

UNIVERSITY OF KWAZULU-NATAL



**Green sourcing strategy challenges faced by Automotive Component Manufacturers in
Durban, South Africa.**

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A dissertation submitted in fulfillment of the requirements for the degree of

**Master of Commerce
Supply Chain Management**

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DECLARATION

I, **Mbalenhle Nokukhanya Mngadi**, declare that:

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ABSTRACT

There is a growing need to protect the environment mainly because a clean environment is of essence for healthy living. One of the means by which automotive component manufacturers (ACMs) may protect the environment is by implementing green supply chains. Demand for motor vehicles has been intensified by continued increase in the world's overall population. Original equipment manufacturers (OEMs) are producing more vehicles to meet demand and ACMs are in turn required to produce more component parts to meet OEMs' demand. The significance of making sustainable sourcing strategy decisions cannot be overstressed. This is because sourcing is the backbone of any organisation, with its main aim being to procure critical components at the lowest possible cost from consistent and reliable suppliers at the best quality. The adoption of Kraljic's (1983) purchasing portfolio model is presumed to be used as a sourcing strategy. The main aim of this research is to understand how ACMs incorporate green elements in sourcing and to identify drivers and barriers to the implementation of green supply chain.

This cross-sectional study made use of mixed method and data were collected using personally administered questionnaires to purchasing and logistics employees as well as managers in ACMs in Prospecton, Durban. Qualitative and quantitative data was analysed using the Statistical Package for the Social Sciences (SPSS) version 23 and Nvivo 11, respectively. Participation in the study was voluntary and anonymity of participants was maintained.

Green sourcing is not yet a priority to ACMs and those that are practicing it confirmed that greening requirements have influenced sourcing. Kraljic's (1983) model is used extensively by ACMs in Durban and the model is considered crucial when conducting sourcing. Recommendations based on findings include; a thorough understanding of the consequences of the deteriorating environment and contributions ACMs make, ACMs providing trainings and courses to educate employees on green sourcing and its significance, mitigating barriers to implementing green sourcing by involving suppliers, customers and government when conducting sourcing.

Keywords: Kraljic's purchasing portfolio, green supply chain management, green sourcing, automotive component manufacturers.

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ABBREVIATIONS

ACMs	: Automotive Component Manufacturers
ANOVA	: Analysis of Variance
APQP	: Advance Product Quality Planning
EMS	: Environmental Management Systems
GDP	: Gross Domestic Product
GSC	: Green Supply Chain
GSCM	: Green Supply Chain Management
GSCP	: Green Supply Chain Practices
ISO	: International Organization for Standardization
NAACAM	: National Association of Automotive Component and Allied Manufacturers
NAAMSA	: National Association of Automotive Manufacturers of South Africa
OEMs	: Original Equipment Manufacturers
SAAW	: South African Automotive Week
SCM	: Supply Chain Management
SPSS	: Statistical Package for Social Sciences
TSA	: Toyota South Africa

CHAPTER ONE: INTRODUCTION

1.1 Introduction to the study

The automotive industry is believed to be the world's largest single manufacturing sector (Lettice, Wyatt & Evans, 2010). Perhaps it is so because demand for motor vehicles has been intensified by continued increase in the world's overall population (Olugu, Wong & Shaharoun, 2010). Original equipment manufacturers (OEMs) are producing more vehicles to meet demand and automotive component manufacturers (ACMs) are in turn required to produce more component parts to meet OEMs' demand (Haleem, Kumar, Kumar & Luthra, 2011). The significance of making sustainable sourcing strategy decisions cannot be overstressed. This is because sourcing is the backbone of any organisation, with its main aim being to procure critical components at the lowest possible cost from consistent and reliable suppliers at the best quality. The adoption of Kraljic's (1983) purchasing portfolio as well as Fisher's (1997) framework is believed to be used by various organisations as a sourcing strategy (Gelderman & van Weele, 2005). However, there is a lack of literature on precisely how these frameworks are used by automotive component manufacturers in green supply chains, the drivers as well as barriers that are encountered when these frameworks are used. There is absence of greening strategies in these models. Hence, the main aim of this research is to understand how ACMs incorporate green elements in sourcing.

This introductory chapter details the background to the study and presents the problem statement. It also lays out the objectives, aim and the research question and details the study's methodology. This chapter also emphasizes the relevance of the study, theoretical framework, delimitations of the study and definition of key terms. The chapter ends with an outline of this dissertation's incorporated chapters.

1.2 Background of the study

There is a growing need to protect the environment mainly because a clean environment is essential for healthy living (Odonell, 2015; Toke, Gupta & Dandekar, 2010; Swami & Shah,

2013). One of the means by which organisations may protect the environment is by implementing green supply chains. A supply chain can be defined as the sequence of processes and procedures involved in the manufacturing and distribution of goods (Beamon, 1999). Stadtler and Kilger (2005) defined a supply chain as the link by information, material and financial flows between two or more organisations. A green supply chain includes the conventional supply chain practices that incorporate environmental consideration and norms into the firm's purchasing decisions and long-term buyer-supplier relationships (Zhu & Sarkis, 2006). Supply chains can reduce the extent to which the environment is damaged by organisational processes (Darnall, Handfield & Jolley, 2006). These supply chains are governed by what are called environmental management systems that entail how the organisation will go about protecting the environment as well as measure the outcomes (Disterheft, da Silva Caeiro, Ramos & de Miranda Azeiteiro, 2012). As an outcome of environmental damage that supply chains caused, green supply chain management was then developed (Zhu, Sarkis & Lai, 2007).

As early as 1998, Narismhan, Carter and Smeltzer (1998) alluded to procurement's role in green supply chain management that include recycling, substitution of resources, reduction and reuse, in other words, procurement's involvement in green activities. Green supply chain management (GSCM) focuses on environmental considerations which are the key criteria for production of products while simultaneously guaranteeing economic sustainability, profitability and competitiveness (Conding, Zubir, Hashim & Lanang, 2012). According to Diab, Al-Bourini & Abu-Rumman (2015), green supply chain management is more about good business sense that realises higher profits and not merely the act of being environmentally friendly.

GSCM is the way organisations monitor and reduce environmental impacts caused by their supply chain (Godfrey, 1998). It is defined as the integration of environmental thinking into supply chain management (Srivastava, 2007). Sarkis and Rasheed (1995) and King and Lenox (2001) have regarded the green concept as a base for learning diverse organisational practices using both operational and strategic perspectives.

According to Simchi-Levi, Kaminsky and Simchi-Levi (2009), an ultimate sourcing strategy can be derived by combining Fisher's (1997) model which focuses on finished products on the

demand side as well as Kraljic's (1983) purchasing portfolio matrix which focuses on the supply side. Kraljic (1983) argues that an organisation's supply strategy relies on two major aspects namely; profit impact and supply risk. Fisher (1997) proposed that the characteristics of product demand classify the product as either functional or innovative (Kaipia & Holmstrom, 2007) and therefore this model can be used by sourcing managers when making sourcing decisions by categorising products using these two criteria, and then deciding whether to make or buy.

The automobile industry is the world's biggest single manufacturing sector as stated by Lettice, Wyatt and Evans (2010). According to Olugu, Wong and Shaharoun (2010), demand for motor vehicles has been intensified by continued increase in the world's population. Haleem, Kumar, Kumar and Luthra (2011) noted that original equipment manufacturers (OEMs) are consequently producing more and more vehicles to meet demand. Therefore, automotive component manufacturers must in turn manufacture more component parts to fulfill OEMs' demand. A total of 6.2% of South Africa's Gross Domestic Product (GPD) is contributed by the automotive industry and accounts for approximately 14 percent of the country's manufacturing exports (SouthAfrica.info, 2012). It can be deduced that there could be economic benefits (reduced costs, increased profits) if the South African automotive industry is encouraged to go green and could contribute to the achievement of ensuring environmental sustainability of the millennium development goals (Easterly, 2009). This study focuses on the sourcing strategies for components required by OEMs in the automotive industry in Durban, South Africa within the context of green supply chains suggested by Simchi-Levi *et al.* (2009).

1.3 Research problem

For any company to successfully compete in a business environment that is extremely competitive in nature, it must be fully engaged in the manner its customers and suppliers do business (Naude, 2009). Due to increased global competition, companies are required to be more conscious of the sources of their suppliers' materials, how products and services are designed and assembled by the suppliers and lastly how suppliers distribute and store their finished goods (Wisner, Keong & Tan, 2005). For example, Toyota's success in adopting green supply chain management practices and lean production compels its suppliers to be

environmentally conscious and be part of a green supply chain (Wiese, Luke, Heyns & Pisa, 2015).

The significance of making sustainable sourcing strategy decisions cannot be overstressed. This is because sourcing is the backbone of any organisation, with its main aim being to procure critical components at the lowest possible cost from consistent and reliable suppliers at the best quality (Handfield, Monczka, Griunipero & Patterson, 2009). The adoption of Kraljic's (1983) purchasing portfolio as well as Fisher's (1997) framework is believed to be used by various organisations as a sourcing strategy (Gelderman & van Weele, 2005). However, there is a lack of literature that precisely state how these frameworks are used by automotive component manufacturers in green supply chains, the drivers as well as barriers that are encountered when these frameworks are used due to the absence of greening strategies in these models.

The aim of this research is to understand how ACMs incorporate green elements in sourcing, identify drivers and barriers to implementing green sourcing as well as provide means to mitigate barriers.

1.4 Research questions

The research seeks to answer the following research questions:

1. What degree of priority is accorded by ACMs to greening requirements in sourcing?
2. To what extent are models used and/or adapted as a sourcing strategy?
3. How has the adoption of greening requirements influenced sourcing?
4. To what extent has ACMs' requirements, regarding green sourcing influenced their suppliers?
5. How has OEMs' requirements regarding green sourcing influenced ACMs' supply chains?

1.5 Research objectives

The objectives of the study are:

1. To identify the degree of priority accorded by ACMs to greening requirements in sourcing.
2. To determine the extent to which the models are used and/or adapted as a sourcing strategy.
3. To find out how the adoption of greening requirements has influenced sourcing.
4. To provide insight into the extent to which ACMs' requirements regarding green sourcing have influenced their suppliers.
5. To investigate how OEMs' requirements regarding green sourcing have influenced ACMs' supply chains.

1.6 Significance

The need to protect the environment is growing, mainly because a clean environment is essential for healthy living (Odonell, 2015; Toke, Gupta & Dandekar, 2010; Swami & Shah, 2013). The significance of this study stems from the growing need to care for the environment and continuously discover new and improved ways to protect the environment. The main benefit that can be identified through this research is environmental protection by considering green supply chain when making sourcing strategy decisions. The contribution of this research is to find the extent to which ACMs use green sourcing strategies as well as identifying the challenges they encounter and suggest remedies to mitigate those challenges. This will then result in the protection of the environment, which is the main object of implementing green supply chains and reducing costs.

1.7 Rationale

This section aims to answer two questions namely; why the study should be conducted and what will happen if this study is not conducted. The study should be conducted particularly because it will assist ACMs as well as other companies with adding knowledge about GSCM and sourcing strategies as well as the significance of considering greening requirements when making sourcing strategy decisions with regards to environmental protection and cost reduction. The main aim of implementing a green supply chain is to reduce environmental damage when making business decisions (Torres, Nones, Morques & Evgenio, 2004) and incorporating GSC

in sourcing is a means to protect the environment hence the absence of a study of this nature could lead to some ACMs continuing with traditional sourcing strategies and continue to cause severe damage to the environment.

1.8 Theoretical framework

For this research, the theory that can accentuate and better emphasize the importance of sourcing is the theory of core competencies, Kraljic's (1983) portfolio model and Fisher's (1997) model. According to the concept of core competency, sourcing should be centred on the level of criticality of business activity or a particular component to an organisation (Hancox & Hackney, 2000). These frameworks are used to identify the potential to either make goods internally (in-house) or to buy from a supplier. This is determined by the criticality of the products and availability of resources (Mohamed, Abdullah, Othman & Uli, 2009). The idea is for the company to utilise its core skills and resources to produce and deliver the necessary products to customers and outsource the other areas that are not of their expertise (Gottschalk, 2006). This reduces wastages incurred by trial and testing skills and the company focuses on what it does best (Gottschalk, 2006). Time is also saved, and the best end product is produced when a company focuses on its core competencies. By reducing or eradicating activities that bring little or no strategic advantage, the company can enhance the values it delivers to both shareholders and customers (Ang, 1993).

The framework proposed by Fisher (1997) for selecting suitable supply chains entails classifying products as either functional or innovative with concomitant consideration to demand characteristics such as: product life cycle, product variety, demand predictability, servicing requirements and lead time. Functional products are those products that can be purchased from a supermarket whereas innovative products are not always readily available, for example fashion or technology sector products (Kaipia & Holmstrom, 2007).

Kraljic (1983) proposed that a firm's supply strategy is reliant on two major factors namely; supply risk and profit impact. These major factors can be further explained as follows; the first is supply risk which is defined as the complexity of the supply market which the buyer has no

control over. It includes the characteristics of the item, globalisation and natural disasters (Caniels & Gelderman, 2007). The second factor is profit impact which can be simplified as the strategic importance of the product that is supposed to be purchased, in other words how much profit impact it has (Kraljic, 1983). This purchasing portfolio matrix suggests that by making use of the abovementioned parameters, a company can reduce risk to a minimum and maximize profits. Over three decades after its introduction, Kraljic's (1983) purchasing portfolio matrix is one of the most common and appreciated models when deciding on a supply strategy in practice and in literature (Pagell, Wu & Wasserman, 2010).

ACMs can use the theory of core competencies in conjunction with Kraljic (1983) and Fisher's (1997) framework to identify the best option when deciding whether to in-source or outsource while taking into consideration the need for considering green practices when making such decisions.

1.9 Research methodology

This study uses a mixed methods research approach. This was motivated by the research objectives that required both qualitative and quantitative data. The study is both exploratory and descriptive. In this cross-sectional study, data were gathered over a period of months. The study site was Prospecton in Durban. The target population comprised purchasing and logistics employees and management because they were assumed to be well positioned to provide the researcher with the relevant information. Data were collected with the aid of personally administered questionnaires to purchasing and logistics employees (buyers, interns, clerks, material planners, logistics analysts & expeditors) and semi structured face-to-face interviews with managers. Quantitative data were analyzed using SPSS version 23 and qualitative data were thematically analysed using Nvivo 11.

1.10 Delimitations of study

Delimitations of a study include all the aspects of the study that the researcher has control of, including: variables, population, data analysis, methodology and focus of research (Leedy & Ormrod, 2010). The delimitations of this study include the geographical location, industry,

methodology and target population. The study was undertaken in Durban, Prospecton and includes participants from ACMs that granted permission for the study to be undertaken within their organisations. The researcher chose to use questionnaires and interviews because the two were the best suited data collection methods when compared to other methods.

1.11 Ethical protocol

The collection of data was undertaken after ethical clearance was granted by the university research office. A complete research proposal, research instruments as well as written consent from ACMs in Durban authorising participation was presented to the institutional research office to secure ethical approval for the study. The protection of participants' identities was guaranteed by ensuring anonymity. Participants were informed that participation was voluntary and that they could withdraw at any given time without the risk of facing any negative consequences.

1.12 Structure of thesis

The dissertation is structured as follows:

Chapter 1: Introduction

This chapter introduces the purpose and need for the study. The problem statement and limitations as well as the research questions and objectives were presented.

Chapter 2: Literature Review

Chapter Two examines the theoretical construct for the study using previous studies and literature on sourcing strategies, green supply chain management, purchasing portfolio model and the automotive industry focusing on automotive component manufacturers.

Chapter 3: Methodology

Chapter Three identifies and discusses the methodology that was employed for this study. The methodology details the type of study, population, sample size, data collection methods, sampling design and data collection instruments that were used.

Chapter 4: Quantitative data

Chapter Four presents qualitative data, collected through questionnaires and was analysed using SPSS version 23. Descriptive and inferential statistics were used to present the data in the form of charts and tables. The chapter also presents qualitative data results that were obtained during the interview process and were analysed using NVivo11 software.

Chapter 5: Discussion of results

The results that were presented in chapter four and five are discussed and analysed against the objectives of the study.

Chapter 6: Recommendations and Conclusion

This chapter discusses whether research objectives have been answered. Recommendations based on findings were made. The chapter concludes the study.

1.13 Conclusion

The purpose of this chapter was to present the background to and present the research problem, the significance of the study, research objectives as well as provide the structure of the thesis and how data will be collected and analysed. The following chapter presents a thorough review of literature on the topics covered in this study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter discusses the various aspects and variables of the topic using relevant literature found in scholarly works. The conventional supply chain will be discussed with the objective of comparing it with the green supply chain. The green supply chain dimensions as well as sourcing strategies which incorporates Fisher's (1997) and Kraljic's (1983) framework are explicated. Environmental management systems and International Standards Organization (ISO) 14000 will also be discussed.

2.2 The automotive industry

The automobile industry is the world's biggest single manufacturing sector as posited by Lettice, Wyatt and Evans (2010). According to Olugu, Wong and Shaharoun (2010) demand for motor vehicles has been intensified by continued increase in the world's population. Haleem, Kumar, Kumar and Luthra (2011) note that original equipment manufacturers (OEMs) are consequently producing more and more vehicles to meet demand and automotive component manufacturers must in turn manufacture more components to fulfill OEMs' demand. In 2015, the South African automotive industry contributed R256.7 billion or 7% to the country's gross domestic product (GDP) of which 4.4% was contributed by the car manufacturing sector and the rest by retail industry (de Lange, 2017). It is believed that by 2020, the South African car manufacturing industry's contribution to GDP can increase to 8.5% if it produces 900 000 units (de Lange, 2017).

As early as 1995, Amey (1995) argued that the automotive industry had fulfilled and in majority of cases exceeded the apparent incompatibilities with, emission regulations, customer-oriented durability and performance standards. Nunes and Bennett (2010) identified solid waste production, very high water and energy consumption and emissions as serious concerns during vehicle production. Goodyer, Popplewell and Singh (2007) alluded to the increase of scrap materials that are left over and disposed of as one potential environmental impact. Presently,

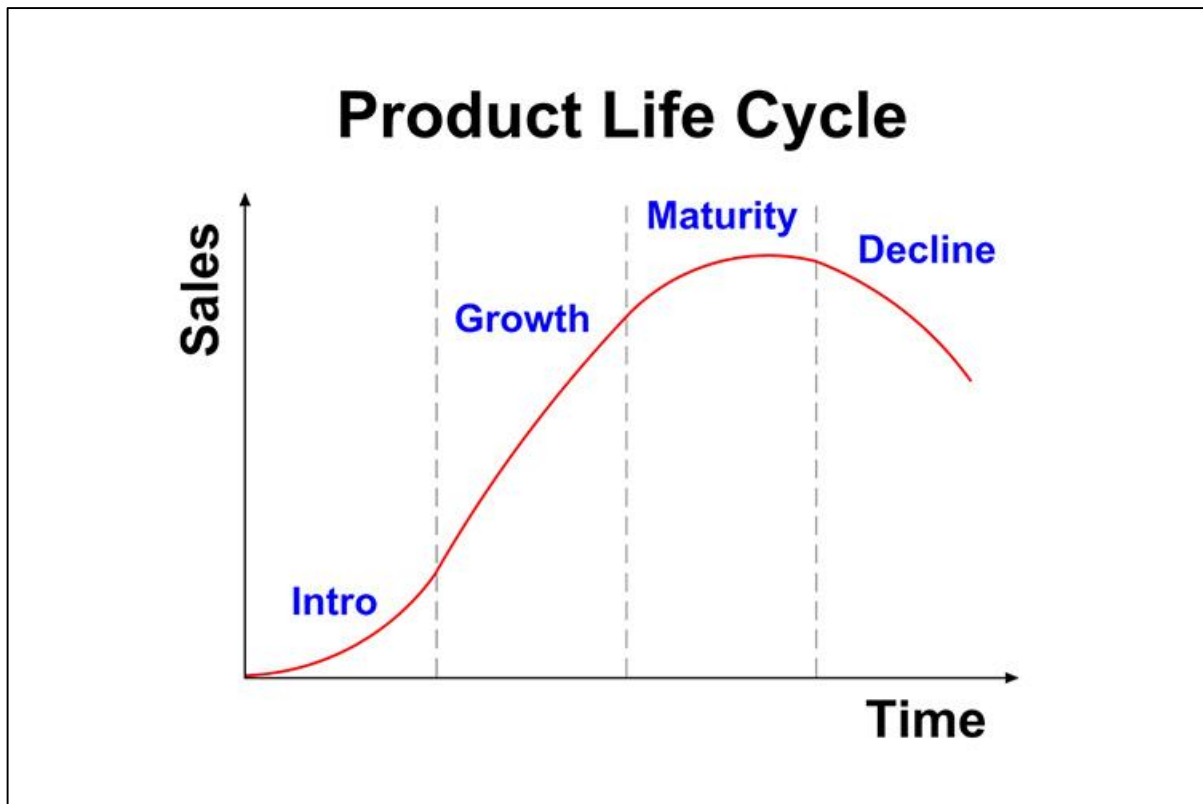
automotive component manufacturers are required to follow certain processes when proposing the designing and manufacturing of new product alternatives that will meet the precise specifications of an OEM (Goodyer *et al.*, 2007). The widely used process to evaluate the design and manufacture of a range of products in an organisation is the Advanced Product Quality Planning (APQP) which is a structured method of establishing and defining all the necessary steps to ensure that a product satisfies customer demands (Goodyer *et al.*, 2007).

Automotive component manufacturers (ACMs) are positioned up-stream in the supply chain, supplying OEMs with products that are component parts, essential to the manufacturing of automobiles (Barnes & Morris, 2008). In 2012, the South African Automotive Week (SAAW) conference took place in East London that focused on the impact of universal green economy on ACMs where opportunities and threats were identified. One of the most critical threats that were identified was the concern of the increasing pace of technological advancement that majority of South African ACMs struggled to sustain (Chibba, 2011). To diminish these threats, manufactures and government should be urged to continuously invest in skills and technology (Chibba, 2011).

For suppliers in the automotive industry to be as profitable as possible, they need to perform in a very challenging, competitive and complex business environment (Gurcaylilar-Yenidogan & Sarvan, 2011). These competitive pressures include costs and high-quality expectations from customers (Blackhurst, Scheibe & Johnson, 2008). Dicken (2011) speculated that automotive suppliers encounter some challenges that affect overall sourcing capabilities and their supply chain. These challenges include the need to be flexible and uncertainty in demand which is caused by fluctuating demand and varying product life cycles (Dicken, 2011).

Product life cycle refers to the diverse phases that a product goes through from introduction right through to withdrawal, in other words the probable pathway a product may take (Aitken, Childerhouse & Towill, 2003). The product life cycle is illustrated in figure 2.1.

Figure 2.1: Product Life Cycle



Source: Adapted from Aitken, Childerhouse and Towill (2003).

Figure 2.1 is a graphical illustration of a typical product life cycle. The horizontal axis represents *time* and the vertical axis represents *sales*. According to Aitken *et al.* (2003), there are four stages of a product life cycle and they include;

- (i) **Introduction:** this is the phase when a product is introduced into the market and in many cases struggles to gain popularity and brand recognition. During this phase, sales are very low and product awareness should be raised through word-of-mouth and advertising;
- (ii) **Growth:** during the growth phase, an increase in sales is noticeable and mass production may be taken advantage of, to reduce production cost and maximise profits;

- (iii) **Maturity:** this is the phase where sales are at their peak, the market has been thoroughly penetrated through advertising, mass production has been taken advantage of and consumers are purchasing the product; and
- (iv) **Decline:** this is the last phase of the product life cycle. At the decline phase, sales start to decline due to over popularity of the product, very little or no improvement of the product, newer and innovative products entering the market that eclipse the product.

Greening requirements may be incorporated throughout the product life cycle. From the introduction right through to the decline stage of a product's life cycle, green supply chain (GSC) may be incorporated in the planning and implementation (Wang & Gupta, 2012). It is important to note that at all stages of a product's life cycle, environmental impacts do occur (Min & Kim, 2012). This is the reason why most products will not be 100 percent green as at some point in their life cycle, they will have an impact on the environment even if it is not a significant impact. A green supply chain is designed with product life cycle considerations (Besbes, Allaoui, Goncalves & Loukil, 2013).

2.3 Supply chain management

As early as 1999, a supply chain was defined as the sequence of processes and procedures involved in the manufacturing and distribution of goods (Beamon, 1999). Stadtler and Kilger (2005) defined supply chain as the link by means of information, material and financial flows between two or more organisations. According to Jacobs, Chase and Lumnus (2014), a supply chain includes planning, sourcing, making, delivering and returning. A supply chain consists of raw materials, finished goods, work-in-progress inventory that flow between facilities as well as manufacturing centres, distribution centres, warehouses, suppliers and retail outlets (Simchi-Levi, Kaminsky, and Simchi-Levi, 2009). Diab, AL-Bourini and Abu-Rumman (2015) defined a supply chain as a system of activities, people, organisations, information and resources involved in producing a product or providing a service from suppliers to customers.

From the above definitions, a supply chain is therefore developed around the flow of money, information and raw materials that converts raw materials from suppliers through the production function to goods and services for customers.

Gopal, Kamauff, Patisc and Tyndall (1998) posit that despite the popularity of the supply chain management (SCM) phrase in academia and in practice, the definition and meaning is still misunderstood. A large majority of supply chain management discussions normally use complicated terminology, consequently reducing management's understanding and perception of the SCM phrase as well as its worth for practical relevance. Supply chain management is defined by Gopal, Kamauff, Patisc and Tyndall (1998) as concerning the flow of materials and products as well as a term of management practice. Christopher (2016) defined SCM as the management of relationships between suppliers and customers from the manufacturing process right through to the end user.

Mentzer, DeWitt, Keebler, Min, Nix, Smith and Zacharia (2001) believe that the definition of supply chain management can be grouped into three groups namely; management philosophies, execution of management philosophies and a collection of management procedures. Wisner, Keong and Tan (2005) defined supply chain management as the combination of activities that are undertaken in a network of facilities that acquire raw materials, convert them into products that can be considered as intermediate or final product depending of the nature of the customer and the purpose of the product. The management of the flow of information, raw materials and activities to transform raw materials into finished goods through factories and warehouses is a supply chain management system (Leenders, Johnson, Flynn & Fearon, 2006).

From the above discussion, the terminology supply chain management can be summarised as the management of the sequence of resources, information and money that converts raw materials from suppliers through the production function to goods and services for customers.

2.4 Green supply chain management

The ecological sustainability concept, which refers to maintaining global ecosystem's ability to sustain human beings and other life (Romeiro, 2012), has been considered by Sarkis and Rasheed (1995) as well as King and Lenox (2001) as a base for learning diverse organisational processes in both operational and strategic contexts. Greening of traditional supply chains has been studied within diverse contexts including process and product design, purchasing, manufacturing practices and a wide combination of these components (Allenby, 1993; Gupta & Piero, 2003). Green supply chain management (GSCM) is defined by Sarkis, Zhu and Lai (2011) as the involvement of relationships, integrations and influence of supply chain management on the natural environment. Kumar, Teichman and Timpernagel (2012) posit that a green supply chain is a requirement for profitability.

Handfield, Walton, Sroufe and Melnyk (2002) summarised GSCM as the integration of green manufacturing, green purchasing, green materials management, green marketing, green distribution and reverse logistics as detailed below:

- (i) **Green manufacturing:** it is reducing pollution and waste by cutting back natural resource use, recycling and reprocess what was considered waste and reducing emissions.
- (ii) **Green purchasing:** The acquisition of products and services that have minimum effect on human health and the environment when set side by side with competing products or services that serve the same purpose.
- (iii) **Green material management:** Focuses on the approach of using and reusing materials more productively over their entire lifecycles. It reflects how society thinks about the use of natural resources and environmental protection.
- (iv) **Green marketing:** The undertaking of selling products and/or services based on their environmental benefits. These products or services might be environmentally friendly or manufactured in an environmentally sustainable fashion.
- (v) **Green distribution:** The transit of goods between trader and buyer with lowest possible impact on the environment. This includes storage order processing and picking, packaging, improved vehicle loadings, and delivery to the consumer.

- (vi) **Green reverse logistics:** Observing the life-cycle of a product after they arrive at the end consumer. This may include how the product could potentially be reused, how it should be properly disposed after use, and any other way where the expired product can create value.

GSCM is the integration of environmental thinking into SCM, incorporating product design, material selection and sourcing, manufacturing process, packaging, storage and delivery of final product to consumers (Srivastava, 2007). GSCM is the way in which innovations in manufacturing purchasing and SCM may be regarded in the environmental framework (Diabat & Govindan, 2011). Narismhan, Carter and Smeltzer (1998) posit that green supply chain management includes procurement's function in association in activities or actions that include reduction, recycling, substitution of resources and reuse. GSCM can thus be summarised as the practice of monitoring and improving environmental consideration in supply chains.

A green supply chain (GSC) includes the traditional SCM practices incorporating environmental consideration and criteria into the company's purchasing decisions and choices and also long-term relationships with suppliers (Fahimnia, Sarkis & Davarzani, 2015). GSCM aims at reducing wastage in the manufacturing process with the aim of conserving energy and preventing the dissipation of dangerous and hazardous substances into the natural environment (Torres, Nones, Morques & Evgenio, 2004). Olugu, Wong and Shaharoun (2010) pointed out that the aim of a GSC is to eradicate or mitigate waste material in the form of hazardous emissions, energy, chemicals and solid waste.

Balancing the environmental and economic performance of a company has become more and more important when it comes to competition (Turner & Houston, 2009). Companies face pressure to continuously improve their supply chains to be a step ahead of their competitors (Lee, 2008). Benchmarking with world class companies is also becoming increasingly common in the manufacturing industry. Benchmarking is defined by Jacobs and Chase (2011) as the act of comparing metrics of one company to that of another. For companies to establish and maintain their environmental image, they must re-examine the main purpose of their business

and success in addressing environmental importance to the company may potentially result in new business opportunities (Turner *et al.*, 2009).

Automotive component manufacturers (ACMs) therefore need to communicate their sustainability goals or environmental performance throughout the entire supply chain to ensure a significant collaborative waste reduction, reduction of costs and more rapid and environmentally friendly technology (Simpson, Power & Samson, 2007).

2.4.1 Green Supply Chain Practices

Companies are facing more pressure to produce greener products and to improve their green supply chains to reduce negative environmental impacts and maximise profits (Lee, 2008). Green supply chain practice (GSCP) is a concept normally used for a range of activities executed by a firm to reduce its impact on the natural environment (Vachon & Klassen, 2007). GSCP definition ranges from green sourcing and green purchasing to integrated supply chains which include the flow of goods and services from suppliers to manufacturers then customers and then reverse logistics (Diab *et al.*, 2015). One can therefore deduce that for any company to become successful, there must be a balance between environmental consideration, economic benefits and social consideration. This concept is defined as the triple-bottom-line (Jacob & Chase, 2011; Elkington, 2013; Paulraj, 2014) and is illustrated in figure 2.2.

Figure 2.2: Triple-bottom-line



Source: Adopted from Jacobs and Chase (2011).

Figure 2.2 is a graphical illustration of the triple-bottom-line that was introduced by John Elkington in 1994. This concept extends the primary focus of companies beyond profits to include environmental and social variables. The main challenge of the triple-bottom-line is measuring environmental and social bottom lines (Jacobs & Chase, 2011).

Green supply chain practices (GSCP) impact on the financial performance of a firm including decreased cost of material purchasing, waste treatment and energy consumption. It also impacts on environmental performance including reduction of water waste, air pollution, reduction of frequency of environmental accidents and solid waste. Lastly, GSCP impacts on a firm's operational performance which includes decreased inventory levels, improved quality of products, increased number of goods delivered on time, reduced scrap rate and improved product line (Zhu, Sarkis & Lai, 2007).

2.4.2 Drivers to implement green supply chain management (GSCM)

According to Lee (2008), there are four fundamental drivers to implement green supply chain in the automotive industry and these include;

- (i) Environmental protection, which is important for health reasons;
- (ii) Customer requirements, customers are demanding more and more environmentally friendly produced products;
- (iii) Government regulations as well as policies are making it a requirement for companies to have green supply chains; and
- (iv) Economic benefits, it is believed that green supply chains reduce costs and in turn maximise profits in the long run.

Some customers and suppliers are imposing green requirements on automotive component manufacturers which puts them under pressure to develop and adopt green sourcing strategies (Lynes & Dredge, 2010). Hence, more and more companies are interested in producing and sourcing greener products. It is only a matter of time before it is one of the top requirements when doing business since it is increasingly important to most companies.

2.4.3 Barriers to implementing GSCM

Companies face various barriers to implementing a green supply chain. While the barriers may be the same to a certain extent, these often differ from one industry to the other (Alkhidir & Zailani, 2009). According to Haleem, Kumar, Kumar and Luthra (2011), the automotive industry faces the following internal and external barriers;

- (i) The first barrier is resistance to technology advancement adoption which simply means the company is not doing adequate advancements in equipment and machinery to improve the products;
- (ii) The second barrier is the lack of information technology (IT) implementation which refers to the non-implementation of IT resources for example the internet and computers as well

as ineffective, improper and slow communication which is caused by the lack of IT implementation;

- (iii) The third barrier is poor quality of human resources which means not recruiting well qualified personnel.
- (iv) The fourth barrier is the lack of organisation encouragement which refers to the act of not giving adequate motivation to employees regarding GSCM;
- (v) The fifth barrier is the lack of government support system which indicates that government is not making adequate policies that are driving companies towards GSCM and having reward programmes, in the form of scoring, in place for those companies that are environmentally friendly;
- (vi) The sixth barrier is supplier reluctance to change;
- (vii) The seventh barrier is market competition and high uncertainty which is caused by global competitiveness and varying customer demands and requirements; and
- (viii) The eighth barrier is customers' lack of awareness of the benefits of green products.

The above barriers may hinder some ACMs to implement green supply chains and action should be taken to reduce these barriers. Trainings for example should be made available to educate employees about green supply chain, the benefits and how to adopt new strategies that are in line with green supply chain (Haleem *et al.*, 2011).

2.5 Environmental legislative framework

There are two main legislative frameworks that guide ACMs regarding waste minimisation and the impact of their organisations on the environment. These legislations are; National Environmental Management Laws Amendment Act 25 of 2014 and the Hazardous Substances Act 15 of 1973. The two are summarised below.

2.5.1 National Environmental Management Laws Amendment Act 25 of 2014

The main purpose of the National Environmental Management Laws Amendment Act is to develop laws that control and regulate the management of waste to ensure that both the environment and health are protected by means of providing logical measures for the reduction

and prevention of pollution as well as ecological degradation. The act also provides institutional arrangements, specifies waste management measures, remedies for contaminated land as well providing for enforcement and compliance (Government Gazette, 2014).

The National Environmental Management Act may be used by ACMs in conjunction with ISO 14001 and environmental management systems to manage and reduce environmental damage.

2.5.2 Hazardous Substances Act 15 of 1973

The purpose of the Hazardous Substances Act is 15 of 1973 is to provide for the control of substances which may cause ill-health, injury or death of human beings because of the substance's corrosive, toxic, irritant or flammable nature. This Act also groups substances according to the degree of danger. The Act provides for the control and prohibition of manufacture, importation, sale modification, use and disposal of hazardous substances (Government Gazette, 2014).

ACMs can find this act beneficial in ensuring that hazardous waste is properly disposed of and hazardous substances are stored in a manner that protects both the environment and people.

2.6 Environmental management systems

A green supply chain cannot be discussed in isolation. Environmental management systems are of fundamental importance when focusing on the topic of green supply chain. Strategic management approaches that summarise how a firm's natural environmental impacts will be attended to are referred to by Darnall, Handfield and Jolley (2006) as environmental management systems. According to Conglianese and Nash (2001), an environmental management system (EMS) involves a group of internal policies, implementation plan, evaluations and plans that affect the entire organisation and its dealings with the natural environment. It is important that ACMs not only implement environmental management systems but also evaluate and monitor the effectiveness and potential improvement opportunities according to the EMS.

2.6.1 ISO 14000

ISO 14000 was published in 1996 and it established a model for companies to implement environmental management systems (Viadiu, Fa & Saizarbitoria, 2006). The systems can form part of a company's global management which comprises the planning, organisational structure, activities, practices and procedures, responsibilities, required resources and review and maintenance of the environmental policy (Viadiu *et al.*, 2006). ISO 14000 aims to simplify business-to-business operations as well as to facilitate global exchange of services and goods (Pan, 2003). According to Brunsson and Jacobsson (2000), ISO 14000 has spread globally and regardless of the fact that adoption of the standard is not mandatory, many organisations have adopted the standard.

The International Organization for Standards (ISO) assumed the ISO 14 000 series as its international requirement and specification standard for environmental management systems, with the following objectives (Abraham, Crawford, Carter & Mazotta, 2000; Russo, 2009):

- (i) To encourage a common international approach to environmental management;
- (ii) To fortify companies' capabilities to improve and evaluate environmental performance by means of continual system audits; and
- (iii) To improve international trade and remove trade barriers.

The ISO 14000 series certification consists of five fundamental components and is predetermined as follows (International Organization for Standardization, 1996):

- (i) ISO 14001 specifies minimum requirements for attaining ISO 14000 certification;
- (ii) ISO 14004 sets out a course of action for developing an environmental management system (EMS);
- (iii) ISO 14010 establishes the broad-spectrum of principles for environmental auditing;
- (iv) ISO 14011 establishes auditing measures and procedures for the auditing of environmental management systems; and
- (v) ISO 14012 establishes the qualification criteria for environmental auditors.

There are primary requirements that a firm is required to meet to be ISO 14000 accredited. These requirements are summarised below (Russo, 2009; Sarkis *et al.*, 1995).

- (i) An advance environmental impact investigation of all recent activities, processes and products;
- (ii) A continuous environmental impact evaluation of current activities, process and products;
- (iii) Standards and goals that consist of guidelines and policies for waste minimisation and pollution prevention that are clearly defined for and constantly improved at each organisational level;
- (iv) Monitoring procedures and numerical targets for every identified objective;
- (v) Procedures to be followed in the occasion of non-compliance with established environmental policies and in cases of accidental discharge; and
- (vi) Procedures to certify that contractors and suppliers that are functioning within or associated with organisational facilities apply established environmental standards that are equal to organisational standards.

2.6.2 ISO 14001

According to Bansal and Hunter (2003), ISO 14001 is the international standards for EMS and is regarded as the most important standard within the 14000 series. The standard is aimed to ensure that the environmental policy is carried out but does not specify any emissions or actions targets for firms to be certified (Pan, 2003).

An EMS is a collection of processes that oblige companies to identify, measure and manage their environmental impacts (Clemens & Douglas, 2006). However, with no external certification, it would be simple for companies to confirm that they had executed an EMS but not necessarily follow through on those activities and actions which is the main reason why companies oblige their suppliers to adopt ISO 14001 management systems (Morrow & Rondinelli, 2002). ISO 14001 plays a role in such instances (Conglianese & Nash, 2001).

Bansal and Hunter (2003) added that the six steps that companies must follow to be considered ISO 14001 compliant include;

- (i) The development of an environmental policy;
- (ii) The recognition of the firm's products, services and activities that interact directly with the environment;
- (iii) Detection of legislative/ regulatory requirements;
- (iv) Recognition of the company's set intentions and objectives for reducing its environmental impacts and its priorities;
- (v) Amending the company's organisational structure; and
- (vi) Arrangement to attain the objectives and to rectify and verify the EMS.

ISO 14001 is directed by three main principles that contribute to its flexibility namely; pollution prevention, voluntary participation and continuous improvement (Lamprecht, 1997; Starkey, 1998).

It can be gathered that ISO 14001 cannot be separated from green supply chains. It is considered a fundamental set of standards that companies are required to adhere to when they are environmentally conscious. ISO 14001 goes into detail about how companies can ensure that their supply chains are green and gives guidelines and policies for waste minimisation and pollution, for example.

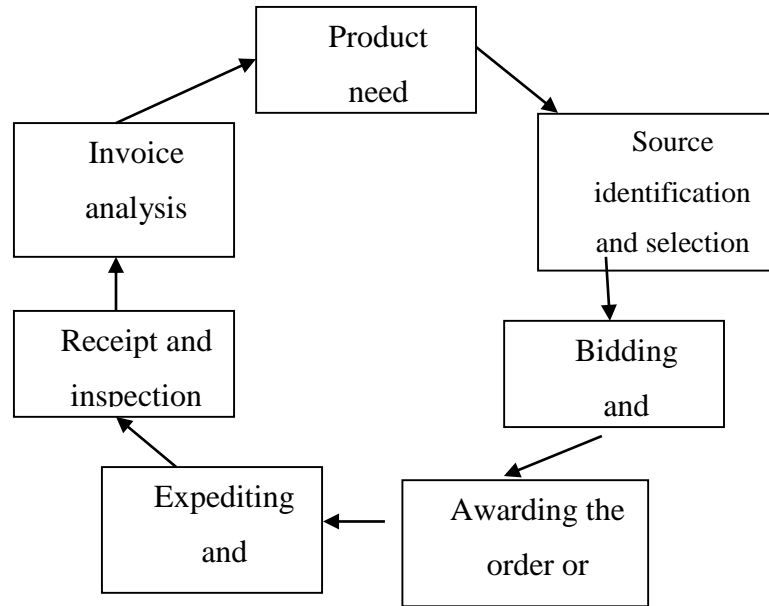
2.7 Sourcing

Supplier networks have become the ultimate lifeline for several companies in today's complex and risky worldwide business setting (Houston, Schwarting, Spieker & Turner, 2008). The sourcing function is no longer considered a back-office function responsible for merely negotiating contracts but is now a major contributor to the overall competitiveness and strategic goals of companies (Houston *et al.*, 2008). Sourcing practitioners are responsible for many activities in the procurement process including; maximising supply chain efficiency, building operational resilience, collaborating with suppliers and enhancing marketing effectiveness (Dutzler, Liberoth, Schwarting & Spieker, 2008). In most companies, the purchasing department consumes about half of the annual operational budget (Houston *et al.*, 2008). ACMS need to manage their sourcing very well to overcome sourcing challenges and gain a competitive edge (Dutzler *et al.*, 2008).

The sourcing cycle consists of a series of consecutive procedures (Leenders *et al.*, 2006).

Figure 2.3 is a presentation of the six basic steps in the sourcing cycle.

Figure 2.3: Steps in the sourcing cycle.



Source: Adapted from Hugo and Bardenhorst-Weiss (2011).

According to Monczka, Handfield, Giunipero and Patterson (2016) and Bardenhorst-Weiss, Cilliers, Dlamini and Ambe (2017), the six basic steps in the sourcing cycle include;

- (i) **Step 1:** Product identification and specification. Certain departments within an organisation may require specific goods, services or parts. This then causes or raises a need for them to be part of the inventory. It is therefore imperative that the purchasing orders are done timorously to avoid urgent last-minute orders. The description and requirements of the products/ services needs to be communicated clearly with one of the following documents: purchasing requisitions, material lists and kanbans. This will help them avoid unnecessary delays.
- (ii) **Step 2:** Source identification and selection. New advancements in technology such as e-sourcing, electronic data interchange and electronic catalogues are beneficial in assisting

the company to identify potential suppliers for specific products/services. Specialised and custom-made products require more effort to source particularly in South Africa. Selecting suppliers especially for non-standard products requires effort and expertise. Standard products are often sourced through recommendations from the relevant department, but the non-standard and larger quantity services/products, supply management should intervene as they are more experienced and knowledgeable.

- (iii) **Step 3:** Bidding and negotiation. Management is usually part of the process when it comes to bidding, to make it transparent and documented. Technology has now been included in the process to make it less time consuming. In the private sector, some companies have included a negotiation phase after the bidding procedure has been finalised. Although frowned upon, it is justifiable should it have been clearly stated in the documents beforehand.
- (iv) **Step 4:** Placing the order/awarding the contract. When it comes to issuing the final order for supply, it is imperative that it be concluded by the purchasing function as it is legally binding. Because of this, it should include all necessary details, such as quantity, discounts, delivery dates and pricing. The basic requirement of the purchase order is that it should include all required information to avoid misrepresentation for all concerned. Once the contract has been concluded, purchasing and supply must then include finance and the legal team to get technical assistance and expertise. It can also be included in the process as it can reduce the cycle time.
- (v) **Step 5:** Expediting and contract administration. A task team is usually responsible for expediting the orders, and again using technology reduces the administrative burden greatly. Follow ups are often necessary and the task team is responsible for reminding and assisting with any problems that may arise. Expedition is particularly important for international orders, but is not recommended, for cost reasons, unless when it is absolutely necessary.
- (vi) **Step 6:** Receipt and inspection. The task team is responsible for receiving and doing a basic inspection on packaging and quantity. Should packaging be severely damaged, acceptance should be refused, or the supplier can be called in to do a thorough inspection. This may unfortunately cause disappointment and hostility; task team should therefore include the purchasing crew.

(vii) **Step 7:** Closing the order. Having the closing order analysed by the financial department or the purchasing team is the first step. Ideally, it should be undertaken by the purchasing team as they are familiar with the supplier and process. The finance department will then receive all the invoices, quotations receiving notes etc. Once payment has been approved, it is then processed, and details of the transactions are then filed for future references. For future purchases, some steps of the cycle may be bypassed should the department be using an old supplier. With that in mind, it is important to emphasize that all seven steps are elementary to the whole task.

A company's value can be increased by using a sourcing strategy. This can be achieved using a sourcing strategy to obtain lower prices, negotiating better terms and conditions as well as favourable warranties (Hugo *et al.*, 2011).

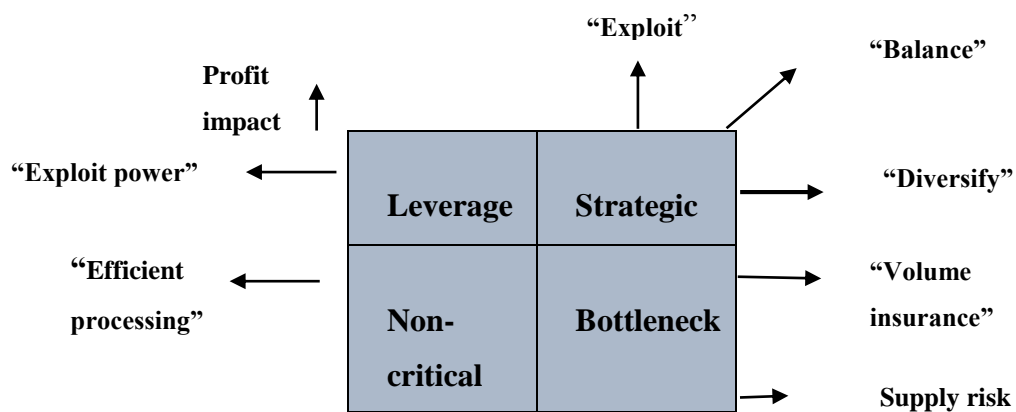
For this study, the two main sourcing models that will be discussed are the following: Peter Kraljic's purchasing portfolio model that was introduced in the 1980s as well as Marshall Fisher's (1997) model. The reason for choosing these two models is based on grounds that Kraljic's (1983) framework has been classified as the foundation upon which all other purchasing portfolio models are drawn upon (Gelderman & van Weele, 2005) and Fisher's (1997) model assists in categorising products according to their nature, namely functional and innovative (Fisher, 1997).

2.7.1 Kraljic's Framework

Kraljic's framework was introduced in 1983 and is one of the most well-known purchasing portfolio models (Gelderman & van Weele, 2005). Kraljic (1983) proposed that a firm's supply strategy is reliant on two major factors namely; supply risk and profit impact. These major factors can be further explained as follows; the first is supply risk which is defined as the complexity of the supply market which the buyer has no control over. It includes the characteristics of the item, globalisation and natural disasters (Caniels & Gelderman, 2007). The second is profit impact which can be simplified as the strategic importance of the product that is supposed to be purchased in other words how much profit impact it has (Kraljic, 1983).

This purchasing portfolio matrix suggests that by using the above-mentioned parameters, a company can reduce risk to a minimum and maximize profits. Over three decades after its introduction, Kraljic's (1983) purchasing portfolio matrix is one of the most common and appreciated models when deciding on a supply strategy in practice and in literature (Pagell, Wu & Wasserman, 2010). This framework is illustrated in figure 2.4.

Figure 2.4: Product categories and purchasing strategies



Source: Adapted from Kraljic (1983)

Figure 2.4 is a graphical illustration of Kraljic's (1983) 2 x 2 purchasing portfolio matrix with supply risk on the horizontal axis and profit impact on the vertical axis. The four different product categories will be expanded on.

There are four quadrants in the Kraljic (1983) matrix which identify the type of product a company may purchase. In the top left quadrant of the matrix are the leverage items that have a low supply complexity and a high profit impact such as heating oil and electronic motors (Ambe & Badenhorst-Weiss, 2011). Since the supply complexity is low, purchasing power can be exploited by the focal company as an aim to reduce purchasing costs and short- medium term contracts are usually advisable with suppliers. The buying company can exploit full purchasing power with leverage items by means of negotiations, product substitution and target pricing (Gelderman & Donald, 2008). The buying company may engage in more negotiations with the

supplier for better prices and terms of contracts, they may also find cheaper, easily accessible substitutes for products and target pricing (Badenhorst-Weiss *et al.*, 2017).

In the top right quadrant are the strategic items that have a high profit impact and high supply risk. In most instances strategic items are scarce, have a high value and have a single or very few suppliers hence strategic planning and long-term relationships with suppliers are crucial for strategic items to counterbalance the supply risk (Gelderman & Donald, 2008). Decisions regarding these items are made by top purchasing managers (Kraljic, 1983) and very strong relationships with the supplier are required. Demand forecasting must be accurate, inventory and logistics control is required to safeguard supply (Simchi-Levi *et al.*, 2009). Mutual commitment and trust that is associated with a strong relationship is likely to result in a reduction of the supply risk (Gelderman & van Weele, 2005).

Non-critical items are in the bottom left quadrant, have a low profit impact and a low supply risk. Non-critical items are usually those items that have a lot of suppliers and plenty of alternatives and choices hence, relationships with suppliers are usually on a short-term basis (Kraljic, 1983). It can be concluded that sourcing strategies for these items are less complex when compared to other items in the matrix. An efficient supply chain is used for these items (Kraljic, 1983; Gelderman & van Weele, 2005).

In the bottom right quadrant are bottleneck items that have high supply risk and a small profit impact but tend to be the most ignored and underestimated items (Kraljic, 1983). Bottleneck items have limited supply caused by competition on the buyer market. Risk of shortage may be experienced due to many potential buyers wanting these items. Supply delays, interruptions and disturbances may be suffered by bottleneck items and may in turn cause delays in the entire production line or projects (Sanderson, Waltson & Robinson, 2018). Long-term contracts are required for bottleneck items to safeguard supply (Caniels & Gelderman, 2007).

Gathering from past studies (Elliott-Shircore & Steele 1985; Olsen & Ellram 1997; Lilliecreutz & Ydreskog 1999; van Weele 2000) done on Kraljic's (1983) purchasing portfolio model, it can be concluded that it is the foundation upon which sourcing strategies are built. In short,

profit impact and supply risk are major factors that are considered by sourcing practitioners when making sourcing decisions.

Various purchasing portfolio models (supply strategy square, procurement positioning overview, classification model, purchasing portfolio and portfolio model) have been introduced by other academics (Elliot-Shircore & Steele, 1985; Hadelar & Evans, 1994; Lilliecreutz & Ydreskog, 1999; Olsen & Ellran, 1997; van Weele, 2000) all originating from the Kraljic (1983) matrix which is regarded as the foundation of portfolio models (Gelderman & van Weele, 2005).

The general thought of the Kraljic (1983) model is to make the most of potential buying power and reduce supply vulnerability (Kraljic, 1983).

The four-stage approach to developing supply strategies as proposed by Kraljic (1983) comprises:

- (i) Classification: entails the classification of profit according to the volumes purchased, product quality, impact on business growth, risk in terms of supply, number of suppliers, demand, storage, substitutes and make or by decisions;
- (ii) Market analysis: entails the weighing of supplier power against the organisation's own strength as a customer measured against the accessibility, quality and quantity of strategic materials (those with high profit impact and high supply risk) and the organisations requirements and aptitude to attain the terms of supply;
- (iii) Strategic positioning: entails the plotting of the organisation's buying strength against supply strength on a purchasing portfolio matrix wherein vulnerabilities, opportunities and risks can be identified to enable the development of strategic thrust and counterstrategies; and
- (iv) Action plan: entails considering various supply scenarios and acting to secure long-term supply and exploit short-term opportunities.

Kraljic's (1983) purchasing portfolio matrix can be presumed as the foundation upon which all other portfolio models are built and derived and the general idea of the Kraljic (1983) model is to make the most of potential buying power and reduce supply vulnerability (Kraljic, 1983).

Green sourcing considers environmental consideration an important factor in the sourcing process and not only the profit impact (van Hoven, 2009). The adoption of greening requirements has influenced sourcing in the sense that it has now been considered a priority in sourcing (Turner & Houston, 2009). It can be speculated that the extent to which greening requirements have influenced sourcing as well as the priority which is accorded by ACMS to green requirements varies from company to company and this study aims to discover the accuracy of this speculation.

ACMs need to ensure that they supply component parts at the lowest possible cost while maintaining good quality to remain competitive in today's economy (Thun & Hoenig, 2011). Similarly, they need to ensure that their own suppliers supply them with products of the desired quality and price.

2.7.2 Fisher's Framework

The framework proposed by Fisher (1997) for selecting suitable supply chains entails classifying products as either functional or innovative with concomitant consideration to demand characteristics such as; product life cycle, product variety, demand predictability, servicing requirements and lead time. Functional products are those products that can be purchased from a supermarket whereas innovative products are not always readily available, for example fashion or technology sector products (Kaipia & Holmstrom, 2007).

Supply chains as well as sourcing strategies vary for different types of products which include functional products which require a supply chain that is centred on delivering products to customers at the lowest possible cost and the entire supply chain is aimed to achieve effective low-cost results throughout the supplier selection process, product design and usage of capacity (Kaipia & Holmstrom, 2007). The supply chain for innovative products is one that is market responsive, where speed is of utmost importance and flexibility is required from both

manufacturers and suppliers (Lee, 2002). Innovative products have a high demand uncertainty and a fast technology clockspeed, which is defined as the speed by which technology changes in a particular industry (Simchi-Levi *et al.*, 2009).

Fisher's (1997) model may be used by ACMS to determine whether a product is either functional or innovative. Kraljic's (1983) matrix may then be used to determine where in the four quadrants an item lies and then decide on the sourcing strategy for that particular product. While a sourcing strategy can be derived by combining Fisher's (1997) and Kraljic's (1983) framework which, for example, consider component forecast accuracy, supply risk, profit impact and technology clockspeed (Simchi-Levi *et al.*, 2009), no specific reference is made to greening as a strategic element.

After careful consideration of Kraljic's (1983) purchasing portfolio matrix which states that a sourcing strategy is reliant on two major factors namely, profit impact and supply risk, a green sourcing strategy has a third factor which is environmental consideration.

2.7.3 Green sourcing

Many organisations are being obligated to 'go green' by their customers, shareholders and supply chain partners (Zhu, Sarkis & Geng, 2005). This has put them under pressure to implement a green supply chain and Bobis and Staniszewski (2009) posit that the best starting point for initiating green initiatives is sourcing and procurement. For green initiatives to be successful and attractive to organisations, they need to maintain or increase economic benefits for the company as well as benefit the customer (Mangla, Kumar & Barua, 2015).

The procurement function is ideally positioned to bear influence in almost all activities in the organisation and is considered a powerful control point for starting green initiatives (Bobis & Staniszwki, 2009). Collaborating with senior leaders in various departments and functions and sourcing managers can facilitate a successful strategy for the reduction of environmental impact while reducing costs and building and improving buyer-supplier relationships (Turner & Houston, 2009).

Unlike the sourcing department, green sourcing is not a department but rather an intensification of sourcing. Traditional sourcing measures the value of each material, supplier or service by means of either the economic benefit or the impact on the customer (Turner & Houston, 2009). Green sourcing on the other hand also starts with both the economic benefit and meeting customer requirements but simultaneously takes environmental impact into consideration for example, transportation, energy source, materials and packaging (Bobis & Staniszewski, 2009).

Before ACMs can attempt a green sourcing initiative, it is essential that they have a well-structured sourcing programme in place and an even deeper insight is required for green sourcing compared to traditional sourcing programmes (Turner & Houston, 2009). This is because the choice between environmentally friendly services and products can be particularly complex, which then raises the need for a network of suppliers that can guarantee provision of transparency where necessary (Turner & Houston, 2009).

One of the main objectives of traditional sourcing is to reduce costs (van Hoven, 2009). Green sourcing also aims to reduce costs in the form of waste while maintaining good quality products and services (Kumar *et al.*, 2015). It is imperative for ACMs' sourcing strategies to be structured and administered in such a way that the environment is considered, costs are reduced and quality is maintained or improved.

Supplier selection and buyer-supplier-relationships are important factors when focusing on the topic of green sourcing (Hill, Eckerd, Wilson & Greer, 2009). Supplier selection is the process by which a company identifies, evaluates and contracts a supplier (Beil, 2009). The process usually uses a large portion of a firm's financial resources and in return the firm benefits from being supplied with goods and services by suppliers offering high value (Beil, 2009). This is because sourcing involves suppliers and customers. Both customers and suppliers may impose green requirements on ACMs and contractual agreements are made. It is possible that some ACMs may not form relationships with suppliers that are not green supply chain compliant and similarly some customers may not purchase products that are not green.

2.8 Make or buy

Sourcing decisions are made around finding out whether a firm is capable and competent enough to produce a product, perform operations fully, should it obtain the required resources or form partnerships with competent suppliers as an aim to outperform their competition (Klein, 2005). Many firms have put greater emphasis on their sourcing practices to improve their operations (Duarte & Machado, 2011). It can thus be gathered that the make-or-buy decision in the manufacturing industry has become one of the key issues of sourcing strategies.

The ‘buy’ strategy which is also referred to as outsourcing is the act of moving some of the firm’s decision responsibilities and internal activities to capable outside providers that have the desired expertise to effectively perform the required task (Mohamed, Abdullah, Othman & Uli, 2009). Outsourcing can enable firms to take advantage of economies of scope and scale, quality, cost reduction, delivery and service improvement and organisational focus (Agerfalk & Fitzgerald, 2008). Benefits of outsourcing include cost advantages, elimination of infrastructural and technology costs, focus on core competency as well as increased efficiency. One of the major disadvantages of outsourcing is the potential risk of losing confidential and sensitive information (Simchi-Levi *et al.*, 2009; Badenhorst-Weiss *et al.*, 2017).

The ‘make’ strategy also known as in-sourcing is the act of retaining various activities and decisions of the firm when the firm feels it can perform it better than outside providers (Capron & Mitchell, 2004). In most cases, firms choose to make rather than to buy when they feel it is their area of core competency hence can perform better at it (Capron & Mitchel, 2004). The advantage of in-sourcing is the alimentionation of losing confidential and sensitive information to external providers and the major disadvantage is the cost incurred from specialised infrastructural technology and personnel (Mohamed *et al.*, 2009).

Firms face trade-offs when deciding whether to make or buy. In some cases, firms choose to form long term strategic sourcing partnerships to work together with outside providers for mutual benefits (Gottschalk, 2006).

It can thus be gathered from the afore-mentioned information that when it comes to sourcing, there will always be trade-offs and ACMs need to make the best decision in terms of quality, environmental consideration, financial gain as well as reliable supply of goods. ACMs need to carefully compare the benefits and drawbacks when deciding whether to make or buy as this could cost them dearly. For ACMs to maintain competitiveness, they are required to make judgment on the various trade-off present, identify available alternatives and make a decision which balances the long and short term requirements of the company. An ultimate green sourcing strategy would be one that attempts to manage trade-offs in a manner that the objectives of the company are not compromised.

2.9 Theory of core competencies

For this research, the theory that can accentuate and better emphasize the importance of sourcing is the theory of core competencies. This is because sourcing practitioners decide whether to make or buy and the company's core competency is a major contributor in the sourcing decision making process (Gottschalk, 2006). According to the concept of core competency, sourcing should be centred on the level of criticality of business activity or a particular component to an organisation (Hancox & Hackney, 2000). ACMs need to identify core strengths and aim to focus on those strengths and potentially outsource other activities.

Kraljic (1983) and Fisher's (1997) frameworks are used in this process to identify the potential to make commodities in house or to buy from a supplier. This is determined by the criticality of the products and availability of resources (Mohamed *et al.*, 2009). The idea is for the company to utilise its core skills and resources to produce and deliver the necessary products to customers and outsource the other areas that are not of their expertise (Gottschalk, 2006). This reduces wastages incurred by trial and testing skills and the company focuses on what it does best (Gottschalk, 2006). It can be deduced that time is also saved, and the best end-product is produced when a company focuses on its core competencies. By reducing or eradicating activities that bring little or no strategic advantage, the company can enhance the values it delivers to both shareholders and customers (Ang, 1993).

Studies on the automotive industry usually focus on the final product or development in the manufacturing practice or the lack thereof (Amey, 1995). A similar study about green sourcing strategies has not been conducted. However, there are various studies on sourcing strategies and very little on green sourcing. Green sourcing can be considered as a major role player in a green supply chain and more studies of this nature should be conducted to ensure that more companies from all industries take full advantage of green sourcing and solutions to drawbacks to implement green sourcing are identified.

2.10 Conclusion

The automotive industry is one of the industries that have a very complex and competitive supply chain. To ensure a sound supply chain, an efficient sourcing strategy is of essence. With the shift from traditional supply chains to environmentally conscious supply chains, the automotive industry is required to conduct sourcing in a manner that environmental damage is significantly reduced. There are various sourcing strategies that ACMs may use and for the purpose of this study Kraljic's (1983) purchasing portfolio model and Fisher's (1997) model were discussed to identify the drivers behind choosing a particular sourcing model. ACMs are faced with many trade-offs and challenges with regards to deciding whether to in-source or outsource activities to focus on their area of core competency. Adding to that, ACMs are also being obligated by their customers and government regulations to implement green supply chains and hence green sourcing. The need to protect the environment is an area that concerns each individual and precautionary measures to protect the environment must be continuously improved. The next chapter which is Chapter Three will discuss the research methodology and give details on various research instruments that the study used and how the data were analysed.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

To develop and advance knowledge on a particular subject, research is conducted. The development of research uses certain methods which vary according to the nature of the study to ensure reliability and validity. It is important for a researcher to ensure that a study is both reliable and valid and can achieve this by using the most appropriate methodology and data analysis approach.

The purpose of this chapter is to describe the several methodological aspects, approaches and techniques that were used in the study which include; sampling design and techniques, data collection methods, target population and sample, measuring instruments, data analysis and ethical consideration.

3.2 Aim and rationale

The aim of this study was to understand how ACMS incorporate green elements in sourcing, identify drivers and barriers to implementing green sourcing and to as provide means to mitigate barriers.

The objectives of the study were:

1. To identify the degree of priority accorded by ACMS to greening requirements in sourcing.
2. To determine the extent to which Kraljic (1983) and Fisher's (1997) models are used and/or adapted as a sourcing strategy.
3. To find out how the adoption of greening requirements has influenced sourcing.
4. To provide insight into the extent to which ACMS requirements regarding green sourcing have influenced their suppliers.
5. To investigate how OEMs' requirements regarding green sourcing have influenced ACMS supply chains.

The study should be conducted particularly because it will assist ACMs as well as other companies with adding knowledge about green supply chain management (GSCM) and sourcing strategies as well as the significance of considering greening requirements when making sourcing strategy decisions with regards to environmental protection and cost reduction. The main aim of implementing a green supply chain is to reduce environmental damage when making business decisions (Torres, Nones, Morques & Evgenio, 2004). Incorporating green supply chain (GSC) in sourcing is a means to protect the environment hence the absence of a study of this nature could lead to some ACMs continuing with traditional sourcing strategies and continue to cause severe damage to the environment.

3.3 Research paradigm

Research paradigm is thought to be a set of habitual agreements and beliefs shared amongst scientists pertaining certain challenges and how they should be understood and addressed (Kuhn, 1970). Morgan (2007) stated that the research paradigm can be seen as the researcher's objective eye with which they observe the world. According to Teddie and Tashakkor (2009), research paradigms can be identified through their:

- (i) Ontology: what is real?
- (ii) Epistemology: how are you informed of something?
- (iii) Methodology: how do you research it?

According to Patel (2015), the three most important paradigms are;

- (i) Positivists: who believe only one reality exists, which can be quantified and therefore use quantitative methods to measure this actuality;
- (ii) Constructivists: who are under the impression that more than one reality exists and can therefore be interpreted. They use qualitative methods for the various realities; and
- (iii) Pragmatists: are of the belief that reality needs to be re-evaluated, renegotiated and for them the best method is one that solves the challenge.

Pragmatism has gained enormous support as an attitude for diverse methods solving actual challenges in the real world instead of assuming the nature of knowledge and is considered best

suitable for mixed methods (Morgan, 2007). This study adopts a pragmatist epistemological approach.

3.4 Research design

There are three main research approaches, namely; qualitative, quantitative and mixed methods. Quantitative studies are undertaken when a researcher primarily makes use of positivist claims to develop knowledge and utilise surveys and experiments and data is collected on predetermined instruments that yield data that can be statistically analysed (Tuli, 2010). Qualitative studies are undertaken when the researcher makes use of mainly case studies, open-ended questionnaires and interviews and the data is intended to develop themes (Cresswell, 2003). A mixed method is a combination of both quantitative and qualitative approaches. Mixed methods can be advantageous in the sense that it takes advantage of the benefits of both quantitative and qualitative approaches (Terrell, 2011).

For this study, mixed methods were used. Interviews which were qualitatively analysed were scheduled for management only and questionnaires which were quantitatively analysed were distributed to purchasing and logistics employees. Interviews were chosen for management because they are the ones that are usually best positioned to provide deeper levels of information about a particular subject matter and for this study, management was considered to be best equipped to go into detail about their sourcing strategies and the various challenges they may face.

This study was exploratory and descriptive in nature. Exploratory studies are undertaken when little is known regarding the area to be investigated or when there is no existing data available on past research specifying how related research problems were resolved (Sekaran & Bougie, 2010). On the other hand, descriptive studies are carried out to establish and better illustrate the characteristics of the variables in a research situation (Saunders, Lewis & Thornhill, 2009).

The initial stage of this research was exploratory since little information was known about the situation and the next stage of this study was descriptive where questionnaires were distributed

to the target population and interviews were undertaken to better understand and gather adequate information to answer the research questions.

This research study was cross-sectional meaning that the data were gathered just once over a period of two months.

3.5 Triangulation

Triangulation is defined by Denzin (2012) as a reflection of an effort to secure an in-depth understanding of the phenomena in question by means of collecting, analysing and comparing both qualitative and quantitative empirical data in one study or a series of studies. It is believed that the use of a combination of multiple methods in a single study is a strategy that adds richness, depth and rigour to an inquiry (Denzin, 2012). There are several disadvantages of triangulation and these include: larger budget as it may cost more to collect and analyse data using more than one method, collecting and analysing multiple methods data may be time consuming and there could be a likelihood of conflicting results from multiple methods (Hammersley, 2008). Triangulation was used in the study for the purpose of providing a complete picture rather than to test reliability.

3.6 Study site

This study was conducted in the Durban region. The reason for choosing this geographical location was particularly because a major OEM, Toyota SA (TSA), assembly plant is in Durban, Prospecton. There are number of ACMs that are also located near the TSA, to take advantage of just-in-time practices (SouthAfrica.info, 2012). Just-in-time was first introduced decades ago by the president of Toyota (Sugimori, Kusunoki, Cho & Uchikawa, 1977). According to Kannan and Tan (2005) just-in-time is defined as only having the required goods at the required time in the required quantity and stock on hand is always kept at a minimum. Previous studies have also been conducted in this area (Rampersad, 2012; Parker, 2000). These studies investigated the optimisation of local content in the automotive component industry and the e-business strategy for the South African automotive industry, respectively.

3.7 Target population

According to Saunders, Lewis and Thornhill (2009), target population refers to a group of events, things, people or any area of interest that a researcher intends to study.

For this study, the target population comprises automotive component manufacturers located in Durban. There are approximately 16 ACMs in Prospecton and surrounding areas near Toyota SA (NAACAM, 2016).

Convenience sampling was used to acquire gatekeeper letters from automotive component manufacturers (ACMs) that were willing to participate in the study. The population was then calculated only using the four ACMs that had authorised their participation and only focused on the logistics and purchasing departments and not the entire company. The population size was calculated to be 140 participants for questionnaires.

3.8 Sampling strategies

This study used purposive sampling technique that is defined as a sampling design that uses a specific target group to obtain data (Zikmund & Babin, 2010). For this study, specific people had the required information that the researcher required. Those included the purchasing and logistics employees as well as management.

There are two types of purposive sampling namely; judgmental and quota sampling. Judgmental sampling is appropriate when a limited number of people or categories are in the best position to provide the required information (Sekaran & Bougie, 2010). Generalisability is impossible and is the only feasible sampling design for obtaining the required information from the specific target people who have the required information and facts sought (Adams, Khan, Raesid & White, 2007). Quota sampling is a form of proportionate stratified sampling that ensures adequate representativeness among certain groups in the study (Matthews & Ross, 2010).

For this study, judgmental sampling was used since the researcher had targeted purchasing and logistics employees and management hence, there was a very precise target of people that possessed the information that the researcher required.

3.9 Sample size

The sample for the interviews included purchasing/sourcing/procurement and logistics managers. Ten participants were interviewed. The sample for the questionnaires included junior, assistant and senior buyers, expeditors, purchasing intern, purchasing clerk, materials planner, inventory control analyst, shipping and receiving manager and logistics analyst. Questionnaires were administered only to the purchasing and logistics departments. The sample size, which is defined as the subset of the population (Mathews & Ross, 2010), was calculated using guidelines provided by Sekaran and Bougie (2010). For a population of 140, a sample size of 103 is considered a sample that could produce reliable results.

3.10 Data collection methods

Primary and secondary data collection methods were used to collect data. Primary data collection methods that were used include; semi-structured interviews and questionnaire and secondary data was gathered using in-depth literature review. Interviews may be conducted face to face, over the phone or through a computer and may be structured or unstructured. Questionnaires may be personally administered, sent via mail or make use of computer software (Sekaran & Bougie, 2010; Greener, 2008).

3.10.1 Interviews

For this study, semi-structured face to face interviews (see Appendix B) were conducted mainly to maximise the advantages of face-to-face interviews which include the potential to adapt the questions when necessary and clarify questions to the interviewee when required. Only seven interviews were conducted and only two managers gave consent for the interview to be recorded. In the remainder of the cases notes were taken during the interview and managers were asked to confirm whether the information that had been summarised was truly what they had said and

meant. Managers were given an opportunity to change their responses if they felt unsatisfied with their initial response. Complex terms were thoroughly explained to each interviewee to avoid inability to respond to questions to their best level of understanding. The main purpose of the interview was to get a deeper understanding from purchasing and logistics managers of the various models that they use when conducting sourcing and get insight on the degree of priority that is accorded by their organisation to greening requirements. This was the third research objective of this study.

3.10.2 Questionnaires

Questionnaires (see Appendix A) were personally administered to save time and for the researcher to be able to clarify any ambiguities that respondent could encounter. Personally administered questionnaires were preferred by the researcher because in many instances, respondents were occupied with work commitments and forget to take time to complete the questionnaire even after doing follow-ups. The researcher scheduled appointments in advance to distribute and administer questionnaires.

The questionnaire was designed around the research questions with the aim to answer them and was structured as follows: The first section contained biographic data as well as the organisational profile where the respondent was required to choose one of the options in the question. The second section comprised dichotomous questions which investigated whether respondents understood various aspects of the topic discussed specifically green sourcing and trying to ascertain whether it is a priority in their organisation. This section assisted in answering the first research question which was “What degree of priority is accorded by ACMs to greening requirements in sourcing?” The third section consisted of ranking questions where respondents were required to rank their responses on a scale of one to three. This section assisted in establishing how the adoption of greening requirements has influenced sourcing which was the third research objective. The last section covered questions relating to the combination of sourcing strategy in the ACM industry and green supply chain and used a one to five-point Likert scale. This section required respondents to rank the challenges that ACMs face when implementing green sourcing which is the main objective of this study.

3.10.3 Data quality control

Reliability and validity determines the quality and value of data gathered and hence played a role in the truthfulness of the research methodology the researcher chooses (Cresswell, 2003). Reliability refers to the consistency, stability and repeatability of results from a study. In other words, the results of a study are considered reliable if they are consistent (Cresswell & Plano Clark, 2007). Validity refers to the extent to which a measuring instrument measures what it is intended to measure (Kayes, 2005). A measurement may be reliable but simultaneously invalid. However, a measurement that is unreliable cannot be valid (Drost, 2011). Questions with the same scales used the Cronbach's Alpha test to determine the integrity and reliability and consistency was regarded to be good if it is a value of 0.7 or above is achieved (Matthews & Ross, 2010).

The questionnaire was designed using some questions from past research on sourcing and green supply chain in the automotive industry that had been validated and other questions that had not been tested for validity were tested using academics (2 lecturers and 3 PhD students) at the University of KwaZulu-Natal's School of Management, IT and Governance.

3.11 Measurements

According to Sekaran and Bougie (2010), a scale is an instrument by which individuals or subjects are differentiated as to how similar or different they are from one another on various variables that are of significance in the study.

This study used nominal, Likert and ratio scales. The nominal scale was used to allocate individuals or subjects to precise groups or categories. Likert scales were designed and used to study on a five-point scale how subjects of interest agreed or disagreed with statements. Ratio scales measure the magnitude of variances on points on the scale and have a unique zero origin (Hair, Wolfinbarger, Ortinau & Bush, 2008).

3.12 Data analysis

The Statistical Package for Social Sciences (SPSS) version 23 was used to analyse quantitative data which comprises a set of programs that are designed to code and analyse quantitative data for interpretation (Subban, 2008). Measures of central tendency were used to measure descriptive statistics including; mean, mode and median, Pearson's correlation and reliability statistics. Inferential statistics were used to observe whether similarities or differences are evident between groups in the study. A T-test was used to compare the average performance of two groups to see if there was a difference or not. Analysis of variance (ANOVA) was used to analyse the difference or similarity between respondents at various job levels.

Qualitative data was analysed using thematic analysis with the aid of computer assisted qualitative data analysis (CASQDA) software Nvivo11. Thematic analysis highlights patterns, pinpoints, and examines data for recurring themes.

3.13 Limitations

There are limitations that the researcher encountered during the research process and the three main limitations included cost, time and access to information. Some companies and individuals were skeptical to participate in the research, which limited the researcher access to certain information. The time spent on the research process did not always go according to the researcher's wishes as participants were almost always busy at work, even after meetings had been requested and confirmed which led to delays for the researcher.

Since the study only took place in selected ACMs in Durban that were willing to participate in the study, generalising of results could be challenging and not possible. ACMs that were used in this study vary in several aspects such as size, age and the category of products they manufacture which could result in a difference in their supply chains and sourcing processes.

3.14 Ethical considerations

The collection of primary data, which was done using interviews and questionnaires at the research site, only took place after obtaining gatekeeper permission from the relevant authorities. Further to that, written permission was sought for respondents to participate in the research. Participants were also informed that partaking was voluntary and they could pull out from the study whenever, had they wished to do so. The protection of participants' identities was guaranteed, by ensuring anonymity in the study and by providing a detailed informed consent form that they were required to sign and none of the participants were under any obligation to provide their names. After the data had been collected, it was safely stored to ensure confidentiality.

After the researcher had obtained gatekeeper permission from companies that participated in the study, the researcher then applied for ethical clearance from the university research office. Once the study was approved, the researcher then received an ethical clearance certificate and could proceed with the primary data collection process from relevant companies that had authorised participation.

3.15 Conclusion

The intention of this chapter was to cover various areas that are of essence to the success of this research project. These areas include the type of study, data collection methods, sampling design, measuring instruments, sampling techniques, data analysis as well as ethical considerations. To conclude, this study was exploratory and descriptive in nature using personally administered questionnaires to logistics and purchasing employees and qualitative interviews for members of the management. Data were only collected once ethical clearance had been approved as per university policy and respondent anonymity and confidentiality was maintained. Analysis of data obtained was done by the aid of Nvivo for interviews and thematic analysis and SPSS for questionnaires.

The next chapter will cover the presentation of quantitative data that was obtained by personally administered questionnaires.

CHAPTER FOUR: QUANTITATIVE AND QUALITATIVE DATA PRESENTATION

4.1 Introduction

This chapter presents quantitative data that was collected with the aid of personally administered closed-ended questionnaires. The quantitative data analysis for this study comprised: descriptive data analysis, Cronbach's Alpha tests, factor analysis tests, Chi-square and Fisher exact value tests. From the sample size of 103, only 79 questionnaires were distributed and retrieved for analysis. The targeted sample size was not reached because some potential participants were busy or unavailable to participate while others did not consent to participate.

This chapter also presents the qualitative data collected using aid of semi-structured face-to-face interviews. Interviews were the second primary tool used in the study to gather data and was scheduled for purchasing and logistics since managers as they were best positioned to give information that was required in the study. Qualitative data was analysed using thematic analysis with the aid of a computer assisted qualitative data analysis (CASQDA) software Nvivo11.

4.2 Presentation of quantitative data

This section presents the respondents' biographical information, which includes gender, the department in which each respondent was working, highest educational qualification obtained and job level. Section A of the questionnaire which was general questions is presented in figures 4.1, 4.2, 4.3 and 4.4. Figure 4.1 illustrates the distribution of respondents according to gender.

Figure 4.1: Distribution of gender

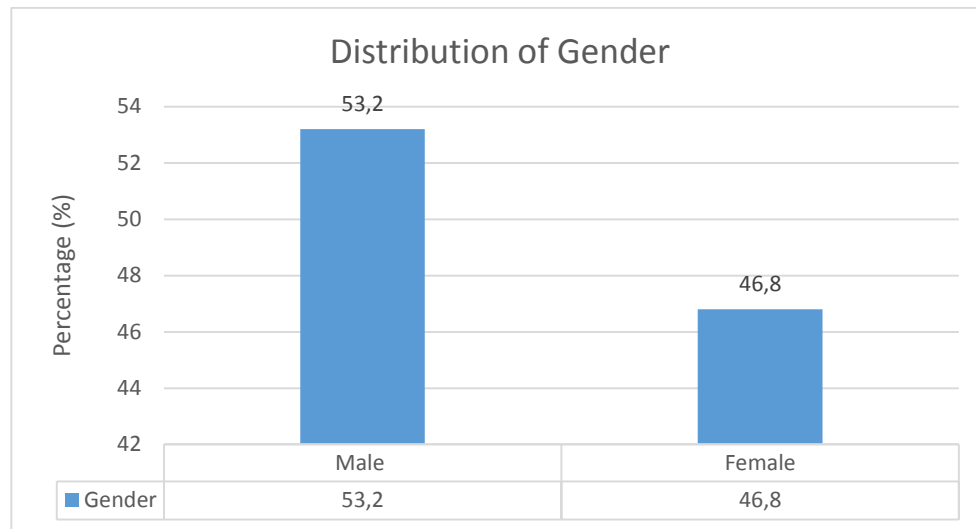
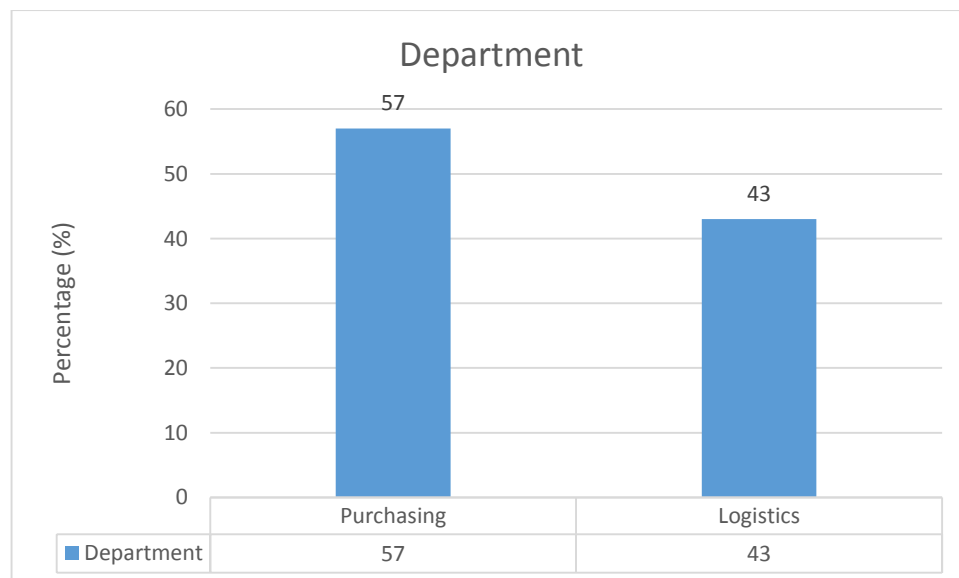


Figure 4.1 demonstrates the gender of all the seventy-nine participants and can be summarised as follows: 53.2% were male (42 respondents) and 46.8% were female (37 respondents). The researcher tried to ensure that questionnaires were equally distributed across both gender and the response rate for both was fairly represented. Figure 4.2 illustrates the distribution of respondents according to department.

Figure 4.2: Department



The study used only two departments in ACMs; purchasing and logistics. This was informed by the knowledge that the purchasing and logistics departments possessed the relevant knowledge and information that was required to adequately answer the research questions. Figure 4.2 shows that of the 79 respondents, 45 were from the purchasing department and contributed 57% while 34 respondents were from the department responsible for and contributed 43%.

Figure 4.3 illustrates the distribution of respondents according to educational level.

Figure 4.3: Educational level

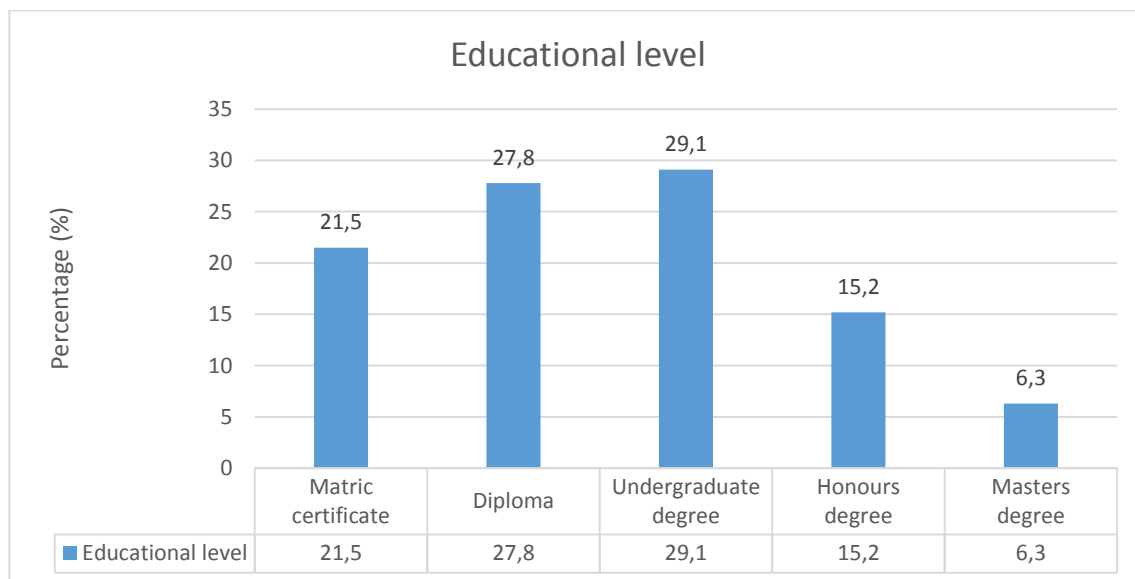


Figure 4.3 is an illustration of the various educational levels of all the respondents and can be summarised as follows: 21.5% (17 respondents) had matric certificate, 27.8% (22 respondents) had diplomas, 29.1% (23 respondents) had undergraduate degrees, 15.2% (12 respondents) had honours degrees and 6.3% (5 respondents) had master's degrees. Most participants had undergraduate degrees and diplomas and a minority had master's degrees.

Figure 4.4 illustrates the distribution of respondents according to job level.

Figure 4.4: Job level

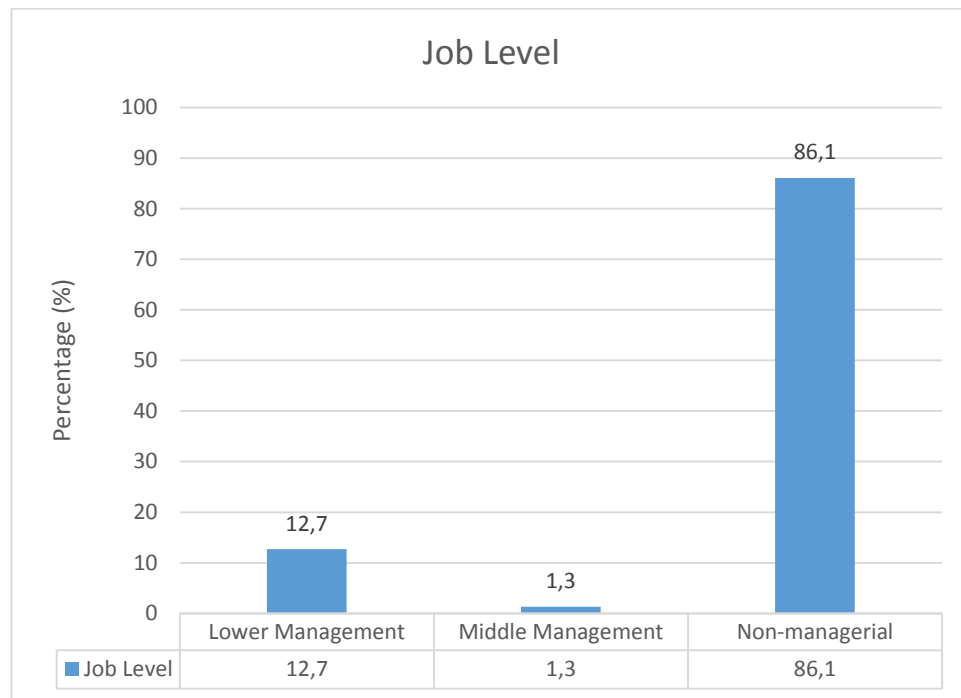


Figure 4.4 is a graphical illustration of the job levels of the respondents. Most respondents had non-managerial positions and they contributed to 86.1%. Respondents from the lower management level contributed to 12.7% and the lowest was middle management participants that contributed only 1.3%.

From the above figures (4.1, 4.2, 4.3 and 4.4) the illustrations can be summarised as follows: most (53.2%) of the respondents were male. The department that contributed the most (57.0%) was that of purchasing. The highest level of education obtained by the respondents shows that most of them had undergraduate degrees and diplomas contributing 29.1% and 27.8% respectively.

The second section of the questionnaire had five dichotomous questions and the purpose of this section was to understand the level of priority that their organisations accorded to greening requirements in sourcing. Table 4.1 summarises the responses for each question in the section.

Table 4.1: Awareness about green sourcing

Variables	Frequency n= 79	Percentage (%)	Cumulative Percentage
I have a good understanding of green sourcing			
Yes	70	88.6	88.6
No	9	11.4	100.0
The organisation strives to implement green sourcing			
Yes	52	65.8	65.8
No	27	34.2	100.0
Our organisation provides training to educate employees about green sourcing			
Yes	18	22.8	22.8
No	61	77.2	100.0
Does your organisation source from suppliers that are not green supply chain compliant?			
Yes	65	82.3	82.3
No	14	17.7	100.0
If a certain supplier does not meet your green requirements, is there any tolerance in place?			
Yes	55	69.6	69.6
No	24	30.4	100.0

Table 4.1 shows that majority (88.6%) of the respondents said they had a good understanding of green sourcing. Most (65.8%) of them also said their organisation strives to implement green sourcing while higher proportion (77.2%) said their organisation does not provide training to educate employees about green sourcing. Majority of the respondents (82.3%) reported that their organisation still source from suppliers that are not green supply compliant and 69.6% of them said if a certain supplier does not meet their organisation's green requirements, there is a tolerance in place, meaning that those suppliers who do not meet greening requirements will not be penalised.

It can be gathered from the above information that greening requirements in ACMs have minimal importance. Although a high percentage (88.6%) of respondents confirmed to have a good understanding of green sourcing, a large majority (77.2%) of respondents stated that their organisation does not provide trainings to educate employees about green sourcing. This confirms that green sourcing is not yet a priority to ACMs in Durban.

The third section of the questionnaire was designed to answer the third research question which was: How has the adoption of greening requirements influenced sourcing? Table 4.2A presents the responses for each question in the section on the perception of green sourcing.

Table 4.2A: Perception of green sourcing

Variables	Frequency n= 79	Percentage (%)	Mean (±SD)
My organisation considers green sourcing to be important to our organisation			
Strongly Agree	21	26.6	3.94 ±0.88
Agree	39	49.4	
Neutral	12	15.2	
Disagree	7	8.9	
Strongly Disagree	0	0	
Our organisation ensures green sourcing is practiced effectively			
Strongly Agree	8	10.1	3.62 ±0.85
Agree	44	55.7	
Neutral	16	20.3	
Disagree	11	13.9	
Strongly Disagree	0	0	
Our customers influence the manner our organisation conducts sourcing.			
Strongly Agree	26	32.9	4.13 ±0.79
Agree	41	51.9	
Neutral	8	10.1	
Disagree	4	5.1	
Strongly Disagree	0	0	
Customers impose greening requirements when conducting sourcing.			
Strongly Agree	13	16.5	3.73 ±0.84
Agree	39	49.4	
Neutral	20	25.3	
Disagree	7	8.9	
Strongly Disagree	0	0	
The adoption of green requirements has influenced sourcing			
Strongly Agree	23	29.1	3.94 ±0.90
Agree	34	43.0	
Neutral	16	20.3	
Disagree	6	7.6	
Strongly Disagree	0	0	

From table 4.2A, it can be recognised that most of the respondents had overall good perception of green sourcing practices in their organisation. For instance, 49.4% of the participants agreed that their organisation considered green sourcing to be important to their organisation and 55.7% ensures effective practice of green sourcing. A similar proportion also agreed with other statements with regards to their perception such as if customers influence the manner their organisation conducts sourcing, if customers impose greening requirement when conducting sourcing and if adoption of green requirement has influenced sourcing. Table 4.2B is a continuation of the perception of green sourcing.

Table 4.2B: Continuation of perception of green sourcing.

Variables	Frequency n= 79	Percentage (%)	Mean (±SD)
Our organisation requires suppliers to be green supply chain compliant.			
Strongly Agree	4	5.1	3.30 ±0.76
Agree	26	32.9	
Neutral	39	49.4	
Disagree	10	12.7	
Strongly Disagree	0	0	
It is a requirement for all our suppliers to be in a green supply chain.			
Strongly Agree	1	1.3	3.18 ±0.78
Agree	27	34.2	
Neutral	38	48.1	
Disagree	11	13.9	
Strongly Disagree	2	2.5	
Our organisation faces suppliers’ resistance towards change with regards to greening requirements.			
Strongly Agree	4	5.1	2.96 ±0.97
Agree	18	22.8	
Neutral	33	41.8	
Disagree	19	24.1	
Strongly Disagree	5	6.3	
Our organisation would stop doing business with suppliers that do not meet its specified green requirements			
Strongly Agree	3	3.8	2.35 ±1.11
Agree	9	11.4	
Neutral	22	27.8	
Disagree	24	30.4	
Strongly Disagree	21	26.6	
Original Equipment Manufacturers (OEMs) have influenced our organisation to implement green sourcing.			
Strongly Agree	2	2.5	3.33 ±0.71
Agree	31	39.2	
Neutral	37	46.8	
Disagree	9	11.4	
Strongly Disagree	0	0	

Table 4.2B shows that most of the respondents were frequently neutral in their responses. Highest proportions (49.4%) of the respondents were neutral in their response in terms of

whether their organisation requires suppliers to be green supply chain compliant. Similarly, 48.1% and 41.8% were both neutral in their responses regarding whether it is a requirement for all their suppliers to be in a green supply chain and if their organisation faces suppliers' resistance towards change with regards to green requirements. Table 4.2C tabulates the continuation of green sourcing.

Table 4.2C: Continuation of perception of green sourcing.

Variables	Frequency n= 79	Percentage (%)	Mean (±SD)
There are clauses in standard contracts that stipulate green sourcing.			
Strongly Agree	2	2.5	3.43 ±0.63
Agree	34	43.0	
Neutral	39	49.4	
Disagree	4	5.1	
Strongly Disagree	0	0	
There is clear communication between OEMs and our organisation about green requirements when doing business.			
Strongly Agree	13	16.5	3.68 ±0.86
Agree	35	44.3	
Neutral	24	30.4	
Disagree	7	8.9	
Strongly Disagree	0	0	
Trainings and availability of information would improve the understanding and implementation of green sourcing.			
Strongly Agree	38	48.1	4.28 ±0.83
Agree	28	35.4	
Neutral	10	12.7	
Disagree	3	3.8	
Strongly Disagree	0	0	

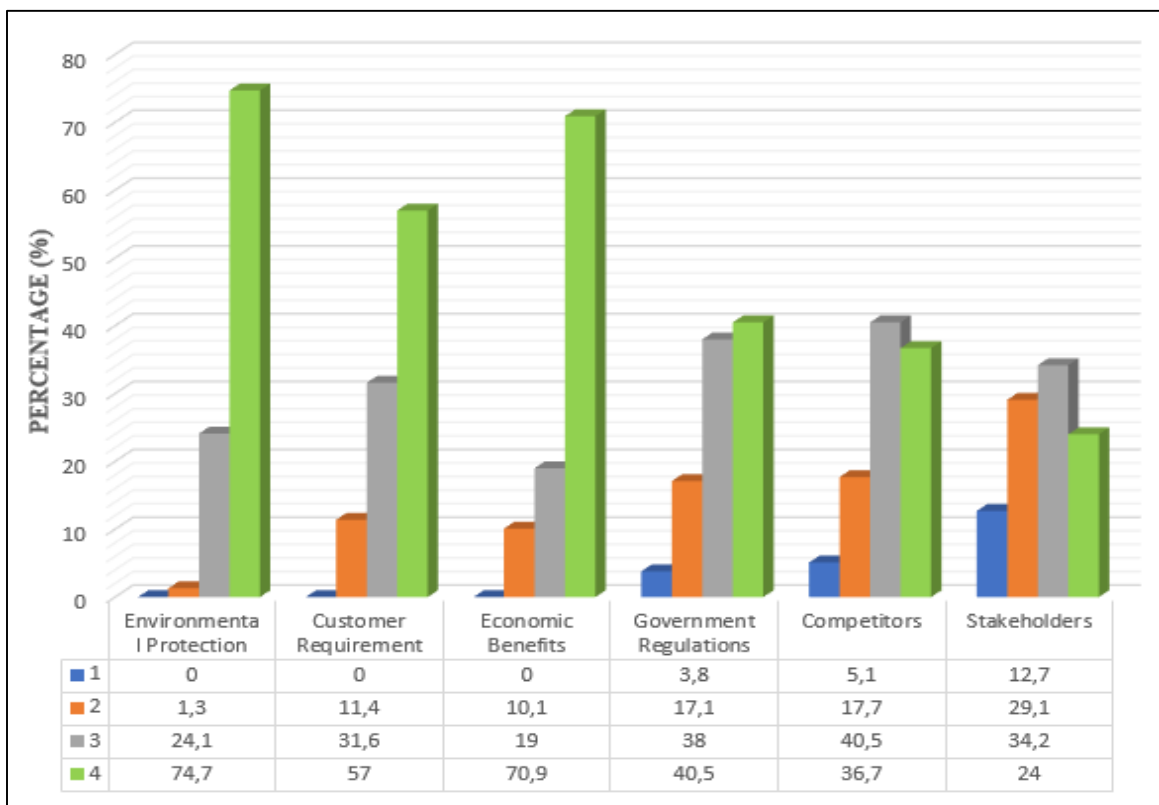
Table 4.2C shows most (49.4%) of the respondents were not decisive in their response regarding the existence of clauses in standard contracts that stipulate green sourcing while 44.3% agreed that there was a clear communication between OEMs and their organisation about green requirement when doing business. In conclusion, almost half of the respondents (48.1%)

strongly agreed that trainings and availability of information would improve the understanding and implementation of green sourcing.

The fourth section of the questionnaire required respondents to rank possible drivers and barriers to the implementing of green sourcing. The purpose of this section was to understand the reason why ACMs implement green sourcing and identifying challenges and barriers that could result in ACMs not making green sourcing a priority.

Figure 4.5 illustrates the possible drivers to implementing green sourcing. The drivers include environmental protection, customer requirements, economic benefits, government regulations, competitors and stakeholders. To get an understanding of the reasons behind ACMs implementing green sourcing, it was important to identify possible drivers. The following figure presents the results where respondents had to rank drivers to implementing green sourcing.

Figure 4.5: Ranking of possible drivers to implementing green sourcing



According to the respondents; the highest ranked possible driver to implement green sourcing was environmental protection (74.7%) and it was closely followed by economic benefits (70.9%). Customer requirements (57%) was ranked third highest and stakeholders was ranked lowest with 24%.

In summary; ACMs implement green sourcing mainly to protect the environment, increase profits and fulfill the needs and requirements of their customers. Identifying and ranking possible barriers to implementing green sourcing was important for this study. Figure 4.6 graphically summarises the information provided by respondents where they were each required to rank the identified possible barriers to implementing green sourcing.

Figure 4.6: Ranking of challenges faced by ACMs when implementing green sourcing

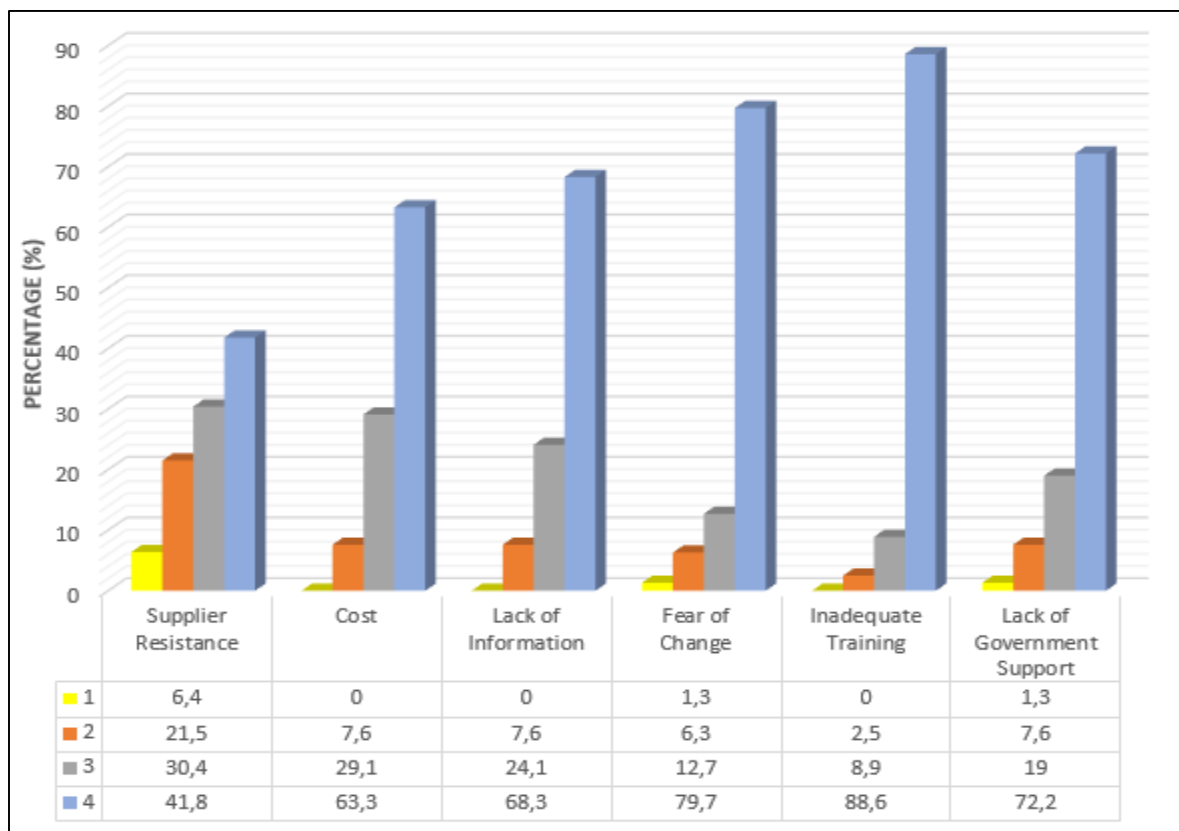
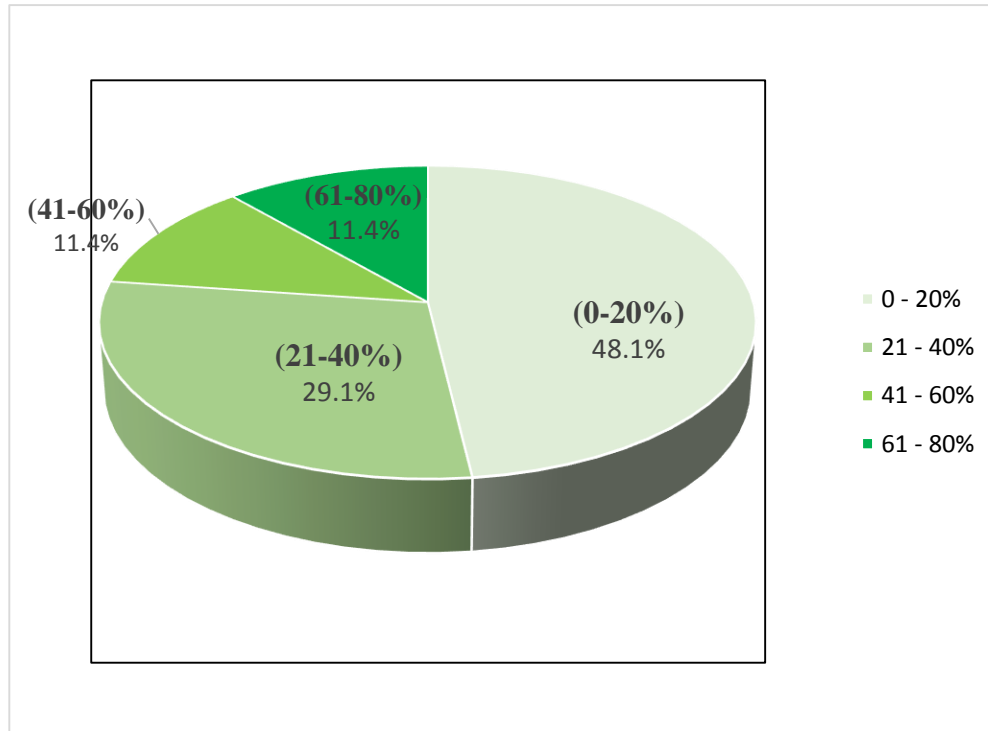


Figure 4.6 above illustrates that the greatest challenge faced by ACMs when implementing green sourcing was inadequate training (88.6%), followed by fear of change (7.7%) and lack of government support (72.2%).

According to the illustrated results, ACMs still fear implementing green sourcing due to lack of information and training sessions to equip and educate them on the importance and benefits of green sourcing.

After the researcher had collected primary and secondary data, it was gathered that it is almost impossible for an ACM to produce a component part that is 100% green. A green component part is one that is produced and caused zero environmental damage. Figure 4.7 below is a graphical summary of the products each ACM considered to be green.

Figure 4.7: Percentage of company's products that are green compliant.



The pie chart above illustrates the percentage of respondents' company product that are green complaint. It shows that most (48.1%) of the companies had a very low compliance of between 0 to 20% while a small proportion (11.4%) had a compliance level of 41 – 60% and 61 – 80% respectively. About 29.1% of respondents stated that their company's green products were between 21 and 40%. Table 4.3 shows the responses for green sourcing practices.

Table 4.3: Green sourcing practices.

Variables	Frequency n= 79	Percentage (%)	Cumulative Percentage
In my organisation the importance attached to green sourcing translates into practice.			
Agree	55	69.6	69.6
Disagree	24	30.4	100.0
In my organisation the importance attached to green sourcing does not translate into practice.			
Agree	27	34.2	34.2
Disagree	52	65.8	100.0
In the case of supplier non-compliance, our organisation would carry on doing business with that supplier.			
Agree	45	57.0	57.0
Disagree	34	43.0	100.0

Table 4.5 above shows that most of the respondents (69.6%) agreed that the importance attached to green sourcing in their organisation translates into practice while similar proportion 65.8% indicated that the importance attached to green sourcing in their organisation does not translate into practice. A relatively large proportion of the respondents (57.0%) agreed that in the case of supplier non-compliance, their organisation would carry on doing business with the supplier.

Table 4.4 illustrates the factor analysis to determine factors influencing green sourcing practice.

Table 4.4: Factor Analysis to Determine Factors Influencing Green Sourcing Practice

Total Variance Explained						
Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.601	27.701	27.701	3.601	27.701	27.701
2	2.294	17.647	45.348	2.294	17.647	45.348
3	1.530	11.768	57.116	1.530	11.768	57.116
4	1.019	7.840	64.956	1.019	7.840	64.956
5	.909	6.990	71.945			
6	.798	6.138	78.083			
7	.630	4.846	82.929			
8	.587	4.518	87.447			
9	.421	3.240	90.687			
10	.376	2.889	93.575			
11	.351	2.700	96.275			
12	.284	2.186	98.461			
13	.200	1.539	100.000			
Extraction Method: Principal Component Analysis.						

The principal component analysis above in table 4.4 generated four main components (components 1 to 4) that influence green sourcing practice. Each component has an eigen value greater than 1.000.

The variables that have correlation with the generated components are illustrated in the component matrix below (table 4.5). In component matrix, variables are considered influential based on their closeness to 1.0 (mostly above 0.5). The first generated component is mostly influenced by organisation considering green sourcing to be important to them, organisation ensuring practicing green sourcing effectively and customers imposing greening requirements when conducting sourcing. The second generated component correlates with “the adoption of green requirements has influenced sourcing”. The third generated component is influenced by

the variable “Trainings and availability of information would improve the understanding and implementation of green sourcing” while the fourth correlates with “Our organisation requires suppliers to be green supply chain compliant”. Table 4.5 illustrates the component matrix analysis.

Table 4.5: Component matrix

Component Matrix^a				
	Component			
	1	2	3	4
My organisation considers green sourcing to be important to our organisation.	.799**	-.251	-.151	.100
Our organisation ensures green sourcing is practiced effectively.	.827**	.049	-.163	.158
Our customers influence the manner our organisation conducts sourcing.	.430	.562	-.225	-.230
Customers impose greening requirements when conducting sourcing	.802**	.131	-.274	-.003
The adoption of green requirements has influenced sourcing.	.443	.671**	-.089	.128
Our organisation requires suppliers to be green supply chain compliant.	.353	-.149	.324	.647**
It is a requirement for all our suppliers to be in a green supply chain.	.382	-.414	.515	-.411
Our organisation faces suppliers’ resistance towards change with regards to greening requirements.	.280	-.596	.350	.057
Our organisation would stop doing business with suppliers that do not meet its specified green requirements.	.515	-.479	-.014	.066
Original Equipment Manufacturers (OEMs) have influenced our organisation to implement green sourcing.	.612	.271	.224	-.464
There are clauses in standard contracts that stipulate green sourcing.	.314	.043	.489	-.159
There is clear communication between OEMs and our organisation about green requirements when doing business.	.266	.517	.423	.270
Trainings and availability of information would improve the understanding and implementation of green sourcing.	-.310	.570	.622**	.081
Extraction Method: Principal Component Analysis.				
a. 4 components extracted.				

In summary, green sourcing practice is mostly influenced by;

- (i) Organisation considering green sourcing to be important to them;
- (ii) Organisation ensuring green sourcing is practiced effectively;
- (iii) Customers imposing greening requirements when conducting sourcing;
- (iv) The adoption of green requirements; and
- (v) Organisation wanting to protect the environment.

Table 4.6 below illustrates the association between customers' requirements regarding GSCM and ACMs' supply chains.

Table 4.6: Association between customers' requirements regarding GSCM and ACMs' supply chains.

Variables	Out of all the products your company manufacturers, what percentage of them are “green”					P-value
	0 – 20 %	21 – 40 %	41 – 60 %	61 – 80 %	Total	
	Freq (%)	Freq (%)	Freq (%)	Freq (%)	Freq (%)	
Our customers influence the manner our organisation conducts sourcing.						
Disagree	1 (25.0)	2 (50.0)	1 (25.0)	0 (0.0)	4 (100.0)	0.003*
Neutral	8 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	8 (100.0)	
Agree	13 (31.7)	12 (29.3)	8 (19.5)	8 (19.5)	41 (100.0)	
Strongly Agree	16 (61.5)	9 (34.6)	0 (0.0)	1 (3.8)	26 (100.0)	
Total	38 (48.1)	23 (19.1)	9 (11.4)	9 (11.4)	79 (100.0)	
Customers impose greening requirements when conducting sourcing.						
Disagree	2 (28.6)	4 (57.1)	1 (14.3)	0 (0.0)	7 (100.0)	0.012*
Neutral	18 (90.0)	2 (10.0)	0 (0.0)	0 (0.0)	20 (100.0)	
Agree	13 (33.3)	15 (38.5)	3 (7.7)	8 (20.5)	39 (100.0)	
Strongly Agree	5 (38.5)	2 (15.4)	5 (38.5)	1 (7.7)	13 (100.0)	
Total	38 (48.1)	23 (19.1)	9 (11.4)	9 (11.4)	79 (100.0)	

Fishers exact p-value, *= statistically significant

Chi-square test and Fisher exact test were used to determine the relationship between customers' requirements regarding GSCM and ACMs supply chain.

Table 4.6 shows that there was a statistically significant association ($P=0.003$) between percentage of company's product that are green compliant and influence of customers on the manner their organization conduct sourcing ($P<0.05$). Most of the respondents who were neutral, agreed and strongly agreed that customers influence the manner the organization conducts sourcing also said that their company manufacture 0 – 20% green compliant products.

Similarly, there was also statistically significant association ($P=0.012$) between percentage of company's product that are green compliant and customers imposing greening requirements when conducting sourcing ($P<0.05$). Although most of the respondents irrespective of their opinion on customers imposing greening requirements when conducting sourcing generally said their company manufacture between 0 – 20% green compliant products.

To measure the reliability of the questionnaire, items were subjected to Cronbach's Alpha Test. The result is as shown in table 4.7.

Table 4.7: Cronbach's Alpha Test

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.705	.713	13

From the test, the Cronbach's alpha of 0.705 shows that the questionnaire items have an acceptable internal consistency. Thus, the questionnaire is relatively reliable.

4.3 Presentation of qualitative data

The researcher conducted seven interviews from an initial sample size of ten participants. Thematic analysis highlights patterns, pinpoints, and examines data for recurring themes.

According to Braun and Clarke (2006), there are six basic procedures to follow when using thematic analysis:

- (i) Getting familiar with the data,
- (ii) Generating the first set of codes,
- (iii) Searching for themes in the coded data,
- (iv) Reviewing the themes,
- (v) Redefining the themes and naming the themes and
- (vi) Producing the final report.

After data collection was done through personally administered face-to-face interviews, the researcher transcribed and imported the data into Nvivo 11 software for coding and analysis. After exporting the data to Nvivo, the first set of coding was done using the questions as the main themes, their responses and non-responses formed the sub-themes. After an in-depth review to search for recurring patterns, themes and consistencies, their responses also gave rise to other set of themes.

Section A of the interview schedule required participants to explain their job and job role and the findings are outlined in this section.

Section A: Job and job role

- (i) What position do you hold in this company?
- (ii) How long have you worked in this company?
- (iii) What are your main responsibilities?
- (iv) Would you consider yourself a decision maker in this company? If yes, please explain your involvement in the decision making process of this company.
- (v) What role do you play in the sourcing process, if any?
- (vi) Have you had any training specifically designed for sourcing?

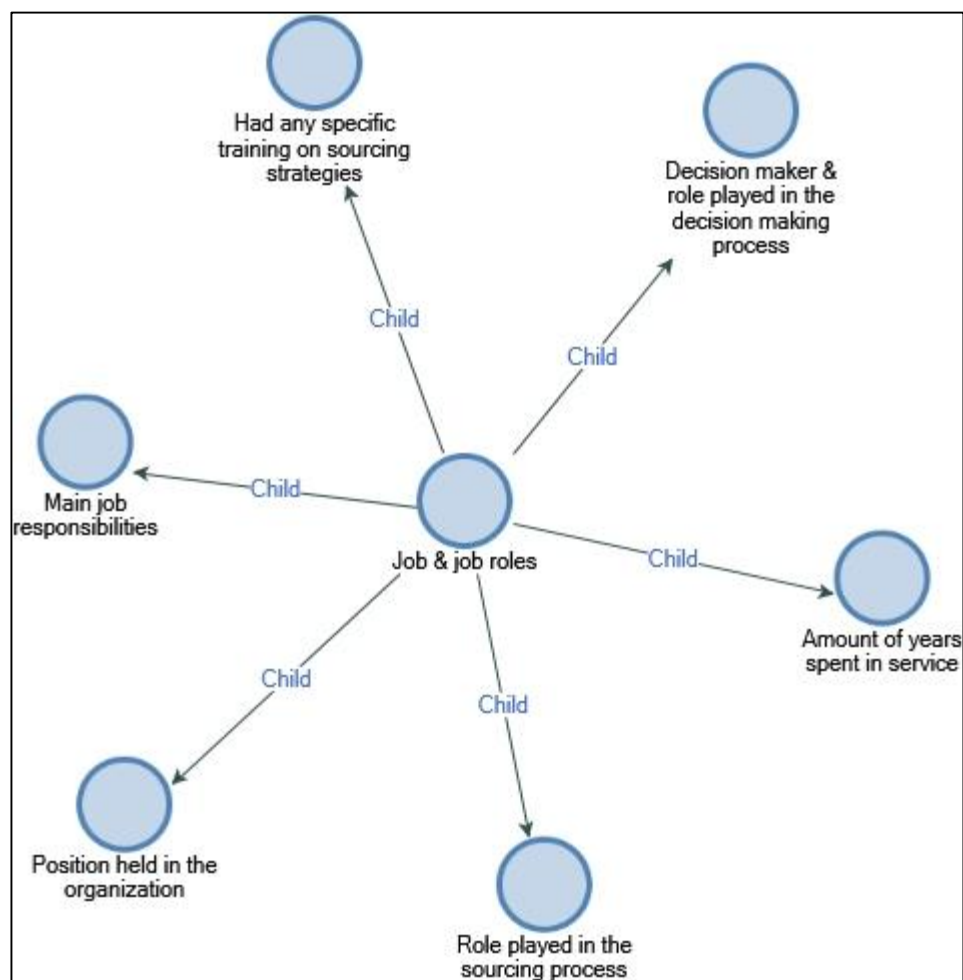
Each question was coded as a theme and the response from the interview participants formed the sub-themes. Then, another round of reviews on the sub-themes revealed inner- patterns and

processes inherent in the data. The themes were visualised with Nvivo and generated model figures with researcher's interpretations.

Figure 4.8 is a graphical illustration of the questions posed to participants pertaining to job and job role.

Section A: Job and job role

Figure 4.8: Illustration of the questions posed to participants involved in the interview.



Interpretation: The general background information focused on the participant's job and job role information without being too personal.

Figure 4.8 graphically summarises the questions that the researcher posed to purchasing and logistics managers and they include the following;

- (i) Main job responsibilities;
- (ii) Whether they had any specific training on sourcing strategies;
- (iii) Role played in the decision making process;
- (iv) Number of years spent in service;
- (v) Role played in the sourcing process; and
- (vi) Position held in the organisation.

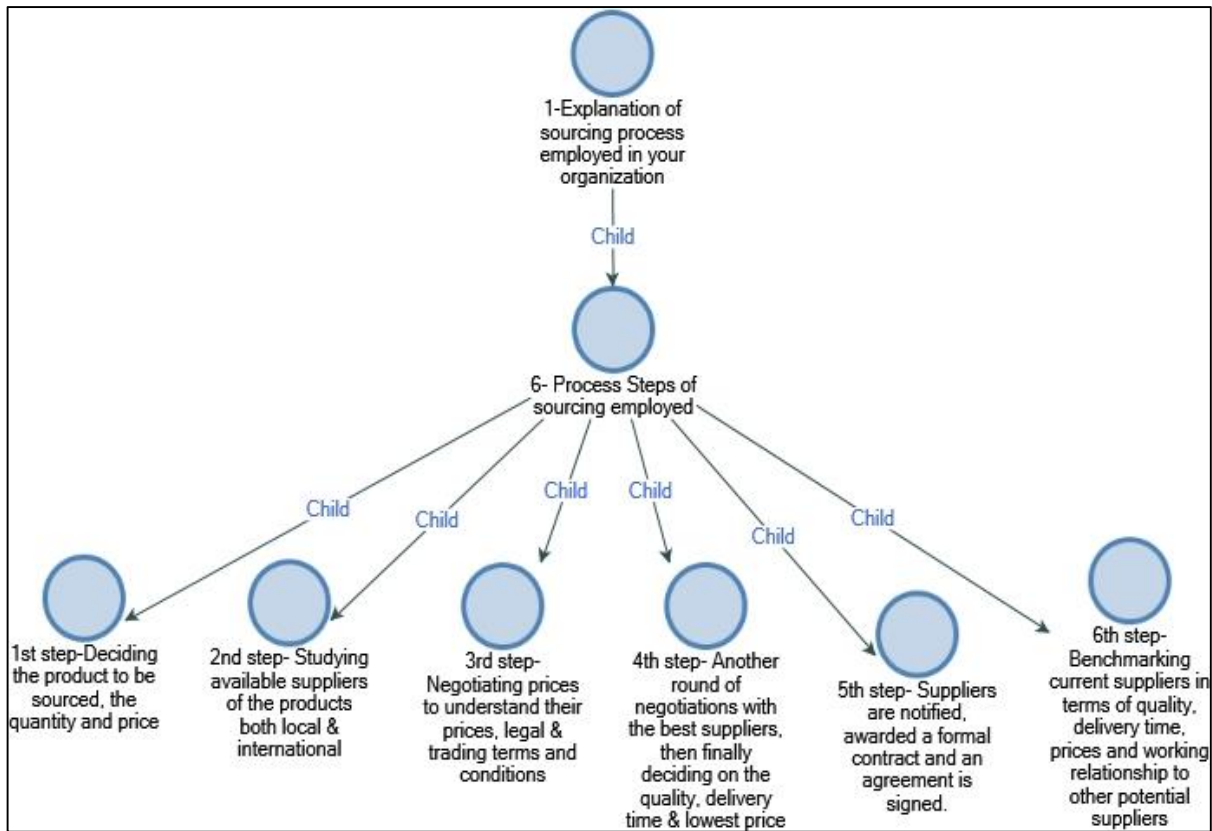
Section B:

Section B of the interview schedule required participants to explain the sourcing process they use in their respective organisations.

a) Please explain briefly the sourcing process your company makes use of.

Figure 4.9 illustrates the sourcing process steps across the participants' organizations.

Figure 4.9: Sourcing process steps across the participants' organisations.



Interpretation: The figure shows that there are usually six basic steps involved in the sourcing process. These steps include;

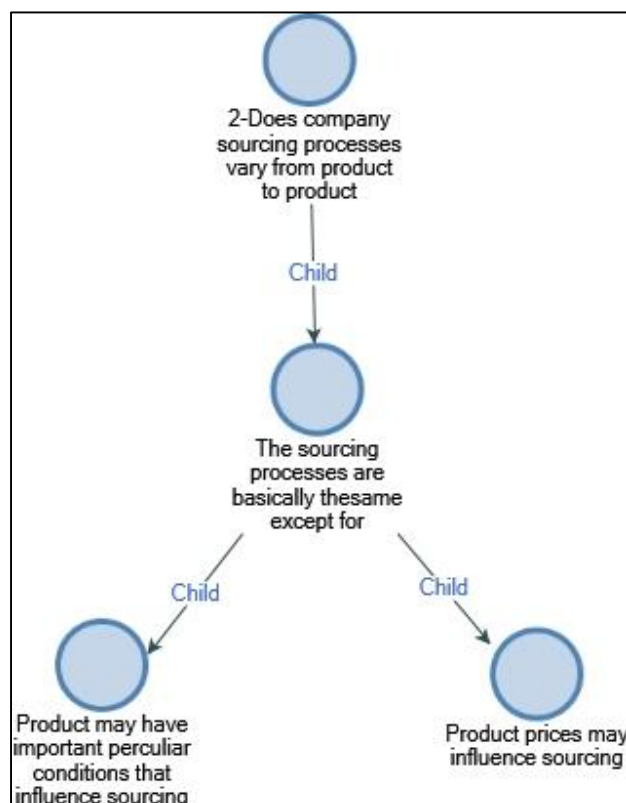
The first step is deciding on the product to be sourced, the quantity and the price(s) of the product(s). The second step is to study the available suppliers of the products both local and international suppliers. The next step is negotiating the prices to understand the prices, legal and trading terms and conditions. The fourth step is a continuation of negotiations with the preferred suppliers, where quality, delivery, time and lowest price bargain is agreed upon. Suppliers are notified and awarded a formal contract and an agreement is signed. The final step is benchmarking the suppliers according to some criteria e.g. quality, delivery time, prices, working relationships and potential suppliers. Almost all of the participants confirmed that the sourcing process that their organisations use is the 6 step sourcing process. These findings show the sourcing steps are similar across ACM organisations.

The next question required participants to explain whether the sourcing process varies from product to product.

b) Does the manner in which your company conducts the sourcing process vary from product to product?

Figure 4.10 illustrates the responses to the question on whether the sourcing process varies from product to product.

Figure 4.10: Responses to the question on whether the sourcing processes vary with products.



This question was to ascertain whether the sourcing process each automotive component manufacturer uses, varies from product to product and the findings are illustrated below.

Interpretation: The responses from the participants show that they usually have similar or the same sourcing processes for all products, except for instances where certain products have a

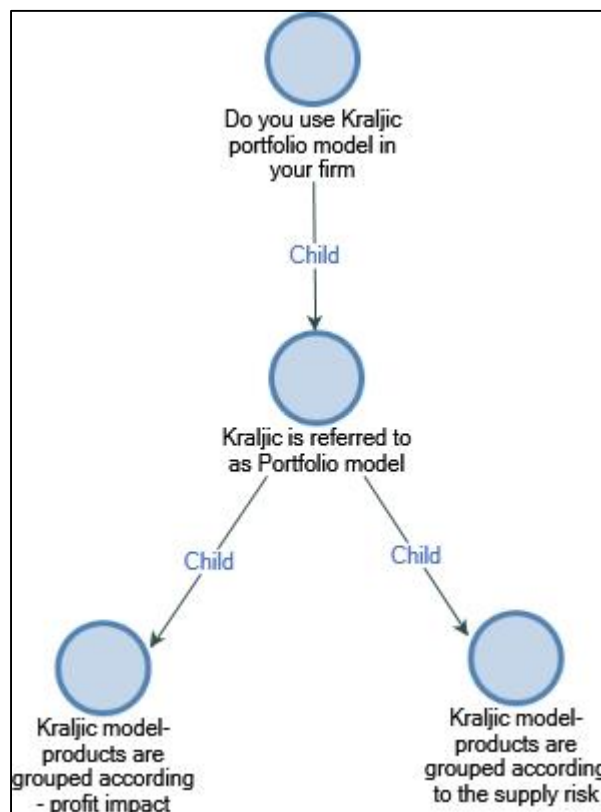
higher price, which may result in them being sourced differently or when a product may have important peculiar conditions that may influence sourcing.

The next question was to ascertain whether the participants' respective ACMs use Kraljic's (1983) purchasing portfolio model in some way.

c) Does your company make use of Kraljic's (1983) portfolio model in some way?

Figure 4.11 shows the responses to the question on whether participants were aware of Kraljic's (1983) purchasing portfolio model being used in some way during the sourcing process.

Figure 4.11: Responses to the question on whether participants were using Kraljic's (1983) portfolio model.



This question was to ascertain whether automotive component manufacturers were using Kraljic's (1983) portfolio model in any way and the findings are summarised below.

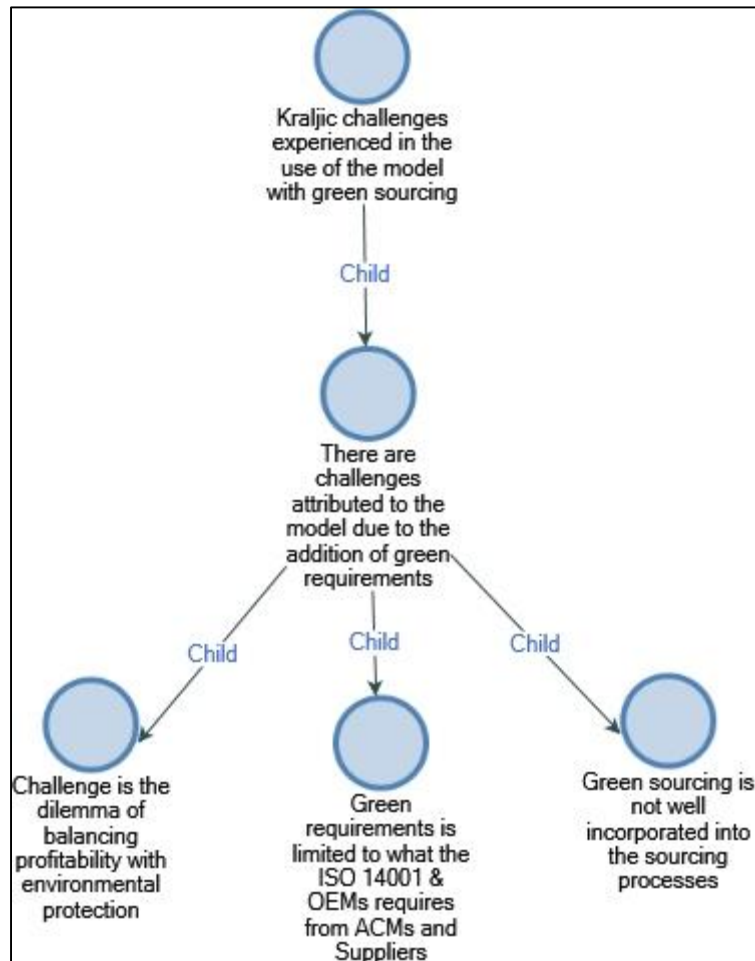
Interpretation: Most of the participants referred to Kraljic's (1983) model as just the 'portfolio model' and they also affirmed that they used the model extensively. They stated that it would be almost impossible to conduct sourcing without the aid of this particular model and that it is the foundation upon which sourcing is conducted. The participants pointed out that they were using the model as is, by grouping products according to its 'supply risk' as well as 'profit impact' derived.

After it was confirmed by participants that they use Kraljic's (1983) portfolio model, the researcher then asked if they were experience any challenges when using this model and incorporating green requirements in the sourcing process.

d) Do you experience any challenges when making use of this model and incorporating green requirements in the sourcing process?

Figure 4.12 is an illustration of responses to the question on whether there are challenges experienced when using Kraljic's (1983) portfolio model with green sourcing.

Figure 4.12: Responses to the question on whether there are challenges experienced when using Kraljic's (1983) portfolio model with green sourcing.



This question was to establish whether automotive component manufacturers experience any challenges when using Kraljic's (1983) portfolio model and incorporating greening requirements in the sourcing process. The findings are summarised below.

Interpretation: The participants' responses demonstrate that they believed there are challenges inherent in the model. They further highlighted some of the challenges faced when sourcing: 'dilemma of balancing profitability with environmental protection', another challenge is the fact that 'green sourcing (GS) is not well incorporated into the sourcing processes' of the firm, another challenge is that 'green environmental requirement is limited and tied to the ISO 14001 and OEMs' requirements from the ACMs and suppliers'.

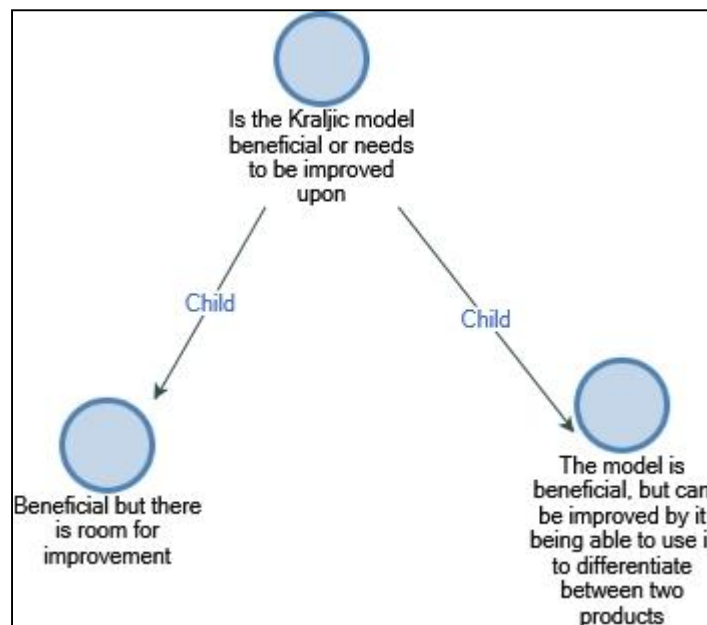
The implication of the third challenge is the rigidity of the ISO and OEMs requirements. It consistently has to be updated to keep abreast with current green sourcing trends and attempt to reduce these challenges to maximise the full benefit of a green sourcing strategy.

The next question required participants to explain whether they find Kraljic's (1983) portfolio model beneficial or if there is room for improvement.

- e) **Do you find this model to be beneficial or is there plenty of room for improvement?**
Please explain?

Figure 4.13 shows the participants' responses to the question on whether they find Kraljic's (1983) portfolio model beneficial or it needs to be improved upon.

Figure 4.13: Response of participants to the question on whether Kraljic's (1983) model is beneficial or needs to be improved.



This question was to determine whether or not the participants consider Kraljic's (1983) portfolio model beneficial or if they felt there is plenty of room for improvement. The findings are presented below.

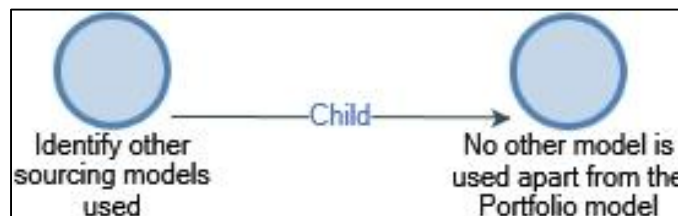
Interpretation: All participants confirmed that the model is very much beneficial, and that like every other model, it needs improvement. Some of the participants stated that ‘the model is beneficial, but there is room for improvement’ while other participants also stated that ‘it is beneficial as a model and can be much more improved upon by being able to use it to differentiate between two products’. The portfolio model is popular and widely used among all participants interviewed. They alluded to the benefits of using Kraljic’s (1983) model and affirmed that it can be improved.

After it was determined that ACMs use Kraljic’s (1983) portfolio model during sourcing, the researcher then wanted to discover if the participants were using any other models. The next question required participants to state this.

f) Do you use other models in the sourcing process? If yes, please identify them.

Figure 4.14 is an illustration of the response from participants to the question regarding the use of any other sourcing models.

Figure 4.14: Response of participants to the question regarding the use of any other sourcing models.



This question was to ascertain whether the interviewed participants used any other models in the sourcing process and if yes, they were required to identify them.

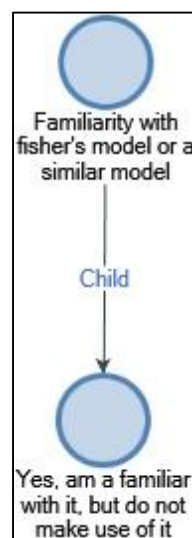
Interpretation: According to Figure 4.14, the responses from all the participants interviewed revealed that they do not use any other sourcing models apart from Kraljic’s (1983) portfolio model.

The next question that was posed to participants was whether they are familiar with Fisher's (1997) model.

g) Are you familiar with Fisher's (1997) model or a similar model?

Figure 4.15 illustrates the participants' response to the question of their familiarity with Fisher's (1997) model.

Figure 4.15: Participants' response to the question on familiarity with Fisher's (1997) model.



This question was to establish if participants are familiar with Fisher's (1997) model and the results are summarized as follows.

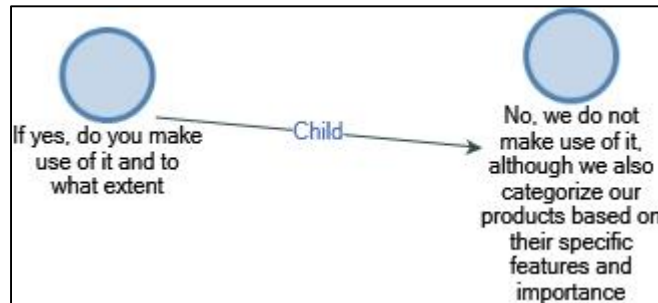
Interpretation: Figure 4.15 illustrates that participants were aware of Fisher's (1997) sourcing model, although they overwhelmingly averred that they do not use it extensively in their organisations.

After participants affirmed familiarity with Fisher's (1997) model, the next question was to ascertain whether they were using it make use of it and to what extent.

h) If yes, do you make use of it and to what extent?

Figure 4.16 illustrates the response to the question posed to participants on whether they use Fisher's (1997) model after they had confirmed to being familiar with it.

Figure 4.16: Participants' responses regarding familiarity with Fisher's (1997) model.



This question was a follow up question to all those participants that affirmed to being familiar with Fisher's (1997) model. This question was to ascertain whether their respective organisations were using Fisher's (1997) model and to what extent. The interpretation of the findings is summarised below.

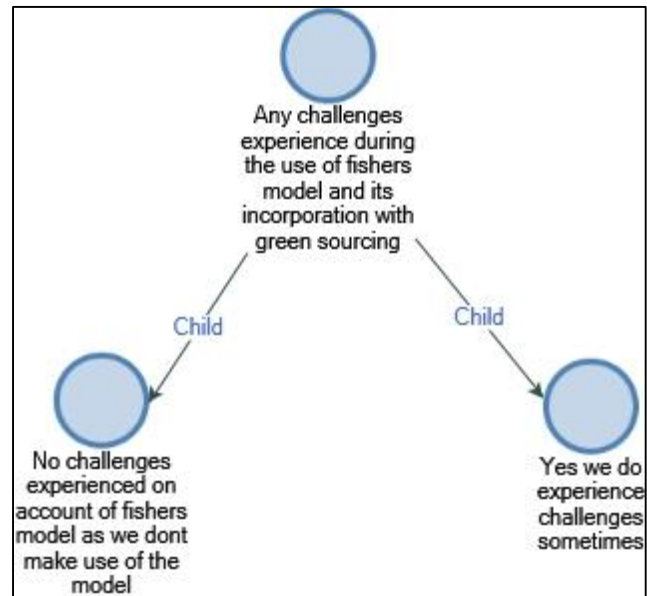
Interpretation: Figure 4.16 shows that the respondents are familiar with Fisher's (1997) model but were not using it in their respective organisations during the sourcing process. As such, the response to this question is negative. Participants' response was a categorical 'No, we do not use the model'. They added that products are categorized based on their specific features and importance. It can be deduced that Fisher's (1997) model is not at all used extensively during the sourcing process.

The next question was to understand the challenges that participants experienced when using Fisher's (1997) model and incorporating green requirements in the sourcing process.

i) Do you experience any challenges when using this model to incorporate green requirements in the sourcing process?

Figure 4.17 below illustrates the participants' responses to the question on challenges experienced when using Fisher's (1997) model and incorporating green requirements.

Figure 4.17: Participants' responses to the question on challenges experienced during the use of Fisher's (1997) model.



This question was to determine whether automotive component manufacturers (ACMs) experience any challenges when using Fisher's (1997) model and incorporating green requirements in the sourcing process. The findings are summarised below.

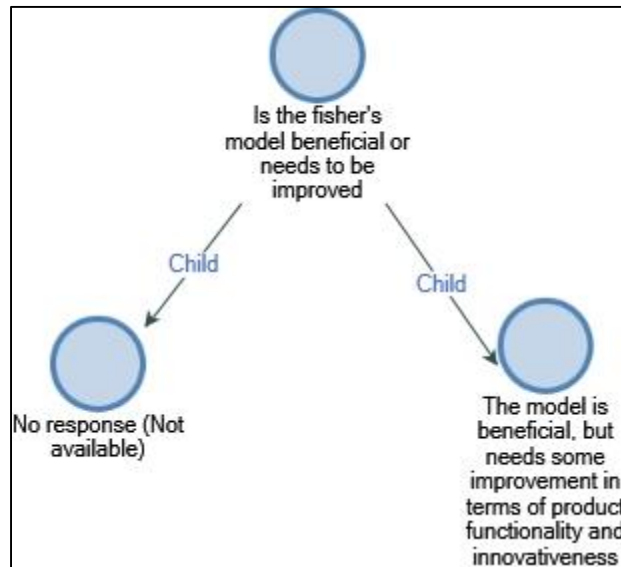
Interpretation: Figure 4.17 reveals the responses from the participants that there is no challenge because they do not make use of Fisher's (1997) model, regardless of the fact that some were familiar with this model. One participant stated that they do experience challenges sometimes but did not go into details to explain those challenges.

The next question was to understand if participants considered Fisher's (1997) model beneficial or felt there was room for improvement.

**j) Do you find this model to be beneficial or is there plenty of room for improvement?
Please explain?**

Figure 4.18 illustrates the response to the question posed to participants on whether or not Fisher's (1997) model is beneficial or needs to be improved.

Figure 4.18: Responses to the question regarding Fisher's (1997) model being beneficial or in need of improvement.



Interpretation: Figure 4.18 shows that all of the participants except one overwhelmingly replied ‘**no response**’ to the question; this is because they do not make use of Fisher’s (1997) model for sourcing in their firms. Only one participant stated that ‘the model is beneficial and needs improvement in the areas of product functionality and innovativeness’.

4.4 Conclusion

This chapter presented quantitative data that was collected by means of personally administered questionnaires. Cronbach’s Alpha Test showed that questionnaire items have an acceptable internal consistency and thus relatively reliable. Factor Analysis was used to determine factors influencing green sourcing practice.

This chapter also presented the qualitative data that was coded using thematic analysis with the aid of a computer assisted qualitative data analysis (CASQDA) software, Nvivo11. A thematic analysis highlights patterns, pinpoints and examines data for recurring themes.

This chapter can be summarised as follows; the purpose of this chapter was to present detailed findings from the quantitative and qualitative data. The next chapter will give a detailed summary of the findings of the study according to each research objective.

CHAPTER FIVE: DISCUSSION OF RESULTS

5.1 Introduction

The purpose of this study was to solicit how automotive component manufacturers (ACMs) can incorporate green elements in sourcing as well as identifying the challenges that they face when implementing green sourcing. For the purpose of this study, mixed methods were used. Interviews, which were qualitatively analysed were scheduled for management only and questionnaires which were quantitatively analysed were distributed to purchasing and logistics employees. This chapter, which follows the data analysis chapter aims to present the results which were elicited through questionnaires and interviews and to discuss in depth the findings of the study. Each research objective is individually discussed in relation to the findings.

The objectives of the study were:

1. To identify the degree of priority accorded by ACMs to greening requirements in sourcing.
2. To determine the extent to which the models are used and/or adapted as a sourcing strategy.
3. To find out how the adoption of greening requirements has influenced sourcing.
4. To provide insight into the extent to which ACMs requirements regarding green sourcing have influenced their suppliers.
5. To investigate how OEMs' requirements regarding green sourcing have influenced ACMs supply chains.

5.2 Discussion relating to research objectives

5.2.1 Objective one: To establish the degree of priority is accorded by automotive component manufacturers to greening requirements in sourcing.

To ensure that the researcher obtained information that was required for the purpose of this study, it was important to ascertain the level of priority that ACMs give to greening

requirements in sourcing. Since the study focused on green sourcing strategies, it was vital to understand if greening requirements were a priority because it would contribute significantly to the other research objectives.

Green sourcing is still a new phenomenon for most people in the organisations involved in this study. This was evident from their minimal knowledge of the term and procedures involved when implementing green sourcing. Some participants were more familiar with the term green sourcing than others and had a clear understanding of what it was all about. As much as almost all the organisations provide training for the staff to educate them about new concepts and strategies, there was little evidence of trainings to educate employees about green sourcing. There was evidence of the knowledge and understanding of environmental management systems and ISO 14001.

Gathering from participants' responses, one can conclude that currently, greening requirements in sourcing are not yet a top priority to automotive component manufacturers in Durban. They do consider environmental consideration and protection an important factor in their overall supply chain. ACMs in Durban are aware of the possible drivers to implementing green sourcing. These drivers include; environmental protection, customer requirements, economic benefits, government regulations, competitors as well as stakeholders.

Environmental protection is not yet a priority to ACMs and if customers were to impose greening requirements, they would have to adopt them to satisfy customer needs and avoid losing valuable customers. Competitors would also drive ACMs to green their supply chains and sourcing strategies.

5.2.2 Objective two: To determine the extent to which the models are used and/or adapted as a sourcing strategy.

For this study, the two main sourcing models that were discussed were Peter Kraljic's (1983) purchasing portfolio model that was introduced in the 1980s and Marshall Fisher's (1997) model. The reason for choosing these two models was based on grounds that Kraljic's (1983)

framework has been classified as the foundation upon which all other purchasing portfolio models are drawn upon (Gelderman & van Weele, 2005) and Fisher's (1997) model assists in categorising products according to their nature, namely functional and innovative (Fisher, 1997).

According to the findings of this study, most of the participants refer to the Kraljic (1983) model as just the 'portfolio model' and they also affirmed that they use the model extensively. They stated that it would be almost impossible to conduct sourcing without the aid of this particular model and that it is the foundation upon which sourcing is conducted. The participants pointed out that it would be almost impossible to conduct sourcing without using Kraljic's (1983) purchasing portfolio model. They use the model as is, by grouping products according to 'supply risk' and 'profit impact' (Figure 5.4).

It was revealed by participants that there are challenges inherent in Kraljic's (1983) model. The first challenge faced by ACMs in Durban was the dilemma of balancing profitability with environmental protection. The other challenge was that green sourcing is not well incorporated into the sourcing process of the company. The third challenge is that green environmental requirement is limited and tied to ISO 14001 and OEMs requirements from the ACMs and suppliers. The implication of the third challenge is the rigidity of the ISO and OEMs requirements. It consistently has to be updated to keep abreast with current green sourcing trends and attempt to reduce these challenges to maximise the full benefit of a green sourcing strategy (Figure 5.5).

Kraljic's (1983) model is considered to be very beneficial when sourcing. It is the most popular and widely used model among all participants interviewed. While participants identified several benefits derived from the model, they also affirmed that it can be improved. It emerged that ACMs do not use any other sourcing models apart from Kraljic's (1983) portfolio model and there is very little evidence of the usage of Fisher's (1997) model by ACMs in Durban. Managers that were interviewed affirmed that the usage of Fisher's model is somewhat minimal by ACMs. At times it is difficult to identify a product according to the level of functionality and innovativeness.

5.2.3 Objective Three: To establish how the adoption of greening requirements has influenced sourcing.

There are many factors that influence sourcing, both internal and external. Greening of supply chains has become more common among companies worldwide. Some companies are already part of a green supply chain and consider it a priority. However, some companies are not yet on board when it comes to green supply chain. This could be a result of the possible existing challenges that ACMs fear to face and overcome. These challenges include; supplier resistance, cost, lack of information, fear of change, inadequate training and lack of government support.

The ACMs that are practicing green sourcing confirmed that greening requirements have influenced sourcing. A large portion of the respondents totaling 72.1%, indicated that the adoption of green requirements has influenced sourcing. This is mainly because of the customer requirements that OEMs impose on ACMs which they in turn impose on their suppliers.

About 57% of respondents disagreed that their organisation would stop doing business with suppliers that do not meet their specified green requirements and 62.1% of respondents disagreed that their organisation requires suppliers to be green supply chain compliant (Table 4.2B). Based on the afore-mentioned results, it can be deduced that sourcing has not been significantly affected by the adoption of greening requirements.

The suppliers that ACMs source from need to be environmentally conscious even though it is not an obligation. However, almost 36% respondents said that it is a requirement for their suppliers to be part of a green supply chain (Table 4.2B). This has influenced the manner in which sourcing is conducted. ACMs now need to consider more factors when deciding who to source from and decide whether they can tolerate non-compliance from suppliers. This can prove to be difficult as they have had long-term relationships with suppliers and building new relationships can be very daunting.

5.2.4 Objective Four: To provide insight into the extent to which ACMs requirements regarding green sourcing have influenced their suppliers.

It can be assumed that it would make sense for suppliers to be influenced by ACMs when they introduce greening requirements in sourcing. However, according to the findings of this study, it can be deduced that most ACMs have not forcefully imposed any green requirements on their suppliers. They still do business with suppliers that are not part of a green supply chain. Most suppliers are however, required to have the ISO 14001 accreditation. It has proved very difficult to prove the extent to which ACMs are environmentally conscious and part of a green supply chain. This is because a supply chain involves activities and processes that start from acquiring raw materials, turning them into products and services and later selling as a final product to an end user. Tracking and tracing the activities involved in the different phases of the supply chain can be very challenging. This is why it would be difficult for ACMs to determine whether their suppliers are strict concerning what is meant by strict greening requirements throughout the supply chain.

The suppliers of ACMs have been required by ACMs to be environmentally conscious and consider environmental protection and important factors when doing business. Suppliers are required to be accredited with the ISO 14001 standard. ACMs are tolerant to non-compliance regardless of how much they may hope each company would regard environmental consideration very important for human beings.

Approximately 57% of respondents disagreed that their organisation would stop engaging with suppliers that do not meet their specified green requirements while 62.1% of the respondents indicated that their organisation requires suppliers to be green supply chain compliant (Table 4.2B & table 4.3 respectively). Gathering from the aforementioned findings, it can be deduced that ACMs have not extensively influenced their suppliers to be green supply chain compliant.

5.2.5 Objective Five: To investigate how OEMs' requirements regarding green sourcing have influenced ACMs supply chains.

As the suppliers of component parts to OEMs, ACMs are obliged to meet the requirements and specifications of OEMs. It can thus be deduced that to some extent, OEMs influence ACMs when conducting sourcing. Very little evidence exists with regards to the extent to which OEMs influence ACMs' green sourcing as 46.8% and 39.2% respondents were neutral and agreed respectively. About 65.9% of respondents alluded that OEMs impose greening requirement when conducting sourcing and 84.4% of respondents indicated that OEMs influence the manner in which they conduct sourcing (Table 4.2B). However, there is evidence that suppliers are required to be ISO 14001 compliant and certified.

5.3 Conclusion

The purpose of this chapter was to provide a summary of the research findings according to each research objective of this study. The findings can be summarised as follows; green sourcing is still a new phenomenon for most people in the organisations that participated in the study. This was evident from their minimal knowledge of the term and procedures involved when implementing green sourcing. Some participants were more familiar with the term green sourcing than others and had a clear understanding of what it was all about. According to the findings of this study, Kraljic's (1983) purchasing portfolio model is used extensively by ACMs in Durban. The model is considered very crucial when conducting sourcing and managers stated that it would be almost impossible to conduct sourcing without using Kraljic's (1983) model. There is very little evidence regarding use of Fisher's (1997) model by ACMs in Durban. The ACMs that were practicing green sourcing confirmed that greening requirements have influenced sourcing. The three primary objectives of the organisation now include economic benefit, social consideration and environmental protection. It can be deduced that most ACMs have not forcefully imposed any green requirements on their suppliers. They still do business with suppliers that are not part of a green supply chain. However, most suppliers are required to have ISO 14001 accreditation. The next chapter presents the conclusions and recommendations of this study.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The purpose of this chapter is to conclude the study by means of providing conclusions based on data collected, make recommendations and give direction for future studies as well as highlighting the limitations of the study.

6.2 Conclusions based on data collected

According to Lettice *et al.*, 2010, the automobile industry is considered the world's biggest single manufacturing sector and demand for motor vehicles has been intensified by continued increase in the world's population. Original equipment manufacturers (OEMs) are consequently producing more and more vehicles to meet demand. Therefore, automotive component manufacturers (ACMs) must in turn manufacture more component products to meet OEM's demand.

The main aim of this study was to understand how ACMs can incorporate green elements in sourcing and to identify the challenges that ACMs encounter when seeking to implement green sourcing strategy. The motivation of this study was the evident extent to which the environment is deteriorating and the contribution the automotive industry makes in the deteriorating environment. The findings highlighted that greening requirements in ACMs are not yet a major priority as they lack the knowledge and training to incorporate it when conducting sourcing.

The automotive industry is one of the industries with a very complex and competitive supply chain. To ensure a sound supply chain, an efficient sourcing strategy is of essence. With the shift from traditional supply chains to environmentally conscious supply chains, the automotive industry is required to conduct sourcing in a manner that environmental damage is significantly reduced. There are various sourcing strategies that ACMs may use and for this purpose of this study only Kraljic's (1983) purchasing portfolio model and Fisher's (1997) model were discussed to identify the drivers behind choosing a particular sourcing model. ACMs are faced

with many trade-offs and challenges with regards to deciding whether to in-source or outsource activities to focus on their area of core competency. Adding to that, ACMs are also being obligated by some of their customers and government regulations to implement green supply chains and hence green sourcing. The need to protect the environment is an area that concerns every individual and precautionary measures to protect the environment must be continuously improved.

A large majority of purchasing and logistics personnel in ACMs indicated that they had very little knowledge of the term green sourcing and its related procedures. Very few participants were familiar with the term and thoroughly understood it. It was confirmed by the aid of primary data collection that Kraljic's (1983) purchasing portfolio model is used extensively by ACMs in Durban. This particular model is considered a foundation upon which sourcing can be effectively undertaken. There is however, very little evidence of ACMs in Durban making use of Fisher's (1997) model. ACMs that are practicing green sourcing have confirmed that greening requirements have influenced sourcing. The three primary objectives of the organisation now include economic benefit, social consideration and environmental protection. It is evident from the main objectives of the organisation that greening requirements have influenced sourcing. It has been proven that most ACMs have not persuasively imposed any green requirements on their suppliers hence, they still source from suppliers that are not part of a green supply chain. Suppliers are however, required to have ISO 14001 accreditation.

6.3 Recommendations

The following recommendations emanated from the study:

- (i) ACMs need to understand the consequences of the deteriorating environment and the major contribution they make. This can be done by familiarising themselves with literature and media on environmental deterioration.
- (ii) ACMs need to provide trainings and courses to educate employees throughout the company, on green sourcing and its importance.
- (iii) ACMs can adopt the triple bottom line during the sourcing process to emphasize the importance of social variables, environmental protection and financial benefits.

- (iv) ACMs can attempt to mitigate barriers to implement green sourcing by involving suppliers, customers and government when conducting sourcing. Sharing of information throughout the supply chain can help reduce barriers.
- (v) Green sourcing can be considered as a major role player in a green supply chain and more studies of this nature should be conducted to ensure that more companies from all industries are taking full advantage of green sourcing.

6.4 Contribution of the study knowledge

The study was conducted to provide insight on how greening elements have influenced supply chains and sourcing in the automotive industry, specifically focusing on automotive component manufacturers. The results of the study may be valuable and beneficial to ACMs that want to green their supply chains while simultaneously maximising profits. Anyone who is affected by ACMs can also find this study valuable suppliers and customers.

6.5 Limitation of study

The researcher encountered various issues that were considered as limitations to achieving ultimate results that the researcher had planned and hoped for. There was initially a challenge to get gatekeeper's letters for companies to participate in the study. There was also a major delay once gatekeeper's letters had been obtained and the research could be conducted. Meetings were scheduled and confirmed with participants in advance and at times, they were postponed. The data collection process proved to be rather time consuming and there was also a lot of financial expenditure that resulted from postponed meetings. Results only represent the group surveyed and cannot be generalisable to all ACMs in Durban.

6.6 Direction of future study

Future studies may explore how government can support green initiatives by means of cash injections and laws and regulations to protect the environment and maximise profits. More benefits of green supply chain and green sourcing may be studied to encourage more ACMs to be environmentally conscious when doing business. Factors on how to overcome and reduce

barriers and challenges when implementing green sourcing is an area that can be studied further. Green sourcing strategies can be studied further as very little literature is available on the subject.

6.7 Conclusion

The purpose of this chapter was to conclude the study, make recommendations, provide direction for future studies and give a description of how the dissertation was structured.

The dissertation was structured as follows:

Chapter 1: Introduction

The purpose of this chapter was to introduce the significance of the study, research objectives as well as provide the structure of the thesis and how data will be collected and analysed.

Chapter 2: Literature Review

Chapter Two examined the theoretical construct for the study using previous studies and literature on sourcing strategies, green supply chain management, purchasing portfolio model and the automotive industry focusing on automotive component manufacturers. The need to protect the environment was discussed. Kraljic's (1983) purchasing portfolio model was identified as the foundation upon which sourcing is conducted. Drivers and barriers to implement green supply chain (GSC) were identified and discussed.

Chapter 3: Research Methodology

The intention of this chapter was to cover various areas that are of essence to the success of this research project. These areas included the type of study, population, data collection methods, sampling design, measuring instruments, sampling technique, data analysis as well as ethical considerations. To conclude, this study was exploratory and descriptive in nature using personally administered questionnaires to logistics and purchasing employees and interviews for purchasing and logistics managers. The population comprised ACMs in Durban. The study used a mixed methods approach. Data were only collected once ethical clearance had been approved as per university policy and respondent anonymity and confidentiality were

maintained. Analysis of data obtained was done by the aid of Nvivo for interviews and thematic analysis and SPSS for questionnaires.

Chapter 4: Quantitative and Qualitative Data Presentation

This chapter presented quantitative data that was collected by means of personally administered questionnaires. Data were presented with the aid of tables, charts and diagrams. Cronbach's Alpha Test showed that questionnaire items have an acceptable internal consistency and thus relatively reliable. Factor Analysis was used to determine factors influencing green sourcing practice. This chapter also presented data that was obtained through personally administered interviews. The chapter then presented qualitative data that was coded using thematic analysis with the aid of a computer assisted qualitative data analysis (CASQDA) software Nvivo11. Patterns were highlighted and data were examined for recurring themes using thematic analysis.

Chapter 5: Discussion of Results

Chapter 6 provided a summary of the research findings according to each research objective of this study. The findings can be summarised as follows; Green sourcing is still a new phenomenon for most people in the organisations that participated in the study. This was evident from their minimal knowledge of the term and procedures involved when implementing green sourcing. Some participants were more familiar with the term green sourcing than others and had a clear understanding of what it was all about. According to the findings of this study, Kraljic's (1983) purchasing portfolio model is used extensively by ACMs in Durban. The model is considered very crucial when conducting sourcing and managers stated that it would be almost impossible to conduct sourcing without using Kraljic's (1983) model. There is very little evidence of the usage of Fisher's (1997) model by ACMs in Durban. The ACMs that were practicing green sourcing have confirmed that greening requirements have influenced sourcing. It can be deduced that most ACMs have not forcefully imposed any green requirements on their suppliers. They still do business with suppliers that are not part of a green supply chain. Most suppliers are however, required to have ISO 14001 accreditation.

Chapter 6: Recommendations and Conclusion

The purpose of this chapter was to conclude the study, make recommendations, provide contribution of the study knowledge, direction of future studies, limitations of study and provide a summary of the study.

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APPENDICES

APPENDIX A: QUESTIONNAIRE

UNIVERSITY OF KWAZULU-NATAL



School of Management

Voluntary Questionnaire

Master of Commerce - Supply Chain Management Research Dissertation

Researcher: Ms Mbalenhle Mngadi 0765297320 208514315@stu.ukzn.ac.za
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Title: Green sourcing strategy challenges faced by Automotive Component Manufacturers in Durban, South Africa.

The purpose of this survey is to solicit information from purchasing and logistics employees on the green sourcing challenges that Durban automotive component manufacturers face. The aim of this study is to study in depth about the new green sourcing phenomena, to find out how companies make use of various sourcing strategies as well as the challenges they face when implementing green sourcing strategies. The information you provide with will go a long way in helping the researcher answer the main research questions.

The questionnaire should only take 10-15 minutes to complete. In this questionnaire, you are asked to indicate what is true for you, so there are no “right” or “wrong” answers to any question. The identity of all participants will be treated with the utmost confidentiality as well as the responses on the questionnaire. Anonymity will be ensured and all respondents are free to withdraw from the research at any time without negative consequences to themselves. Your participation will be highly appreciated. Please answer all these questions as honestly as possible.

CONSENT

I----- (full name of participant) hereby confirm that I understand the contents of this document and the nature of the research project and I consent to participating in the research project. I understand that I am at liberty to withdraw from the project at any time, should I so wish.

SIGNATURE OF PARTICIPANT: -----

DATE: -----

Thank you for participating!

Section A: General questions. Please tick the relevant box.

1. Gender

Male		Female	
------	--	--------	--

2. Department

Purchasing		Logistics		Other	
------------	--	-----------	--	-------	--

3. Highest educational qualification obtained

Matric Certificate	
Diploma	
Undergraduate Degree	
Honours Degree	
Masters Degree	

4. What is your job status/level?

Top Management	
Middle Management	
Lower Management	
Non-managerial	

Section B: Dichotomous questions. Please select either *yes* or *no* for the following questions.

	Yes	No
I have a good understanding of green sourcing.		
The organization strives to implement green sourcing.		
Our organization provides training to educate employees about green sourcing.		
Does your organization source from suppliers that are not green supply chain compliant?		
If a certain supplier does not meet your green requirements, is there any tolerance in place?		

Section C: Please indicate the extent to which you agree or disagree by ticking one relevant box.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
My organization considers green sourcing to be important to our organization.					
Our organization ensures green sourcing is practiced effectively.					
Our customers influence the manner our organization conducts sourcing.					
Customers impose greening requirements when conducting sourcing.					
The adoption of green requirements has influenced sourcing.					
Our organization requires suppliers to be green supply chain compliant.					
It is a requirement for all our suppliers to be in a green supply chain.					
Our organization faces suppliers' resistance towards change with regards to greening requirements.					
Our organization would stop doing business with suppliers that do not meet its specified green requirements.					
Original Equipment Manufacturers (OEMs) have influenced our organization to implement green sourcing.					
There are clauses in standard contracts that stipulate green sourcing.					
There is clear communication between OEMs and our organization about green requirements when doing business.					
Trainings and availability of information would improve the understanding and implementation of green sourcing.					

Section D: Ranking Questions

1. Below is a list of possible drivers to implement green sourcing. You are required to rank all the drivers by allocating the relevant number from 0 to 5 (0 being the least and 5 being the most).

Environmental protection	
Customer requirements	
Economic benefits	
Government regulations	
Competitors	
Stakeholders	

2. Below is a list of challenges ACMs face when implementing green sourcing. Please rank all the challenges by allocating the relevant number from 0 to 5 (0 being the least and 5 being the most).

Supplier resistance	
Cost	
Lack of information	
Fear of change	
Inadequate Training	
Lack of government support	

3. A “green” product is defined as one that has less of an environmental impact or is less detrimental to human health than the traditional product equivalent.

Out of all the products your company manufacturers, what percentage of them are “green”?

(Please tick one box)

0-20%	
21-40%	
41-60%	
61-80%	
81-100%	

Section E: The following section requires you to select either *agree* or *disagree* for all the questions.

	Agree	Disagree
In my organization the importance attached to green sourcing translates into practice.		
In my organization the importance attached to green sourcing does not translate into practice.		
In the case of supplier non-compliance, our organization would carry on doing business with that supplier.		

APPENDIX B: INTERVIEW SCHEDULE

UNIVERSITY OF KWAZULU-NATAL



School of Management

Voluntary Interview

Title: Green sourcing strategy challenges faced by Automotive Component Manufacturers in Durban, South Africa.

Thank you for reading the information sheet about the interview sub-study. If you are happy to participate, please complete and sign the form below. Please initial the boxes below to confirm that you agree with each statement or leave it blank if you do not agree.

*Please
Initial box:*

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline.

☐

I understand that my responses will be kept strictly confidential.

☐

I understand that my name will not be linked with the research materials, and will not be identified or identifiable in the report or reports that result from the research.

☐

I agree for this interview to be tape-recorded. I understand that the audio recording made of this interview will be used only for research purposes.

☐

I understand that no other use will be made of the recording without my written permission, and that no one outside the research team will be allowed access to the original recording.

☐

I confirm that I have read and understood the information sheet dated and have had the opportunity to ask questions.

☐

I agree to take part in this interview.

☐

Name (optional)

Date

Signature

Section A: Job and job role

1. What position do you hold in this company?
2. How long have you worked in this company?
3. What are your main responsibilities?
4. Would you consider yourself a decision maker in this company? If yes, please explain your involvement in the decision making process of this company.
5. What role do you play in the sourcing process, if any?
6. Have you had any training specifically designed for sourcing?

Section B: Sourcing

Green sourcing is a new phenomena and some people use different terminologies to refer to green sourcing. For the purpose of this study and interview green sourcing is defined as the consideration of the environment in the sourcing process.

7. Please explain briefly the sourcing process your company makes use of.
8. Does the manner in which your company conducts the sourcing process vary from product to product?

Kraljic introduced the first comprehensive portfolio approach for the determination of a set of differentiated purchasing strategies. The general idea is to minimize supply risk and make the most of buying power. This explains the choice of dimensions: accounting for risk on the one hand, and using buying power on the other hand. Kraljic's approach includes the construction of a portfolio matrix that classifies products on the basis of two dimensions: profit impact and supply risk ('low' and 'high'). The result is a 2x2 matrix and a classification in four categories: bottleneck, non-critical, leverage and strategic items. Each of the four categories requires a distinctive approach, in proportion to the strategic implications.

9. Does your company make use of Kraljic's portfolio model in some way?
10. Do you experience any challenges when making use of this model and incorporating green requirements in the sourcing process?
11. Do you find this model to be beneficial or is there plenty of room for improvement? Please explain.
12. Do you use other models in the sourcing process? If yes, please state them.

Fisher introduced a model for selecting the right supply chain for a product. He recommends that the features of product demand define whether the product is functional or innovative. A

functional product is one that has a long product life cycle, predictable demand and is usually produced in large quantities and cost is reduced so is profit. Innovative products are high end fashion products with an unpredictable demand, usually supplied in small quantities, cost more and have a higher profit.

13. Are you familiar with Fisher's model or a similar model?
14. If yes, do you make use of it and to what extent?
15. Do you experience any challenges when making use of this model and incorporating green requirements in the sourcing process?
16. Do you find this model to be beneficial or is there plenty of room for improvement? Please explain.

We have come to the end of our interview, is there anything that you would like to add or ask?

APPENDIX C: TURN-IT-IN REPORT

APPENDIX D: PERMISSION TO SUBMIT

APPENDIX E: EDITOR'S LETTER

APPENDIX F: ETHICAL CLEARANCE

DECLARATION

I, **Mbalenhle Nokukhanya Mngadi**, declare that:

The research reported in this dissertation, except where otherwise indicated, is my original research.

This dissertation has not been submitted for any degree or examination at any other university.

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

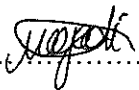
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Their words have been re-written but the general information attributed to them has been referenced;

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Signed: 

Date: 27/08/2019