree	5	6.3	6.3	100.0
	Total	80	100.0	100.0	

We have successfully integrated most of our software applications with our key suppliers.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	8	10.0	10.0	10.0
	Agree	18	22.5	22.5	32.5
	Neutral	29	36.3	36.3	68.8
	Disagree	22	27.5	27.5	96.3
	Strongly Disagree	3	3.8	3.8	100.0
	Total	80	100.0	100.0	

Most of our software applications work seamlessly across our key suppliers.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	4	5.0	5.0	5.0
	Agree	23	28.7	28.7	33.8
	Neutral	29	36.3	36.3	70.0
	Disagree	22	27.5	27.5	97.5
	Strongly Disagree	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

The quality of the order fulfilment process in our hospital is getting better with time.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	5	6.3	6.3	6.3
	Agree	29	36.3	36.3	42.5
	Neutral	28	35.0	35.0	77.5
	Disagree	15	18.8	18.8	96.3
	Strongly Disagree	3	3.8	3.8	100.0
	Total	80	100.0	100.0	

We have seen an improvement in the quality of the order fulfilment process with time.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	5	6.3	6.3	6.3
	Agree	23	28.7	28.7	35.0
	Neutral	30	37.5	37.5	72.5
	Disagree	18	22.5	22.5	95.0
	Strongly Disagree	4	5.0	5.0	100.0
	Total	80	100.0	100.0	

Based on our knowledge of the order fulfilment process, we think it is of high quality.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	6	7.5	7.5	7.5
	Agree	20	25.0	25.0	32.5
	Neutral	32	40.0	40.0	72.5
	Disagree	19	23.8	23.8	96.3
	Strongly Disagree	3	3.8	3.8	100.0
	Total	80	100.0	100.0	

The length of the order fulfilment process in our hospital is getting shorter with time.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	8	10.0	10.0	10.0
	Agree	18	22.5	22.5	32.5
	Neutral	24	30.0	30.0	62.5
	Disagree	24	30.0	30.0	92.5
	Strongly Disagree	6	7.5	7.5	100.0
	Total	80	100.0	100.0	

We have seen an improvement in the cycle time of the order fulfilment process with time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	4	5.0	5.0	5.0
	Agree	18	22.5	22.5	27.5
	Neutral	31	38.8	38.8	66.3
	Disagree	24	30.0	30.0	96.3
	Strongly Disagree	3	3.8	3.8	100.0
	Total	80	100.0	100.0	

Based on our knowledge of the order fulfilment process, we think it is short and efficient.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	4	5.0	5.0	5.0
	Agree	13	16.3	16.3	21.3
	Neutral	32	40.0	40.0	61.3
	Disagree	29	36.3	36.3	97.5
	Strongly Disagree	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

The cost associated with the order fulfilment process in our hospital is getting better with time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	4	5.0	5.0	5.0
	Agree	19	23.8	23.8	28.7
	Neutral	31	38.8	38.8	67.5
	Disagree	22	27.5	27.5	95.0
	Strongly Disagree	4	5.0	5.0	100.0
	Total	80	100.0	100.0	

We have seen an improvement in the cost associated with the order fulfilment process with time;

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	5	6.3	6.3	6.3
	Agree	17	21.3	21.3	27.5
	Neutral	33	41.3	41.3	68.8
	Disagree	23	28.7	28.7	97.5
	Strongly Disagree	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

Based on our knowledge of the order fulfilment process, we think it is cost efficient.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	4	5.0	5.0	5.0
	Agree	16	20.0	20.0	25.0
	Neutral	33	41.3	41.3	66.3
	Disagree	24	30.0	30.0	96.3
	Strongly Disagree	3	3.8	3.8	100.0
	Total	80	100.0	100.0	

The flexibility of the order fulfilment process in our hospital is getting better with time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	10	12.5	12.5	12.5
	Agree	20	25.0	25.0	37.5
	Neutral	33	41.3	41.3	78.8
	Disagree	16	20.0	20.0	98.8
	Strongly Disagree	1	1.3	1.3	100.0
	Total	80	100.0	100.0	

We have seen an improvement in the flexibility of the order fulfilment process with time.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	2	2.5	2.5	2.5
	Agree	23	28.7	28.7	31.3
	Neutral	39	48.8	48.8	80.0
	Disagree	16	20.0	20.0	100.0
	Total	80	100.0	100.0	

Based on our knowledge of the order fulfilment process, we think it is flexible.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	3	3.8	3.8	3.8
	Agree	19	23.8	23.8	27.5
	Neutral	35	43.8	43.8	71.3
	Disagree	21	26.3	26.3	97.5
	Strongly Disagree	2	2.5	2.5	100.0
	Total	80	100.0	100.0	

Appendix 5: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ST1	80	1	5	2.41	.937
ST2	80	1	5	2.35	.887
ST3	80	1	5	2.50	.994
ST4	80	1	5	2.96	1.130
ST5	80	1	5	2.94	1.083
ST6	80	1	5	2.35	1.069
ST7	80	1	5	2.86	1.040
ST8	80	1	5	2.89	1.019
ST9	80	1	5	3.12	1.060
ST10	80	1	4	2.16	.934
ST11	80	1	5	2.62	.933
ST12	80	1	5	2.41	.924
ST13	80	1	5	2.98	1.018
ST14	80	1	5	3.05	1.054
ST15	80	1	5	2.93	1.028
ST16	80	1	5	2.94	.932
ST17	80	1	5	2.78	.954
ST18	80	1	5	2.91	.983
ST19	80	1	5	2.91	.970
ST20	80	1	5	3.03	1.113
ST21	80	1	5	3.05	.940
ST22	80	1	5	3.15	.901
ST23	80	1	5	3.04	.961
ST24	80	1	5	3.00	.928
ST25	80	1	5	3.07	.925
ST26	80	1	5	2.72	.968
ST27	80	1	4	2.86	.759
ST28	80	1	5	3.00	.871
Valid N (listwise)	80				

Appendix 6: Descriptive responses (%)

Code	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
ST28	3.8	23.8	43.8	26.3	2.5
ST27	2.5	28.7	48.8	20	0
ST26	12.5	25	41.3	20	1.3
ST25	5	20	41.3	30	3.8
ST24	6.3	21.3	41.3	28.7	2.5
ST23	5	23.8	38.8	27.5	5
ST22	5	16.3	40	36.3	2.5
ST21	5	22.5	38.8	30	3.8
ST20	10	22.5	30	30	7.5
ST19	7.5	25	40	23.8	3.8
ST18	6.3	28.7	37.5	22.5	5
ST17	6.3	36.3	35	18.8	3.8
ST16	5	28.7	36.3	27.5	2.5
ST15	10	22.5	36.3	27.5	3.8
ST14	8.8	20	35	30	6.3
ST13	7.5	25	35	27.5	5
ST12	13.8	45	30	8.8	2.5
ST11	8.8	38.8	37.5	11.3	3.8
ST10	25	45	18.8	11.3	0
ST9	6.3	22.5	32.5	30	8.8
ST8	10	23.8	37.5	25	3.8
ST7	6.3	33.8	36.3	15	8.8
ST6	22.5	40	20	15	2.5
ST5	11.3	21.3	36.3	25	6.3
ST4	13.8	16.3	37.5	25	7.5
ST3	16.3	35	33.8	12.5	2.5
ST2	13.8	50	25	10	1.3
ST1	16.3	38.8	35	7.5	2.5

90

Appendix 7: Descriptive Codes

No.	Statement	Code
1	Our key suppliers are competent and effective in their interactions with our hospital.	ST1
2	We believe that our key suppliers would act in our best interest.	ST2
3	We would characterise our key suppliers as being honest.	ST3
4	We often contribute in the development of new product of our key suppliers.	ST4
5	Due to the level of trust our suppliers have on us; we even make suggestions on they can execute some tasks.	ST5
6	We inform our suppliers in advance of changing needs.	ST6
7	Our key suppliers share business knowledge of core business processes with us.	ST7
8	We and our key suppliers exchange information that helps establish our business planning.	ST8
9	We exchange information, share ideas, and resources with our suppliers.	ST9
10	We protect the knowledge that we received from our suppliers from inside and outside of the hospital.	ST10
11	The knowledge we share have a positive effect on our ability to make improvements to the hospital performance.	ST11
12	We exchange the knowledge with our suppliers that contribute positively to the success of our hospital.	ST12
13	Purchasing data are available once there is a need to be retrieved by our suppliers.	ST13
14	Our software applications are integrated with the product information of our key suppliers.	ST14
15	We have successfully integrated most of our software applications with our key suppliers.	ST15
16	Most of our software applications work seamlessly across our key suppliers.	ST16
17	The quality of the order fulfilment process in our hospital is getting better with time.	ST17
18	We have seen an improvement in the quality of the order fulfilment process with time.	ST18
19	Based on our knowledge of the order fulfilment process, we think it is of high quality.	ST19
20	The length of the order fulfilment process in our hospital is getting shorter with time.	ST20
21	We have seen an improvement in the cycle time of the order fulfilment process with time	ST21
22	Based on our knowledge of the order fulfilment process, we think it is short and efficient.	ST22
23	The cost associated with the order fulfilment process in our hospital is getting better with time	ST23
24	We have seen an improvement in the cost associated with the order fulfilment process with time;	ST24
25	Based on our knowledge of the order fulfilment process, we think it is cost efficient.	ST25
26	The flexibility of the order fulfilment process in our	ST26
27	hospital is getting better with time	ST27
28	We have seen an improvement in the flexibility of the order fulfilment process with time.	ST28