UNIVERSITY OF JOHANNESBURG

www.manaraa.com

AN ANALYSIS OF CRITICAL RISK FACTORS OF SUSTAINABLE SUPPLY CHAIN IN THE SOUTH AFRICAN MINING INDUSTRY

A dissertation submitted in partial fulfilment of the degree of

MASTER OF TECHNOLOGY

In the

Department of Quality and Operations Management

At the

FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

Of the

UNIVERSITY OF JOHANNESBURG

By

NTHABISENG SENKOTO

200826109

November 2019

Supervisor: Dr Ndala Yves Mulongo

Co-Supervisor: Prof Clinton Aigbavboa

DECLARATION

I, **NTHABISENG SENKOTO**, hereby declare that the current study an analysis of critical risk factors of sustainable supply chain in the South African mining industry has been conducted by myself. It is currently submitted in accordance with requirements of the Master of Technology Degree in the Department of Quality and Operations Management at the University of Johannesburg. The study has not been submitted or used anywhere prior. All sources used in the compilation of the study are herein acknowledged.

ABSTRACT

All over the world, the mining sector is gradually being considered accountable for the environmental, social and economic consequences generated by their internal operations and by their suppliers' operations. Sustainable supply chain management (SSCM) that is concerned with incorporating ecological, social and economic aims within a central company's supply chain processes, has emerged as an approach for companies to enhance the three sustainability pillars (i.e. environmental, social and economic) results in their supply chains. However, the integration of sustainability within supply chain continues to be challenging in Global Supply Chains (GSC). In light of this, and given the limitations on the literature on the integration of sustainability practices within supply chain sustainability in mining sector particularly in South Africa, the primary goal of this study is to analyse critical risk factors for sustainable supply chain in the South African mining industry, which will assist decision makers in the mining sector regarding the factors affecting the sustainability of supply chain practices. The data used in this study was derived from primary and secondary sources. The secondary data for the study was derived from the review of literature. The primary data was obtained through the use of a structured questionnaire, which was distributed, to participants from the South African government, supply chain professionals in mining, supply chain specialists and managers. A total of 110 questionnaires were distributed with 100 responses, which represented a response rate of 90%. The data from the questionnaires formed the basis of this study. Frequency analysis and various statistics procedures were used to analyses the returned questionnaire data. Findings emanating from the survey revealed that the current state of mining sustainability particularly in South Africa with regard to supply chain is not taken into serious considerations by mining management, and there is also a lack of formal policies from the government that clearly state and regulate the use of land and other factors related to sustainability. This vacuum leads to a lot of industrial action in the mining industry, production interruptions and a decline in global competitiveness.

Acknowledgments

I would like to relay gratitude to my supervisor, Dr Ndala Yves Mulongo, who made this study possible. Dr Ndala Yves Mulongo's supervision and expert advice have been priceless throughout all stages of my work. I would also wish to express my gratitude to Professor Clinton Aigbavboa for his role as my Co-Supervisor. Special thanks is reserved for my parents, Mr. Tohlang Wilfred Senkoto and Mrs. Tebello Lettie Senkoto, for their continuous support and understanding. I would like to thank the Construction CETA for providing an excellent working environment and finally I am grateful to all those I have had the pleasure of working with during this project.

PREFACE

The work presented in this master's thesis was conducted at the Department of Quality and Operations Management within the Faculty of Engineering and the Built Environment at the University of Johannesburg under the Supervision of Dr. Ndala Yves Mulongo and Co-Supervisor Professor Clinton Aigbavboa.

Table of Contents

vi

Tables

Figures

LIST OF APPENDICES
APPENDIX 1

CHAPTER ONE

INTRODUCTION

This study is aimed at analysing critical risk factors of sustainable supply chain in mining industry, using South Africa as case study. The chapter is simply a gathering of plain contextual data about the research. It starts with research concerning the related background and further brief-supporting features in the literature.

1.1 Background

Mining sector is key factor of the economy growth within several developing countries. However, the operations and activities associated with mining industry create various environmental degradation issues (Poulton, 2013). Consequently, mining industries have been coping with important criticism, pressures, and questions. All these factors have questioned the legitimacy of the sector from different stakeholders such as government, non-governmental organisation and the public. From this perspective, there is a strong need for improving environmental performance by greening the operations and activities of mining industry' supply chains (Hall, 2000). In addition, operations related to mining industry have steadily caused an increase of the degree of changes within the natural environment, such as the ecosystem. The operations have changed landscapes, which might negatively affect over the society in the long term as well as creating a degradation of mineral resources. The reason behind the potential degradation of the ecosystem by mining's activities is solely due to physical deteriorating nature, and the employment of chemicals and other polluting substances. The environmental effects also rely on the geological system and the techniques of extraction. In response to these environmental concerns, many business organisations have shifted their focus upon internal organisational operational and environment practices. Generally, the internal practices are restricted when trying to respond to the pressures from diverse stallholders such as Non-governmental Organisations; mass media; and public. in numerous leading organisations within the mining sector have noticed the limitations of only focusing over internal practices and striving to inflate their obligation to extended manufacturers, which in return would influence the mining' supply chain environmental effects (Lenzen, 2007). Mining industries have therefore included their suppliers, who then have to share both risk and responsibility (Dey and Cheffi, 2013). As it can be seen from the figure 1.1 below:

Figure 1.1: extraction of raw material in the mine (internet source)

South Africa retains the environmental weight of mineral sector, whose impacts also decreases whatsoever it gains from the benefits of its minerals. (Kuhndt, 2008) noticed an important change within European resource conditions from local sources onto the employment of imports from developing countries. They notice that this is followed by a change of environmental weight of resource deploy. Whilst the resource productivity within European countries is growing, countries such as South Africa, are struggling to deal with the environmental effects generating from the extraction of minerals activities rates: ''significant amounts of waste, wastewater and dissipative losses''. The legacy of mining in African countries is that of unfilled holes and abandoned artisanal mining sites. Several environmental issues linked to mining stem from the contamination of, and competition for, surface and groundwater. Water contamination from mining operations is generated by the discharge of effluents that have got toxic chemicals employed within the processing of mineral ores an example for such chemicals are cyanide, organic chemicals and leached heavy metal oxides. Generally, the effluents contain high levels of acidity. In addition, these may seep into water bodies, causing damage to societies and aquatic life. In addition, chemicals within effluents might contaminate ground water. The water's quality and access are important when activities related to mining sector are taking place near the agricultural or societies.

Among the environmental effects of mineral sector, climate change needs to be discussed since it is one of the critical worldwide environmental issues in the current century that needs a significant attention. Despite the facts that countries in Southern African Development Community (SADC) region do not contribute much c to global warming around the world, but they are disproportionately affected by shifting climatic conditions. Together with their economic weaknesses, and high reliance over natural resource that is primary source of local livelihoods and national revenue make them particularly vulnerable to climate change. Hence, nowadays mineral sector in South Africa has set up an objective based on directing their intra- and inter relationships (i.e. supply/value chains), with the objective of ameliorating the effectiveness of their operations, and optimizing utilization of resources, reducing transactional and total costs, meting their networks' values, better match supply with demand, and designing more competitive business models. Nevertheless, previously some companies have noticed that these advancements have resulted within an unsustainable management. Sustainable development involves all the interdependent and mutually reinforcing pillars of economic development, social development, and environmental protection (United Nations World Summit, 2005). Whilst financially possible, activities associated with industrial sector remain mostly reliant on non-renewable sources of energy. Furthermore, industrial actions have demonstrated to negatively affect the natural environment and society. For instance, pollution, emissions, visual intrusion, deteriorating cultural carrying capacity (Hardin, 1991), negative impact over human being' health and safety, and waste disposal. On the other hand, the environment and society as a whole in turn also have a negative effect over all activities related to industrial sector and supply chains. For example, natural disasters such as floods, earthquakes, volcanic eruptions, and tornados, rust, corrosion, sudden temperature changes, smuggling of goods. Therefore, improving sustainability practices in mining activities through the identification and analysis of the critical risk factors is crucial especially for the environment and society, as a whole, and this was the main objective of the present study.

1.2. Environmental degradation

Over the last decades, environmental deterioration has earned so much attention from non-governmental organisations, government authorities, and consumers as a whole. In accordance with (UNEP, 2011), environmental deterioration increases risks and decreases opportunities regarding the improvement of humankind well-being, particularly for poor and vulnerable people. The degradation of environment is happening within a progressively more globalized, industrialized and interconnected world, with the ever-increasing number of humans around the world as well as production and consumption trend that are not sustainable. The deterioration of ecosystem service is lowering enhancement opportunities and might negatively affect future generations well-being. In the context of environmental

issues such as global warming, ozone depletion, solid waste disposal and air pollution on the ascendency, mining industries in South Africa are being regarded as the main source from which these environmental issues are generated (Rozar, 2013). Despite the contribution of mining sector to the economic growth, but the sector has caused serious damage to the environment. The damage caused to the environment across the region and human health through mining sector operations is of high level and hard to be quantified (Munnik, 2010). (Warhurst, 1999) considered the damage caused to the environment as overwhelming. Furthermore, (Gunson and Jian, 2001) point out that annually coal mining causes at least 6000 deaths in China alone. Whilst the deterioration of land by the cobalt, copper, steel, and gold mining is pronounced, chemical contamination from the extraction process of these minerals creates a heavy weight over the environment, with harmful gases emissions release into the air (Yelpaala, 2004). Additionally, research by (Camara, 1997) show that the trend of mercury intoxication during the gold amalgamation process is high. While (Kitula, 2006) argues that, the main issues within communities that are close to mining sector are pollution of water and air from carbon oxide, carbon dioxide, sulphur dioxide, mercury and cyanide. Despite the fact that mining sector sometimes support the communities for economic causes (Bloch and Owusu, 2012), it is seen as a socio-environmentally destruction firm (Peck and Sinding, 2003). The current level of deterioration of the environment by mining sector as well as its negative impact over the entire ecosystem require important introspection on how effectively the operations creating the deterioration would self-check. Additionally, throughout the effects of supply chain activities over the environment, business organisations are being encouraged to develop environmental governance strategies concerning the changes of environmental requirements (Beamon, 1999). In accordance with (Kusi-Sarpong, 2014) in order to improve the current condition of the environment concerning its degradation, both non-governmental organisations, have set up the regulations to push mining sector to integrate sustainability practices and initiatives into their supply chain activities. In light of this, Sustainable Supply Chain Management is gaining a significant momentum among industry practitioners as well as scholars. It is being designed with the purpose of mitigating the negative effect of the mining sector operations and improves the competitive advantage of such sector (Rozar, 2013) to guarantee environmental sustainability. Sustainable Supply Chain Management practices aim at achieving what no single firm on its own would possibly achieve. This means, reducing waste disposal, lessening environmental degradation whilst in the meantime meeting customers' needs, and making maximum profits for the company.

1.3 Research Problem

Regardless of the pressures from non-governmental organisations, government legislations, and customers forcing business organisations to integrate sustainability practices and initiatives into their supply chain activities (Bhool & Narwal, 2013). Research by Barve and Muduli (2013) reveal that an important gap has been pointed out in many studies regarding investigation of the challenges and barriers of the implementation of Sustainable Supply Chain Management. Chang, Kenzhekhanuly and Park (2013) argue that considering the global trend regarding environmental degradation there is paucity regarding empirical research on Sustainable Supply Chain Management practices in Republic of Korea. While, Liang and Chang (2008) focus on mentioning that there is no previous studies that aimed at testing an empirical connection between Sustainable Supply Chain Management efforts and subsequent enhancement regarding economic performance in China. Furthermore, Rusli, Rahman and Ho (2012) state that few researches of Sustainable Supply Chain Management were conducted amid manufacturers in Malaysia. Rao (2002) indicates that besides sparse study regarding Sustainable Supply Chain Management in Malaysian samples, there are also various gaps in the body of knowledge in Sustainable Supply Chain Management. Additionally, Huang, Tan and Ding (2012) also notice that few researches were conducted over Sustainable Supply Chain Management and small and medium-sized enterprises (SMEs). In turn Elbarky, (2015) states that there is a significant gap regarding Sustainable Supply Chain Management research in the Africa. These studies are just the tip of an iceberg among many studies that have revealed how limited research in Sustainable Supply Chain Management is and South Africa is not different, there is a paucity of research regarding Sustainable Supply Chain Management practices in mining sector. Furthermore, the consequence of environmental effect of mining sector in South Africa is the deterioration of land. In addition, this can have significant damage on food security as a huge number of populations living in South Africa do not have easy access to food. In this sense, this study argues that there is a great challenge in ensuring a balance between development and environmental sustainability. Furthermore, concerns regarding pollution-free environment still to be well mastered by all relevant parties and as such continuous research is required to fully understand the governance of Sustainable Supply Chain Management activities. When making a comparison with European, American, and Asian countries, mining companies in South Africa are still seeking best ways concerning an effective integration of sustainability practices and initiatives into their supply chain activities. To this end, the research problem of this study is the identification and assessment of the critical risk factors of sustainable supply chain management, using the South African mining industry as a case study.

1.3 Research Questions

To address the research problem as stated in the previous section, the following research questions were developed:

- ➢ **RQ 1:** To what extent has sustainable supply chain management has been approached from a holistic point of view in the current literature?
- ➢ **RQ 2:** To what extent has the concept of the sustainable supply chain has been integrated and implemented within the mining sector?
- ➢ **RQ 3:** What are the challenges hindering the adoption and implementation of sustainable supply chain management within the South African mining sector?
- ➢ **RQ 4:** What are the benefits related to the adoption and the implementation of sustainable supply chain management within South African mining sector?

1.4 Research Goal

The overall research aim was the analysis of the critical risk factors of sustainable supply chain in the South African mining sector. This will assist decision makers in the mining sector in outlining the factors affecting the sustainability of supply chain practices.

1.5 Research objectives

In order to achieve the research, aim of this study, the following research objectives emerged:

- ➢ **RO 1:** Determining the extent to which sustainable supply chain management has been approached from a holistic point of view in the current literature.
- ➢ **RO 2:** Determining the extent to which the concept of the sustainable supply chain has been integrated and implemented within the mining sector.
- ➢ **RO 3:** Determining the challenges hindering the adoption and implementation of sustainable supply chain management in the mining sector, using South Africa as a case study.
- ➢ **RO 4:** Determining the benefits related to adoption and the implementation of sustainable supply chain management in the mining sector, using South Africa as a case study.

1.6 Research Justification

In South Africa, the mining business remains a key sponsor to economic development. As indicated by the Chamber of Mines (2009), the sector represented R49 billion in remote money

6

income or 8.8 percent of total merchandise exports (the second biggest fare worker after platinum). The business additionally contributed 2.4 percent towards the GDP (if the multipliers and actuated impact are incorporated) and utilized 159 925 employees who earned R17.4 billion in wages. As a standard guideline, "for each one individual utilized in the mining business, eight to ten individuals gain monetarily from such work." (Badenhorst, 2011)

Additionally, the manufacturing put R10.3 billion in capital use in the nation, paid an expected R1.4 billion in direct tax collection to the state and R506 million in profits to the suppliers of capital (Chamber of Mines, 2009). In addition, the gold mining division has generally prompted the foundation of metropolitan focuses, for example, Johannesburg, Welkom, Orkney, Springs, Benoni, Witbank, and Klerksdorp (Radebe and Short, 2008). Until 2007, South Africa was the world's biggest gold producer. In 1995, the nation delivered 23.3 percent of the world's gold with the United States a far off second at 14.1 percent (Goldsheet Mining Directory, 2009). Nevertheless, South Africa used to be responsible for a significant yield of worldwide gold yield has reliably diminished its output in recent decades. In 2007, China outperformed South Africa as the world's biggest creator with generation dimensions of 10.9 percent and 10.1 percent respectively.

1.7 Research Methodology

Regarding the methodology path, research studies espouse three main options at the disposal of the researcher (that it is a quantitative technique, qualitative technique or a grouping of both). Whilst a quantitative technique is established on analyzable statistical information got through experiments, a qualitative technique is based on real-life stories narrated by people with knowledge of the issue being researched. (Creswell, 2012). This study employed a quantitative study for two main reasons. The primary reason was that since a quantitative method is based on careful science, the findings would be more precise than those generated through a qualitative method (Creswell, 2010). The next aim was that a quantitative training consumes fewer time than a qualitative method (Creswell, 2010).

1.8 Significance of the study

The learning will deliver knowledge on the extent to which sustainable supply chain management is advanced holistically and will determine the extent to which the idea of the sustainable supply chain has been integrated and implemented. The study will also establish the challenges hindering the adoption and application of sustainable supply chain

7

management and highlight the benefits related to adoption and the implementation of sustainable supply chain management within the mining segment.

1.9 Overview of the Research

This study comprises of the following five chapters:

Chapter One

Introduces the study by outlining its research questions, purpose and objectives, the definition of key concepts, problem statement, and its significance to the manufacturing sector. The objective of this chapter is to ensure that the reader has a full understanding of what each chapter entails.

Chapter Two

Provides the literature review that underpins the study. This chapter seeks to ground the study on the scholarly work of researchers who studied the same topic before. Despite the fact that various examinations have been directed in the recent decades to address these tests, there is still a gap in the present writing audit, the objective is an attempt to bridge some of the identified knowledge gaps. It also outlines the literature review. Definitions of supply chain management, explanation on sustainability, sustainable supply chain practices, and supply chain policy and supply chain challenges in the mining sector will be outlined.

Chapter Three

This chapter seeks to evaluate sustainable supply chain management practices that are prevalent in Australia, Botswana, and South Africa. The chapter outlines the factors that drive supply chain performance in Australia, Botswana as well as South Africa. In addition, the chapter also highpoints some of the challenges the hinder the performance of the Supply Chain Management (SCM) in the mining sector in all these countries.

Chapter Four

This chapter deliberates on the research methodology engaged in this study with the aim of meeting the research intentions. The population sample, study design and the geographical area where the studies were taken upon are outlined. Additionally, the section embraces an explanation of the tools utilised in bringing together the data, together with approaches managed to uphold rationality and consistency of the tools with the aim of carrying out the

8

assessment of the principles, methods, obstacles, possible benefits of sustainable supply chain systems in the South African mining industry

Chapter Five

This chapter outline the outcomes of the study and discusses the results; it presents the results of data attained from the organized questionnaires, which were given to the research respondents in the mining sector that were sampled. The analysis of the data and interpretation of the outcomes were received from the questionnaire study and aided as the foundation of this quantitative data collection. Descriptive statistics of biographical data, factor analysis, reliability analysis of the data using Cronbach's alpha coefficient, normality test with Kolmogorov-Smirnov and Shapiro-Wilk, correlation analysis with attention on linear correlation with regression analysis and scatter plots were utilized.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the relevant literature of the study. This will help to depict the different views expressed by other scholars regarding sustainable supply chain practices in various sectors. The views of other scholars will be used in benchmarking the findings of this study. The chapter starts by defining key supply chain concepts and sustainability. The concepts that have been elaborated in this chapter are supply chain and sustainable supply chain practices.

It is important for the user of this study to understand the related meaning of these two terms. In addition, the chapter also highlights and examines the factors that influence supply chain practices within mining. These factors shape the character of the four entities' supply chain practices. The chapter also outlines the legislative framework that influences supply chain cultures or practices of the four entities investigated. Systemic supply chain procedures and processes of the four entities are also discussed. This chapter gives an overview of existing literature pertinent to the subject of sustainable development in the supply chain management, distinguishing issues, approaches and hypothetical structures that have been applied in this field. The idea of Sustainable Supply Chain Management is viewed as first to set up a setting for the substance to pursue.

2.2 Definition of key concepts

2.2.1. Globalisation

Within the current decade, globalization is being considered as a factor that has an important impact over every kind of business sectors, most of the activities associated with companies' framework have become by nature, therefore affecting many sides of economy (Ohmae, 1990; Barnet and Cavanagh, 1994; Brecher Costello, 1994 and Perraton, 1997). The above statement becomes real when taking into account the growth within foreign direct investment in developed countries and the liberalization of international trade in products and services, which both elements have created an increased within national economic and technological development, and a growth employment within such less developed countries. On the other hand, globalization is seen as a key player that increases the application of supply chain management as a factor to improve corporate performance. Meantime this fast economy growth has as well increased major concerns associated with environmental and social conditions within these areas, and this has attracted attention from public and media.

One of the important developments from the statement above is the changing within most of manufacturing activities in developed or developing countries. South Africa is one the developing countries where outsourced activities ends up in adverse social effects such as huge income disparities and unequal sharing of gains, as has been evident through the previous decades. This illustrates a general trend of the rich people becoming richer whilst poor people becoming poorer. It was pointed out by Pearson and Seyfang (2001) that globalization encountered some challenges such as the costs and benefits of globalisation are unevenly distributed, especially in developed countries. In accordance with the literature, that point out that the current process of globalisation is not sustainable when looking in the long term unless new policies are introduced that can help to manage it (Tisdell, 2001).

In light to the previously mentioned challenge, numerous business associations have gotten changes the targets set for the inventory network as new improvement, for example, organisation authoritative structure, without a moment to spare conveyance, focal warehousing and coordination's activity. Previously, business associations needed to possess every one of the exercises included in their production network, but at this point, they are worried about the vital center of their store network exercises and depend fundamentally upon outside colleagues. Thus, providers are being considered as a critical factor of their social and natural exhibition. A few global associations think that it is helpful to source and create merchandise from low salary economy and offered the items to higher pay economy. That is the reason; a great deal of the items are re-appropriated to temporary workers and sub-contractual workers inside an enormous assorted variety of ease working areas. Largely, a considerable lot of national speculators possess the producing destinations and are autonomous business. Through redistributing of generation some part of the store network, obligation additionally transforms from a solitary company to different partnerships, this relies upon the sorts of the item showcase. In this manner, the inventory network has gotten increasingly perplexing and socially different.

Additionally, globalization is being viewed as another pattern of contemporary business, which gives important attention over Sustainable Supply Chain Management. The development of international supply chains has helped many firms in designing novel strategies with the purpose of improving their competitiveness and performance in harsh market. To low the prices, several companies hand over manufacturing processes to suppliers within a country that has a lower labor costs (Donna. 2015; Gopal & Jitesh 2016; Jonas. & Joachim, 2013; Rameshwar & Angappa, 2016). Furthermore, the development of novel and price advantageous markets for sourcing and producing, various companies are deploying the new

11

markets to sell their goods or services, thus, contribute in increasing sources of incomes and profits for the all participants. Whereas prolonged international supply chain is contributing to wealth and worth development for companies and their stakeholders, and these have been a stream of toughness and risk.

Porter (1998) states that with the current business model, single company is not capable of surviving by itself; it can only survive as a component of the supply or value chain within an ever-increased competitive business environment. Furthermore, Christopher (1993) points out that it is the supply chain that can create real competitive advantage to companies, through meeting the expectations of customers and reducing operating costs. Thus, supply chain management plays an important role in managing concerns that arise beyond organisational limits, enhancing corporate competitiveness and profitability in nowadays operating environment (Wood, 1997; BSR, 2001). Christopher (1998) emphasizes that single business organisations do not anymore compete as solely autonomous sectors, however rather as supply chains.

2.2.2. Corporate Social Responsibility (CSR)

The term CSR was introduced since the early 1950s; CSR was described by Bowen (1953) as the obligation to apply the policies that are in line with the goals and values of the human society. In meantime, Ackerman (1975) points out that business organisation only aimed at ameliorating their financial health, which based on social responsiveness. Furthermore, it was argued by Friedman (1963 and 1970) that the sole objective of companies was merely relied on making a profit and in those days companies have no obligation to solve the issues that surrounded the world (Reinhardt, 1999: 53), specifically as CSR is seen as a setback that voluntary hindering from maximising the profit (Andrews, 1989: 257). On the other hand, McDonald and Puxty (1979) had a view of CSR as a social must. The social commitments were classed into three principle types: monetary commitments (profitability and financial practicality); lawful and moral commitments (nearby administrative consistence and recognizing standards and values) and charitable commitments (proactively offer back to society) (Carroll, 1979).

Tuzzolino and Armandi (1981) contend that business associations would acknowledge CSR simply in the wake of beating physiological or endurance worries through corporate benefits. During the 1990s, the pattern headed towards the idea of CSR being considered as a part of the executives. By and by, a few investigations didn't recognize CSR a social must, contending that it is not reasonable for organisations to accept obligation regarding society overall and

12

that CSR should just be engaged over those that straightforwardly or by implication influence or are influenced through organisations' exercises (Donaldson and Preston, 1995; Jones, 1995; Wood and Jones, 1995). Balabanis. (1998) point additionally out those corporate needs to assume the full liability identified with any of its exercises that harm networks and the earth.

Throughout the most recent decade, obligation has risen up out of monetary viewpoint to natural and social issues that influence the network. In this manner, it has been forced on organisations to do not just be center around addressing purchasers' needs, anyway, to likewise incorporate into their motivation the issues that are hitting the general public overall. Maignan and Ferrell (2003) characterize organisation obligations in two kinds, which are corporate social duties (Frederick, 1978; Caroll, 1979; Strand, 1983; Wartick and Cochran, 1985) and corporate partner duties (Clarkson, 1988, 1991 and 1995; Donaldson and Preston, 1995). The last one expresses that duty inside the store network does not just incorporate organisation accomplices, anyway additionally officials, guidelines associations, customers and researchers (Meinders, 2001). However, CSR is viewed as a partner commitment (Maignan and Ferrell, 2003). As expressed over, the job and obligation of a business association changes as per procedure of globalization. Also, Ledgerwood (1997) states that the portion of obligations among organisations and network is inside ceaseless quick, with government taking on a portion of the venturesome attributes and practicing more extensive social duties. As this sub-segment has delineated, these days' partners request that business association's center around an enormous social obligations and be increasingly liable for their exercises contrasted with the past. With the consistently Increasing open concern has additionally raised concern in regard to the usage of CSR; this will be examined in writing audit of this examination.

2.2.3. Supply Chain Management (SCM)

The following studies Özer and Ayse (2016), Sini (2017), Andrea (2017), Hendrik and David (2017), Ali (2016), Dia (2016), Roberto and Emilio (2016), Rameshwar (2017), Vijay (2017), Dimitrios (2017), Zulfiquar (2017), Hamed (2017), De Gao (2017), Rakesh (2017), Hamed (2016) have defined supply chain management as a the combination of the activities linked to the flow and production of products from the raw materials stage (extraction), through the final-consumers through enhanced supply chain relationships, to achieve competitive advantage. Material and information flow up and down the supply chain. The figure 2.1 below illustrates all activities that form supply chain management that involves an array of interdependent activities from sourcing and purchasing, production, distribution and transportation, and sales that operate in the developed and developing countries.
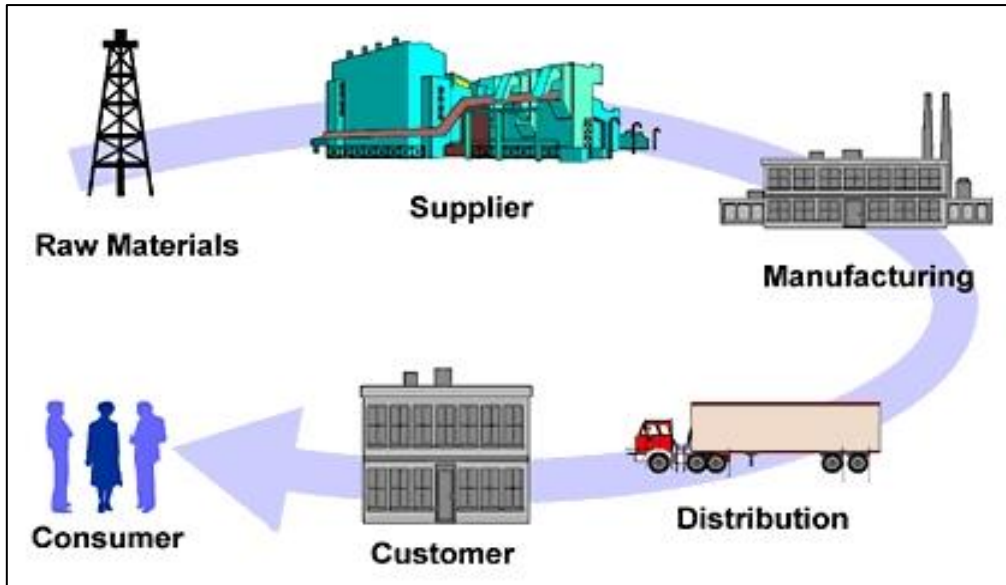
Figure 2.1: activities associated with supply chain network (internet source)

Currently, with the issues linked to climate changes several multinational organisations, especially manufacturing, energy and mining companies are being considered as elements that are socially and environmentally destructive, and this especially within developing countries in terms of extracting raw materials from developing nations, paying substandard wages to overseas workers and operating without regard to local communities. This creates serious and permanent damage to the local communities. Social and human rights concerns such as child labour, employee working conditions and working hours, employee health and safety and freedom of association to name a few, attract media attentions. Environmental concerns such as over-exploitation of natural resources, the degradation of marine habitat and deforestation, air pollution and chemical emissions are emerging in the headlines for public scrutiny. The aforementioned outsourcing system has created serious issues concerning environmental, social and human rights impacts in developing and developed countries where products are sourced and produced. Heiskanen (1998) states that Western users' demand for adding value other than the traditional elements of price, quality and time is a critical driving factor for enhancement. Irresponsible behavior of manufacturing industries is watched by non-governmental organisations (NGOs) and labor activists, which has had direct effect over users purchasing decisions that have in turn directly affected the sales and reputation of the companies. This has resulted in an increased distrust amongst the general public towards manufacturing industries.

Mohammad (2016); Babu (2016); Wan (2016); Marisa (2016); Majid (2015) all state that having an understanding of streams and techniques for sustainability is very important for the

14

company in terms of competitiveness. Generally, Supply chain targets the capacities of company responsiveness to the market change, producing at cost effective, meeting customers' expectation, and flexibility (Donna .2015; Gopal & Jitesh .2016). The objective is that a well-established framework among strategies and abilities of a company can significantly ameliorate the performance of the company (Paolo, 2015; Konrad 2016; Paweł & Jarosław .2015; Jury & Matteo .2016; Brian & Mary .2016; Vincent. & Li-Chuan, 2014). A constructive supply chain may be seen as design of decisions making associated with sourcing goods, capacity scheduling, transformation of raw materials, collaboration in the whole supply chain, and goods, delivery or services (Josef. 2016; Yılmaz & Hasan. 2016); that is the reason why, supply chain management approaches must coordinate with business unit and corporate level approaches.

Additionally, Jianteng (2016); Fang (2016); Zhalechian (2016); Petrică (2015); Ceren (2015); and Payman (2016) argue that several firms see their supply chain tasks strategically because of elements such as: limited resources, choppiness within supply markets, and increased competition. From the perspective of business approach, companies' sustainability is sometimes seen in the way of profitability and economic well-being of all participants. Companies are forced to make means and economical worth for stakeholders and institutions invested within the companies. Whereas, Jianteng (2016) and Fang (2016) state that the aforementioned bequest of commitment may be summarized as: business exist concerning the growth of economic. Nevertheless, the today's worldwide business general focus upon profitability is under an ever-increasing strain because of exhaustible resources and demands of action from regulatory agencies and environmentally consciousness of buyers (Mohammad 2016). Thus, companies are enlarging their commitment including environmental and societal goals. The introduction of economic, environmental, and of social goals across core business operations have fallen in the domain of supply chain management, which is being called as Sustainable Supply Chain Management (Huiping. 2016). Additionally, because business competition is not only just company against company, however as well between supply chains (Bruno. 2015; Yuan. & Ming-Lang. 2016; Marco & Paolo 2016), it is very important for firms to assess and develop their supply chains in global sphere in order to sustain their business performance.

Furthermore, supply chain management activities support and allow companies to be competitive within a harsh market (Josef. 2016; Yılmaz&Hasan 2016; Jianteng. 2016; Fang. 2016; Zhalechian. 2016; Petrică. 2015; Ceren .2015; Payman. 2016). For instance, Toyota's lean manufacturing strategy and buying system have made them inimitable and has become

a stream of sustained competitive advantage (Susanne.2013; Chin-Shan. 2016; Amin. 2011). Thus, companies may grip resource and capacities developing from their supply chains as streams of sustained inter-companies competitive benefit (Zhonghua& Anjali .2014) and developing supply chain management approaches to reinforce the capacity of a company, creating opportunities for buyers by supplying direct or indirect advantages, and reducing prices. Nevertheless, within the nowadays' internationally competitive business market, reaching out sustained competitive benefit from supply chain approaches is not sufficient (Panchanan&Anand .2015). Furthermore, there exists enough proof that demonstrates the needs of incorporating environmental and social issues within supply chain management. For instance, a recent research has been conducted from Pro-Purchaser determine that at least 85% of buying managers look at the suppliers that show interest in sustainability activities (Dadhich. 2015). In addition, another new research conducted by Boston Consulting Group and MIT Sloan Management Review demonstrates that more than one third of managers considered sustainability as a stream of making profits and almost half of responded firms sifted their supply chain activities from this view (Wan. 2016 & Marisa 2016). The word "sustainable" is no longer used to define "competitive benefit" but rather it is referred to sustain the triple bottom lines, which economic, environmental and social performance.

In accordance with Shaofeng (2014) and Sunil (2015) internationally firms that have sustainable supply chain perform well on measures of profitability, and also over a prolonged conceptualization of performance, which involves social and environmental concerns. This prolonged idea is generally viewed as the triple bottom lines (Panchanan & Anand 2015; Nisakorn & Tritos .2016; Craig 2008). These concerns generally create a circle that put environmental, economical, and social against one another. Therefore, many companies are finding difficult to incorporate sustainability into their supply chains management. As matter of fact, the word sustainability is used to describe the triple bottom line orientation that is becoming the more and more popular after the realising of the report of the World Commission on Economic Development (WCED, 1987). WCED described sustainability as a way of meeting the present's demand without creating constraint for future generations to meet their own demands. This description gives important attention on the environmental concerns of sustainability (Craig, 2008). Additionally, Payman (2016) point out that sustainability principles are probably becoming increasingly significant for the survival, growth and profitability of business.

The aforementioned activities or approaches must not only be focused on corporate shareholders, however over all stakeholders within the supply chain. Because the idea of

sustainability is becoming more popular, (Xun & Dogan, 2015) companies should seek ways to enlarge their focus from shareholders to all stakeholders. Widespread issues within business concerning the all universe, and profits are being addressed by many organisations around the world. The driving factors of economic associated with the way human beings and business meet their resource requirements and desires (e.g., securing food, water, shelter, human comforts, and financial security). Economical concerns of supply chain sustainability stress creates an important opportunity for return on investment, increased incomes, reduce cost, and decreased facilities, guiding to reductions in wastes and exposures to financial risk (Wan. 2016 & Marisa 2016).

Chu-hua (2011) and Daniel (2012) argue that environmental issues can take in voluntary or regulated practices to preserve, keep and restore ecosystems and natural resources. Whereas, Josef (2016) point out that social concerns shows conditions and activities that specifically affect negatively humanity. Yılmaz & Hasan (2016) describe global supply chain approaches as a way of achieving reduction within global waste and cost for long-run operational efficiency gains and profits; regulatory compliance; and strategic environmental competence. Therefore, many opportunities exist for introducing sustainability into the supply chain of companies to achieve competitive advantage.

2.2.4. Sustainability

During the last decades, across the global market sustainability has been introduced by many organisations in their supply chain activities with the objective of supporting the tripe bottom line, which are economic, environmental, and social standard. Several factors have been determined to encourage the implementation of sustainability, for example increasing consciousness associated with climate change, supply and demand in energy use, and significant concerns about the environmental and social issues regarding the actions taken by organisations (Joanne, .2011; Panchanan & Anand .2015; Nisakorn & Tritos .2016; Craig 2008). The word sustainability illustrated the combination of economic, environmental, and social responsibilities that has included the operations and managements for organisations. Furthermore, Supply Chain Management (SCM) has been an interesting area that has been investigated by many academics and companies in the recent decades, with the goal of assuring the supply chains' competitiveness, outsourcing is also a major component of supply chain management within a physically distributed enterprise environment (Mohammad. 2016; Babu .2016; Wan. 2016; Marisa 2016; Majid .2015).

Furthermore, the introduction of sustainability within supply chain management is being explored by companies and academic communities (Huiping. 2016; Dadhich. 2015; Huiping.

2015). That is why; it is earning a significant value from industries of all ranges and even involving in a large dimension of companies (Bruno. 2015; Yuan. & Ming-Lang, 2016; Marco &Paolo. 2016). Due to the idea of introducing sustainability into supply chain management, the business of many organisations is growing without any constraint. Nevertheless, there is various challenges to implement sustainable principles, and these challenges are raising many unanswered questions (Josef. 2016). Due to the idea of Supply Sustainable Chain Management recent literatures have demonstrated that supply chains can be managed in achieving significant economic incomes to its members (Yılmaz & Hasan, 2016). However, all stakeholders might not reach satisfactory solutions due to the fact that economic goals may not be separated from the environmental and social issues (Jianteng. 2016; Fang. 2016; Zhalechian. 2016; Petrică. 2015; Ceren .2015; Payman 2016).

Additionally, it has been demonstrated by Chu-hua (2011); Daniel (2012); Jeremy (2012); Natalia (2012); and Zhonghua & Anjali (2014) that Sustainable Supply Chain Management may be a driving factor to the business success of an organisation. Nevertheless, many studies have also demonstrated that sustainability's social aspect is from time to time ignored within the existing researches and practices (Paolo. 2015). Furthermore, Paolo (2015); Konrad (2016); Paweł & Jarosław (2015); Jury & Matteo (2016); Brian & Mary (2016); and Vincent. & Li-Chuan (2014) argue that many researchers are basically focused over environmental issues. In addition, the environmental issues and principles are more debated than social issue from literatures in the current decade as showed by Susanne (2013); Chin-Shan (2016); and Amin (2011). Therefore, it is important to go beyond the supply chain's environmental issues or incorporating environmental practices in Corporate Social Responsibility (CSR) focus of the entire supply chains.

The description of sustainability results within a rough activity with the purpose of creating benefits in order to meet the present demands whereas practices sustainable tasks aims at decreasing possible effects over the lives of future generations (Shaofeng, 2014; Sunil 2015). Besides economic considerations, challenges associated with the implementation of sustainability within supply chain management must be taken into account within a way where people can have an understanding and implementing sustainable principle with only restricted knowledge, experiences and tools (Donna .2015; Gopal & Jitesh, 2016; Jonas. & Joachim, 2013; Rameshwar & Angappa, 2016). In addition, Nathan & Stefan (2015); Andreas & Min (2015) state that despite the aforementioned desire most of industries have not implemented Sustainable Supply Chain Management principles, even though some firms have reached a certain level of commitment within sustainable tasks; nevertheless, other firms are reluctant

from doing so. The common characteristic among these firms is that there is no any existing common standard to assess sustainability measures (Xun & Dogan, 2015; Anna & Ladimer, 2010; Karen .2008; Janaina. & Nathalie, 2007). Anna (2007); Ari (2010); Julia (2007) argue that there is incompatibility among the knowledge of knowing principles of sustainability and supply chain dynamics.

Table 2.1: Different definitions of sustainability (author's literature review)

Studies	Definitions	Focus
WCED (1987)	The process of meeting today's demands without preventing the future generations to respond their demands.	Environment
Zhalechian (2016); Petrică (2015); Ceren (2015); Payman (2016)	Utilization that may keep on indefinitely growing without the depletion of natural, physical, and intellectual capital.	Environment, Society
Chu-hua (2011); Daniel (2012); Jeremy (2012), and Natalia (2012)	A strategy of business, which can make a long-run shareholder worth by incorporating opportunities and management of risks that derive from economic and social developments	Economic, Society
Mohammad (2016) Babu (2016) Wan (2016) and Marisa (2016)	The approach, explicit combination and performance of a company's social, environmental, and economical objectives within a systemic process of key inter-company's business processes for developing the long-run economic performance of the individual company and its supply chains.	Economic, Environment, Society
United Nations Global Compact (2010)	The definition involves the role of business to address environmental, social and company management concerns.	Environment, Society
Majid (2015) and Huiping (2016)	A model of handling business, which makes benefits whilst preventing damage from human and the planet.	Economic, Environment, Society
Dadhich (2015) and Huiping (2015)	The capacity of meeting the demand of present time without creating constraint for future generation to respond to their needs with regards to economic, environmental and social concerns.	Economic, Environment, Society

Josef (2016); Yılmaz & Hasan (2016); and Jianteng (2016)	The amount of efforts made by a firm associated with doing business within a socially and environmentally responsible way. It involves factors comprising sustainable development, corporate social responsibility (CSR), stakeholder issues, and company accountability.	Economic, Environment, Society

The early description of sustainability made by WCED (1987) was very wide within its scope and was not well specified, thus, keeping it open to various interpretations. Nevertheless, a base companies used as a starting point to introduce sustainability as part of their core business approach. The first emphasize of supply chain management was on quicker and more reliable delivery of raw material and end-goods to customers; hence, a critical issue for firms was to ameliorate functional effectiveness and steady flow of goods and information across supply chains. In addition, firms were more focused on reducing the amount of waste, not for environmental or social issues, rather for economic concerns (Donna 2015; Gopal & Jitesh, 2016; Jonas. & Joachim, 2013; Rameshwar & Angappa, 2016). Furthermore, Josef (2016) and Yılmaz & Hasan (2016) developed a comprehension system of non-economic elements to introduce within supply chain management by holistically describing sustainability and addressing a strategy of Sustainable Supply Chain Management. This was the beginning of a new era of study in supply chain management. In current decade, increasing concerns such as the rising trend of energy demand, reducing the production of electrical power from non-renewable energy sources, questions related to climate change, and issues for enhancing the quality of life have caused new issues for firms ending up in great knowledge of the sustainable supply chains research area (Joanne, .2011; Panchanan & Anand .2015; Nisakorn & Tritos .2016; Craig 2008).

Table 2.2: Summary of different definitions related to sustainable supply chain (author's literature review)

Terms	Definitions	Sources
Sustainable supply chain	A supply chain which operates without any constraint conventional measures of profitability, and also on the prolonged conceptualization of development, which takes into account social and environmental issues.	Zhalechian (2016); Petrică (2015); Ceren (2015)
Supply chain sustainability	Governance of natural, social and economic issues, and the development of good management principles, during the lifecycles of products and services.	United Nations Global Compact (2010)
Sustainable supply chain management	The governance of goods, data and capital flows, and also collaboration between firms across the supply chain whilst considering objectives from the triple bottom lines of sustainable development, for example economic, environmental and social that are obtained from buyers and stakeholder demands.	Bruno (2015); Yuan. & Ming-Lang.(2016); and Marco & Paolo (2016)
Sustainability performance	Sustainability performance is described as the result derived from evaluating the intersection of economic, environmental and social concerns.	Joanne (2011); Panchanan & Anand (2015); Nisakorn &Tritos (2016)

From supply chain management perspective, all the definitions regarding sustainability were created over the previous years. Tables 2.1 and 2.2 assist in establishing the definitions regarding sustainability and develop the understanding of sustainability as an idea that does not only include environmental, however also social and economic concerns. Wan (2016); Marisa (2016) and Majid (2015) propose a more comprehensive description of sustainability is growing and earning a global acceptance. This premise is proved by the increasing interest within sustainability by companies and schools. Two recent definitions of sustainability argue that incorporation of sustainability activities in supply chain management is new, however increasing continuously (Yuan. & Ming-Lang. 2016; Marco & Paolo. 2016). Seuring and Müller (2008) publish a research paper about Sustainable Supply Chain Management. In their outcomes, it is demonstrated that 185 articles on Sustainable Supply Chain Management were published between 1994 – 2007, with a great amount of publications that begin from the year 2001 showing an important academic interest within Sustainable Supply Chain Management in recent decade. It also demonstrates in their results that external strains and incentives can push firms to introduce sustainability in their supply chains. Due to the external strains and incentives, the authors determine two strategies linked to sustainability. Firstly, supplier

management for risks and performance that most organisations used owing to the fear reputational risks related to sustainability concerns. Thus, other social and environmental concerns are considered in order to complement economically based supplier assessment. Secondly, supply chain management for sustainable goods or services, which is developed in accordance with life cycle, based benchmark for social and environmental concerns related to the products.

Carter and Easton (2011) conducted a systematic literature review based on Sustainable Supply Chain Management in the major logistics and Sustainable Supply Chain Management journals over two decades. Almost 130 articles were published between the years of 1991 to 2010. It their findings, it is illustrated that research within the domain of Sustainable Supply Chain Management revolve around from the perspective of sustainability' standalone to a multidimensional view of all facets of the triple bottom line goals. Firms' interest within sustainability has as well been growing over the last decades as demonstrated by a growing number of sustainability report released every year by many companies. This proves that, in the academic and companies' areas interest in Sustainable Supply Chain Management has become pervasive.

2.2.5 Sustainable Supply Chain Management (SSCM)

To completely comprehend the idea of Sustainable Supply Chain Management, one should initially have a reasonable comprehension of its segment parts. Studies conducted by Seuring and Müller (2008), Carter and Rogers (2008) and Carter and Easton (2011) all start examinations concerning systems for Sustainable Supply Chain Management by setting up these definitions. Seuring and Müller (2008) first consider the importance of supply chain management, citing a definition by Handfield and Nichols (1999), which states:

"*The supply chain encompasses all activities associated with the flow and transformation of goods from raw materials stage (extraction), through to the end user, as well as the associated information flows. Material and information flow both up and down the supply chain. Supply chain management (SCM) is the integration of these activities through improved supply chain relationships to achieve a sustainable competitive advantage.*"

In setting up their comprehension of supply chain management, Carter and Rogers (2008) started by citing Mentzer (2008), which sees supply chain management as:

"*The systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole*"

Carter and Rogers (2008) at that point present a second understanding by Lambert (2006), which characterizes supply chain management, as "*The integration of key business processes from end-user through original suppliers that provides products, services, and information that add value for customers and other stakeholders*".

Sustainable Supply Chain Management requires a more extensive way to deal with supply chain management (Svensson 2007) and proceeding onward to think about the additional idea of manageable improvement, Seuring and Müller (2008, p.1700) present a definition by the Brundtland Commission (World Commission on Environment and Development, 1987) in which it is portrayed as: "A development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

As mentioned earlier on, previous studies discover that implementing environmental measures for any business organisation is costly, because it needs to be implemented throughout all levels of the company (Cho & Lim, 2016; Choi & Hong, 2002; Ciliberti, 2009). In this sense, customers and organisations have to be more willing to pay for premium prices in order to implement green measures (Clarke & Boersma, 2017; Cooper, 1997; Darnall, 2008; De Marchi, 2013). Like with manufacturing companies, management is always focus on the fact that commitment to implement green measures will decrease profit at the expense of current environmental performance (Delmas & Montiel, 2009; Distelhorst, 2015; Foerstl, 2015; Formentini & Taticchi, 2016). And also, the commitment of top management towards environmental investments within new greener markets can supply the company with an innovation to earn a competitive benefit in short time (Gereffi, 2001; Gereffi, 2005; Gereffi & Lee, 2014; Gimenez & Sierra, 2013; Gimenez & Tachizawa, 2012). Various manufacturing companies in different service industries have launched measures for becoming green in goods sold, or within production processes. But, service organisations regards the conflicts of different stakeholders, involving consumers, employees, suppliers, regulators, governmental agencies, and stockholders and their reactions in implementing green measures. These stakeholders put in place conflicting priorities for governance's policies such as significant profit on investments, good quality goods and prolonged profitability (Giunipero, 2008; Gold, 2013; Golicic & Smith, 2013; Gonzalez, 2008; Grimm, 2016; Grimm, 2014; Gualandris, 2014;

Gualandris, 2015). That is why; many business organisations are still looking for the best way possible to develop Sustainable Supply Chain Management practices in their business environment.

Research by Gopal & Jitesh (2016) ; Jeremy (2012) ; Jianteng (2016); Joanne & Xavier (2011); Jonas & Joachim (2013); Josef-Peter (2016); Jury & Matteo (2016); Konrad (2016); Marco & Paolo (2016) define supply chain management as a the combination of the activities involving the flow of information, transformation, movement, production of products from the raw materials stage (extraction), storage of materials and transport of end-product to the final-consumers with the objective of meeting customer's needs in order to achieve competitive advantage. Its focus is to raise company's effectiveness and efficiency. Furthermore, Huiping (2016); Janaina & Nathalie (2007); Jeremy (2012); Gopal & Jitesh (2016); Julia (2007) describe supply chain management as the process that helps manufacturer to strategically communicate with his supply chain partners and collaboratively govern intra- and inter-organisation system. They continue by stating that the major goal for supply chain management is to reach the maximum potential of effectiveness and efficiency when delivering the products or services and to achieve consumers' worth by delivering goods and services with the minimum cost possible and the shortest time. In accordance with Jury & Matteo (2016) the traditional supply chain management is described as a set of various entities involve within the upstream or downstream flow of goods, services, finances, and/or information from a source to the end-users. The idea of sustainability was born due to environmental deterioration and the need to develop social aspect for employees. Bruntland's who was among the pioneer in promoting the implementation of sustainability practices into the supply chain management, he describes sustainability practices as a process of meeting current needs without compromising the ability of future generation to meet their needs, and this definition has been being used by many researchers during the current decade (Giunipero, 2008; Gold, 2013; Golicic & Smith, 2013; Gonzalez, 2008; Grimm, 2016; Grimm, 2014; Gualandris, 2014; Gualandris, 2015). Generally, sustainability is based on three important bottom lines: economic growth, environmental degradation concerns, and social developments, which are interconnected and complementary. Lately, the main goal of research in sustainability has been changed from local optimization within a single firm to that of the whole supply chain management.

Furthermore, sustainability is now an important measure that dictates the way of doing business, by buying goods that are environmentally friendly and even in the section process of our leaders. As environment sustainability is attracting more attention, the literature on Sustainable Supply Chain Management practices focusing on environmental performance has

created a stream known as green supply chain management (Cho & Lim, 2016; Choi & Hong, 2002). It is not only based on lowering the amount of produced waste or deploying less energy, but it is also associated with creating processes, which will completely make business environmentally sustainable in the future.

In additionally, community should not only be environmentally sustainable, rather should it also become socially sustainable. Giunipero, (2008) Gold, (2013) Golicic & Smith (2013) Gonzalez, (2008) Grimm, (2016) Grimm, (2014) Gualandris, (2014) Gualandris, (2015) point out that social sustainability is considered like a process that helps to create a sustainable environment that encourages well-being, by considering the needs of human being from the places they live and work. Previous literatures have addressed the social dimension of sustainability by analyzing several social facets such as community concerns, corporate governance, diversity considerations, employee relations, human rights and diversity, educational and ethical considerations, training and development and safety (Cho & Lim, 2016; Choi & Hong, 2002). It is far harder to quantify than economic growth or environmental impact and as a result, it is the most neglected factor of triple bottom line reporting.

Even though the business appears to be larger or smaller, it can actually assist to enhance social sustainability such as changing local and international social requirements of crew, their families, communities and society as a whole. While, economic sustainability evaluates different facets of supply chain management focusing on guaranteeing healthy cash flow, good profit margins and a significant return on investment, business performance enhancement and competitive benefit (Gereffi & Lee; 2014; Gimenez & Sierra, 2013; Gimenez & Tachizawa, 2012). Speaking from the literature perspective upon the economics of sustainability, it emphasizes utility, for which a worth is computed. The costs of keeping the environment green are sometimes not onerous and in several cases, the cost saved from deploying resources more wisely and the reputational advantage in attracting consumers from being known as a "green" organisation augment organisational profitability (Gereffi & Lee, 2014; Gimenez & Sierra, 2013; Gimenez & Tachizawa, 2012).

Basically, supply chain management takes into account the completely physical process from obtaining the raw materials throughout all process phases until the end product, directly or indirectly, transports to the consumers, and also the related information flows. Additionally, supply chain management involves various separate components with the main goal to meet the consumers' needs. Supply chain management channel does not only involve the manufacturer and supplier, but also transporters, warehouses, retailers, and end-users. The

26

concept of supply chain management was introduced since 1980s. The topic of sustainability from the supply chain management perspective has been analyzed deploying various terms in the literatures. Sustainability is now an international concern and business organisations are forced to adapt sustainability principles into their supply chain management. Over the current decade, this has led industry practitioners and scholars as a whole to embrace new terms, which are most closely link sustainability and supply chain management concepts are Green Supply Chain Management (GSCM). Research by Gereffi & Lee (2014); Gimenez & Sierra (2013); Gimenez & Tachizawa (2012); Giunipero, (2008); Gold, (2013); Golicic & Smith (2013); Gonzalez, (2008) the findings demonstrate that integrating sustainability principles into supply chain management started by focusing over merging "green" considerations with supply chain management practices. Therefore, Sustainable Supply Chain Management is the extension concept of GSCM. Gold, (2013) defined Sustainable Supply Chain Management as the strategic, transparent incorporation and implementation of an organisation's social, environmental and economic goals within a systemic coordination of key inter-organisational business process for enhancing the long-run economic performance of a single organisation and its supply chain. Furthermore, [5] regards Sustainable Supply Chain Management as the governance of material, information and capital flows as well as cooperation amid firms along the supply chain management whilst considering goals from all three bottom lines of sustainable development: economic, environmental and social that are depicted from consumers and stakeholder conditions. People acknowledged that profits and profitability were the only factors within a long-run business success and the economic as the new economic order unfolded (Gereffi & Lee 2014). In addition, Konrad (2016); Majid (2015); Natalia (2012); Nisakorn &Tritos (2016); Panchanan & Anand (2015); Paolo (2015) describe sustainability as a process of meeting present demands without compromising the capacity of future generation to meet their needs also. Furthermore, Studies by Payman (2016); Paweł & Jarosław (2015); Petrică (2015); Seuring &Müller (2008); Rameshwar & Angappa (2016); Shaofeng (2014); Wan (2016); Yılmaz & Hasan (2016) point out that sustainability refers to the productions of products and creation of services employing processes and systems, which do not generate pollution into the environment; conservation of energy and natural wealth; economically viable; safe and healthful for employees, communities and customers; and socially and creatively rewarding for all stakeholders.

Sustainable Supply Chain Management is solely based on three bottom lines, which are environmental, social, and economic effect of goods and service (Zhonghua & Anjali, 2014). The purpose of developing a sustainable supply chain system is based on creating, keeping and flourishing long-run environmental benefits (Zhalechian 2016). There exist several

27

reasons that force companies to apply sustainability principles into their supply chain management such as laws enforcement and regulations establish by the government as whole, with the objective of ensuring their social responsibility to the public, and due to some economics and business paybacks (Wan 2016; Nisakorn & Tritos, 2016). Introducing sustainability principles into business organisation's activities has merely an objective of ensuring the management of social, economics, and environmental benefits (Karen, 2008). Such incorporation is seen a profit for the company to increase competitive advantages. In addition, Sustainable Supply Chain Management is simply the governance of material, information flows, and collaboration amid business organisations whilst considering goals from economics, environmental and social size that are depicted from consumers and stakeholder requirements (Craig 2008).

Carter & Easton (2011); Ari (2010); Anna & Ladimer (2010); and Jonas & Joachim (2013) state that Sustainable Supply Chain Management is a supply chain that has switched from green purchasing to incorporated supply chain commencing from supplier, to manufacturer, to end-users and reverse logistics, which is closing the loop". Additionally, the introduction of sustainability into the supply chain activities is quite important to follow up with the market trends, in meanwhile developing a business competitive environment. Panchanan & Anand (2015); Sunil (2015); and Susanne (2013) argue that the action of implementing sustainability principles within the supply chain process is basically incorporating environmental thoughts into supply chain management, involving the design of product, material sourcing and selection, manufacturing framework, delivery to the end-users.

Carter and Rogers (2008) likewise open with this much-cited meaning of maintainability, anyway they note the difficulties associations may look in applying this full-scale monetary definition, which offers little direction regarding distinguishing and managing future versus present needs, and adjusting an association's duties to its many direct partners too society and the earth. Moreover, they call attention to that the broadness of the Brundtland Commission's definition makes it hard for associations "to decide their individual job inside this more extensive, full scale financial viewpoint" (Carter and Rogers, 2008). Recognizing the presence of assorted elucidations of the idea of manageability, Seuring and Müller (2008) recommend that the 'triple main concern' approach (Elkington, 1998) is a focal idea that serves to operationalize supportability. Carter and Rogers (2008) agree on the centrality of the triple main concern approach, seen as "the crossing point of natural, social, and financial execution" (Carter and Easton, 2011).

Having investigated the base ideas of inventory network the board and sustainability, Seuring and Müller (2008) join these plans to characterize Sustainable Supply Chain Management as:

"The administration of material, data and capital streams just as collaboration among organisations along the store network while taking objectives from every one of the three components of practical advancement, i.e., monetary, natural and social, into account which are gotten from client and partner necessities." They see the satisfaction of ecological and social criteria as an essential for individuals from a production network who wish to stay drew in, and yet likewise believe it to be a potential wellspring of aggressiveness got from addressing the requirements and financial criteria of clients (Seuring and Müller, 2008). Carter and Rogers (2008) concur that taking part in sustainability is a prerequisite; anyway, their Sustainable Supply Chain Management system likewise legitimately stresses the significance of the financial measurement. They propose that sustainability for an association is something beyond distinguishing and participating in "social and natural exercises, which ideally help, or if nothing else not hurt, financial execution" (Carter and Easton, 2011). Or maybe it includes obviously following the standards of the 'triple main concern' (Elkington, 1998), that "unequivocally guides directors to distinguish those exercises which improve monetary execution and manage the evasion of social and natural exercises which fall outside this crossing point". This thought is bolstered by Pagell and Wu's, (2009) examination of contextual investigations of model firms planned for building progressively complete Sustainable Supply Chain Management hypothesis, which recommends that a SSC is "one that performs well on both customary proportions of benefit and misfortune just as on an extended conceptualization of execution that incorporates social and common measurements."

Developing the model presented via Carter and Rogers (2008), Carter and Easton (2011) depict Sustainable Supply Chain Management as including since a long time ago run upgrades to the association's budgetary exhibition and controlling directors through the way toward distinguishing substantial activities that will assist it with thriving soon and past. They moreover feature four aspects that Carter and Rogers (2008) have recognized as facilitators of Sustainable Supply Chain Management including (Carter and Easton, 2011):

❖ Strategy – comprehensively and deliberately recognizing individual Sustainable Supply Chain Management activities which line up with and bolster the association's general manageability system;

❖ Risk the executives, including possibility getting ready for both the upstream and downstream production network;

❖ An hierarchical culture which is profoundly instilled and incorporates authoritative citizenship, and which incorporates high moral gauges and desires (a structure obstruct for Sustainable Supply Chain Management) alongside a regard for society (both inside and outside of the association) and the common habitat; and

❖ Transparency as far as proactively captivating and speaking with key partners and having recognizability and perceivability into upstream and downstream production network activities." Therefore, consolidating the two ideas of supply chain management (Mentzer., 2008; Lambert., 2006), Elkington's (1998) triple primary concern and these four encouraging features,

Carter and Rogers (2008) and Carter and Easton (2011) utilize a meaning of Sustainable Supply Chain Management, seen as: "The vital, straightforward reconciliation and accomplishment of an association's social, ecological, and financial objectives in the fundamental coordination of key between authoritative business forms for improving the long haul monetary execution of the individual organisation and its inventory chains" (Carter and Rogers, 2008,).

In Figure 2.2 beneath, we see that genuine manageability is discovered where ecological, social and monetary execution converge and where these three territories are joined into the advancement of long-haul vital targets (Carter and Rogers, 2008).
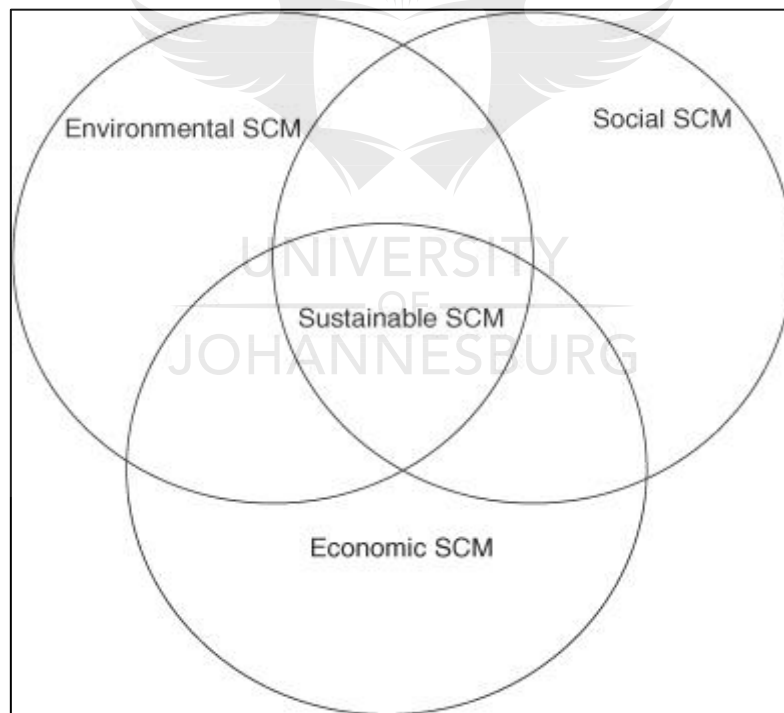
Figure 2.2: Sustainable Supply Chain Management (Carter & Rogers, 2008)

Pagell and Wu (2009) carried out a dash of reality to the dialog, portraying a genuinely feasible store network as one that "would best case scenario do no net damage to characteristic or social frameworks while delivering a benefit over an all-inclusive timeframe." Based on the way that none of the models they considered have made cases of having accomplished

30

genuine supportability and setting that no such production network really exits to date, Pagell and Wu (2009) recommend that, "most are in reality more maintainable than others in their industry." That being the situation, they at that point take a gander at Sustainable Supply Chain Management as "the particular administrative moves that are made to make the inventory network increasingly economical with an ultimate objective of making a genuinely manageable chain" (Pagell and Wu, 2009).

2.4.1 Supply chains and value chains

Having built up a comprehension around supply chains, it is helpful to think about the significance of the related ideas of significant worth and worth chains, which likewise get inclusion in a portion of the writing on Sustainable Supply Chain Management (Closs, 2011; Vurro., 2009; Smith, 2007; Senge, 2010). The thought of significant worth chains was created in 1985 by Porter who characterized an incentive as, "the sum purchasers are happy to pay for what a firm gives" and worth chain as "the mix of nine conventional worth included exercises working inside a firm" (Feller, 2006). Watchman further built up the idea of a worth framework to speak to the linkage of significant worth chains between organisations, anyway "in the present period of more noteworthy re-appropriating and coordinated effort the linkage between different firms' worth making forms has all the more ordinarily become called the worth chain" (Feller, 2006).

Feller. (2006) recommend that the advantages clients get, the associated worth making forms and the subsequent request and stream of assets made, are "the essential center in esteem chains." with an end goal to carry clearness to esteem, Feller. (2006) feature that "esteem happens when requirements are met through the arrangement of items, assets or administrations," anyway it is likewise "an emotional experience that is subject to setting." Additionally, they call attention to that the idea of significant worth can be comprehended as an encounter that streams from the client. Overall, "the key distinction between a worth chain and a production network is that they stream in inverse bearings" as spoke to in the Figure 2.3, contrasting esteem chains and supply chains (Feller, 2006).

31
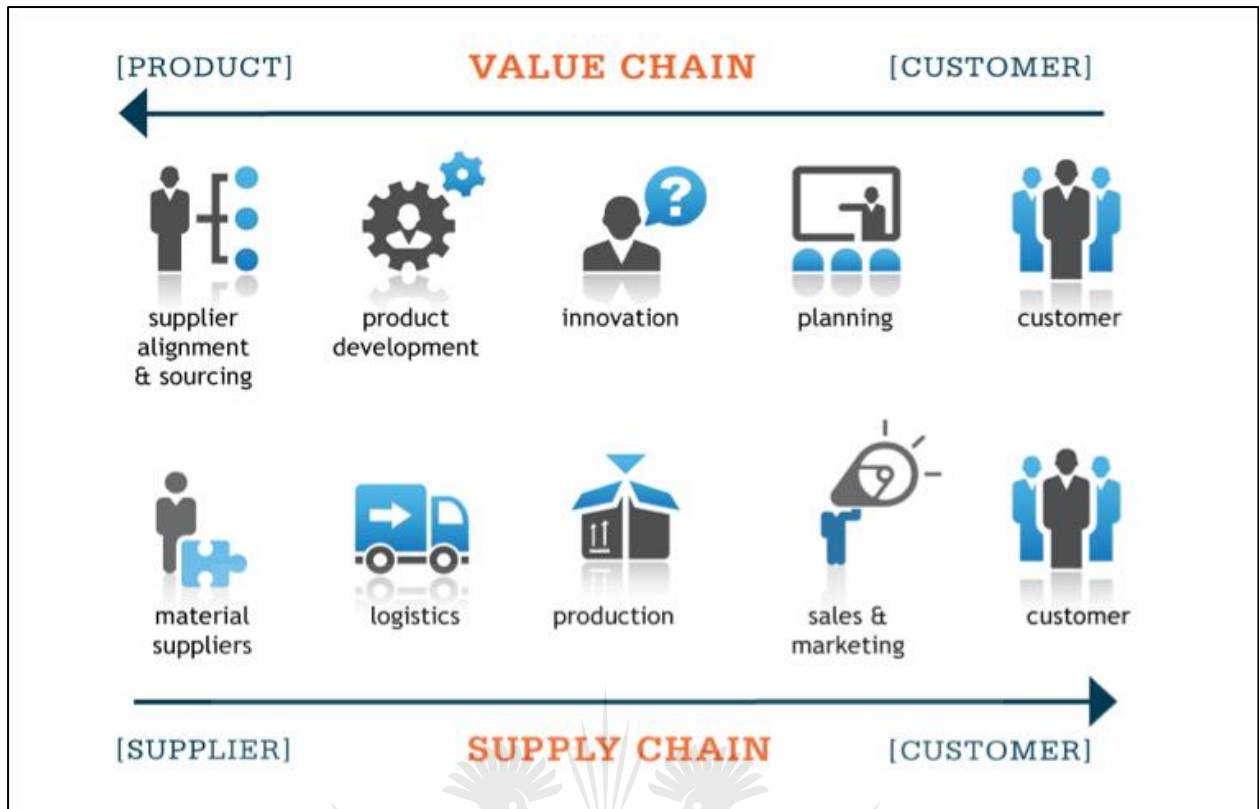
Figure 2.3: A comparison of a Value Chain with a Supply Chain (Feller, 2006)

Considering the relationship showed above, Feller (2006) propose that organisations can augment the worth created by their stock chains, by coordinating the progression of items or administrations provided with the progression of significant worth requested by clients. Doing so requires incorporation of the ideas of supply and worth chains in "a comprehensive perspective on the start to finish business process all through the item life cycle" (Feller, 2006, p.6). Despite the fact that this examination centers fundamentally on corporate stockpile chains, it is essential to be conscious of their relationship to esteem chains and consequently the effect of significant worth.

2.5 Drivers for sustainable supply chain concept

Understanding the potential reasons for SSC idea may comprehend the distinctions in SSC exercises or scarcity in that department. Carter and Easton (2011) recommend there are numerous elements driving enthusiasm for supportability including expanded mindfulness and comprehension of environmental change science, more straightforwardness with regards to associations' natural and social conduct and the effect of market interest on vitality utilization. Albeit all administrators have a need to address expanding partner requests for associations to oversee ecological and social issues affected by their business, "store network directors are in an especially invaluable situation to affect natural and social execution" through choices, for example, provider choice or provider advancement (Carter and Easton, 2011). Closs

(2011) feature the association between chance evaluation and upgraded esteem creation in dealing with an association's triple primary concern. The accompanying area gives a diagram of discoveries from the writing on these triggers for Sustainable Supply Chain Management.

2.5.1 Risk management

With the rising enthusiasm for sustainability issues, SSC activities are viewed as a significant part of an association's methodology "to get ready for, moderate, recognize, react to, and recuperate from potential worldwide dangers" (Closs, 2011). In their system for Sustainable Supply Chain Management, Carter and Rogers (2008) explicitly feature the need to distinguish and oversee financial as well as natural and social dangers. Seen lacks with respect to natural and social execution can incite customer or NGO activism, discoloring an association's notoriety and prompting diminished piece of the overall industry and gainfulness (Maloni and Brown, 2006; Smith, 2007). Envisioning issues and tending to them through SSC activities that incorporate with day by day tasks is in this manner a methods for ensuring the company's notoriety (Maloni and Brown, 2006; Seuring and Müller, 2008). As per Smith (2007) a few reporters consider this to be the essential method of reasoning for interest in feasible sourcing, anyway Seuring and Müller's (2008) Delphi study, which reviewed a board of specialists in Sustainable Supply Chain Management "presumed that NGO pressure is to a lesser degree an inspiration for Sustainable Supply Chain Management than is ordinarily depicted in the writing." Weakness to changes in government guideline is another hazard that organisations may endeavor to address through usage of SSC activities (Closs, 2011; Seuring and Müller, 2008; Hopwood, 2010). Svensson (2007) accepts that exploration discoveries, for example, the 2007 UN report on environmental change has expanded this hazard and will lead worldwide specialists, for example, the UN, the European Union or other local exchange bodies to execute guidelines requiring maintainable practices in general society and business areas. Notwithstanding these outer dangers, SSC activities are additionally being utilized to deal with the danger of potential interruptions of operational procedures (Seuring and Müller, 2008), handling issues, for example, ability the executives, dangers to the stock of vital sources of info and unwavering quality of the store network (Carter and Rogers, 2008; Hopwood, 2010, Closs, 2011). In any case, as Closs (2011) points out, hazard decrease is not the main driver for Sustainable Supply Chain Management, with numerous features of significant worth creation affecting this pattern too.

2.5.2 Production of value added

An emphasis on sustainability expands the point of view on advancing tasks in the store network to join the total creation framework (Linton, 2007), prompting, "Improved productivity

33

and gainfulness over the long haul" (Closs, 2011). Notwithstanding lessening waste and cost, SSC activities bolster the improvement of the people and networks that add to a company's tasks and help to limit dependence on rare and in this way progressively significant common assets (Closs, 2011). Moreover, SSC are less effectively reproduced "especially if providers dedicate resource explicit ventures or offer rich data and create more elevated levels of trust related with the implanted ties" in this manner giving a focused edge (Carter and Rogers, 2008). While the thought of significant worth creation through advancement and expanded aggressiveness appears to be consistent, Linton, (2007) recommend that it may not be so direct since tending to supportability in the production network drastically builds "the intricacy related with characterizing, organizing and communicating with partners" and besides implies managing natural and social issues that are less simple to evaluate. Simultaneously, the act of Sustainable Supply Chain Management can encourage commonly useful associations with providers and conceivably even give the "permit to work or to venture into certain universal markets" (Smith, 2007). Hazard the board and worth creation are additionally connected as helpers for firms to take part in Sustainable Supply Chain Management since the flipside to the reputational chance for firms who neglect to mindfully address ecological and social issues is "the chance to effectively draw in and show their dedication towards society, which could prompt included an incentive in their items and administrations through improved corporate picture" (Mark-Herbert, 2010). Increasing the value of items is attached to display interest for both "inborn (item quality, arrangement, bundling, and so forth.), and extraneous item properties, which are identified with commonplace process attributes" (Trienekens, 2011). Expanded enthusiasm for outward qualities identifying with ecological and social execution among Western buyers has along these lines prodded developing consideration regarding supportability issues in corporate supply chains (Trienekens, 2011).

As per Linton (2007,), "an attention on supply chains is a stage towards the more extensive selection and advancement of supportability, since the store network considers the item from preparation of crude materials to conveyance to the client." However reviewing Pagell and Wu's (2009, p.38) recommendation that most SSC are not genuinely practical but instead "more reasonable than others in their industry," comprehends the contention by some showcasing experts that: "The sheer intricacy of the manageability idea including a gigantic scope of social and ecological issues, exchange offs, time scales and needs, makes promoting 'created utilizing (progressively) feasible horticulture' and 'conveyed to you through an (increasingly) maintainable inventory network' an outlandish suggestion" (Smith, 2007, p. 852).

This test might be especially clear for processors and retailers with supply chains including items or various surges of supply (Smith, 2007). In spite of the fact that shoppers unmistakably consider buying to be of characteristics, for example, item security, quality and execution, enthusiasm for extraneous ascribes identified with "increasingly maintainable generation is deficient to legitimize the higher store network costs and diminished adaptability inborn in a littler, progressively supportable stock base" (Smith, 2007, p.851). Along these lines, if Sustainable Supply Chain Management neglects to produce included an incentive for buyers, "basic worldwide financial aspects and rivalry will slaughter the organisations that pay premiums to providers to help change or convey high additional expenses for confirmation and personality protected inventory chains" (Smith, 2007, p.852). Anyway, a practical way to deal with supply chain management extends the viewpoint on esteem creation to a more extensive gathering of partners, which notwithstanding an association's speculators and clients would likewise incorporate workers, supply accomplices, society largely and the indigenous habitat (Svensson, 2007). Firms propelled by an awareness of other's expectations to this extended partner base may confront "exchange offs between what is monetarily sane for inventory network individuals and what is of most prominent incentive to the whole framework or populace" (Linton, 2007, p.1079). Seen from this point of view, Sustainable Supply Chain Management fuses outer costs, for example, harm brought about by over the top asset use or the arrival of contamination and waste into the earth; along these lines speaking to the genuine all out cost (Linton, 2007). Imprint Herbert (2010, p.5), call attention to that past "giving back something to society" organisations can likewise set a positive model, in this manner affecting the business.

2.6 Relationship between sustainable supply chain and the business environment

In a universe of expanded worldwide interconnectedness it is essential to recollect the significance of setting as, "esteem is exceptionally molded by the bigger social and financial condition through which perplexing and various connections influence the human view of significant worth-based exchanges" (Feller, 2006, p.6). Thus, the nature of the information sources being sourced, and the firm occupied with building up the inventory network, both effect the possibility for Sustainable Supply Chain Management (Smith, 2007; Trienekens, 2011; Hamprecht, 2005; Ton and Bijman, 2006; Yakovleva, 2009). As per Trienekens (2011, p.76), thought of the business condition is basic as it "might both empower and oblige esteem chain redesigning forms."

2.6.1 Pillars of sustainable supply chain

Supply chains create after some time and are intensely affected by the three columns, for example, monetary, social and natural viewpoints in which they develop (Osinga and Hofstede, 2005). For instance, in creating nations nourishment security is regularly an essential concern and in this way "may outweigh natural effects" (Aiking and Boer, 2005, p. 360). Moreover, an absence of information, instructed work, innovation, framework and assets required to put resources into enhancements may likewise exhibit hindrances to creating Sustainable Supply Chain Management (Osinga and Hofstede, 2005; Smith, 2007; Trienekens, 2011). An administration that supports such advancements is likewise plainly fundamental to the improvement of these significant elements (Trienekens, 2011). Beside the financial elements, Linton (2007, p.1079) refer to "social standards, individual and gathering practices, job of government and network, association with science, and association with the indigenous habitat" as basic to understanding and mentalities with regards to supportability. Other pertinent social qualities that may affect endeavors to seek after Sustainable Supply Chain Management rehearses incorporate sees on cash and time point of view in connection to speculations, a general public's way to deal with recognizing and settling issues, and contemplations of trust (Roth, 2008; Hofstede, 2010). Neglecting to consider potential social contrasts can prompt breakdowns of trust that challenge supply connections (Hofstede, 2010). Firmly connected to the monetary, social and world of politics is the institutional condition, which incorporates:

"Regulative institutions (legislation and government regulations and policies), normative institutions (business practices, business policies and ethical standards), and cognitive institutions (the way people interpret and make sense of the world around them on the basis of rules and schemata) impact organisational life" (Trienekens, 2011). Clearly each of the three classifications of institutions will affect a company's capacity to actualize an SSC. Missing or insufficient lawful establishments may exhibit a test if contracts assume a significant job in the execution of SSC activities (Wei and Zhang, 2004; Trienekens, 2011). Moreover, standardizing and intellectual foundations influence partner impression of supportability rehearses and will affect the usage of value control and other important capacities and speculations (Osinga and Hofstede, 2005). It ought to be pointed out that material sources of info go from item items to client explicit items that require propelled capacities to create and the idea of the information sources utilized by a firm is another factor that will affect its capacity to execute SSC activities (Trienekens, 2011). Item inputs are "mass-created, unspecialized items that are commonly broadly accessible for prepared trade in the market, prompting littler overall revenues and decreased significance of variables other than value" (www, Merriam-Webster, 1). Overall, item supply affixes are not helpful for impact, the progression of

information or recognizability, which are significant for Sustainable Supply Chain Management (Smith, 2007, Carter and Rogers, 2008). Thusly a firm utilizing products or close items and intending to build up a SSC would need to "make parallel, littler, costly character protected stock chains in-house before making any more elevated level maintainability claims, along these lines invalidating a large portion of the exchange and mass taking care of cost reserve funds presented by the utilization of pattern guidelines and the board frameworks" (Smith, 2007, p.852). Despite what might be expected, the utilization of non-commoditized inputs requires a progression of information and consistence between all gatherings starting from the manufacturer to the essential maker to accomplish the higher worth included advantage (Trienekens, 2011). A case of this from the nourishment division would be processors that utilization an information requiring explicit practices to develop so as to accomplish unrivaled quality, for example, crop assortment, collecting innovation, or geological generation territory that binds to the picture (Smith, 2007). A circumstance like this is helpful for Sustainable Supply Chain Management, as it requires the improvement and upkeep of firmly connected inventory chains including propelled abilities among ranch and purchaser (Smith, 2007; Trienekens, 2011).

2.6.3 Design of supply chain management

As indicated by Smith (2007), the capacity of a partner to affect others in a supply chain changes significantly as per the flow of products, economy information and impact. As "standards of responsibility, straightforwardness and partner commitment are for the most part profoundly pertinent to Sustainable Supply Chain Management," inventory network arrangement will hence affect the capacity of a firm to execute an SSC (Yakovleva, 2009). While short, (specifically neighborhood) supply binds are moderately simple to delineate, and control, longer and progressively complex stockpile chains require altogether more exertion to draw in members past prompt providers (Smith, 2007). The more grounded the ties between joins in a production network, the simpler it is for data to stream between them (Vurro, 2009). Discernibility and data stream are additionally hampered by exercises, for example, blending and substitution (Smith, 2007), while sharing a typical provider confounds the quest for maintainability, since a provider's ability to satisfy numerous guidelines comes at a significant expense (Hamprecht, 2005). In this way, processors utilizing entangled or dynamic stockpile chains that cannot be dependably mapped will think that it's difficult to actualize SSC activities and may need to acknowledge the dangers not tended to by common quality administration framework (Smith, 2007).

In the equivalent vain, retailers and brand makers will in general assume a lead job in overseeing and updating an incentive in the inventory network (Yakovleva, 2009; Ton and Bijman, 2006). Given their nearness to clients and people, in general when all is said in done, they additionally face the best strain to assume liability for item supportability, driving them to seek after Sustainable Supply Chain Management as a method for tending to providers' natural and social exhibition (Yakovleva, 2009). The more focal a firm is in the chain, the better situated it is to impact the system and execute a coordinated way to deal with esteem including exercises, for example, Sustainable Supply Chain Management (Vurro, 2009). While job and position are unmistakably significant, Smith (2007, p.849) proposes that the frame of mind of a business towards "broadening obligation regarding item quality into social and ecological execution inside their very own stock chains" is another key factor in SSC advancement. This point is upheld via Carter and Rogers (2008) and Pagell and Wu (2009) who see Sustainable Supply Chain Management as encouraged by a corporate culture that advances basic leadership that holds fast to the TBL and upgrades ecological, social and financial capital. For this to be conceivable, duty regarding social and ecological execution should be shared by all representatives and completely joined in the store network (Pagell and Wu, 2009). Notwithstanding a strong corporate culture, viable Sustainable Supply Chain Management likewise requires development abilities and a proactive way to deal with adjusting natural and social focuses to the plan of action (Pagell and Wu, 2009; Carter and Rogers, 2008; Seuring and Müller, 2008).

2.7 Governance structures for SSC

Having mulled over the inspirations of a firm for actualizing SSC and the effect of the setting wherein this happens, it is imperative to consider the job that supply chain management has on this procedure. At the point when basic worth drivers are in the inventory network, the structure for choosing, persuade and overseeing providers can be vital (Johnson, 2008). Besides, with regards to overseeing maintainability in supply chains firms face extra difficulties identifying with the need to keep current with new discoveries on natural and social issues and the way toward coordinating manageability execution angles with monetary controls (Hamprecht, 2005). Synergistic administration is broadly observed as significant for improving ecological and social execution of providers and in this manner key to dealing with an SSC (Carter and Rogers, 2008; Seuring and Müller, 2008; Vurro, 2009, Pagell and Wu, 2009; Smith, 2007). Anyway, the writing investigated examines its importance from two points of view including "provider the board for dangers and execution" (Seuring and Müller, 2008; Carter and Rogers, 2008) and "store network the board for manageable items.

2.7.1 Supply chain risk management

Supply chains include a huge number of zones and members, including different connections, making them helpless against the impacts of dubious endogenous and exogenous variables of each one of those associated with the chain (Guo, 2011). As portrayed in the Figure 2.4 next page
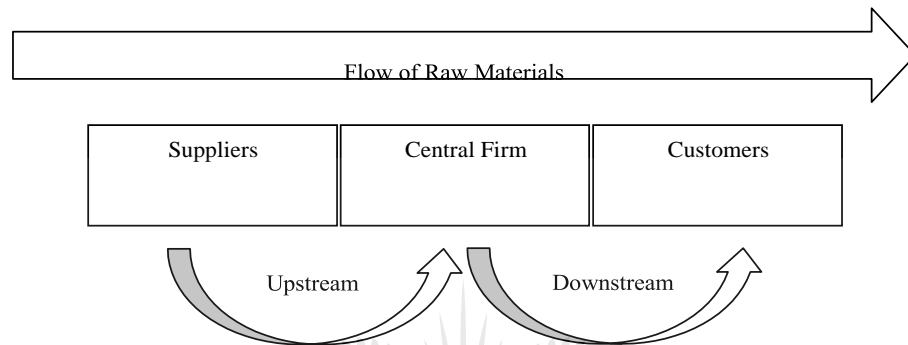
Figure 2.4: Supply chain model (Hahn & Kuhn, 2012)

In this environment, the possibility of breakdown is high, requiring alternate courses of action to maintain a strategic distance from cracks in the chain that mischief the business (Tummala and Schoenherr, 2011). As per Ghadge. (2012), the danger of a SC can be extensively characterized as the presentation to an occasion that causes aggravations, influencing the productive administration of the SC. These dangers, as put by Manuj and Mentzer (2008), can be delegated quantitative or subjective. Quantitative dangers incorporate understock, overload, out of date quality and lacking accessibility of parts and materials in the SC. Subjective dangers incorporate absence of the correct accuracy or dependability of parts and materials in the chain. Further as indicated by Manuj and Mentzer (2008), the wellsprings of hazard can be separated into supply dangers, working dangers, request dangers, data security dangers, macroeconomic dangers, political dangers, focused dangers and asset dangers. The initial four of these (supply, activities, request and data security) are explicitly connected with supply chains, since they can intrude on the tasks of supply as well as appropriation. Chase (2010) contend that the dangers characteristic to supply chains have an exogenous component for every member, since each firm that forms a decided SC has its very own goals and thought processes, which can conflict with those of different firms in the chain. Therefore, their administration is mind boggling (Chopra and Sodhi, 2004), since this incorporates the focal firm itself, however all the upstream and downstream accomplices in the chain.

As per Guo (2011), SCRM comes down to how to control the components that can affect the ordinary working of the SC, to improve its dependability. Other than this, SCRM affects the security of the dynamic participation among the chain's accomplices, so it is critical to the presentation of every one of their activities (Xia and Chen, 2011). In this manner, the goal of SCRM is to distinguish potential wellsprings of hazard and execute suitable measures to dodge or limit the powerlessness of the SC (Singhal, 2011). This implies controlling the components that can cause negative impacts on the ordinary working of the SC, improving its dependability (Guo, 2011). Different creators (Harland, 2003; Hallikas, 2004; Zsidisin, 2005; Wu, 2006; Ritchie and Brindley, 2007; Wagner and Bode, 2008; Rao and Goldsby, 2009; Jia and Rutherford, 2010; Tummala and Schoenherr, 2011; Wieland and Wallenburg, 2012; among others) have proposed SCRM models to oversee hazards in supply chains, by diminishing the powerlessness and guaranteeing kept working of the SC. For Jia and Rutherford (2010), for instance, SCRM fundamentally comprises of: I) characterizing the ideas of hazard and unfavorable results; ii) assessing the wellsprings of hazard; iii) observing the hazard elements; and iv) limiting them. For Tummala and Schoenherr (2011), in comparative structure, SCRM additionally includes four stages: I) hazard recognizable proof; ii) chance assessment; iii) proposition of methodologies to acknowledge, move, lessen or relieve dangers; and iv) chance observing.

Overseeing supply chains for sustainability dangers and execution requires the utilization of instruments that aid the controlling and inspecting process (Yakovleva, 2009). Natural the board frameworks, for example, the ISO 14001 can be utilized to accomplish the base essential exhibition on these issues, anyway on the social front the utilization of formal approaches like the SA 8000 or sets of principles are as yet not broadly received (Seuring and Müller, 2008). Provider assessment plots that build up least ecological and social norms have likewise gotten increasingly normal and bolster objectives for both hazard decrease and execution improvement, which are frequently decidedly corresponded (in the same place). Quality principles are especially significant in evolved ways of life (Trienekens, 2011), and "if ranchers are the prompt providers for nourishment organisations, there is a chance to fuse more significant level maintainable farming criteria into supply contracts" (Smith, 2007, p.855). In any case while utilization of measures benefits endeavors to expand natural and social duty in the store network, extraordinary consideration ought to be paid to how they are characterized and actualized with the end goal that providers can really embrace them (Perez-Aleman and Sandilands (2008). While an association's worldwide objectives are the beginning stage, including nearby makers, government and people in general during the time spent characterizing and executing norms, "takes into consideration alteration dependent on

40

neighborhood data, and for a structure that is adjusted to nearby conditions" (Perez-Aleman and Sandilands, 2008). It is likewise imperative to give motivating forces, since "vulnerability with respect to the advantages of updating can be an issue" for providers who need to contribute time and bear the expenses of changes practices to meet higher ecological and social gauges (in the same place, p.41). Value premiums and longer-term agreements can assist providers with managing the greater expenses and vulnerability by giving extra security (in the same place). Organisations may likewise take proactive measures to help utilization of benchmarks including correspondence and preparing focusing on their own obtaining staff and the staff of their providers, in this way prompting improved relations and execution for the two sides (Seuring and Müller, 2008).

Carter and Rogers (2008, p.374) concur and propose that, "the discovering that outcomes among purchasers and providers concerning natural and social exercises can affect provider execution and decreased working expenses in inventory network connections." A communitarian approach further supports Sustainable Supply Chain Management as it expands straightforwardness and correspondence, subsequently lessening observing expenses related with the risk of sharp conduct, which is especially important when sourcing items with explicit generation claims with regards to ecological and social execution (Carter and Rogers, 2008; Carter and Easton, 2011).

2.10 Conclusion

Corporate social duty is more than a pattern; it is turning into a significant piece of typical business activities. With expanding government guideline altogether affecting inside and outer consistence and more organisations looking into social consistence, mine administrators would be perceptive to create moral or feasible arrangements and executing formal activities. Having such activities set up can work to the benefit of organisations trying to improve their feasible practices and stay preferable service providers for them further up the supply chain. However, to ensure that an initiative has the intended positive impact, mine operators need to understand which corporate social responsibility practices to implement report and track of the outcomes of their initiatives and verify that third-party suppliers and contractors are supporting their goals (Browz, 2018).

CHAPTER THREE

MINING SECTOR FROM INTERNATIONAL PERSPECTIVE

3.1 Introduction

This chapter is aimed at outlining the sustainable supply chain management system from a global scale, regional scale, and local scale with regard to the mining sector. In this chapter, different countries have different supply chain management models or practices. These models or strategies are influenced by country-specific needs and complexities. In addition, the chapter also highlights some of the challenges that hinder the performance of the supply chain management in the mining sector in these countries. Lastly, the chapter outlines some of the key lessons derived from the case studies.

3.2 MINING SECTOR IN AUSTRALIA

The first section is aimed at outlining the sustainable supply chain management practices from a mining point of view and a global scale. According to this chapter, different countries have different Sustainable Supply Chain Management models or practices. These models or strategies are influenced by country-specific needs and complexities. This chapter seeks to evaluate sustainable practices that are prevalent in Australia. The chapter outlines the factors that drive the sustainability of supply chain practices in Australia. In addition, the chapter also highlights some of the challenges that hinder the performance of the mining sector in Australia. Lastly, the chapter outlines some of the key lessons derived from the Australian case study.

3.2.1 Overview of sustainable supply chain management in Australia

Australia has created and perfected the technologies needed to adapt to these intense conditions. It has a solid presence in the planning, development, and conveyance of a wide scope of world-driving mining hardware, innovation and administrations (METS, 2015) intended to guarantee mines stay gainful to accomplish high environmental principles and add to feasible monetary improvement. The Australian mining industry essentially puts resources into its kind, guarantees care for the network and condition and places wellbeing first, needs that have helped make Australia comprehensively aggressive over all parts of the mining business (Worst, 2016).

Australia's immense supply of regular assets joined with political and social cohesion, a well-created scholarly aptitude base and proceeding with a vibrant economy, has added to strong worldwide market request over the business. This industry capacity proclamation gives a diagram of Australian ability in the mining business, including instances of a portion of the numerous Australian organisations with professional skills. Converse with your nearby Australian agent for progressively custom-made guidance and data on interfacing and joining forces with the Australian mining industry (Knoppen, Christiaanse and Huysman 2010). Australia has a developed mining and assets industry based on about 200 years of experience. The quality of Australia's asset division has fueled quite a bit of its financial advancement and supported social improvement. Australia is bestowed with plentiful supply of mineral assets, including the world's biggest Economically Demonstrated Resources (EDR) of lead, iron metal, rutile, zircon, nickel, uranium and zinc (Burt 2003; Leenders 2006). The wealth of mineral assets, supported by huge interest in innovative work (A\$2.8 billion of every 2013/14), has created a talented industry of experts, propelled extraction procedures and cutting-edge innovation (Auminestats,2017).

3.2.2 Overview of the Australian economy

Following centuries of continuous development, low unemployment rate, limited growth, low public debts, and a hard and steady monetary outline, Australia entered 2018 confronted by a scope of growth limitations, primarily determined by the sharp fall in universal costs of key material. Interest for assets and energy from Asia and mainly China has reduced down and a sharp drop in present costs have pretentious development (Paulraj, (2006). The administrations division is the main piece of the Australian economy, representing about 70% of Gross Domestic Product(GDP) and 75% of services. Australia was nearly monetary framework remained solid and expansion levelled out (Reserve bank of Australia, 2018). Australia profited by an emotional flood in its terms of exchange ongoing years, even though this pattern has switched because of falling worldwide item costs. Australia is a noteworthy exporter of characteristic assets, vitality, and nourishment. Australia's plentiful and assorted regular assets pull in abnormal amounts of outside speculation and incorporate broad stores of coal, iron, copper, gold, petroleum gas, uranium, and sustainable power sources. A progression of real ventures, for example, the US$40 billion Gorgon Fluid Gaseous Petrol Task, will fundamentally extend the assets segment (RBA,2018).

Australia is an exposed market with insignificant limits on imports of products and ventures. The way toward opening has extended efficiency, energetic development, and made the economy increasingly flexible and lively. Australia undertakes an operative job in the WTO, APEC, the G20, and other exchange deliberations. Australia's organised trade understanding (FTA) with China went into effect in 2015, addition to existing FTAs with the Republic of Korea, Japan, Chile, Malaysia, New Zealand, Singapore, Thailand, and the US, and a provincial FTA with ASEAN and New Zealand. Australia saves on arranging two-sided agreements with India and Indonesia, just as bigger concurrences with its Pacific neighbors and the Inlet Participation Gathering nations, and an Asia-wide Local Exhaustive Monetary Organisation that joins the 10 ASEAN nations and China, Japan, Korea, New Zealand, and India(RBA,2018).

3.2.3 Factors that drive mining performance in Australia

The Importance of the human issue is very critical; miners are favourably rewarded, meaning that efficient miners will optimise on this variable first before anything else. Job attitudes and job satisfaction, specifically, have established a central issue in this field. The accentuation on occupation fulfillment has been so extraordinary, indeed, that the absence of proof of its immediate relationship with work execution is regularly ignored. Additionally, the strength of enthusiasm for employment fulfillment has, would in general blot other human factors that might be increasingly essential to work execution in specific conditions (Foley, 2017). The broad volume of research has given grounds to an assortment of differentiating hypotheses about the spot of employment fulfillment in connection to work execution. A survey of the writing recommends that a large portion of these perspectives can be suited by one or other of the four basic models portrayed in following text (Lawrence, 2011).

Fulfillment Performance Models; According to a typical theory, different components decide a specialist's activity fulfillment, and work execution is straightforwardly identified with this fulfillment. The components are in some cases viewed as characteristic for the work itself, (for example, work content, assortment, opportunity, etc.), or extraneous, (for example, working conditions, social advantages, compensation, etc.). Based on the suspicion that activity fulfillment decides work execution, endeavors have been made to distinguish those elements about which the board should plan to improve work fulfillment and consequently work execution. This is the premise of the old, and now to a great extent ruined, 'human relations' way to deal with faculty of the board, yet it in any case still has solid help (H. G. M. Rose, 2009).

44

3.2.4 Challenges affecting Australia mine sector

Even though global recession has hit businesses hard, the Australian mining industry visits certain about its future. Mining part development is expected to stay solid as the interest for characteristic possessions additions and the Australian government boosts extension, yet the business will likewise oppose problems. This white paper investigates current issues in Australia's mining industry and its potential effect on the production network and consistency of the board. Current authoritative issues that may influence the Australian mining industry include, for example, the ongoing patterns in Australian Mining Compliance (AMC) including the attention on lessening costs and improving efficiencies just as pending and future guidelines influencing the Australian mining industry (RBA, 2018).

Although some mining managers may trust that their industry is pardoned from taking on business social duty activities, this methodology can upset an organisation in the end. It could take a long time to recuperate from the result if a firm neglect to perceive Corporate Social Responsibility (CSR) as one of the utmost issues challenging the business and react accordingly (Moorhouse, 2008). As per (Forbes,2014) mining administrators in distant areas may once had the option to pull off not executing corporate social obligation strategies, yet with the web's capacity to spread data over the globe instantly , all organisations currently need to turn out to be increasingly severe about setting up methods that will secure their notorieties, their agreements, and their specialists. The accompanying rundown features a few coherent center zones for mining administrators that are investigating or performing CSR activities.

Natural Environmental anxieties are one zone where it is rudimentary for mines to essence on corporate social duty activities. As worries about ecological change and contamination keep on expanding, the mining and coal activities will keep on being under scrutiny by ecological gatherings, activists, and government policy enactment. It is accepted that Coal use adds to pollution, however the coal mining procedure is likewise perceived by frequent individuals to hinder manageability endeavors (Swart, 2016). The gear utilised by mining administrators can likewise affect green endeavors. Wiping out any potential sources of ecological anxiety might be helpful for administrators observing to both reduce charges and keep up their status as a favored provider for their biggest assistants (Michaels, 2013).

While it is clearly, the duty of mining administrators to set up supportability benchmarks for their own tasks, firms ought to likewise find a way to guarantee their providers and temporary

workers pursue similar strategies (James, 2011). Conflicting ecological arrangements can distort an organisation's image, particularly on the off chance that it is observed to work with a firm that neglects to conform to or execute any supportability guidelines. A few associations may think that it is accommodating to make approaches that are in accordance with those of their biggest clients to guarantee another organisation that has officially actualized comparative CSR activities will not supplant them.

Worldwide delay and local populaces are another huge test challenging the mining business is fast worldwide growth. The expose of normal possessions in new zones might be a shock for the mining business, and the nations that will revenue by these unearthing's; notwithstanding, worldwide growth additionally presents possible dangers. Extended mining starts have been found in nations, for example, Canada and Australia, which are home to huge indigenous populaces. Subsequently, mine administrators need to deliberately consider the ramifications of mining ashore that might be certain by local populaces (Pike, 2014).

"Many northern and indigenous regions continue to worry about the effects mining projects may have on their lands and on the environment," said Anja Jeffrey, director of Canada's Centre for the North, rendering to Mining Weekly. "Such issues can only be resolved through dialogue." While Jeffrey was speaking specifically to aboriginal groups in Canada, clear communication with Australian Aborigines is also necessary to start addressing these concerns around the globe (Morrison, 2010).

According to (Forbes, 2014) making an effort through dialogue may not be quite enough to guarantee a company is respecting native rights as mining operations expand. It is also important for businesses to recognise that indigenous groups often have unique rights and protections granted to them by local governments and these issues must be considered when seeking to mine in an area. Learning about native history and culture can be beneficial to gaining the trust of indigenous people, but that trust must also be protected once established. Firms should ensure they recognise the goals and aspirations of those in the area, support local development, give native groups any important information about the undertaking and ensure they have consent before beginning any projects (Pewkkiin, 2016). They should also take the time to explain how pending projects can help benefit a local community, both immediately and in the future, after the mine has closed.

However, abundant like environmental creativities, it is significant for a company to ensure its partners are also seeing local groups' rights and errands. A company should take the essential rankings to ensure its dealers and servicers are not only conscious of these important issues but are compliant with any required steps that ensure no company outwits its boundaries and openings a contract with a native group or disrupts aboriginal rights (Walker, 2011).

46

3.3 MINING SECTOR IN BOTSWANA

The first section is aimed at outlining the supply chain management from a regional scale. According to this chapter, different countries have different Sustainable Supply Chain Management models or practices. These models or strategies are influenced by country-specific needs and complexities. This chapter seeks to evaluate sustainable practices that are prevalent in Botswana. The chapter outlines the factors that drive the sustainability of supply chain practices in the Botswana. In addition, the chapter also highlights some of the challenges that hinder the performance of the mining sector in Botswana. Lastly, the chapter outlines some of the key lessons derived from the Botswana case study.

The fundamental goal of this part is to analyse the components that drive mining performance using the Botswana experience as a point of reference. The chapter also profiles some of the lessons that South African mines can draw from the Botswana experience. Key subheadings of the chapter include: (1) An overview of the mining sector in Botswana; (2) An overview of the Botswana economy; (3) Drivers of mining performance in Botswana; (4) Challenges facing the mining sector in Botswana; and lastly (5) Lessons learned from the Botswana experience.

3.3.1 Overview of the mining sector in Botswana

According to Tompkins (1998), the principal function of a mine is to provide natural resources to be used by customers to make different kind of products from everywhere such as jewellery etc, Mining in Botswana has been created from a moderately little capacity of association's coordination framework to a standout amongst the most critical function (Grant., 2006). In a micro-economy sense, mining performs a critical function especially when it comes to economic expansion etc. When it comes to mining, it does not matter whether a plant is big or small. The central role-played by a mines/ plants in a country's economy cannot be under-stated. The following section evaluates the mining sector in Botswana

There are less than 1000 plants in Botswana. However, at least 56% of all plants in Botswana rely on in-sourced mining services. Botswana pins its hope of growing the sector on its well-developed ports and road infrastructure. The outlook of the sector is bright and very promising. Its proximity to most North African countries positions Botswana to become the kingpin of transport for the African East regions. The Botswana government is spending billions of Pulas on new infrastructure. This makes the mining sector attractive from operations across North and Central Africa. Tompkins (1998) posits that an excellent road and port infrastructure is a key enabler of this industry. However, with Globalisation affecting Africa, competition has become intense and fierce within the sector. The threat of new entrants makes the

substitutionary risk more real than ever. Every year at least 10 new operations enter the market. Currently the occupancy rate is estimated to be in the region of between 69% and 77%.   In terms of occupancy rate, Botswana mines are experiencing the same challenges faced by Australian firms. Firms are now generating a competitive edge by automating their functions.

3.3.2 Overview of the Botswana economy

Botswana is a scarcely populated, parched, landlocked nation in Southern Africa. The nation attained independence from Britain in 1966. Botswana had been a British Protectorate since 1885. At the inception of independence had per capita pay of just $70 per year. For the first few years of freedom, around 60% of current government use comprised of worldwide advancement help. There were just 12 kilometers of cleared streets, and horticulture represented 40 percent of GDP. By 2007 Botswana had 7,000 kilometers of cleared streets, and per capita salary had increased to about $6,100 ($12,000 at acquiring power equality), making Botswana an upper-center – pay nation like Chile or Argentina (Leith, 2005). Diamond mining during independence e   and to a less degree other minerals and the judicious administration of mineral incomes that followed empowered the improvement of the nation (Kegomoditswe Koitsiwe, 2018).

Botswana's prosperity is apparent as evidenced by various proportions of human advancement. At the inception of freedom, the lifespan in Botswana averaged 37 years however; by 1990, it was 60 years. The mortality rate for children under five years fell to 45 for each 1,000 live births in 1990, and the mortality rate to 43.3 1,000 births in 2015 and this is in contract to the African overall (World Bank, 2001; 2015). Improvement help has contracted to under 3% of the administration-spending plan, and agribusiness right now represents just about 2.5% of GDP. Significant steps have additionally been made in framework and training. Yearly development in per capita salary arrived at the midpoint of 7% percent between 1966 and 1999 (Sarraf and Jiwanji 2001). Nevertheless, not all markers are sure, pay in Botswana remains unequal (the Gini coefficient was 0.55 in 1994 and 0.60 in 2015). The unemployment rate remains high, reflecting to a large migration from the rural environment to urban (Lewin, 2011).

As noted in the past section, it is usually acknowledged in financial aspects and mineral financial aspects that asset copious economies will in general become less quickly than asset rare economies. Botswana speaks to a special case to the asset revile rule by figuring out how

to change mineral riches into monetary development. For instance, Limi (2006) contends the significance of good administration in encouraging monetary improvement and Siphambe (2007) contends that approach intelligibility assumed a key role in diverting mineral incomes into financial development. Botswana amazing regular asset board and development record have seen the nation named as 'Africa's example of overcoming adversity' (Acemoglu 2002).

3.3.3 Development of Infrastructure

Regardless of being landlocked, Botswana has a well-created framework in contrast with different nations in the region. The nation's street division stays solid, profiting by numerous long stretches of cautious arranging and speculation, albeit more subsidies should be made accessible for standard and intermittent support. There are prospects for extension of the railroad system, especially to send out coal from the Mmamabula coal arenas finished Namibia. The nation has a flourishing portable media communications industry with one of the most raised penetration heights in Africa. Botswana has 971km of rail lines, 18,482 km of streets (23 percent of which are cleared) and 92 airplane stations (12 of which have cleared runways). The national aircraft is Air Botswana, which flies locally and to other African nations (*Kitamura, 2018*).

3.3.4 Transportation

As indicated by the World Bank, Botswana has a moderately well-developed land transport framework, street and railroads, even though administration of these benefits could be improved. Enthusiastically, improving the productivity of the nation's vehicle framework remains a need. The administration means to accomplish this through the usage of the nation's P2.6 billion Botswana Combined Transport Project (BITP), which at the broadest dimension plans to improve the nation's fare intensity by means of the modernisation of its vehicle framework. The undertaking plans to manufacture current business executive's limit, improve provincial transport mix along the A1 street/rail passageway, and construct basic transport foundation. A proficient transport framework thus could make open doors for fare broadening, which remains a key target for the precious stone ward economy. Extra modernisation parts incorporate framework venture considering the Trans-Kalahari, Mmamabula– Ellisras and Mosetse-Kazungula bar lines, to ease in the congestion within the Gaborone territory. The task, which is set up for the period 2009– 20, is co-subsidised between the World Bank's International Bank for remaking and Development, and the Botswana administration.

Given the nation's landlocked status, the road network is the prominent transport type constituting of 90% of cargo and traveler traffic. Massive improvement of the division in post-autonomy decades has brought about a broad system nowadays, which incorporates 6,000km of cleared street and 12,000km of unpaved streets. Interest in the division has slowed lately. The fight for constrained open budgetary assets between the social divisions including counting HIV/AIDS foundation has turned out to be progressively articulated. An outcome of this contention has been a lack of support of road development. Postponed against quick rising traffic development, including haulers, the state of numerous streets has declined and thus requires recovery. The legislature has, nonetheless, attested its responsibility to keeping up existing foundation offices. The 2013/14 monetary spending plan noticed that the support and fixing of existing government resources remains a need, with P388m set aside for street upkeep alone (KPMG Botswana, 2012). Botswana's financial year runs from 1 April to 31 March.

Regarding rail transport, the state-owned Botswana railroads (Br) maintains the nation's current railroad system which involves a principle line that keeps running from Ramatlabama in the south to Bakaranga in the north, three division lines to the mines, and various private and administration sidings. The system joins with the South African railroad in the south and the Zimbabwe rail line toward the northeast. Cargo traffic remains the overwhelming activity with items transported including concrete, coal, copper, soft drink, grain, fuel and salt. However, cargo traffic has declined largely due to an expanded challenge from long-separate haulers.

As far as up and coming ventures are concerned proceeding with development for sought after coal far and wide, Namibia and Botswana are set to start issuing offers for the development of a 1,500km railroad line linking the coal fields in eastern Botswana to Walvis Bay Port. The railroad line, to be known as the Trans-Kalahari Rail Line, will be a pivotal boost for Botswana's landlocked economy as currently the country is, compelled to exports its coal produce through South Africa and Mozambique.

Concerning media communications, Botswana takes one of the most progressive portable market line entrance rates in Africa (infiltration rate of 150 percent in 2012, as indicated by the International Telecommunication Union). The broadcast communications space is viewed as a standout amongst the most changed in the locale, because of administrative change. The versatile market is commanded by three portable administrators: Mascom Wireless, Orange Botswana and BeMobile, a backup of state–owned Botswana Telecommunications Corporation (BTC). Concerning optic links, the administration is taking an interest in a joint endeavor with the private sector in the advancement of the undersea fiber optic link

50

frameworks and their connections with different nations. The task is separated into two stages: The East Africa Submarine Cable System (EASS), which includes arrangement of undersea fiber link associating nations along the east shore of Africa; and the improvement of the West Africa Cable System (WACS) interfacing nations from South Africa to the United Kingdom (UK) via Portugal. The EASS was finished in August 2010, while the WACS was open for business in May 2012. The two activities empower Botswana to have high limit, high caliber, expanded and moderate worldwide correspondence services (KPMG Botswana, 2012).

3.3.5 Challenges facing the mining industry in Botswana

The worrying factor in Botswana's mining sector is its over-reliance on manual labor to carry out key tasks in most instances. Few mines have enough capital to invest in digital-based equipment systems. An operation transaction that can be processed in seconds in Australia can take a few hours to complete in Botswana. This often leads to the erosion of competitive advantage (KPMG, 2012). Despite generally high rates of monetary development and GDP per capita, Botswana faces key difficulties of expertise in the mining area, which results in a high unemployment rate. . Botswana had an unemployment rate of about 17.9% in 2010, as per the 2013 Vision 2016 and Millennium Development Goals Indicators report. The report notes, nonetheless, that unemployment amongst school graduates declined from 35%t in 2006 to 24.3% in 2010 (Central Africa Mining report, 2015). The general unemployment rate is deemed fundamentally basic in nature and is driven by a gap between interest in the work advertised and the accessible work skills. To reduce unemployment, it would require receiving judicious open work arrangements, including adjusting the educational program for college, tertiary instruction and professional preparation to fulfill the need for skilled workers in the economy. On upside, Botswana's populace is moderately youthful, with roughly 55% of the population below 24 years. Accordingly, there is potential to prepare this age group and equip with the essential skills set to t to grow Botswana's economy (Central Africa Mining report, 2013)

3.4 MINING SECTOR IN SOUTH AFRICA

This section aimed at outlining the sustainable supply chain management systems from a local scale. This chapter looks at variables that drive mining performance in South Africa. It profiles a portion of the exercises that can be drawn from the African experience. Key subheadings of the part include: (1) An outline of the mining division in South Africa; (2) A review of the South African economy; (3) Drivers of mining execution in South Africa and; (4) Challenges confronting this segment.

51

3.4.1 Overview of the mining sector in South Africa

Mining in South Africa was at some point, the primary main factor late the history and development of Africa's most developed and advanced economy. Enormous scale and productive mining began with the discovery of diamonds on the banks of the Orange River in 1867 by Erasmus Jacobs and the consequent revelation and misuse of the Kimberley, a town in the Northern Cape province of South Africa, pipes a couple of years after the discovery. Expeditions to Pilgrim's Rest and Barberton were precedents to the greatest discovery, which was the Main Reef/Main Reef Leader on Gerhardus Oosthuizen's homestead Langlaagte, Portion C, in 1886, the Witwatersrand Gold Rush and the resultant advancement of the goldfields thereby creating the most productivity of all mining activities in South Africa (Mineral council SA, 2018).

Precious stone and gold generation in South Africa have declined from their highest yield however; South Africa remains the fifth highest in gold production. The country still possesses an array of inorganic wealth. South Africa is the world's biggest creator of chrome, manganese, platinum, vanadium, and vermiculite. It is the second biggest producer of ilmenite, palladium, rutile, and zirconium. It is also the world's third biggest coal exporter. South Africa is additionally a big producer of iron and in 2012, it surpassed to become the world's third-highest iron metal exporter to China, the world's biggest buyers of iron metal (Moloto, 2013.) Due to a past wrought with maladministration in the South African mining area, the ruling party (African National Congress (ANC_ Secretary-General, Gwede Mantashe, declared in 2013 that mining organisations distorting their aims would have their mining licenses revoked.

Precious stone and gold discoveries had a significant influence on the growth of the early South African economy. A site on higher east of Cape Town, a town in the Western Cape province of South Africa, was originated to have rich stores of precious stones, and thousands hurried to the territory of Kimberley trying to benefit from the disclosure. The British later added the locale of Griqualand West, a zone that incorporated the diamond fields. In 1868, the Republic of South Africa sought to add areas close to newfound precious stone fields, drawing dissent from the adjacent British provincial government. These accompaniments later prompted the First Anglo-Boer War of 1880-1881(MCSA, 2018).

Gold was discovered in the zone known as Witwatersrand today, triggering what turned into the Witwatersrand Gold Rush of 1886. Like the precious stone discoveries previously, the gold

rush caused a huge number of immigrants and migrants labour to rush to the area. This elevated political strains in the zone and led to the Second Boer War in 1899. Responsibility for jewel and gold mines ended up in the hands of a couple of businesspeople, to a great extent of European descent, known as the Owners. South Africa's and the world's utmost precious stone digger, De Beers, was financed by Baron Nathaniel Mayer Rothschild in 1887, and Cecil John Rhodes turned into the Founding Chairman of the leading body in 1888. Cecil John Rhodes' place was later occupied by Sir Ernest Oppenheimer, fellow backer of the Anglo-American Corporation with J.P. Morgan (Thomas, 2011).

The gold mining manufacturing kept on emerging all through a significant part of the mid twentieth century, adding to the significantly increasing of the financial value of what was then known as the Union of South Africa. Specifically, revenue from gold profits provided passable money to buy sincerely necessary apparatus and oil-based goods to help a growing assembling base. From 2007, the South African mining industry utiliseds 493,000 specialists. The business contributes 18% of South Africa's $588 billion USD GDP (mining industry of SA, 2012)

3.4.2 Overview of the South African economy

South Africa's GDP projected growth figure for 2019 has been adjusted to 1.5%, from an expected 1.7% during the season of the 2018 Medium Term Budget Policy Statement (MTBPS). The more fragile viewpoint extends a moderate improvement underway and work following poor venture development in 2018 and a control in worldwide exchange and speculation. The medium-term standpoint is stifled, with GDP development anticipated to achieve 2.1% in 2021, boosted by a slow improvement in certainty, increasingly successful open foundation spending, and a superior product cost viewpoint than recently anticipated. Following a time of financial shortcoming, there are signs that the economy has started to cover lost ground. The approach dormancy and vulnerability that have obliged speculation and certainty have started to lift. The reconfiguration of Eskom is a noteworthy development in the expansive change of state-owned organisations. A few commissions are testing claims of far reaching debasement in the general population and private areas. The President's venture drive has yielded vows of R300 billion in speculation (Economic diagram report, 2019).

Throughout the following three years, general government foundation speculation is anticipated at R526 billion. Mediation is now in progress to improve the effectiveness of this

pipeline. Likewise, the government administration will contribute R100 billion to a mixed money foundation finance throughout the following decade as new spending, reprioritisation and certifications. The reserves will enable the public and private entities to cooperate to fund manageable social and monetary framework ventures. Government is acting conclusively to relieve the dangers that Eskom poses to the economy and the open funds. The rebuilding of the power division and state support for Eskom's monetary record are vital to a straightforward and trustworthy change of the utility's plan of action. Over the long haul, this will bolster the progress towards a sustainable and strong economy. The President of South African's financial upgrade and recuperation plan, declared in September 2018, expects to reestablish approach certainty and grow trust in the short term. Endeavors to execute the development upgrading changes laid out in the arrangement have made some inroads (Statistics South Africa, 2019).

3.4.3 Factors that drive mining performance in SA

In South Africa, the growth of the mining sector is linked to the events at play in the global sustainable value chain. This is because South Africa's industrialised economy is closely connected to the global world. For example, when hostile events are reported in the United States (US)'s economy, the South Africa's mining sector is affected (Neingo and Tholana, 2015). A case in point is the contagion effect that was felt by this sector during the 2007/8 financial crisis. The sector lost at least 30% of its market value. Another example is when the South African economy was downgraded to junk status in 2015/16. The warehouse sector lost at least 6% of its market share. A downgraded economy is not good in that it shakes the confidence of offshore investors. Once offshore investors lose confidence in an economy, that loss in confidence triggers an unmitigated capital flight (Deloitte, 2014).

3.4.4 Challenges facing the mining sector in SA

The challenges in the removal business in South Africa has its underlying basics in a few unique variables. Firstly, the fall in worldwide attention for platinum and different minerals because of subsiding. Secondly, the results of the industrial strike action at the Anglo Platinum mine in Marikana that led to fatalities established work relatives. Thirdly, the auxiliary character of South Africa is mining industry. An extraordinary arrangement has been expounded on the initial two variables, so this article will look at the last factor, particularly as the uncommon highlights of mining cuts over the entire mining sector and not only platinum. Mining in South Africa has consistently been an enclosed industry, yet with significant effect on the remainder

of the economy. Minerals have been removed from profound dimensions, exposed to some essential handling and after that sent out as metals without a lot of beneficiation or job creation. For example, we do not have significant gold or jewel fabricated items capacities despite having colossal regular resources (ESDPM report, 2018).

3.5 Conclusion

The South African mining sector is undergoing an industry-changing transition. This transition is predicated on digital-based Sustainable Supply Chain Management models. The aims of the reforms remain to disengage the sector from traditional mining management approaches. The idea to accelerate the diffusion of digital-based models is an idea whose time for implementation has arrived. The future of the sector lies in its ability to modernise its internal infrastructure as well as its ability to strengthen the skill sets of its champions. The impact of skill shortages is not only felt in Botswana but are experienced continent-wide in Africa. Rapid education curriculum changes will be a critical intervention to reduce this continental challenge and the need for skills development and technological advancement in Botswana and Africa as a whole is key (Ntase, 2014). In Australia, practically 95% of all mining exercises are driven by cutting edge applications. These applications are credited for conveying one of the world's most acclaimed mining management systems. It is without uncertainty that Australia runs of one of the most complex mining management systems on the planet. This makes the Australia model a genuine guide to pursue or imitate. While this part gave an extensive diagram of the components that drive the mining execution of the world's third economy, the following segment tries to talk about a similar driving variable from an African setting or point of view (Bernard, 2011).

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter clarifies the research practice used in carrying out this study. The geographical area wherever the study was led, the study project and people sample are also labelled. Furthermore, the tool used in meeting the information, including methods applied to sustain rationality and reliability of the tool are labelled in order to carry out the examination of issues affecting sustainable supply chain does in the South African mining sector.

4.2 BALANCED OF THE STUDY

The rank of this study is to contribute to the body of knowledge on the subject of exploring the issues affecting sustainable supply chain practices in the South African mining sector, the effects it has on the sustainable supply chain management, challenges hindering the adoption and implementation of sustainable supply chain management and also finding the benefits related to the adoption and the application of sustainable supply chain management in the South African mining sector.

4.3 RESEARCH APPROACH AND DESIGN

The quantitative study method was adopted in the study. (Fellows and Liu, 2008) define quantitative research as a formal, objective (value free, genuine by the beliefs and values of the researcher), methodical procedure to label and test relations and inspect causes and effects connections among variables. However, Polit and Hungler (1993) state that a quantitative research is a survey to get data from an example of people by means of self-report.

Therefore, in this study the data was composed through a structured questionnaire spread to the respondents by the researcher. A descriptive survey was selected because it gives an accurate account of the characteristics, for example behaviour, opinions, abilities, beliefs and knowledge of a particular individual, situation or group (Burns and Grove, 1993). This method was chosen to meet the objectives of this study, namely to determine the extent to which sustainable supply chain management is approached from a holistic point of view in the current literature ; Determining the extent to which the concept of the sustainable supply chain has been integrated and applied within the mining sector, determining the challenges delaying the acceptance and implementation of sustainable supply chain management in the mining sector,

using South Africa as a case study and to evaluate the benefits related to acceptance and the implementation of sustainable supply chain management in the mining sector.

4.4 RESEARCH AREA

The study was approved out in South Africa, in the North-West province of the country. The research incorporated all supply chain professionals practicing in the Rustenburg area mines and government employees. The respondents were supply chain professionals, managers and engineers. Supply chain consultants were also included in the research. Regarding the consulting, the study focuses on the mines and public entities. This focus was necessitated by the major role the South African government plays in the country's mining sector.

4.5 TARGET POPULATION

A population is the entire of all the individuals who have certain features and are of attention to the researcher that meets the example standards for inclusion in a study (Fellows & Liu, 2008:101). The board population is clear as groups or individuals to whom the survey slights. However, this can also be branded as groups or individuals who are able to answer the questions and to whom the results of the survey tell. The target population in this study were technicians, engineers, project managers, and consultants. This was skillful with the aid of structured questionnaires dispersed to the respondents who are specialists in the field of supply chain in the South African mining sector.

4.6 SAMPLE

They are two major groups of sampling strategy in the social science: probability sampling and purposive sampling. Probability sampling techniques are generally used in quantitative research (Teddlie and Yu, 2007:77). The random sampling was preferred and adopted in this study than the stratified sample, bunch sampling and sample using many likelihood methods. Random sampling was accepted because it gave all the participants an equal of selection and all the participants were selected using similar standards, which was that the participants had to be supply chain professionals in mining and government. This technique is typically adopted when the target population gifts same presentation or qualifications, or the sampling size is very large to signify the whole population professionally and each member of the whole population has an equivalent chance of being selected as a sampling respondent

57

4.7 DATA COLLECTION

In this study, the questionnaire was used to gather data. The questionnaire was designed according to the problems or challenges revealed by literature.

4.8 QUESTIONAIRE

Generally, data collection is done via a research questionnaire survey, which has been one of the preferred methods for most studies. The reason is that a questionnaire is a published self-report form designed to draw data that can be obtained through the written replies of the subject. According to Burns and Grove (1993), data found through a questionnaire is similar to that got through an interview, but the questions tend to have less depth. Information was collected with the aid of a questionnaire to determine the extent to which sustainable supply chain management is approached from a holistic point of view in the current literature, to determine the extent to which the concept of the sustainable supply chain has been integrated and implemented within the mining sector. Information was collected to determine the challenges hindering the adoption and implementation of sustainable supply chain management in the mining sector, using South Africa as a case study. Information was also collected to determine the benefits related to adoption and the implementation of sustainable supply chain management in the mining sector, using South Africa as a case study.

 There are two kinds of questionnaires, the closed-ended and the open-ended questionnaires. In the open-ended questionnaires the respondents are required to respond in writing in their own words and providing more details as they wish, while in the closed-ended questions the respondents are given options related to the investigation topic which are determined by the researcher (Burns and Grove 1993:370). Therefore, a closed-ended questionnaire was accepted in this research because they are calmer to administer and analyses.

The surveys were designed in the English language as all the respondents are proficient supply chain specialists who are able to read and answer the questions in the selected language. The respondents were assured of the secrecy of their responses. Section A was aimed at gaining demographic data such as sex, position they held in the company another data. This data would help to assist the researcher when understanding the results.

4.9 STATISTICAL PACKAGE FOR THE SOCIAL SCIENCE (SPSS)

The quantitative information collected was analysed with Statistical Package for the Social Science (SPSS) a computer programmer which is used for analysing information worried with social marvels. The software was used to make many statistical, including evocative statistic, which offers a plain swift of all variables in the data (Henn, 2006). The benefits of using SPSS is that it allows for counting and analysing quantitative data at speed and it can also be used to perform multivariate analysis. SPSS also helps to current the information in a rational format (Babbie, 2004:398) thereby plunging time spent on scheming nicks. However, correctness in results is highly reliant on inputs, hence the need to precisely capture data from the questionnaire.

4.10 MEAN ITEM SCORE (MIS)

This technique was used to analyse the information collected from the questionnaires study. The calculation of the mean was calculated from the total of all weighted replies and then connecting it to the total replies on a particular aspect. This was founded on the principle that respondents' notches on all the selected criteria, careful together, are the empirically determined directories of comparative importance. Weightings were allocated to each reply ranging from one to five for the replies of 'strongly disagree' to 'powerfully agree' and 'Never' to 'Always'. This is spoken mathematically below. The mean item score (MIS) was calculated for each item as follows;

MEAN = $(1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5)/ \sum N$

Where;

n_1	=	Number of respondents for extremely unlikely or strongly disagree;
n_2	=	Number of respondents for unlikely of disagree;
n_3	=	Number of respondents for neutral;
n_4	=	Number of respondents for likely or agree;
n_5	=	Number of respondents for extremely likely or strongly agree;
N	=	Total number of respondents

After mathematical computations, the standards are then ranked in descending order of their mean item score (from the highest to the lowest). The data was collected by the researcher during the month of August 2019.

4.11 RELIABILITY

Reliability refers to the degree of consistence or accuracy with which a tool events the quality it is designed to measure (Polit & Hungler, 1993). If a study and its result are reliable, it means that the same consequences would be obtained if the same study were to be fake. The dependability of a scale designates how free it is from random error. Two often-used pointers of a scale dependability are test-retest dependability and internal consistency. However, the study will pay attention to internal consistency. Internal constancy is the degree to which items that make up the scale are all gaging the same underlying attribute (i.e. the extent to which the items hang out together) (Pallat, 2013). Internal consistence is measured in different ways and the most common used is the Cronbach's coefficient alpha. This statistic provides an indication of the average association among all the items that make up the gage. Value variety from 0 to 1 with higher values signifying greater dependability (Pallat, 2013).

While different levels of dependability are required, depending on the nature and purpose of the scale, Pallat (2013), recommends a minimum level of 0.7 Cronbach alpha values are depends on several substances in the scale. When there are several items in the scale (fewer than 10), Cronbach alpha standards can be small. In this situation, it may be better to calculate and report the mean inter-item correlation for items (Pallat, 2013). Cronbach Alpha Co-efficient is a measurement which signify the consistency with which a research tool measures a given presentation or behaviour.

4.11.1 Descriptive statistics

Marshall and Rossman (1999) characterize descriptive as, "gathering huge volumes of information into a couple of outline measures. The descriptive statistics utilized in the present study included percentage distribution and mean scores. Rates are characterized as the occasions a specific answer shows up in the information. The mean ascertains a normal over various perceptions and the standard deviation is the square foundation of the difference around the mean, at the end of the day, how the mean speaks to the information" (Mellville and Goddard, 1999).

4.11.2 Inferential Statistics

Inferential statistics is the territory of statistics which expands the data mined from the sample to the genuine condition in which the issue emerges" (Mellville and Goddard, 1999).

4.11.3 Pretesting

Pretesting alludes to the testing of the survey on a little example of respondents in request to recognize and dispense with potential issues" (Malhotra, 1993). In this examination, pre-

testing was utilised as an exploration instrument in the review's improvement organize through a pilot study. With the end goal of the pilot study, information was gathered from around 15-30 respondents. This was hence breaking down utilizing Cronbach Alpha Test programming.

4.11.4 Content validity

This is a non-factual sort of validity that includes "the deliberate assessment of the test substance to decide if it covers a delegate test of the conduct space to be estimated" (Babbie and Mouton, 2001). A gathering of specialists was used in inspecting the articles and making remarks on whether the articles spread an agent test of the populace.

4.11.5 Internal validity

Internal validity alludes to, "the certainty that is set in the circumstances and logical results relationship". In different terms, it tends to the accompanying inquiry: "to what degree does the exploration structure grant us to state that the autonomous variable causes an adjustment in the reliant variable" (Babbie and Mouton, 2001).

4.12 DATA ANALYSIS

in fact, data analysis comprises of running different statistical methodology and tests on the collected data (Cart, 1999). "It is the transformation of pointless information into something which can without much of a stretch be comprehended. The motivation behind any research is to derive data from the information collected. to this end, data analysis includes the separating and arranging of information acquired in order to get prepared data used to arrive at resolutions, foresee results and supporting decision-making" (Wellman et.al, 2005).Quantitative information gathered was inspected with the utilization of SPSS (Statistical Package for Social Sciences) strategy. This is a standardized statistical technique generally utilized for quantitative and qualitative data analysis. SPSS made it simpler in looking at information between changed factors in this investigation, statistic and salary information" (Dark and Kinnear, 2012). Descriptive Statistics were utilised to outline and portray the research findings of the study. As per Minor (2008), "there are two subdivisions of measurable strategies. The initial one is descriptive measurements which manages the introduction of numerical realities, or information, in either tables or diagrams structure, and with the system of breaking down the information. The second one is Inferential Statistics which includes procedures for making inductions about the entirety populace based on perceptions got from tests". The econometric models or measurable models underneath were used in breaking down the gathered information. The analysis utilized recurrence appropriations and graphical presentations. "This included computing the occurrence or the quantity of periods in which a specific event happens what's more, showing the information in an outline or graphical way"

61

(Robinson, 2002). "They are quickly and essentially comprehended by an assorted variety of group of spectators. Outline insights will likewise be utilised in the study. This includes characterizing the degree of spreading of the insights, utilizing proportions of focal inclination. Three proportions of focal tendency are utilized, to be specific the normal middle and mode" (Krivtsov, 2009). Qualitative information was dissected utilizing the, "topical approach where various subjects were recognized. Topical approach is a subjective analytical strategy for: 'identifying, analyzing also, recording designs (subjects) inside information" (Clarke, 2006, 79). Qualitative information was arranged what's more, composed into various topical territories and broke down utilizing content investigation. Qualitative data was sorted and organized into different thematic areas and analysed using content analysis. After information was collected and analysed, it was presented in incidence distributions and percentages of all the respondents. Frequency benches were drawn and from there the information was obtainable in pie chart diagrams, bar charts and tables.

4.13 ETHICAL CONSIDERATION

The ethical thought in this research took into account the obligations of the professionals in the manufacturing whose work had donated to the works and was correctly cited and acknowledged. The duty to the members in the research questionnaire, was that their input was to be kept close and was to only be used for theoretical drives. Respondents to the questionnaire had the right not to answer questions that they felt were not appropriate without any coercion. A written cover letter of permission to carry out this research study was obtained from the University of Johannesburg, Department of Quality and Operations Management, Kingsway Campus which was fixed to the questionnaires that were sent out. Anonymity and confidentiality were sustained throughout the study. Anonymity is a situation where the respondents cannot be linked, even by the researcher, to their individual responses (Burns and Grove 1993:762).

4.14 LIMITATION OF THE STUDY

Study limitation is the potential weakness or problems affecting the internal validity (Culler, 2009). This research assessment was based on the supply chain in mining industry in South Africa and limited to supply chain professions including engineers i.e. supply chain specialist, procurement staff, managers, who volunteered to participate in the study. Therefore, limiting factors may have been the time required to complete the surveys and unwillingness of most professionals to reveal information that would enhance the research data.

4.15 CONCLUSION

In this chapter, the research methodology used for this study was demonstrated, with the population, sample, information collection tools as well as strategies used to ensure ethical values and outline why questionnaires were accepted for the research. The next chapter presents the information analysis and conversation of the information.

UNIVERSITY
OF
JOHANNESBURG

CHAPTER FIVE

FINDINGS OF THE STUDY

5.1 Introduction

This chapter outlines the outcomes of the study and discusses the results, it grants the marks of information attained from the organised questionnaires, which were given to the research respondents in the mining sector that were sampled. The analysis of the data and interpretation of the outcomes were received from the questionnaire study and aided as the foundation of this quantitative information collection. Descriptive statistics of biographical data, factor analysis, and dependability study of the data using Cronbach's alpha coefficient, normality test with Kolmogorov-Smirnov and Shapiro-Wilk, correlation analysis with attention on linear correlation with regression analysis and scatter plots were utilised. The data will be presented by means of tables, graphs and figures.

5.2 Section A: Biographical Data Analysis

This section outlines the background information of the participants according to their demographics, such as gender, age group, professional qualification, work experience, position in their workplace and the department they are working for.

5.2.1 Distribution of Sample According to Gender

Biographical gender frequencies and descriptive samples of respondent's shows that 54% are females while their male counter parts accounted to 46% as illustrated in figure 5.1
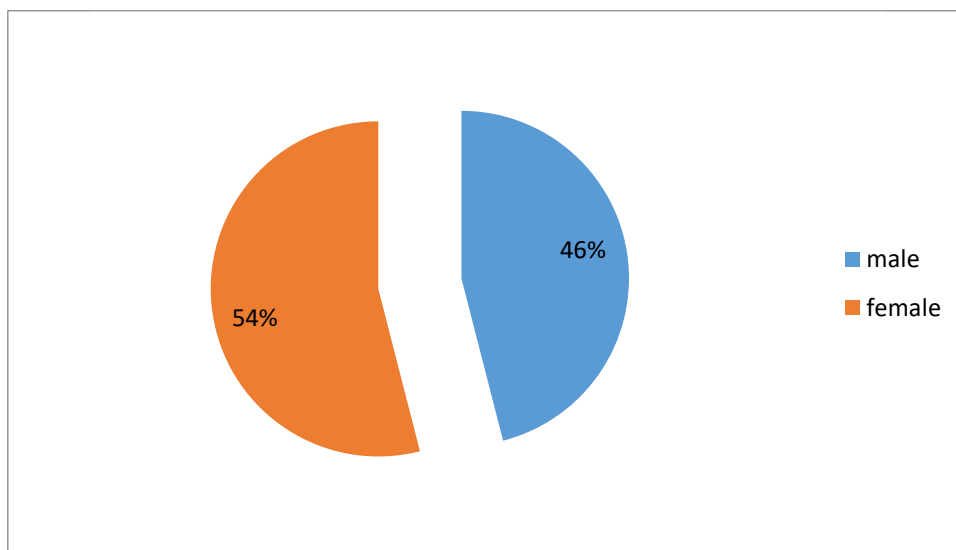
Figure 5.1 Respondent's per Gender

5.2.2 Distribution of Sample According to Educational Qualification

Figure 5.2 below shows the respondent's educational background; 2% include those who had completed Grade 11 or lower, while 11% had completed Grade 12 and 87% of respondents had post schooling diploma or certificates.
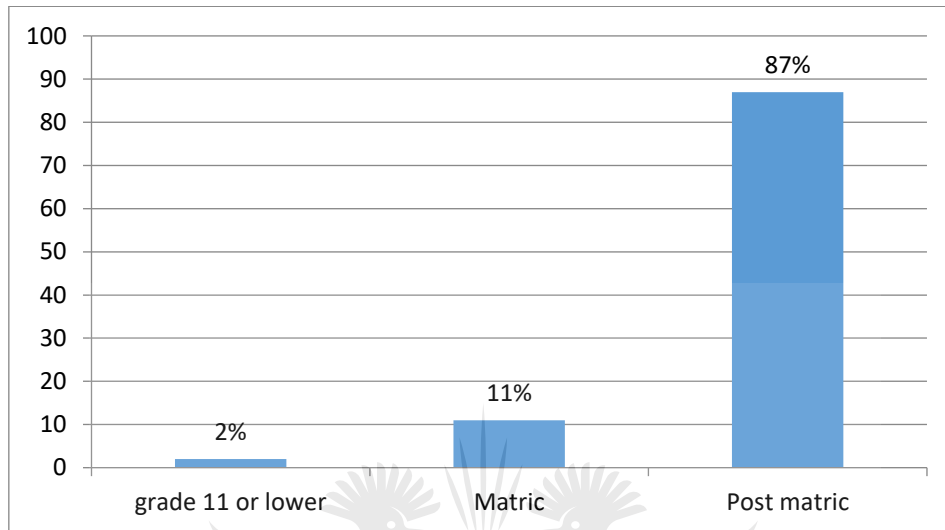
Figure 5.2 Respondent's education background

5.2.3 Distribution of Sample According to Years of Experience

Findings from Figure 5.3 below, relate to the respondents and how long have they been in the professional career and it revealed that 66% of the respondents' experience range from 6 to 10 years, 18% of the respondent 's experience varied 11 to 15 years, 12% had experience varying between 16 to 20 years and lastly 4% had over 20 years of professional experience.
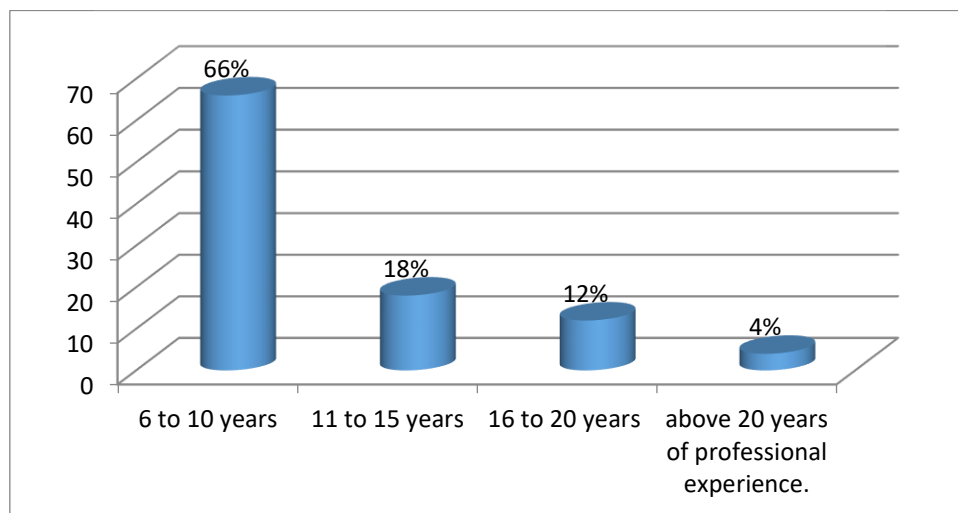
Figure 5.3 Respondent's years of experience

65

5.2.4 Distribution of Sample According to Titles

Findings from figure 5.4 below shows respondents job titles, 13% of respondents were engineers, 20% where project officers, 29% of respondents were business coordinators and lastly 38% were respondents from the procurement department.
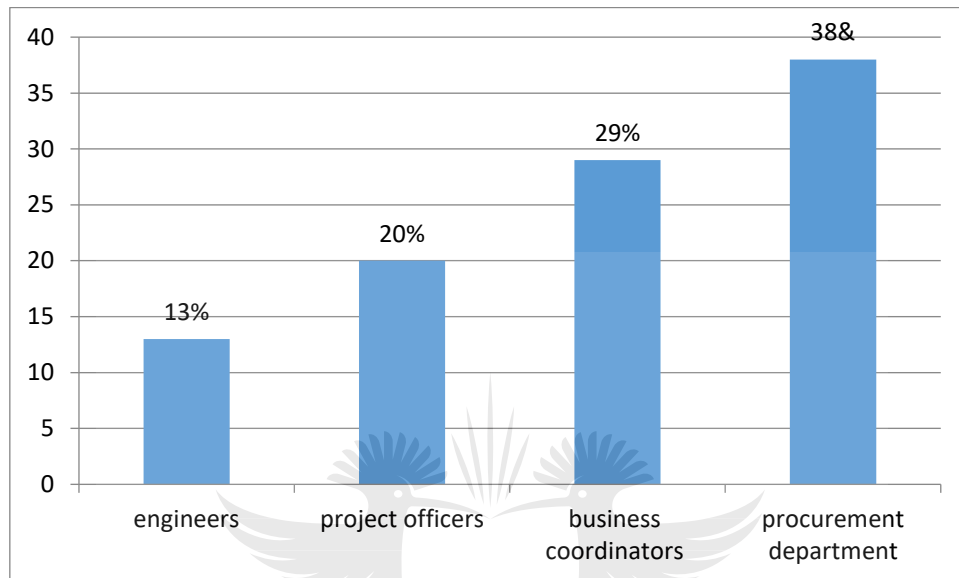
Figure 5.4 Respondent's job titles

5.3 Section B - Sustainable Supply Chain

This section grants the results of section B of the questionnaire, which aims to determine the extent to which the concept of sustainable supply chain has been integrated and implemented within the respective companies. The Mean Item Score (MIS) of the questions, skewness as well as the Exploratory Factor Analysis (EFA) of the results are presented. The descriptive results reveal the ranking of all the factors from the highest to the lowest with the table also showing the individual mean and standard deviation of the factors.

Exploratory Factor Analysis (EFA) is often deployed in the early stages of research in order to gather data about the interrelationships among a set of variables (Pallant, 2007). The EFA was undertaken using version 21.0 of the SPSS software. The necessary tests were carried out to determine the competence of the sample size for factor analysis to proceed. As

66

suggested by Pallant (2007), to determine the factorability of the correlation matrix, the correlation matrix should show some correlations of r = 0.3 or greater; Bartlett's test of sphericity should be statistically significant at p < 0.5 and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value should be 0.6 or above. To confirm suitability, the reliability of the research instrument, the Cronbach's alpha values above 0.7 are considered acceptable but values above 0.8 are most preferable (Pallant, 2007). The recommended range for the inter-item correlation should be between 0.2 – 0.4 (Briggs & Cheek, 1986:115), in cases where the Cronbach's alpha values fall below 0.7. The afore-mentioned values are adopted in this research study.

The data was subjected to Principal Component Analysis (PCA) with varimax rotation. To determine the number of factors to extract using Kaiser's criterion, the total number of components that have an eigenvalue of 1 or more are determined and adopted. The eigenvalue is described as a mathematical property of a matrix deployed both as a criterion of establishing the number of factors to extract and as a measure of variance accounted for by a given dimension (Dainty, 2003:212; Ahadzie, 2008:681). In addition, the graphical scree test is used to exclude factors with the scree plot indicating the cut-off point at which the eigenvalues levelled off (Dainty, 2003:212).

5.3.1 Results from Descriptive Analysis SSC

The results of the MIS of the questions and skewness of the data are presented and discussed below.

Table 5.1 Outcome of sustainable supply chain

Statement	Mean	Std. Deviation	Rank
Uses disposal systems of waste reject metal in the production process	3.95	0.829	1
Collaborates with your customer's logistics.	3.89	0.776	2
Is quick to correct the amount in the production process	3.86	0.770	3
Regularly updates policies.	3.84	0.799	4
Collaborates with your customers on reclaiming used products	3.82	0.879	5
Cooperate with legislations.	3.80	0.816	6
Your top managers make a commitment to environmental management.	3.77	0.827	7
Your middle managers give support to environmental management.	3.69	0.848	8
Considers if products can be recycled.	3.68	0.980	9
Has a staff training program?	3.56	0.776	10
Collaborates with the suppliers for environmental protection goals.	3.17	1.590	11
Follow a Just-In-Time system.	2.03	1.240	12
Has regular supplier audits.	1.83	0.382	13

67

Table 5.1 above shows respondents ranking of sustainable supply chain in the South African Mining sector. It shows the uses disposal systems of waste reject metal in the production process was ranked first with a mean score of 3.95 and standard deviation (SD) of 0.829, second ranked was collaborates with your customer's logistics with a mean score of 3.89 and SD of 0.776, thirdly was quick to correct the amount in the production process with a mean score of 3.86 and SD of 0.770, fourthly ranked is regularly updates policies with a mean score of 3.84 and SD of 0.799, fifth raked was collaborates with your customers on reclaiming used products with a mean score of 3.82 and standard deviation of 0.879, Sixth ranked is cooperate with legislations with a mean score of 3.80 and SD of 0.816.

Seventh raking is your top managers make a commitment to environmental management with a mean score of 3.77 and SD of 0.827, eighth ranking is your middle managers give support to environmental management with a mean score of 3.69 and SD of 0.848, ninth raking is considers if products can be recycled with a mean score of 3.68 and SD of 0.980, tenth raking is has a staff training program with a mean score of 3.56 and SD of 0.776, eleventh raked was collaborates with the suppliers for environmental Protection goals with a mean score of 3.17 and SD of 1.590, twelve raking is follow a Just-In-Time system with a mean score of 2.03 and SD of 1.240 and lastly ranked thirteen is has regular supplier audits with a mean score of 1.83 and SD of 0.382.

5.3.2 Exploratory factor analysis

Exploratory Factor Analysis (EFA) is normally adopted in the primary phases of study in order to gather information pertaining to inter-relationships between a set of variables (Pallant, 2007). The EFA was assumed using version 21.0 of the SPSS software. The essential tests were done to define the appropriateness of the sample size for factor analysis to continue. As recommended by Pallant (2007), to define the factorability of the correlation matrix, the correlation matrix must show some correlations of r = 0.3 or above; Bartlett's test of sphericity must be statistically significant at p < 0.5 and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value should be 0.6 or above. The EFA was undertaken using version 21.0 of the SPSS software. The necessary tests were carried out to determine the adequacy of the sample size for factor analysis to proceed.

As suggested by Pallant (2007), to determine the factorability of the correlation matrix, the correlation matrix should show some correlations of r = 0.3 or greater; Bartlett's test of sphericity should be statistically significant at p < 0.5 and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value should be 0.6 or above. To confirm suitability, the

68

reliability of the research instrument, the Cronbach's alpha values above 0.7 are considered acceptable but values above 0.8 are most preferable (Pallant, 2007). The recommended range for the inter-item correlation should be between 0.2 – 0.4 (Briggs & Cheek, 1986:115), in cases where the Cronbach's alpha values fall below 0.7. The afore-mentioned values are adopted in this research study.

The data was subjected to Principal Component Analysis (PCA) with varimax rotation. To determine the number of factors to extract using Kaiser's criterion, the total number of components that have an eigenvalue of 1 or more are determined and adopted. The eigenvalue is described as a mathematical property of a matrix deployed both as a criterion of establishing the number of factors to extract and as a measure of variance accounted for by a given dimension (Dainty, 2003:212; Ahadzie, 2008:681). In addition, the graphical scree test is used to exclude factors with the scree plot indicating the cut-off point at which the eigenvalues levelled off (Dainty, 2003:212).

In order to define the factorability of the correlation matrix, the correlation matrix must show some correlations of r = 0.3 or above; Bartlett's test of sphericity must be statistically significant at p < 0.5 and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value should be 0.6 or above. Before performing the Principal Component Analysis (PCA), the suitability of the information for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of 63 coefficients of above 0.3 as presented in Table 5.2 below between B7 & B8.

Table 5.2 Correlation matrix for Sustainable supply chain

		B6	B7	B8	B9	B10	B11	B12	B13
	B6	**1.000**	0.438	0.445	0.277	0.203	0.176	0.102	0.154
	B7	0.438	**1.000**	0.636	0.510	0.345	0.255	0.430	0.338
	B8	0.445	**0.636**	**1.000**	0.518	0.476	0.299	0.288	0.150
	B9	0.277	0.510	0.518	**1.000**	0.795	0.270	0.354	0.261
Correlation	B10	0.203	0.345	0.476	0.795	**1.000**	0.277	0.226	0.138
	B11	0.176	0.255	0.299	0.270	0.277	**1.000**	0.497	0.415
	B12	0.102	0.430	0.288	0.354	0.226	0.497	**1.000**	0.492
	B13	0.154	0.338	0.150	0.261	0.138	0.415	0.492	**1.000**

Illustrated in Table 5.3 below, The KMO measure of sampling adequacy achieved a value of 0.734, exceeding the recommended minimum value of 0.6 and Bartlett's test of sphericity was also statistically significant (less than 0.05), thus supporting the factorability of the correlation matrix.

Table 5.3 KMO and Bartlett's test for Sustainable supply chain

KMO AND BARTLETT'S TEST		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.734
Bartlett's Test of Sphericity	Approx. Chi-Square	374.977
	df	28
	Sig.	0.000

The information was exposed to PCA (with varimax rotation). The eigenvalue was set at Conventional high values of 1.0. As shown in table 5.4, three (3) factors with eigenvalues exceeding 1.0 were extracted. The scree plot presented in Figure 5.5 also revealed the excluded factors by indicating the cut-off point at which the eigenvalues levelled off. The total variance explained by each of the extracted factors is as follows: Factor 1 (43.863%), Factor 2 (60.855%) and Factor 3 (73.423%) please note that cumulative percentage was utilised. This is shown in table 5.6 Thus, the final statistics of the PCA and the extracted factors accounted for approximately 59%of the total cumulative variance.

Table 5.4: Rotated factor matrix for sustainable supply chain

ROTATED FACTOR MATRIX			
	Factor		
	1	2	3
Your middle managers give support to environmental management	0.968		
Your top managers make a commitment to environmental management	0.713		
Collaborates with your customer's logistics		0.731	
Collaborates with your customers on reclaiming used products		0.718	
Is quick to correct the amount in the production process		0.552	
Cooperate with legislation			0.768
Regularly updates policies			0.638
Has a staff training program			0.576
Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalisation.[a]			

Figure 5.5 below also revealed the excluded factors by indicating the cut-off point at which the eigenvalues leveled off.
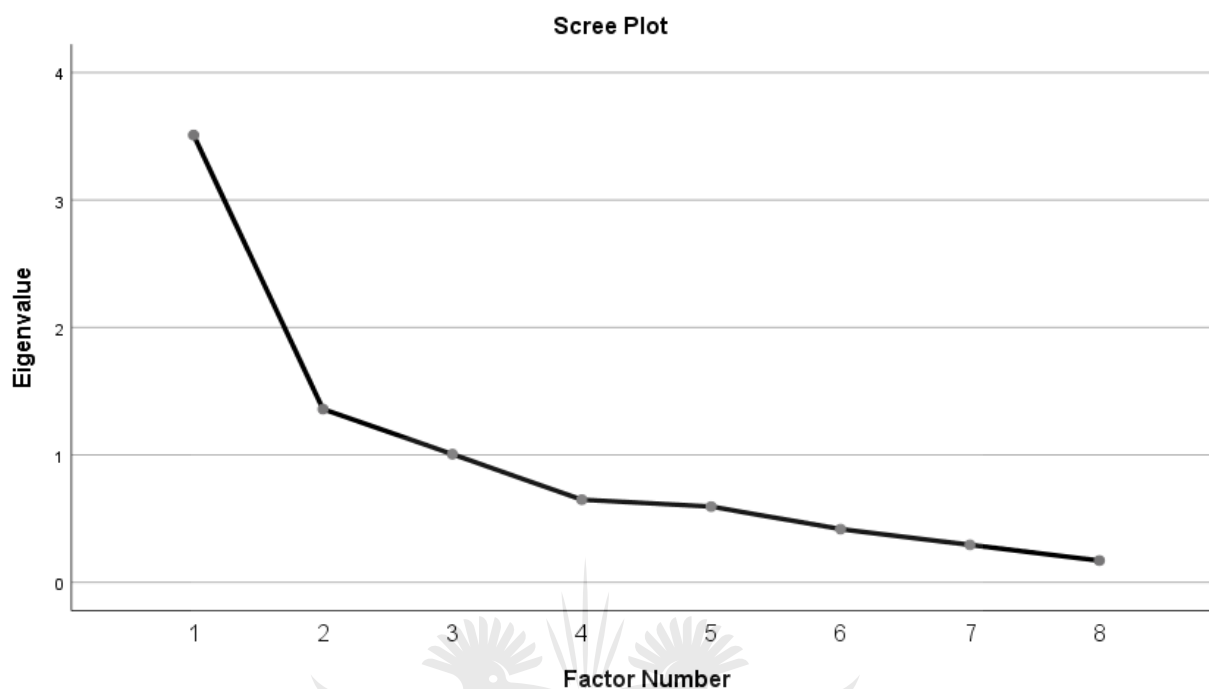
Figure 5.5 Scree plot for sustainable supply chain

Table 5.5 Explanation of total variance of sustainable supply chain

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**3.509**	43.863	**43.863**	3.164	39.545	39.545	1.638	20.475	20.475
2	**1.359**	16.992	**60.855**	0.964	12.044	51.589	1.587	19.836	40.311
3	**1.005**	12.568	**73.423**	0.650	8.120	59.709	1.552	19.398	**59.709**
4	0.648	8.105	81.527						
5	0.594	7.430	88.958						
6	0.418	5.224	94.182						
7	0.294	3.679	97.861						
8	0.171	2.139	100.000						
Extraction Method: Principal Axis Factoring.									

Principal axis factoring showed the presence of three (3) factors with eigenvalues above 1 as demonstrated in Table: 5.5 Rotated Factor Matrix. Founded on the consideration of the

71

inherent associations between the variables underneath each factor, the subsequent explanations were established by naming each factor for readers to understand:

5.3.3 Factor one: Management Views on supply chain management Concepts of Supply Chain

As displayed in Table 5.4, the three (3) factors that affect sustainable supply chain were extricated and are explained as follows; your middle managers give support to environmental management has 97% and your top managers make a commitment to environmental management at 71%. This simply shows that there is more than 80% on management views regarding the supply chain management concept to be made out of these two factors.

5.3.4 Factor two: Customers Views on supply chain management Concepts of Supply Chain

As displayed in Table 5.4, the three (3) factors that affect sustainable supply chain were extricated and are explained as follows; Collaborates with your customer's logistics at 73%, Collaborates with your customers on reclaiming used products at 71% and lastly Is quick to correct the amount in the production process at 55%, this shows that there is over 60% on customers views with regards to the concept made out of this three factors.

5.3.5 Factor three: Staff Views on supply chain management Concepts of Supply Chain

As displayed in Table 5.4, the three (3) factors that affect sustainable supply chain were extricated and are explained as follows: Cooperate with legislations at 76%, Regularly updates policies at 63% and lastly Has a staff training program at 57%, this shows that more than 60% of staff views on the concept of supply chain management to be made out of this three factors.

5.4 Reliability Test Analysis

The collected data from the study was tested for reliability, normality, correlation and to enable the research to make a prediction about the population. The internal consistency of the data collected on the sustainable supply chain indicators was measured by calculating the Cronbach's alpha coefficient on Importance of information such as Management Views on supply chain management Concepts of Supply Chain, Customers Views on supply chain

management Concepts of Supply Chain and Staff Views on supply chain management Concepts of Supply Chain. Table 5.6 below presents the reliability statistics for the above-mentioned factors.

Table 5.6 Reliability statistics on sustainable supply chain

Statement	Reliability Statistics		
	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Management Views on supply chain management Concepts of Supply Chain	0.886	0.886	2
Customers Views on supply chain management Concepts of Supply Chain	0.755	0.755	3
Staff Views on supply chain management Concepts of Supply Chain	0.725	0.725	3

One of the most normally used indicators of internal consistency is Cronbach alpha co-efficient values, ideally, the co-efficient of a scale should be above 0.7. However, these values are sensitive to the number of items in the scale.

Pallant 2007, with short scales (e.g. scales with fewer than 10 items) it is common to experience fairly low Cronbach value (e.g. less than .5), in this circumstance, it might be imperative to report the mean inter-item correlation for the items, (Briggs and Cheek, 1986), recommended an optimal range for the inter-item correlation. Table 5.6 above illustrates the results scale factors affecting the sustainable supply chain. The Cronbach's' alpha is higher than the required value of 0.7 at 0.886 based on two item scale for Management Views on supply chain management Concepts of Supply Chain, which is a good value, secondly the Customers Views on supply chain management Concepts of Supply Chain is also a good value based on three item scale at 0.755 and lastly the third factor which is Staff Views on supply chain management Concepts of Supply Chain at 0.725 on three scale factor, which represent a good value and reliable data statistics.

5.5 Normality test on sustainable supply chain

To test the supposition that the data gathered follows a normal distribution (Razali & Wah, 2011) and to clarify that the sample was taken from a population that follows a normal distribution, a normality test was conducted on Management Views on supply chain management Concepts of Supply Chain, Customers Views on supply chain management Concepts of Supply Chain and Staff Views on supply chain management Concepts of Supply Chain.

Table 5.7 Normality test on sustainable supply chain

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Statements	Statistic	df	Sig.	Statistic	df	Sig.
Management Views on supply chain management Concepts of Supply Chain	0.731	16	.200[*]	0.972	16	0.864
Customers Views on supply chain management Concepts of Supply Chain	0.601	16	.200[*]	0.956	16	0.886
Staff Views on supply chain management Concepts of Supply Chain	0.711	13	.200[*]	0.956	16	0.986

The Kolmogorov-Smirnov test results on sustainable supply chain were as follows: Management Views on supply chain management Concepts of Supply Chain is 0.731, Customers Views on supply chain management Concepts of Supply Chain is 0.601 and Staff Views on supply chain management Concepts of Supply Chain is 0.711. Each of the p-values presented is higher than 0.05. According to Ghasemi and Zahediasi (2012), if the p-value is higher than 0.05 then it is an indication of normal distribution.

The Shapiro-Wilk test results indicated the following: Management Views on supply chain management Concepts of Supply Chain is 0.864, Customers Views on supply chain management Concepts of Supply Chain is 0.886 and Staff Views on supply chain management Concepts of Supply Chain is 0.986. All the values presented fell between 0 and 1. The values of a normal distribution on a Shapiro-Wilk test fall between 0 and 1 (Razali & Wah, 2011). Each of the p- values presented is higher than 0.05. According to Ghasemi and Zahediasi (2012), if the p-value is higher than 0.05 then it is an indication of normal distribution.

74

5.6 Section C: Challenges related to Sustainable Supply Chain Implementation

This section offers the outcomes of section C of the questionnaire which aims at identifying the challenges hindering the implementation of sustainable supply chain management in your organisation and implemented within your company.

The Mean Item Score (MIS) of the questions, skewness and likewise the exploratory factor Analysis (EFA) of the results are presented. The descriptive results reveal the ranking of all the factors from the highest to the lowest with the table also showing the individual mean and standard deviation of the factors. EFA is one of the two approaches to factor analysis. It is often deployed in the early stages of research in order to gather information about the interrelationships among a set of variables (Pallant, 2007). The EFA was undertaken using version 21.0 of the SPSS software. The necessary tests were carried out to determine the adequacy of the sample size for factor analysis to proceed.

5.6.1 Results from Descriptive Analysis SCC

The results of the MIS of the questions and skewness of the data are presented and discussed below.

Table 5.8 Results from Frequencies and Descriptive Factor Analysis supply chain challenges

Statistics			
Statement	**Mean**	**Std. Deviation**	**Rank**
Inadequate individual capacity	4.17	0.737	1
Lack of managerial practical tools	4.15	0.741	2
Lack of recycling activities	3.97	0.798	3
Lack of Political support	3.93	0.822	4
Poor senior management's commitment	3.84	0.850	5
Lack of commitment	3.78	0.855	6
Lack of knowledge sharing	3.68	0.953	7
High cost associated with the implementation of Sustainable Supply Chain Management	3.68	0.979	8
Lack of communication	3.65	0.993	9
Poor Supplier Commitment	3.60	1.111	10
Ineffective monitoring and control system	3.59	1.049	11
Lack of Green Practitioners	3.55	1.068	12
No effective policy and legislation direction	3.47	1.012	13

Table 5.8 above Shows respondents ranking of challenges related to sustainable supply chain implementation. It shows that inadequate individual capacity was ranked first with a mean score 4.17 and Standard Deviation (SD) of 0.737, second-ranked was lack of managerial practical tools with a mean score of 4.15 and SD of 0.741, third was lack of recycling activities

75

with a mean score of 3.97 and SD of 0.798, fourth was lack of political support with a mean score of 3.93 and SD of 0.822, fifth-ranked was Poor senior management's commitment with a mean score of 3.84 and SD of 0.850, sixth was Lack of commitment with a mean score of 3.78 and SD of 0.855.

Seventh raked was lack of knowledge sharing with a mean score of 3.68 and Standard Deviation (SD) of 0.953, eighth was High cost associated with the implementation of Sustainable Supply Chain Management with a mean score of 3.68 and SD of 0.979, ninth was lack of communication with a mean score of 3.65 and SD of 0.993, tenth-ranked was poor supplier commitment with a mean score of 360 and SD of 1.111, eleventh- ranked was ineffective monitoring and control system with a mean score of 3.59 and SD of 1.049, twelfth ranked was lack of Green Practitioners with a mean score of 3.55 and SD of 1.068, thirteenth was No effective policy and legislation direction with a mean score of 3.47 and SD of 1.012.

5.6.2 Exploratory factor analysis

Exploratory factor analysis (EFA) is normally adopted in the primary phases of study in order to gather information pertaining to inter-relationships between a set of variables (Pallant, 2007). The EFA was assumed using version 21.0 of the SPSS software. The essential tests were done to define the appropriateness of the sample size for factor analysis to continue. As recommended by Pallant (2007), to define the factorability of the correlation matrix, the correlation matrix must show some correlations of r = 0.3 or above; Bartlett's test of sphericity must be statistically significant at $p < 0.5$ and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value should be 0.6 or above. The EFA was undertaken using version 21.0 of the SPSS software. The necessary tests were carried out to determine the adequacy of the sample size for factor analysis to proceed.

As suggested by Pallant (2007), to determine the factorability of the correlation matrix, the correlation matrix should show some correlations of r = 0.3 or greater; Bartlett's test of sphericity should be statistically significant at $p < 0.5$ and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value should be 0.6 or above. To confirm suitability, the reliability of the research instrument, the Cronbach's alpha values above 0.7 are considered acceptable but values above 0.8 are most preferable (Pallant, 2007). The recommended range for the inter-item correlation should be between 0.2 – 0.4 (Briggs & Cheek, 1986:115), in cases where the Cronbach's alpha values fall below 0.7. The afore-mentioned values are adopted in this research study.

76

The data was subjected to principal component analysis (PCA) with varimax rotation. To determine the number of factors to extract using Kaiser's criterion, the total number of components that have an eigenvalue of 1 or more are determined and adopted. The eigenvalue is described as a mathematical property of a matrix deployed both as a criterion of establishing the number of factors to extract and as a measure of variance accounted for by a given dimension (Dainty, 2003:212; Ahadzie, 2008:681). In addition, the graphical scree test is used to exclude factors with the scree plot indicating the cut-off point at which the eigenvalues levelled off (Dainty, 2003:212).

In order to define the factorability of the correlation matrix, the correlation matrix must show some correlations of r = 0.3 or above; Bartlett's test of sphericity must be statistically significant at p < 0.5 and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value should be 0.6 or above. Before performing the Principal Component Analysis (PCA), the suitability of the information for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of 71 coefficients of above 0.3 as presented in Table 5.9 below between C5 & C4.

Table 5.9 Correlation matrix for Challenges of Sustainable Supply Chain Implementation

CORRELATION MATRIX											
		C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Correlation	C2	**1.000**	0.602	0.515	0.482	0.534	0.459	0.151	0.203	0.367	0.349
	C3	0.602	**1.000**	0.500	0.434	0.342	0.205	0.131	0.290	0.284	0.238
	C4	0.515	0.500	**1.000**	0.719	0.511	0.392	0.487	0.577	0.565	0.374
	C5	0.482	0.434	**0.719**	**1.000**	0.473	0.459	0.367	0.448	0.394	0.234
	C6	0.534	0.342	0.511	0.473	**1.000**	0.702	0.433	0.252	0.406	0.273
	C7	0.459	0.205	0.392	0.459	0.702	**1.000**	0.300	0.297	0.478	0.437
	C8	0.151	0.131	0.487	0.367	0.433	0.300	**1.000**	0.671	0.593	0.421
	C9	0.203	0.290	0.577	0.448	0.252	0.297	0.671	**1.000**	0.809	0.717
	C10	0.367	0.284	0.565	0.394	0.406	0.478	0.593	0.809	**1.000**	0.778
	C11	0.349	0.238	0.374	0.234	0.273	0.437	0.421	0.717	0.778	**1.000**

Illustrated in Table 5.10 below, The KMO measure of sampling adequacy achieved a value of 0.798, exceeding the recommended minimum value of 0.6 and Bartlett's test of sphericity was also statistically significant (less than 0.05), thus supporting the factorability of the correlation matrix.

Table 5.10 KMO and Bartlett's test for Challenges of Sustainable Supply Chain Implementation

KMO AND BARTLETT'S TEST		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.798
Bartlett's Test of Sphericity	Approx. Chi-Square	777.780
	df	45
	Sig.	0.000

The information was exposed to PCA (with varimax rotation). The eigenvalue was set at Conventional high values of 1.0. As shown in table 5.11 below, two (2) factors with eigenvalues exceeding 1.0 were extracted. The scree plot presented in Figure 5.5 also revealed the excluded factors by indicating the cut-off point at which the eigenvalues levelled off. The total variance explained by each of the extracted factors is as follows: Factor 1 (49.833%), Factor 2 (65.660%) please note that cumulative percentage was utilised. This is shown in table 5.12 Thus, the final statistics of the PCA and the extracted factors accounted for approximately 58% of the total cumulative variance

Table 5.11 Rotated factor matrix for Challenges of Sustainable Supply Chain Implementation

Rotated Factor Matrix

	Factor	
Statement	**1**	**2**
Poor senior management's commitment	**0.936**	
Lack of recycling activities	**0.856**	
Lack of Political support	**0.716**	
Lack of Green Practitioners	**0.629**	
Lack of communication		**0.771**
High cost associated with the implementation of Sustainable Supply Chain Management		**0.701**
No effective policy and legislation direction		**0.663**
Ineffective monitoring and control system		**0.662**
Lack of knowledge sharing		**0.577**
Poor Supplier Commitment		**0.572**
Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization. [A]		
a. Rotation converged in 3 iterations.		

Figure 5.6 below also revealed the excluded factors by indicating the cut-off point at which the eigenvalues leveled off.

78
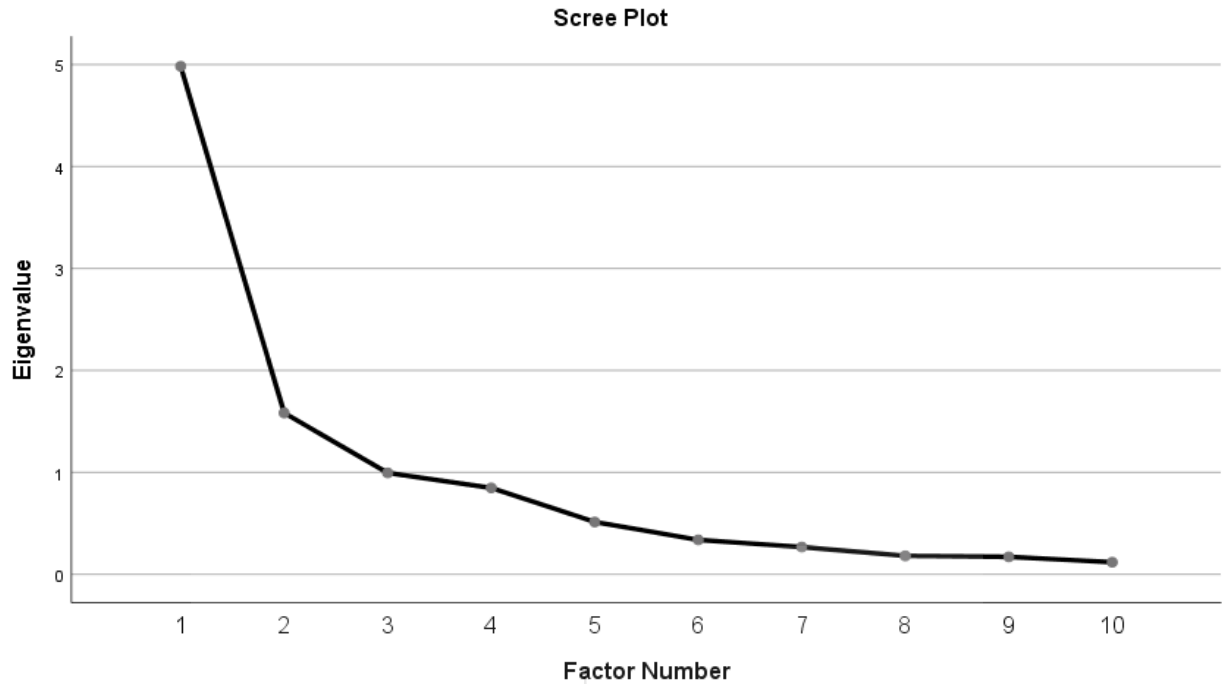
Figure 5.6 scree plot for Challenges of Sustainable Supply Chain Implementation

Table 5.12 Explanation of total variance of Challenges of Sustainable Supply Chain Implementation

	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**4.983**	49.833	**49.833**	4.600	46.005	46.005	2.955	29.546	29.546
2	**1.583**	15.828	**65.660**	1.212	12.123	58.128	2.858	28.582	**58.128**
3	0.995	9.949	75.610						
4	0.848	8.479	84.089						
5	0.514	5.136	89.225						
6	0.338	3.379	92.604						
7	0.268	2.676	95.280						
8	0.181	1.814	97.094						
9	0.172	1.717	98.812						
10	0.119	1.188	100.000						

Principal axis factoring showed the presence of two (2) factors with eigenvalues above 1 as demonstrated in Table: 5.11 Rotated Factor Matrix. Founded on the consideration of the

79

inherent associations between the variables underneath each factor, the subsequent explanations were established by naming each factor for readers to understand:

5.6.2 Factor one: Activities on Challenges Hindering the Implementation of Supply Chain Management

As displayed in Table 5.11, the two (2) factors that affect Challenges of Sustainable Supply Chain Implementation were extricated and are explained as follows; Poor senior management's commitment has 93%, Lack of recycling activities 85%, Lack of Political support 71% and Lack of Green Practitioners 62%.

5.6.3 Factor two: Policies on Challenges Hindering the Implementation of Supply Chain Management

As displayed in Table 5.12, the two (2) factors that affect Challenges of Sustainable Supply Chain Implementation were extricated and are explained as follows; Lack of communication 77%, High cost associated with the implementation of Sustainable Supply Chain Management 70%, No effective policy and legislation direction 66%, Ineffective monitoring and control system 66%, Lack of knowledge sharing 57% and Poor Supplier Commitment also on 57%.

5.7 Reliability Test Analysis on Challenges of Supply Chain implementation

The collected data from the study was tested for reliability, normality, correlation and to enable the research to make a prediction about the population. The internal consistency of the data collected on the sustainable supply chain indicators was measured by calculating the Cronbach's alpha coefficient on Importance of information such as M Activities on Challenges Hindering the Implementation of Supply Chain Management and Policies on Challenges Hindering the Implementation of Supply Chain Management . Table 5.13 below presents the reliability statistics for the above-mentioned factors.

Table 5.13 Reliability statistics on Challenges of Supply Chain implementation

Statement	Reliability Statistics		
	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Activities on Challenges Hindering the Implementation of Supply Chain Management	0.876	0.888	4
Policies on Challenges Hindering the Implementation of Supply Chain Management	0.851	0.851	6

One of the most normally used indicators of internal consistency is Cronbach alpha co-efficient values, ideally, the co-efficient of a scale should be above 0.7. However, these values are sensitive to the number of items in the scale.

Pallant 2007, with short scales (e.g. scales with fewer than 10 items) it is common to experience fairly low Cronbach value (e.g. less than .5), in this circumstance, it might be imperative to report the mean inter-item correlation for the items, (Briggs and Cheek, 1986), recommended an optimal range for the inter-item correlation. Table 5.13 above illustrates the results scale factors affecting the challenges of supply chain implementation. The Cronbach's' alpha is higher than the required value of 0.7 at 0.876 based on four item scale for Activities on Challenges Hindering the Implementation of Supply Chain Management, which is a good value, secondly the Policies on Challenges Hindering the Implementation of Supply Chain Management is also a good value based on six item scale at 0.851, which represent a good value and reliable data statistics.

5.8 Normality test on Challenges of Supply Chain implementation

To test the supposition that the data gathered follows a normal distribution (Razali & Wah, 2011) and to clarify that the sample was taken from a population that follows a normal distribution, a normality test was conducted on Management Views on supply chain management Concepts of Supply Chain, Customers Views on supply chain management Concepts of Supply Chain and Staff Views on supply chain management Concepts of Supply Chain.

81

Table 5.14 Normality test on Challenges of Supply Chain implementation

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Statements	Statistic	df	Sig.	Statistic	df	Sig.
Activities on Challenges Hindering the Implementation of Supply Chain Management	0.841	16	.200[*]	0.983	16	0.891
Policies on Challenges Hindering the Implementation of Supply Chain Management	0.713	16	.200[*]	0.898	16	0.898

The Kolmogorov-Smirnov test results on challenges of supply chain implementation were as follows: Activities on Challenges Hindering the Implementation of Supply Chain Management is 0.841, and Policies on Challenges Hindering the Implementation of Supply Chain Management is 0.713. Each of the p-values presented is higher than 0.05. According to Ghasemi and Zahediasi (2012), if the p-value is higher than 0.05 then it is an indication of normal distribution.

The Shapiro-Wilk test results indicated the following: Activities on Challenges Hindering the Implementation of Supply Chain Management is 0.983, Policies on Challenges Hindering the Implementation of Supply Chain Management is 0.898. All the values presented fell between 0 and 1. The values of a normal distribution on a Shapiro-Wilk test fall between 0 and 1 (Razali & Wah, 2011). Each of the p- values presented is higher than 0.05. According to Ghasemi and Zahediasi (2012), if the p-value is higher than 0.05 then it is an indication of normal distribution.

5.9 Section D: Achievements related to sustainable supply chain Implementation

This section offers the outcomes of section D of the questionnaire, which are achievements related to sustainable supply chain Implementation. It indicates the extent to which you agree with each of the following statements below based on the conditions of your Supply Chain Management (SCM) department.

The Mean Item Score (MIS) of the questions, skewness and likewise the Exploratory Factor Analysis (EFA) of the results are presented. The descriptive results reveal the ranking of all the factors from the highest to the lowest with the table also showing the individual mean and standard deviation of the factors.

EFA is one of the two approaches to factor analysis. It is often deployed in the early stages of research in other to gather information about the interrelationships among a set of variables (Pallant, 2007). The EFA was undertaken using version 21.0 of the SPSS software. The necessary tests were carried out to determine the adequacy of the sample size for factor analysis to proceed.

5.9.1 Results from Descriptive Analysis SCI

The results of the MIS of the questions and skewness of the data are presented and discussed below.

Table 5.15 Results from Frequencies and Descriptive Factor Analysis achievements related to sustainable supply chain Implementation

Statistics			
Statement	Mean	Std. Deviation	Rank
Uses disposal systems of waste emission in the production process	4.25	0.713	1
Collaborates with your customers on green packaging	4.23	0.716	2
Collaborates with your customers on clean production	4.18	0.722	3
Requests Your suppliers to use green Packaging	4.15	0.847	4
Collaborates with the suppliers to use less Packaging materials	4.13	0.728	5
Recycles or sells by-products in the production process.	4.13	0.798	6
Collaborates with your customers on Eco design.	4.13	0.709	7
Has Total Quality Environmental Management system	4.08	0.705	8
Complies with related environmental regulations and requirements	4.05	0.887	9
Has got Finance certification	4.03	0.829	10
Implements rewards and penalty systems about the environmental performance of your top managers	3.98	1.004	11
Has got Public Finance Management Act (PFMA) certification	3.96	0.911	12

Table 5.15 above Shows respondents ranking of achievements related to sustainable supply chain Implementation, Uses disposal systems of waste emission in the production process was ranked first with a mean score of 4.25 and standard deviation (SD) of 0.713, second was Uses disposal systems of waste emission in the production process with a mean score of 4.23 with SD of 0.716, third was Collaborates with your customers on clean production with a mean score of 4.18 and SD of 0.722, fourth was Requests Your suppliers to use green Packaging with a mean score of 4.15 and SD of 0.847, fifth was Collaborates with the suppliers to use less Packaging materials with a mean score of 4.13 and SD of 0.728, sixth was Recycles or sells by-products in the production process with a mean score of 4.13 and SD of 0.798.

83

Seventh-ranked was Collaborates with your customers on Eco design with a mean score of 4.13 and SD of 0.709, eighth was Has Total Quality Environmental Management system with a mean score of 4.08 and SD of 0.705, ninth-ranked was Complies with related environmental regulations and requirements with a mean score of 4.05 and SD of 0.887, tenth was Has got Finance certification with a mean score of 4.03 and SD0.829, eleventh-ranked was Implements rewards and penalty systems about the environmental performance of your top managers with a mean score of 3.98 and Sd of 1.004, twelfth was Has got PFMA certification with a mean score of 3.96 and SD of 0.911.

5.9.2 Exploratory factor analysis

Exploratory Factor Analysis (EFA) is normally adopted in the primary phases of study in order to gather information pertaining to inter-relationships between a set of variables (Pallant, 2007). The EFA was assumed using version 21.0 of the SPSS software. The essential tests were done to define the appropriateness of the sample size for factor analysis to continue. As recommended by Pallant (2007), to define the factorability of the correlation matrix, the correlation matrix must show some correlations of $r = 0.3$ or above; Bartlett's test of sphericity must be statistically significant at $p < 0.5$ and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value should be 0.6 or above. The EFA was undertaken using version 21.0 of the SPSS software. The necessary tests were carried out to determine the adequacy of the sample size for factor analysis to proceed.

As suggested by Pallant (2007), to determine the factorability of the correlation matrix, the correlation matrix should show some correlations of $r = 0.3$ or greater; Bartlett's test of sphericity should be statistically significant at $p < 0.5$ and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value should be 0.6 or above. To confirm suitability, the reliability of the research instrument, the Cronbach's alpha values above 0.7 are considered acceptable but values above 0.8 are most preferable (Pallant, 2007). The recommended range for the inter-item correlation should be between 0.2 – 0.4 (Briggs & Cheek, 1986:115), in cases where the Cronbach's alpha values fall below 0.7. The afore-mentioned values are adopted in this research study.

The data was subjected to Principal Component Analysis (PCA) with varimax rotation. To determine the number of factors to extract using Kaiser's criterion, the total number of components that have an eigenvalue of one or more are determined and adopted. The eigenvalue is described as a mathematical property of a matrix deployed both as a criterion of

84

establishing the number of factors to extract and as a measure of variance accounted for by a given dimension (Dainty, 2003:212; Ahadzie, 2008:681). In addition, the graphical scree test is used to exclude factors with the scree plot indicating the cut-off point at which the eigenvalues levelled off (Dainty, 2003:212).

In order to define the factorability of the correlation matrix, the correlation matrix must show some correlations of r = 0.3 or above; Bartlett's test of sphericity must be statistically significant at p < 0.5 and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value should be 0.6 or above. Before performing the Principal Component Analysis (PCA), the suitability of the information for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of 75 coefficients of above 0.3 as presented in Table 5.18 below between D2 & D7.

Table 5.16 Table of correlation matrix of achievements related to sustainable supply chain Implementation

CORRELATION MATRIX												
		D1	D2	D3	D4	D6	D7	D8	D9	D10	D11	D12
Correlation	D1	**1.000**	0.365	0.331	0.216	0.010	0.055	0.236	0.193	0.373	0.101	-0.007
	D2	0.365	**1.000**	0.477	0.376	-0.060	0.075	0.289	0.324	0.307	0.202	0.106
	D3	0.331	0.477	**1.000**	0.635	0.045	0.109	0.157	0.123	0.308	0.171	0.024
	D4	0.216	0.376	0.635	**1.000**	-0.090	0.021	0.100	0.197	0.242	0.185	0.065
	D6	0.010	-0.060	0.045	-0.090	**1.000**	0.798	0.511	0.306	0.267	0.327	0.445
	D7	0.055	**0.075**	0.109	0.021	0.798	**1.000**	0.564	0.337	0.212	0.299	0.567
	D8	0.236	0.289	0.157	0.100	0.511	0.564	**1.000**	0.439	0.316	0.215	0.114
	D9	0.193	0.324	0.123	0.197	0.306	0.337	0.439	**1.000**	0.607	0.513	0.459
	D10	0.373	0.307	0.308	0.242	0.267	0.212	0.316	0.607	**1.000**	0.685	0.453
	D11	0.101	0.202	0.171	0.185	0.327	0.299	0.215	0.513	0.685	**1.000**	0.626
	D12	-0.007	0.106	0.024	0.065	0.445	0.567	0.114	0.459	0.453	0.626	**1.000**

Illustrated in Table 5.17 below, The KMO measure of sampling adequacy achieved a value of 0.694, exceeding the recommended minimum value of 0.6 and Bartlett's test of sphericity was also statistically significant (less than 0.05), thus supporting the factorability of the correlation matrix.

Table 5.17 KMO and Bartlett's test for achievements related to sustainable supply chain Implementation

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.694
Bartlett's Test of Sphericity	Approx. Chi-Square	634.309
	df	55
	Sig.	0.000

The information was exposed to PCA (with varimax rotation). The eigenvalue was set at Conventional high values of 1.0. As shown in table 5.20 below, three (3) factors with eigenvalues exceeding 1.0 were extracted. The scree plot presented in Figure 5.5 also revealed the excluded factors by indicating the cut-off point at which the eigenvalues levelled off. The total variance explained by each of the extracted factors is as follows: Factor 1 (35.667%), Factor 2 (19.730%) and factor 3 (11.800%) please note that cumulative percentage was utilised. This is shown in table 5.19 Thus, the final statistics of the PCA and the extracted factors accounted for approximately 56 percent of the total cumulative variance

Table 5.18 Rotated factor matrix for achievements related to sustainable supply chain Implementation

Statement	Factor		
	1	2	3
Has got Finance certification	0.837		
Has Total Quality Environmental Management system	0.742		
Implements rewards and penalty systems about the environmental performance of your top managers	0.660		
Has got PFMA certification	0.589		
Collaborates with your customers on green packaging		0.935	
Collaborates with your customers on clean production		0.810	
Complies with related environmental regulations and requirements		0.581	
Recycles or sells by-products in the production process			0.768
Uses disposal systems of waste emission in the production process			0.637
Collaborates with the suppliers to use less Packaging materials			0.634
Requests Your suppliers to use green Packaging			0.471
Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization.[a]			
a. Rotation converged in 5 iterations.			

Figure 5.7 below also revealed the excluded factors by indicating the cut-off point at which the eigenvalues leveled off.
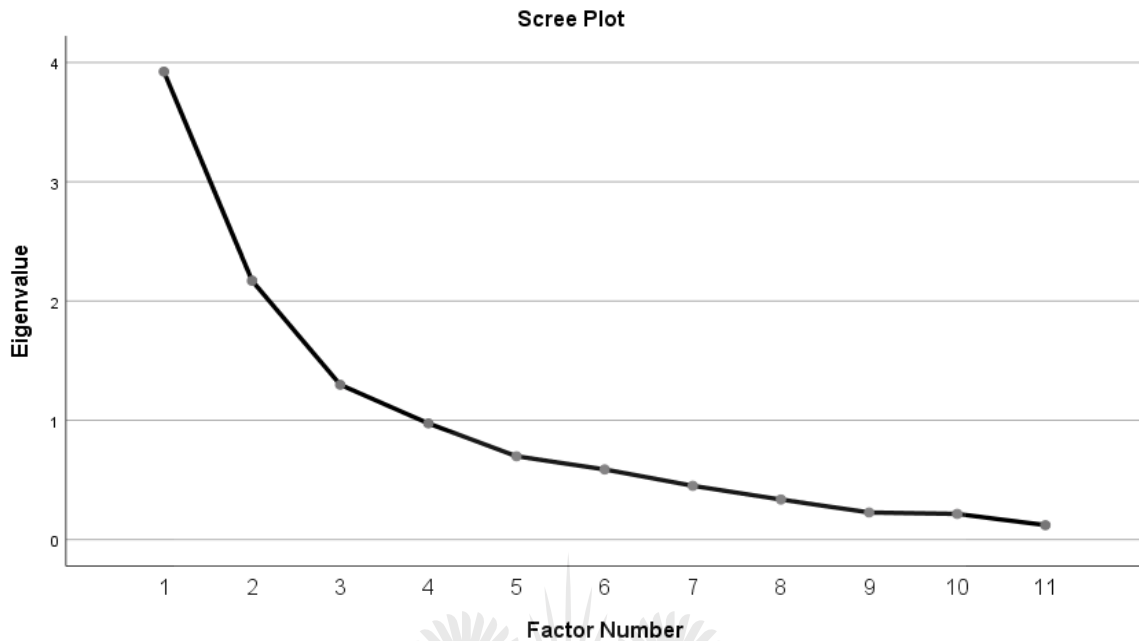
Figure 5.7 scree plot for achievements related to sustainable supply chain Implementation

Table 5.19 Explanation of total variance for achievements related to sustainable supply chain Implementation

Total Variance Explained									
Fact or	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumula tive %	Total	% of Varianc e	Cumul ative %	Total	% of Variance	Cumulati ve %
1	**3.923**	**35.667**	35.667	3.550	32.272	32.272	2.213	20.118	20.118
2	**2.170**	**19.730**	55.397	1.740	15.819	48.091	2.094	19.033	39.151
3	**1.298**	**11.800**	**67.197**	0.947	8.605	56.697	1.930	17.546	**56.697**
4	0.974	8.852	76.049						
5	0.698	6.348	82.397						
6	0.588	5.344	87.741						
7	0.450	4.095	91.836						
8	0.336	3.051	94.887						
9	0.227	2.061	96.948						
10	0.215	1.956	98.904						
11	0.121	1.096	100.000						
Extraction Method: Principal Axis Factoring.									

Principal axis factoring showed the presence of three (3) factors with eigenvalues above 1 as demonstrated in Table: 5.20 Rotated Factor Matrix. Founded on the consideration of the inherent associations between the variables underneath each factor, the subsequent explanations were established by naming each factor for readers to understand:

5.9.2 Factor one: Certification on Achievement Implemented in Supply Chain Management

As displayed in Table 5.20, the three (3) factors that have achievements related to sustainable supply chain Implementation were extricated and are explained as follows; Has got Finance certification 83%, Has Total Quality Environmental Management system 74%, Implements rewards and penalty systems about the environmental performance of your top managers 66%, Has got PFMA certification 58%.

5.9.3 Factor two: Collaborating on Achievement Implemented in Supply Chain Management

As displayed in Table 5.20, the three (3) factors that has achievements related to sustainable supply chain Implementation were extricated and are explained as follows; Collaborates with your customers on green packaging 93%, Collaborates with your customers on clean production 81%, Complies with related environmental regulations and requirements 58%.

5.9.4 Factor three: Packaging the Achievement Implemented in Supply Chain Management

As displayed in Table 5.20, the three (3) factors that has achievements related to sustainable supply chain Implementation were extricated and are explained as follows; Recycles or sells by-products in the production process 76%, Uses disposal systems of waste emission in the production process 63%, Collaborates with the suppliers to use less Packaging materials 63%, Requests Your suppliers to use green Packaging 47%.

5.10 Reliability Test Analysis on Challenges of Supply Chain implementation

The collected data from the study was tested for reliability, normality, correlation and to enable the research to make a prediction about the population. The internal consistency of the data collected on the achievements related to sustainable supply chain Implementation was

measured by calculating the Cronbach's alpha coefficient on Importance of information such as Certification on Achievement Implemented in Supply Chain Management, Collaborating on Achievement Implemented in Supply Chain Management and Packaging the Achievement Implemented in Supply Chain Management.Table 5.20 below presents the reliability statistics for the above-mentioned factors.

Table 5.20 Reliability statistics on achievements related to sustainable supply chain Implementation

Statement	Reliability Statistics		
	Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
Certification on Achievement Implemented in Supply Chain Management	0.823	0.834	4
Collaborating on Achievement Implemented in Supply Chain Management	0.820	0.833	3
Packaging the Achievement Implemented in Supply Chain Management	0.722	0.727	4

One of the most normally used indicators of internal consistency is Cronbach alpha co-efficient values, ideally, the co-efficient of a scale should be above 0.7. However, these values are sensitive to the number of items in the scale.

Pallant 2007, with short scales (e.g. scales with fewer than 10 items) it is common to experience fairly low Cronbach value (e.g. less than .5), in this circumstance, it might be imperative to report the mean inter-item correlation for the items, (Briggs and Cheek, 1986), recommended an optimal range for the inter-item correlation. Table 5.23 above illustrates the results scale factors sustainable supply chain Implementation . The Cronbach's alpha is higher than the required value of 0.7 at 0.823 based on four item scale for Activities on Certification on Achievement Implemented in Supply Chain Management, which is a good value, secondly Collaborating on Achievement Implemented in Supply Chain Management   is also a good value based on three item scale at 0.820, which represent a good value, lastly Packaging the

Achievement Implemented in Supply Chain Management at 0.722 which is a good value and reliable data statistics**.**

5.11 Normality test on achievements related to sustainable supply chain Implementation

To test the supposition that the data gathered follows a normal distribution (Razali & Wah, 2011) and to clarify that the sample was taken from a population that follows a normal distribution, a normality test was conducted on Management Views on supply chain management Concepts of Supply Chain, Customers Views on supply chain management Concepts of Supply Chain and Staff Views on supply chain management Concepts of Supply Chain.

Table 5.21 Normality test on achievements related to sustainable supply chain Implementation

<table>
<tr><th colspan="7">Tests of Normality</th></tr>
<tr><th rowspan="2">Statements</th><th colspan="3">Kolmogorov-Smirnov[a]</th><th colspan="3">Shapiro-Wilk</th></tr>
<tr><th>Statistic</th><th>df</th><th>Sig.</th><th>Statistic</th><th>df</th><th>Sig.</th></tr>
<tr><td>Certification on Achievement Implemented in Supply Chain Management</td><td>0.830</td><td>16</td><td>.200[*]</td><td>0.893</td><td>16</td><td>0.897</td></tr>
<tr><td>Collaborating on Achievement Implemented in Supply Chain Management</td><td>0.770</td><td></td><td>.200*</td><td>0.799</td><td></td><td>0.888</td></tr>
<tr><td>Packaging the Achievement Implemented in Supply Chain Management</td><td>0.792</td><td>16</td><td>.200[*]</td><td>0.831</td><td>16</td><td>0.898</td></tr>
</table>

The Kolmogorov-Smirnov test results on achievements related to sustainable supply chain Implementation: Certification on Achievement Implemented in Supply Chain Management is 0.830, Collaborating on Achievement Implemented in Supply Chain Management is 0.770 and Packaging the Achievement Implemented in Supply Chain Management is 0.792. Each of the p-values presented is higher than 0.05. According to Ghasemi and Zahediasi (2012), if the p-value is higher than 0.05 then it is an indication of normal distribution.

The Shapiro-Wilk test results indicated the following: Certification on Achievement Implemented in Supply Chain Management is 0.897, Collaborating on Achievement Implemented in Supply Chain Management is 0.888 and Packaging the Achievement Implemented in Supply Chain Management is 0.898. All the values presented fell between

zero and 1. The values of a normal distribution on a Shapiro-Wilk test fall between zero and one (Razali & Wah, 2011). Each of the p- values presented is higher than 0.05. According to Ghasemi and Zahediasi (2012), if the p-value is higher than 0.05 then it is an indication of normal distribution.

5.12 Discussions

The findings of this research study agreed with the findings of the studies of (Sugan and Trisha, 2007), (Martins, 2015), (Supply Chain Sustainability, 2011), which established and propagated that these approaches is the path through which knowledge is transferred in the application of sustainability for its overarching goal. The findings also correspond with the findings of the studies of (Mark,2012), (David, 2010), which stated that the adoption of these approaches will help transform the mining environment from an unsustainable state to an effective and resilient paradigm as they proffer sustainable solutions to identified existing challenges in the mining industry.

The findings from the results of the descriptive and exploratory factor analysis revealed that challenges related to sustainable supply chain in mining industry has emerged from lack of managerial practical tools and lack of government policy infrastructures. A lack of a well-defined approach is identified as a major barrier to the employability of sustainability by (Siu, 2006). However, the finding from this research study provides an answer by identifying the two approaches to achieving the goal of sustainability in the mining industry.

5.13 CONCLUSION

This chapter presented the findings for the research study. The interpretations of the results were done using tables, graphs/charts, and histograms, amongst others. In the next chapter, a discussion of conclusion, discussions and recommendations of these results are presented.

Chapter Six

Conclusions and Recommendations

6.1 Introduction

Companies across the world are under pressure to realise positive results along the ecological, social and economic dimensions. Creating Sustainable Supply Chain Management to manage sustainability in supply chain activities, but, continues to be tenuous. This study took a step towards addressing this issue through the analysis of critical risk factors of sustainable supply chain in the South African mining industry. This led to the identification of key elements of Sustainable Supply Chain Management specific in the mining industry and offering avenues for future research to further develop the field. In light of this, this chapter deliberates the results from the study analysis with admiration to the research questions. The results are further deliberated in relative to the studied literature in Chapter 2 and 3. This is with the opinion to determining whether the clear study questions have been responded from the information analysis in Chapter 5.

6.1.1 Findings from research question one

Results from the descriptive and exploratory factor analysis were used in answering this Research question.

Based on the results from the descriptive analysis, It shows the uses disposal systems of waste reject metal in the production process was ranked first with a mean score of 3.95 and Standard Deviation (SD) of 0.829, second ranked was collaborates with your customer's logistics with a mean score of 3.89 and SD of 0.776, thirdly was quick to correct the amount in the production process with a mean score of 3.86 and SD of 0.770, f ranked fourth is regularly updates policies with a mean score of 3.84 and SD of 0.799, ranked fifth was collaborates with your customers on reclaiming used products with a mean score of 3.82 and standard deviation of 0.879, Sixth-ranked is cooperate with legislations with a mean score of 3.80 and SD of 0.816.

Seventh ranking is your top managers make a commitment to environmental management with a mean score of 3.77 and SD of 0.827, ranking eighth is your middle managers give support to environmental management with a mean score of 3.69 and SD of 0.848, ninth raking is considers if products can be recycled with a mean score of 3.68 and SD of 0.980, tenth ranking is has a staff training program with a mean score of 3.56 and SD of 0.776, eleventh ranked was collaborates with the suppliers for environmental Protection goals with a

www.manaraa.com

mean score of 3.17 and SD of 1.590, ranked twelfth raking is Follow a Just-In-Time system with a mean score of 2.03 and SD of 1.240 and lastly ranked thirteenth is has regular supplier audits with a mean score of 1.83 and SD of 0.382.

6.1.2 Findings from research question Two

To what extent the concept of the sustainable supply chain has been integrated and implemented within the mining sector? To answer this research question, the study used a literature review with regards to define sustainability, looking at the benefits in different countries such as Australia, Botswana and South Africa and the impact it also has. . In Australia, practically 95% of all mining exercises the concept of sustainability and are driven by cutting-edge applications. These applications are credited for conveying one of the world's most acclaimed mining management system. In Botswana there is less than 1000 plants; however; at least 56% of all plants are already utilising sustainable supply chain concept, they rely on in-sourced mining services. Looking into South African mining industry, a mere 18% have currently integrated sustainability in supply chain. To this end, current literature demonstrated that although various studies have been conducted on the significance of sustainable supply chain in mining industry over the past decades, few studies focused on the big mining industry provinces such as South Africa 's North West and Mpumalanga province especially in the context of South Africa. In light of this, the present study sought to fill this gap by placing emphasis on the need to conceptualise various provinces that have mines and explore the sustainability factor.

6.1.3 Findings from research question Three

Based on the results from the descriptive analysis the respondents were asked to indicate challenges for sustainable integration and implementation and they responded as follows as per data analysis; It shows that Inadequate individual capacity was ranked first with a mean score 4.17 and Standard Deviation (SD) of 0.737, ranked second was Lack of managerial practical tools with a mean score of 4.15 and SD of 0.741, third was Lack of recycling activities with a mean score of 3.97 and SD of 0.798, fourth was Lack of Political support with a mean score of 3.93 and SD of 0.822, ranked fifth was Poor senior management's commitment with a mean score of 3.84 and SD of 0.850, sixth was Lack of commitment with a mean score of 3.78 and SD of 0.855.

Seventh- ranked was Lack of knowledge sharing with a mean score of 3.68 and Standard Deviation (SD) of 0.953, eighth was High cost associated with the implementation of Sustainable Supply Chain Management with a mean score of 3.68 and SD of 0.979, ninth was Lack of communication with a mean score of 3.65 and SD of 0.993, ranked tenth was Poor

الٍمـارة للاستشارات

Supplier Commitment with a mean score of 360 and SD of 1.111, ranked eleventh was Ineffective monitoring and control system with a mean score of 3.59 and SD of 1.049, ranked at twelve was Lack of Green Practitioners with a mean score of 3.55 and SD of 1.068, thirteen was No effective policy and legislation direction with a mean score of 3.47 and SD of 1.012.

6.1.4 Findings from research question Four

Based on the results from the descriptive analysis respondents were asked on the benefits or achievement of sustainable supply chain and they responded as follows; Shows respondents ranking of achievements related to sustainable supply chain Implementation, Uses disposal systems of waste emission in the production process was ranked first with a mean score of 4.25 and Standard Deviation (SD) of 0.713, second was Uses disposal systems of waste emission in the production process with a mean score of 4.23 with SD of 0.716, third was Collaborates with your customers on clean production with a mean score of 4.18 and SD of 0.722, fourth was Requests Your suppliers to use green Packaging with a mean score of 4.15 and SD of 0.847, fifth was Collaborates with the suppliers to use less Packaging materials with a mean score of 4.13 and SD of 0.728, sixth was Recycles or sells by-products in the production process with a mean score of 4.13 and SD of 0.798.

Seventh ranked was Collaborates with your customers on Eco design with a mean score of 4.13 and SD of 0.709, eighth was Has Total Quality Environmental Management system with a mean score of 4.08 and SD of 0.705, ninth was Complies with related environmental regulations and requirements with a mean score of 4.05 and SD of 0.887, tenth was Has got Finance certification with a mean score of 4.03 and SD0.829, eleventh ranked was Implements rewards and penalty systems about the environmental performance of your top managers with a mean score of 3.98 and SD of 1.004, twelfth was Has got PFMA certification with a mean score of 3.96 and SD of 0.911.

6.3 Conclusion

It is obvious from the literature studied for this research that mining industry around the sphere is conscious of the need for sustainable development and environmentally welcoming processes. The acceptance of sustainable does in the mines are driven by many internal services such as improving efficiency, reducing costs and easing supply chain sustainability, in addition to external forces such as consumer burden, rising fuel prices and changing legislature (World Economic Forum, 2009). While mines are alert of the position of organisational sustainability, they are in different stages of application. Some mines are in the infancy stages where they only implement sustainable performs due to legislature changes. Others embrace a holistic viewpoint that includes financial, social and environmental purposes

in all result making. The South African mining industry is utilising international tools such as ISO standards and the GRI sustainability writing rules, which facilitate the use of best performs and international values.

The themes of sustainable growth, corporate governance, corporate social responsibility and corporate sustainability are all interwove and deliver support assemblies for one another. South Africa is noted for its excellent corporate governance values and development. Value creation, human capital organisation and environmental management are also measured as part of corporate sustainability strategies. There are numerous financial and non- financial aids that offset associated costs as a result of joining corporate social responsibility and corporate sustainability into corporate strategies and processes.

6.4 Recommendations for Future Research

More study on this topic is necessary to sustenance and enlarge on the answers of this study. It would be helpful to comprise all segments of the economy to produce more overall results that could be used as a holistic suggestion of sustainable supply chain applies for the South African economy. That being said, the collaboration of privately-owned businesses is necessary to fold more information to attain an important number of comments in all sectors.

It is authoritative to investigate profounder into the answers of this study by counting more keywords such as other pertinent ISO standards to determine the full range of the conversation on supply chain performs and sustainability. It would also be helpful to conduct this study over a number of years to control the changes that have happened chiefly when policy changes such as implementation of a carbon tax occur. Advancing the study through qualitative study in the form of in-depth meetings and emphasis groups with pertinent industry associates would provide detailed data on the exact wildlife of supply chain operations and the degree to which sustainable practices are implemented. From a larger sample of the population thus producing more generalisable results with higher levels of significance. With significant data collected over a number of years, further statistical analyses could be performed and patterns and areas in need of improvement could be more easily identified.

Assumed the comparatively low level of conversation on ideas relating to carbon releases and the imminent application of the carbon tax in South Africa, further study into the groundwork efforts of businesses to decrease their releases and carbon paths and alleviate the financial influence of the tax is essential. This can also be attained by counting more businesses in the study, by counting more segments in the study and by counting extra pertinent keywords in the study. In-depth meetings and emphasis groups would also deliver valued particulars on

the ways in which organisations are handling and measuring their environmental influences and the ways in which they have combined the imminent carbon tax into their organisational plans.

APPENDIX 1: INTRODUCTORY LETTER

UNIVERSITY
OF
JOHANNESBURG

Dear Sir/Madam,

We, University of Johannesburg are undertaking a research project that aims at exploring the issues affecting sustainable supply chain practices in the South African mining sector. To this end, we kindly request that you provide her with accurate information as possible.

The interviews should not take more than 15 minutes to complete. Please answer each question carefully. The information collected in this project is strictly confidential and the identity of participants will be protected.

Hence, **DO NOT** mention your surname and name.

I thank you so much in advance for your time and cooperation in this matter. Should you require more information on the project do not hesitate to contact us telephonically at 073 157 0019 or e-mail us at misssenkoto@gmail.com

Yours sincerely

University of Johannesburg

REFERENCES

Amin C., Amar R& Marc P.2011. Designing supply chains with sustainability considerations, Production Planning & Control, 22:8, 727-741, DOI: 10.1080/09537287.2010.543554

Andreas T & Min T.2015. Information technology for sustainable supply chain management: a literature survey, Enterprise Information Systems, DOI: 10.1080/17517575.2015.1091950

Anna N &Ladimer S.2010. Sustainable supply chain network design: a multicriteria perspective, International Journal of Sustainable Engineering, 3:3, 189-197, DOI: 10.1080/19397038.2010.491562

Anna N., Zugang L & Trisha W.2007. Sustainable Supply Chain and Transportation Networks, International Journal of Sustainable Transportation, 1:1, 29-51, DOI: 10.1080/15568310601060077

Ari P.2010. Consumers' Sustainability Perceptions of the Supply Chain of Locally Produced Food. Sustainability 2010, 2, 1492-1509; doi: 10.3390/su2061492

Babu J., Ting C., Patriya T., Nadia P.2016. Influences of Firm Orientations on Sustainable Supply Chain Management. Journal of Business Research, 69, 3406-3414

Barrat, M., (2004). Understanding the meaning of collaboration in the supply chain, Supply Chain Management: An International Journal 9, (1) 30.

Bogetic, Z., and Fedderke, JW. (2006), International benchmarking of South Africa's infrastructure performance. Journal of Development Perspectives 1 (2) 23-24. World Bank Policy Working Paper No. 3830

Boyer, K., and Mcdermott, C. (2009) Strategic Consensus in Operational Strategy. Journal of Operations Management, 17 (3) 289-305.

Brian G & Mary M.2016.Sustainable Supply Chain Management and the End User: Understanding the Impact of Socially and Environmentally Responsible Firm Behaviors on Consumers' Brand Evaluations and Purchase Intentions, Journal of Marketing Channels, 23:1-2, 34-46, DOI: 10.1080/1046669X.2016.1147885

Bruno S. 2015. Sustainable supply chain management in emerging economies: Environmental turbulence, institutional voids and sustainability trajectories. Int. J. Production Economics, 167, 156-169

Cachon, G., and Fisher, M., (2000). Supply Chain Inventory Management and the Value of shared information. Management Science. 46, (8) 78.

Capobianco, A., and Christiansen, H. (2011), Competitive neutrality and State-owned Enterprises: Challenges and Policy Options. OECD Corporate governance Working Paper No 1, OECD Publishing online. Available at http://dx.doi.org/10.1787. Accessed on 12 June 2018

Carter, C. & Easton, P. 2011. Sustainable supply chain management: evolution and future directions. International Journal of Physical Distribution & LogisticsManagement, 41(1), 46-62

Ceren A.2015. Sustainable Demand Chain Management: An Alternative Perspective for Sustainability in the Supply Chain. 11th International Strategic Management Conference 2015. Procedia - Social and Behavioral Sciences 207, 262 – 273

Chang, HJ. (2007), State owned Enterprise Reform, United Nations Department for Economic and Social Affairs. Online available from URL: http://esa.un.org/technology/documents. Accessed on 13 June 2018.

Chin-Shan L., Po-L & Yi-Pin C.2016. Container terminal employees' perceptions of the effects of sustainable supply chain management on sustainability performance, Maritime Policy & Management, 43:5, 597-613, DOI: 10.1080/03088839.2016.1190471

Cho, S., Lim, U., 2016. The sustainability of global chain governance: network structures and local supplier upgrading in Thailand. Sustain.

Choi, T.Y., Hong, Y., 2002. Unveiling the structure of supply networks: case studies in Honda, Acura, and DaimlerChrysler. J. Oper. Manag. 20, 469-493.

Christopher, M. (2005). Supply chain management – creating value adding networks. 3dt Ed. FT Prentice Hall, London.

Chu-hua K., Christian N. &Chinho L.2011. Developing global supply chain quality management systems, International Journal of Production Research, 49:15, 4457-4481, DOI: 10.1080/00207543.2010.501038

99

Ciliberti, F., Groot, G. De, Haan, J. De, Pontrandolfo, P., 2009. Codes to coordinate supply chains: SMEs' experiences with SA8000. Supply Chain Manag. Int. J. 14, 117-127.

Clarke, T., Boersma, M., 2017. The governance of global value chains: unresolved human rights, environmental and ethical dilemmas in the Apple supply chain. J. Bus. Ethics 143, 111-131.

Cooper, M.C., Lambert, D.M., Pagh, J.D., 1997. Supply chain management: more than a new name for logistics. Int. J. Logist. Manag. 8 (1), 1-14.

Craig R. Carter Dale S. Rogers.2008.A framework of sustainable supply chain management: moving toward new theory", International Journal of Physical Distribution & Logistics Management, Vol. 38 Iss 5 pp. 360 – 387

Creswell, J.W. (2012). Research designs: Qualitative, quantitative and mixed methods approaches (4th Edition). Sage publication, Thousand Oaks, California, USA.

Dadhich P., Genovese A., Kumar N., Acquaye A. 2015. Developing sustainable supply chains in the UK construction industry: A case study. Int. J. Production Economics, 164, 271-284

Daniel H., Constantin B & Kai F.2012. Does sustainable supplier co-operation affect performance? Examining implications for the triple bottom line, International Journal of Production Research, 50:11, 2968-2986, DOI: 10.1080/00207543.2011.582184

Darnall, N., Jolley, J., Handfield, R., Jolley, G.J., Handfield, R., 2008. Environmental management systems and green supply chain management: complements for sustainability? Bus. Strat. Environ. 17, 30-45.

De Marchi, V., Di Maria, E., Micelli, S., 2013. Environmental strategies, upgrading and competitive advantage in global value chains. Bus. Strat. Environ. 22, 62-72.

De Vos, A.S. 2011. Research at Grass Roots for the Social Sciences and Human Service Professions (2nd Ed.). Pretoria: Van Schaik.

Delmas, M., Montiel, I., 2009. Greening the supply chain: when is customer pressure effective? J. Econ. Manag. Strat. 18, 171-201.

Distelhorst, G., Locke, R.M., Pal, T., Samel, H., 2015. Production goes global, compliance stays local: private regulation in the global electronics industry. Regul. Gov. 9, 224-242.

Donna M., Lucy M., Ciarán H & Paul M.2015. Environmental and social supply chain management sustainability practices: construct development and measurement, Production Planning & Control, 26:8, 673-690, DOI: 10.1080/09537287.2014.963726

Evans, PB. (2007), In search of the 21st century Developmental state. Working paper (4). Centre for Global Political Economy. University of Sussex. Available at www.susses.ak.uk. Accessed on 18 June 2018.

Fang Y., Lei X., Changyin S., Chun Z.2016. Product transportation distance based supplier selection in sustainable supply chain network. Journal of Cleaner Production, 137, 29-39

Fawcett, S., Magnan, G. (2002). Rhetoric and Reality of Supply Chain Integration. International Journal of Physical Distribution and Logistics Management. 32, (5) 23.

Fisher, M., (1997). What is the right supply chain for your product? Harvard Business Review. March/April.

Foerstl, K., Azadegan, A., Leppelt, T., Hartmann, E., 2015. Drivers of supplier sustainability: moving beyond compliance to commitment. J. Supply Chain Manag. 51, 67-92.

Formentini, M., Taticchi, P., 2016. Corporate sustainability approaches and governance mechanisms in sustainable supply chain management. J. Clean. Prod. 112, 1920-1933.

Gattorna, J. (2006). Living Supply Chains – How to mobilise the enterprise around delivering what your customers want, FT Prentice Hall, London.

Gereffi, G., Humphrey, J., Kaplinsky, R., Sturgeon, T.J., 2001. Introduction: globalization, value chains and development. IDS Bull. 32, 1-8.

Gereffi, G., Humphrey, J., Sturgeon, T., 2005. The governance of global value chains. Rev. Int. Polit. Econ. 12, 78-104.

Gereffi, G., Lee, J., 2014. Economic and social upgrading in global value chains and industrial clusters: why governance matters. J. Bus. Ethics 1-14.

Gimenez, C., Sierra, V., 2013. Sustainable supply chains: governance mechanisms to greening suppliers. J. Bus. Ethics 116, 189-203.

Gimenez, C., Tachizawa, E.M., 2012. Extending sustainability to suppliers: a systematic literature review. Supply Chain Manag. Int. J. 17, 531-543.

Giunipero, L.C., Hooker, R.E., Joseph-Matthews, S., Yoon, T.E., Brudvig, S., 2008. A decade of Sustainable Supply Chain Management literature: past, present and future implications. J. Supply Chain Manag. 44, 66-86.

Gold, S., Hahn, R., Seuring, S., 2013. Sustainable supply chain management in "Base of the Pyramid" food projects-A path to triple bottom line approaches for multinationals? Int. Bus. Rev. 22, 784-799.

Golicic, S.L., Smith, C.D., 2013. A meta-analysis of environmentally sustainable supply chain management practices and firm performance. J. Supply Chain Manag. 49, 78-95.

Gonzalez, P., Sarkis, J., Adenso-Diaz, B., 2008. Environmental management system certification and its influence on corporate practices: evidence from the automotive industry. Int. J. Oper. Prod. Manag. 28, 1021-1041.

Gopal P &Jitesh T.2016. Sustainable supply chain practices: an empirical investigation on Indian automobile industry, Production Planning & Control, 27:1, 49-64, DOI: 10.1080/09537287.2015.1060368

Grimm, J.H., Hofstetter, J.S., Sarkis, J., 2014. Critical factors for sub-supplier management: a sustainable food supply chains perspective. Int. J. Prod. Econ. 152, 159-173.

Grimm, J.H., Hofstetter, J.S., Sarkis, J., 2016. Exploring sub-suppliers' compliance with corporate sustainability standards. J. Clean. Prod. 112, 1971-1984.

Gualandris, J., Golini, R., Kalchschmidt, M., 2014. Do supply management and global sourcing matter for firm sustainability performance? Supply Chain Manag. Int. J. 19, 258-274.

Gualandris, J., Klassen, R.D., Vachon, S., Kalchschmidt, M., 2015. Sustainable evaluation and verification in supply chains: aligning and leveraging accountability to stakeholders. J. Oper. Manag. 38, 1-13.

Hahn, G.J., Kuhn, H., 2012. Value-based performance and risk management in supply chains: a robust optimization approach. Int. J. Prod. Econ. 139 (1), 135-144

Harrison, A., & Van Hoek, R. 2011. Logistics management and strategy – competing through the supply chain, 4th Ed. FT Prentice, London.

Harrison, A., Christopher, M., & Van Hoek, R. (1999). Creating the agile supply chain. School of Management Working Paper, Cranfield University, Cranfield.

Hines, P. & Taylor, D. (2000). Going lean. Lean Enterprise Research Centre. Cardiff Business School, Cardiff, UK.

Huiping D., Qilan Z., Zhirong A., Jia X., Qian L. 2015. Pricing strategy of environmental sustainable supply chain with internalizing externalities. Int. J. Production Economics, 170, 563-575

Huiping D.,Qian L., Lucy Z. 2016. Assessing the economic performance of an environmental sustainable supply chain in reducing environmental externalities. European Journal of Operational Research, 255, 463-480

Janaina D. & Nathalie F.2007.Supply Chain Management and Supply Chain Orientation: key factors for sustainable development projects in developing countries? International Journal of Logistics Research and Applications, 10:3, 235-250

Jeremy H., Stelvia M & Bruno S.2012.Understanding why firms should invest in sustainable supply chains: a complexity approach, International Journal of Production Research, 50:5, 1332-1348, DOI: 10.1080/00207543.2011.571930

Jespersen, B.D., Skjoett-Larsen, T.2005. Supply Chain Management – in Theory and Practice. Copenhagen Business School Press, Koege, Denmark

Jianteng X., Yuyu C., Qingguo B.2016. A two-echelon sustainable supply chain coordination under cap-and-trade regulation. Journal of Cleaner Production, 135, 42-56

Joanne B. & Xavier F.2011. Barriers to Tour Operator Sustainable Supply Chain Management, Tourism Recreation Research, 36:3, 205-214, DOI: 10.1080/02508281.2011.11081667

Jonas B. & Joachim Z.2013. Supply chain transparency as a key prerequisite for sustainable agri-food supply chain management, The International Review of Retail, Distribution and Consumer Research, 23:5, 553-570, DOI: 10.1080/09593969.2013.834836

Josef-Peter S., Morgane M., Rupert J. 2016. Toward supply chain-wide sustainability assessment: a conceptual framework and an aggregation method to assess supply chain, performance. Journal of Cleaner Production, 131, 822-835

Julia K., Stefan S., Michael M.2007. Incorporating sustainability into supply management in the automotive industry e the case of the Volkswagen AG. Journal of Cleaner Production 15 (2007) 1053e1062

Jury G & Matteo K.2016.Developing environmental and social performance: the role of suppliers' sustainability and buyer–supplier trust, International Journal of Production Research, 54:8, 2470-2486, DOI: 10.1080/00207543.2015.1106018

Karen S., Richard T & Xavier F.2008. A Sustainable Supply Chain Management Framework for Tour Operators, Journal of Sustainable Tourism, 16:3, 298-314

Kim, WC., & Mauborgne, R. (2005). Blue Ocean Strategy. Harvard Business School Press, Boston.

Konrad Z., Magnus F & Frank S.2016.Sustainable supplier management – a review of models supporting sustainable supplier selection, monitoring and development, International Journal of Production Research, 54:5, 1412-1442, DOI: 10.1080/00207543.2015.1079340

Lambert, M. & Renan, B. 2000. Measuring and selling the value of Logistics. The International Journal of Logistics Management. 11 (1) 1-17.

Lee, H. (2004). The Triple-A Supply Chain. Harvard Business Review, 82, (10), 102.

Lee, H., So, K., and Tang, C. (2000). The value of information sharing in a Two-level Supply Chain Management Science, 46, (5) 345.

Lee, HL (2006). The triple –A-supply chain. Harvard Business Review on supply chain management 12 (3) 12. Harvard Business School Press, New York.

Leedy, P. D. & Ormrod, J. E. (2010). Practical Research (Planning and Design). 9th Edition. New Jersey. Pearson Education International.

Li, S. and Xia, J. 2007. The role and performance of state owned firms. Organisation Science. Volume 4. No.4 645-666.

Lu, D. (2011). In pursuit of World Class Excellence, Ventus Publishing Aps. Fredricksberg, Denmark.

Majid E., Pierre D., Joe M. Olivier P.2015. Sustainable supply chain network design: An optimization-oriented review. Omega, 54, 11-32

Marco F., Paolo T. 2016. Corporate sustainability approaches and governance mechanisms in sustainable supply chain management. Journal of Cleaner Production, 112, 1920-1933

Mentzer, S., DeWitt, W., Keebler, D., Min, S., Smith, C., and Zachariah, Z., (2001). Defining Supply Chain Management, Journal of Business Logistics. 22, (2) 25.

Mohammad H., Anjali A., Manoj K. 2016. Interpretive structural modeling-analytic network process integrated framework for evaluating sustainable supply chain management alternatives. Applied Mathematical Modelling, 40, 3671-3687

Narayaran, A., and Raman, A. 2004. Aligning incentives in Supply Chains. Harvard Business Review, 82, (11), 94.

Natalia Y., Joseph S & Thomas S.2012.Sustainable benchmarking of supply chains: the case of the food industry, International Journal of Production Research, 50:5, 1297-1317, DOI: 10.1080/00207543.2011.571926

Nathan K & Stefan G.2015. Sustainable humanitarian supply chain management – exploring new theory, International Journal of Logistics Research and Applications, DOI: 10.1080/13675567.2015.1103845

Neumann, W.L. 2011. Social Research methods: Qualitative and Quantitative approach. Boston: Pearson.

Nisakorn S &Tritos L.2016. Prioritization of applicable drivers for green supply chain management implementation toward sustainability in Thailand, International Journal of Sustainable Development & World Ecology, DOI: 10.1080/13504509.2016.1187210

Panchanan B. & Anand P.2015. Understanding Construction Supply Chain Management, Production Planning & Control, 26:16, 1332-1350, DOI: 10.1080/09537287.2015.1045953

Paolo T., Patrizia G., Sai S., Flavio T & Roberto P. 2015. A review of decision-support tools and performance measurement and sustainable supply chain management, International Journal of Production Research, 53:21, 6473-6494, DOI: 10.1080/00207543.2014.939239

Paweł S & Jarosław W.2015. A hybrid framework for the modelling and optimisation of decision problems in sustainable supply chain management, International Journal of Production Research, 53:21, 6611-6628, DOI: 10.1080/00207543.2015.1005762

Payman A., Cory S., Mohamad Y.2016.Energy-related performance measures employed in sustainable supply chains: A bibliometric analysis. Sustainable Production and Consumption, 7, 1-15

Petrică C., Camelia M., Corina P., Mara H.2015. An efficient Reverse Distribution System for solving sustainable supply chain network design problem. Journal of Applied Logic, 13, 105-113.

Rameshwar D & Angappa G.2016. The sustainable humanitarian supply chain design: agility, adaptability and alignment, International Journal of Logistics Research and Applications, 19:1, 62-82, DOI: 10.1080/13675567.2015.1015511

Rushton, A. Croucher, P., and Baker, P., (2006). The Handbook of Logistics and Distribution Management 3rd Ed. Kogan Page Limited, London, United Kingdom.

Sadler, I., (2007). Logistics and Supply Chain Integration. Sage Publications Ltd., LA. USA.

Seuring, S.,&Müller, M. 2008. From a literature review to a conceptual framework for sustainable supply chain management.Journal ofcleaner production, 16(15), 1699-1710.

106

Shaofeng L., Jonathan M., Phil M., Dulekha K &Uchitha J.2014. A knowledge chain management framework to support integrated decisions in global supply chains, Production Planning & Control, 25:8, 639-649, DOI: 10.1080/09537287.2013.798084

Sunil L., Dixit G &Abid H.2015. Critical success factors of green supply chain management for achieving sustainability in Indian automobile industry, Production Planning & Control, 26:5, 339-362

Susanne F.2013.Calculating sustainability in supply chain capitalism, Economy and Society, 42:4, 571-596, DOI: 10.1080/03085147.2012.760349

United Nations Global Compact.2010. Supply Chain Sustainability: A Practical Guide for Continuous Improvement. UN Global Compact Office and Business for SocialResponsibility.

Vincent F. & Li-Chuan T.2014.Measuring social compliance performance in the global sustainable supply chain: an AHP approach, Journal of Information and Optimization Sciences, 35:1, 47-72, DOI: 10.1080/02522667.2013.876777

Wan N., Jafar R., Marisa P., Lóránt A.2016. The influence of external factors on supply chain sustainability goals of the oil and gas industry. Resources Policy, 49, 302-314

Wan N., Jafar R., Tavasszy L. Marisa P. 2016. Commitment to and preparedness for sustainable supply chain management in the oil and gas industry. Journal of Environmental Management, 180, 202-213

World Commission on Environment and Development. 1987. Our common future. Oxford: Oxford University Press

Xun X &Dogan G.2015. A Conceptual Framework of Sustainable Hospitality Supply Chain Management, Journal of Hospitality Marketing & Management, 24:3, 229-259, DOI: 10.1080/19368623.2014.909691

Yılmaz B., Hasan S. 2016. Sustainable design of renewable energy supply chains integrated with district heating systems: A fuzzy optimization approach. Journal of Cleaner Production, 133, 863-885

Yuan-H., Ming-Lang T. 2016. Assessing the competitive priorities within sustainable supply chain management under uncertainty. Journal of Cleaner Production, 112, 2133-2144

Zhalechian M., Tavakkoli M., Zahiri B., Mohammadi M.2016. Sustainable design of a closed-loop location-routing-inventory supply chain network under mixed uncertainty. Transportation Research Part E, 89, 182-214

Zhonghua Z & Anjali A.2014. Modelling customer and technical requirements for sustainable supply chain planning, International Journal of Production Research, 52:17, 5131-5154, DOI: 10.1080/00207543.2014.899717

UNIVERSITY
OF
JOHANNESBURG

APPENDIX 2: QUESTIONNAIRE

SECTION A: BIOGRAPHICAL DETAILS

This section of the questionnaire refers to the respondent background or biographical information. Although we are aware of the sensitivity of the questions in this section, the information will allow us to compare groups of respondents. Once again, we assure you that your response will remain anonymous.

Please tick the appropriate box and supply the necessary information.

    1. Gender:

Male	1
Female	2

    2. Level of Education:

Grade 11 or lower (std 9 or lower)	1
Grade 12 (Matric, std 10)	2
Post-Matric Diploma or certificate	3
Baccalaureate Degree(s)	4
Post- Graduate Degree(s)	5

    3. Years of Work Experience:

0 - 5	1
6 - 10	2
11 - 15	3
16 - 20	4
Above 20	5

    4. Job Title:

Technician	1
Engineer	2
Project Manager	3

Business Manager	4
Procurement Specialist	5
Other (please specify)	6

SECTION B: SUSTAINABLE SUPPLY CHAIN

This section aims at determining the extent to which the concept of sustainable supply chain has been integrated and implemented within your company. Please indicate the extent to which you agree with each of the following statements below based on the conditions of your Supply Chain Management (SCM) department. Use the scale below to tick the appropriate number from 1 to 5.

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

No.	Your Supply Chain Management Department………….	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
B.1	Collaborates with the suppliers for environmental Protection goals.	1	2	3	4	5
B.2	Has regular supplier audits.	1	2	3	4	5
B.3	Follow a just-in-time system.	1	2	3	4	5
B.4	Considers if products can be recycled.	1	2	3	4	5
B.5	Uses disposal systems of waste reject metal in the production process.	1	2	3	4	5
B.6	Is quick to correct the amount in the production process.	1	2	3	4	5
B.7	Collaborates with your customer's logistics.	1	2	3	4	5

111

B.8	Collaborates with your customers on reclaiming used products.	1	2	3	4	5
B.9	Your top managers make a commitment to environmental management.	1	2	3	4	5
B.10	Your middle managers give support to environmental management.	1	2	3	4	5
B.11	Has a staff training program	1	2	3	4	5
B.12	Cooperate with legislations	1	2	3	4	5
B.13	Regularly updates policies.	1	2	3	4	5

SECTION C: CHALLENGES RELATED TO SUSTAINABLE SUPPLY CHAIN IMPLEMENTATION

This section aims at identifying the challenges hindering the implementation of sustainable supply chain management in your organisation. To what extent do you agree that the following are challenges within your Supply Chain Department? Kindly tick the appropriate number from 1 to 5.

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

No.	Challenges within your Supply Chain Management Department…	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
C.1	Lack of commitment	1	2	3	4	5
C.2	Lack of communication	1	2	3	4	5
C.3	Lack of knowledge sharing	1	2	3	4	5
C.4	Ineffective monitoring and control system	1	2	3	4	5
C.5	No effective policy and legislation direction	1	2	3	4	5
C.6	High cost associated with the implementation of Sustainable Supply Chain Management	1	2	3	4	5
C.7	Poor Supplier Commitment	1	2	3	4	5
C.8	Lack of Green Practitioners	1	2	3	4	5
C.9	Poor senior management's commitment	1	2	3	4	5
C.10	Lack of recycling activities	1	2	3	4	5

113

C.11	Lack of Political support	1	2	3	4	5
C.12	Lack of managerial practical tools	1	2	3	4	5
C.13	Inadequate individual capacity	1	2	3	4	5

SECTION D: ACHIEVEMENTS RELATED TO SUSTAINABLE SUPPLY CHAIN IMPLEMENTATION

This section aims at identifying the achievements in the implementation of sustainable supply chain management in your organisation. To what extent are the following achievements implemented within your Supply Chain Department? Kindly tick the appropriate number from 1 to 5.

1.	2.	3.	4.	5.
No Extent	Small Extent	Medium Extent	Large Extent	Very Large Extent

No.	Supply Chain Management department…	No Extent	Small Extent	Medium Extent	Large Extent	Very Large Extent
D.1	Requests Your suppliers to use green Packaging	1	2	3	4	5
D.2	Collaborates with the suppliers to use less Packaging materials	1	2	3	4	5
D.3	Recycles or sells by-products in the production process.	1	2	3	4	5
D.4	Uses disposal systems of waste emission in the production process.	1	2	3	4	5
D.5	Collaborates with your customers on Eco design.	1	2	3	4	5
D.6	Collaborates with your customers on clean production	1	2	3	4	5

115

D.7	Collaborates with your customers on green packaging.	1	2	3	4	5
D.8	Complies with related environmental regulations and requirements.	1	2	3	4	5
D.9	Has got PFMA certification	1	2	3	4	5
D.10	Has Total Quality Environmental Management system	1	2	3	4	5
D.11	Has got Finance certification	1	2	3	4	5
D.12	Implements rewards and penalty systems about the environmental performance of your top managers.	1	2	3	4	5

Thank you!