

**SPECIFIC SERVICE LEVEL EXPECTATIONS THAT AUTOMOTIVE
MANUFACTURERS HAVE OF THIRD PARTY LOGISTICS SERVICE
PROVIDERS IN THE EASTERN CAPE PROVINCE**

By

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DECLARATION

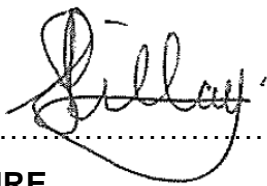
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In accordance with Rule G5.6.3, I hereby declare that the above-mentioned thesis is my own work and that it has not previously been submitted for assessment to another University or for another qualification.



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3/9/18
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ABSTRACT

Very few business enterprises, whether as a service provider or manufacturer, operate in isolation. Most business enterprises have suppliers from whom they acquire their resource inputs (inbound processes), and customers to whom they supply (outbound processes) their outputs. These processes include logistics functions such as transportation, warehousing, information technology, packaging and design activities. In an effort to reduce costs, both these inbound and outbound processes are often outsourced to a third party when the business enterprise finds it too costly to do the processes by itself. Logistics outsourcing refers to an arrangement whereby a logistics service provider, called a third party logistics (3PL) service providers, performs services for a firm that could be, or have previously been, provided in-house.

3PL service providers have a strategic role to play especially in the business of automotive manufacturing firms. They act as external suppliers of logistical services that ensure the efficient and effective flow of resource inputs into the firm as well as final products to the end customer. Low cost, despite being a critical success factor, is not the only expectation. 3PL service providers are also expected to be flexible and versatile in its operations, and to cater for the needs of the manufacturing business strategy. Millions of Rands are spent on 3PL service providers, with the hope and belief that they will streamline business processes.

Outsourcing of the logistics division to 3PL service providers reduces the costs of getting the right product to the right place for the consumer. Automotive manufacturing firms are not willing to add any costly service to the commodity which is not perceived as value-adding by the customer. Customers have always been classified as value conscious, but in recent times of economic difficulty and uncertainty, this has become even more apparent. This trend has caused many automotive manufacturing firms to prioritise cost saving, and logistics is no exception.

The main objective of this study was to investigate the specific service level expectations that automotive manufacturing firms have of third party logistics (3PL) service providers in the Eastern Cape Province. In support of the main objective, it was necessary to source the reasons why automotive manufacturing firms in the Eastern Cape Province find it important to trade with 3PL service providers and to

determine whether or not 3PL service providers are meeting the expectations of automotive manufacturing firms in the Province. Furthermore, the study set out to highlight the major problems currently associated with 3PL service providers, as well as to determine the consequences of unacceptable performance levels provided by 3PL service providers. Lastly, to identify the action plans that automotive manufacturing firms have to bring 3PL service providers in line with their expectations.

As a starting point to the study, a literature review was undertaken which revealed that the supply chain philosophy is an important operation in any manufacturing environment. In order to satisfy the end customer, business organisations need to ensure that all supply chain operations are completed in the most efficient and effective manner. In addition, modern business strategies, also referred to as international trends, need to be practiced by principal manufacturing organisations in their quest to be more efficient, effective, competitive and successful in an ever-changing business environment. In order to achieve supply chain success, principal organisations need to ensure that all supply chain partners, particularly 3PL service providers, are aligned with the goals of the principal organisation's supply chain. The review highlighted that business organisations need to review their selection methods for 3PL service providers on a continuous basis and only select providers that can tailor their service offerings according to the principal organisation's needs. Therefore, in order for automotive manufactures to realise more potential from their 3PL service providers in the future, issues such as early 3PL service provider involvement, cost saving initiatives from 3PL service providers and 3PL service provider development, will become more crucial.

Lastly, the review showed that the automotive industry plays a key role in developing countries as it is a significant contributor to GDP and provides a source of employment, which is much needed in South Africa. However, automotive logistics is a highly complex field, demanding considerable capital resources. One of the most important roles of 3PL service providers in the automotive industry is the management of cargos of goods within the supply chain. As a result, the automotive industry is becoming more based on a system of modularity, through a system of modular production.

Logistics outsourcing is receiving increased attention, since it is a sector in which productivity and efficiency improvements are possible in order to lower operating

costs, while improving customer services. However, 3PL service providers face significant barriers in developing countries such as stringent legal regulations, poor infrastructure and equipment, as well as a lack of competent manpower for efficient operations.

This research was performed mainly within the positivist research paradigm of causality, since it was held by the researcher that there should be a clear causal relationship between the variables that may be observed to answer the research questions of this study. A simple random probability sample of participants from the research population of automotive manufacturing firms in the Eastern Cape Province was gathered, and the questions posed in the questionnaire of this study were structured using both Likert-scale and open-ended questions. In order to analyse the data, two popular quantitative data analysis techniques of descriptive statistical analysis and inferential statistical analysis were employed, with particular techniques of Correlation Analysis, Cronbach's alpha, and tests for normality being performed.

The empirical study revealed that the largest group was employed in the assembly sector, and the vast majority of the respondents made use of 3PL service providers for both sending and receiving components and parts. Almost all of the respondents outsourced transportation services to 3PL service providers. Most respondents were satisfied or very satisfied with their transportation 3PL service providers; but fewer were satisfied, and some were dissatisfied or very dissatisfied, with warehousing and VAS 3PL service providers.

The range of mean values across all of the 'consequences' that had been caused due to inferior 3PL performance was concisely grouped, indicating that no single issue stood out as far more or less of a problem than the others; though three common problems noted were that respondents had not received parts and components on time, experienced production stoppages; and higher costs had impacted their organisations negatively.

The Cronbach alphas of each of the transportation, warehousing, VAS and consequences data sets, combined, indicated that the data was reliable, and had suitable internal consistencies.

The main corrective actions to be taken by automotive manufactures against 3PL service providers who fail to perform as promised are to impose a penalty as per the terms and conditions of the contract signed between the automotive manufacturing firm and the 3PL service provider or to cancel the contract and look for an alternative 3PL service provider if they do not have a back-up service provider.

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CHAPTER 1

INTRODUCTION, PROBLEM STATEMENT AND DEMARCATION OF THE STUDY

1.1 INTRODUCTION

Very few business enterprises, whether as a service provider or manufacturer, operate in isolation. Most business enterprises have suppliers from whom they acquire their resource inputs (inbound processes), and customers to whom they supply (outbound processes) their outputs (Barns 2008:12). These processes include logistics functions such as transportation, warehousing, information technology, packaging and design activities. In an effort to reduce costs, both these inbound and outbound processes are often outsourced to a third party when the business enterprise finds it too costly to do the processes by itself. Logistics outsourcing refers to an arrangement whereby a logistics service provider, called a third Party Logistics (3PL) service provider, performs services for a firm that could be, or have previously been, provided in-house (Lynch 2004:2).

3PL service providers have a strategic role to play especially in the business of automotive manufacturing firms. They act as external suppliers of logistical services that ensure the efficient and effective flow of resource inputs into the firm, as well as final products to the end customer. Low cost, despite being a critical success factor, is not the only expectation. 3PL service providers are also expected to be flexible and versatile in its operations, and to cater for the needs of the manufacturing business strategy (Waters 2007:217). Millions of Rands are spent on 3PL service providers, with the hope and belief that they will streamline business processes. Globally, logistics outsourcing expenditure as a fraction of total logistics costs are calculated at over 40% and are expected to rise even further (Cahill 2007:24).

Outsourcing of the logistics division to 3PL service providers reduces the costs of getting the right product to the right place for the consumer. Automotive manufacturing firms are not willing to add any costly service to the commodity which is not perceived as value-adding by the customer. Customers have always been classified as value conscious, but in recent times of economic difficulty and uncertainty, this has become even more apparent (Waters 2010:54). This trend has caused many automotive manufacturing firms to prioritise cost saving, and logistics is no exception.

Given the high levels of competition, specifically in the automotive manufacturing industry, business enterprises need to create ways to improve their competitive positions. Most automotive manufacturers are faced with the same dilemma: either yield control over its own logistics systems, or face the possibility of higher costs. In-house logistics offers a wide range of benefits for automotive manufacturing organisations, for example:

- Direct contact with consumers
- Greater control over meeting expectations
- Customised customer service levels

However, for many automotive manufacturing organisations the costs of in-house logistics services outweigh the advantages because of:

- Lack of specialisation
- Maintenance demands on transportation modes
- High levels of capital requirements

For these reasons they consider outsourcing some or all of the logistics functions. Therefore, when a manufacturer is willing to sacrifice control over its distribution and supply chain operations, it does so trusting that the entity which is providing the 3PL service, will enhance the capability of the automotive manufacturing firm. Collaboration between automotive manufacturing firms and 3PL service providers offers a much leaner business structure as it allows both parties to focus on their core business activities. Automotive manufacturing firms can focus on their core business, which is to produce high quality commodities, while 3PL service providers can offer the client a wide range of logistic services which meet the automotive manufacturing firm's needs. The collaboration also highlights the magnitude of work, resources, as well as information flows needed to ensure a successful relationship (Sharma 2010:206). Collaboration for a long-standing relationship involves a symbiosis existence, where each entity is reliant on the other for success.

Given the short background to 3PL as outlined above, the automotive manufacturing industry is faced with the following question: Do 3PL service providers fulfil the expectations of individual automotive manufacturing firms? The prevailing preference for outsourcing of logistics versus in-house services would seemingly positively answer this question. This study, however, seeks to examine whether the choice is not simply the choice between the lesser of two evils. An ideal scenario would be for manufacturers to, in their quest to become more efficient, effective and competitive, select 3PL service providers that fully meet the expectations of the firm. However, since this idealistic notion is not always realistic, the selection of a 3PL service provider depends to a great extent on the type of services they provide, the costs incurred for the required services, and the quality of the services provided (Cahill 2007:25).

3PL service providers, a manufacturer itself, as well as its inbound and outbound suppliers, all form part of the supply chain in which a business enterprise operates. A supply chain is defined by Stevenson (2007:26) as a sequence of organisations - their facilities, functions, and activities - that are involved in producing and delivering a product or service. This sequence begins with the basic suppliers and extends all the way to the final customer. These organisations and functions have to be coordinated to function as a unit called supply chain management. Therefore, being a manufacturer, supply chain management forms an imperative component of the general planning functions. The overall business policy in terms of what products it will add, or what changes it intends to make to the existing product range, depends on whether it can select the correct 3PL service providers to assist in obtaining the required supplies at competitive prices, at the right time and place, and with the required quality and quantity specifications.

Therefore, the selection of the right 3PL service providers is of paramount importance as they offer automotive manufacturing firms leaner business structures as well as opportunities to gain a competitive advantage over their competitors. 3PL service providers whose performance in terms of quality of service, reliability, financial stability, flexibility, reputation and cost is acceptable, is therefore one of the most critical aspects of a successful supply chain (Sharma 2010:148).

Selecting the wrong 3PL service provider could have severe detrimental implications for a manufacturer, the final customer and the entire supply chain network in which it

operates. Problems associated with selecting the wrong 3PL service provider may, for example, lead to out of stock situations and consequent production stoppages, which in turn could lead to the non-availability of finished products to the customer network, cancelled orders and, ultimately, lost customers. According to Hugo, Badenhorst-Weiss and Van Rooyen (2004:132), all these problems negatively affect the profitability and survival of the firm and the supply chain of which it is part of.

On the positive side, 3PL service providers are often an important source of information to automotive manufacturing firms. As they service a number of different manufacturers, they are subjected to information in various industries which allows them to assist individual automotive manufacturing firms in problem solving. Assume, for example, a situation where a 3PL service provider services both manufacturers A and B which are part of two different supply chains. Should manufacturer A experience a routing problem, the 3PL service provider can then suggest a routing system that manufacturer B uses. Therefore, in an attempt to assist business enterprises to focus more on their core activities, 3PL service providers also offer automotive manufacturing firms an outsourcing opportunity. Consequently, world class automotive manufacturing firms in all industries are currently scrutinising the selection and qualification of their 3PL service providers more critically than before.

1.2 PROBLEM STATEMENT AND RESEARCH SUB-OBJECTIVES

The main objective of this study was to investigate the specific service level expectations that automotive manufacturing firms have of third party logistics (3PL) service providers in the Eastern Cape Province.

1.2.1 Sub-objectives of the study

In support of the main objective, the following five sub-objectives have been identified:

- To source the reasons why automotive manufacturing firms in the Eastern Cape Province find it important to trade with 3PL service providers.
- To determine whether or not 3PL service providers are meeting the expectations of automotive manufacturing firms in the Province.

- To highlight the major problems currently associated with 3PL service providers.
- To determine the consequences of unacceptable performance levels provided by 3PL service providers.
- To identify the action plans that automotive manufacturing firms have to bring 3PL service providers in line with their expectations.

1.3 DELIMITATION OF THE STUDY

In order to obtain the most accurate results, the target group was made of logistics, procurement and supply chain managers of all ages and races who were asked to complete the questionnaire and return it to the researcher at a predetermined date. Automotive manufacturing firms in the Eastern Cape Province formed the population of the study; these automotive manufacturing firms include manufactures in the metal, rubber, electrical, plastic, automotive, as well as chemical industries. The investigation was conducted at automotive manufacturing firms operating in the Eastern Cape Province. The study therefore excludes automotive manufacturing firms that are situated outside of the Eastern Cape Province, as well as non-manufacturing firms.

The main reasons for this delimitation are detailed below.

- Automotive manufactures, to a large extent, depend heavily on the services offered by 3PL service providers. The South African automotive industry is concentrated in three regions in the country, with Eastern Cape Province being the second most important behind the Gauteng Province (AIDC, 2005:13). The Eastern Cape Province is home to four major original equipment manufacturers (OEMs), namely Volkswagen in Uitenhage, General Motors and the Ford motor company in Port Elizabeth, as well as Mercedes Benz in East London (ECDC, 2009:1).
- A large number of automotive component manufacturing firms acting as first-tier suppliers to the above-mentioned motor manufactures, are situated in the Eastern Cape Province. These automotive component manufactures each

make use of various different types of 3PL service providers and can provide valuable input to the study.

- The 11,000ha Coega, near Port Elizabeth, is South Africa's largest industrial development zone (IDZ). The multibillion-Rand industrial park is adjacent to Ngqura, the new dedicated deep-water port with purpose-built container, bulk and break-bulk terminals (ECDC, 2009:5). Including Coega as part of the study will improve its significance as a large number of manufactures and 3PL service providers make use of the port on a daily basis.
- By only focusing on automotive manufacturing firms in the Eastern Cape Province, close geographic concentration made it easier for the researcher to obtain data by paying multiple visits to the automotive manufacturing firms which formed part of the study target group.

1.4 SIGNIFICANCE OF THE STUDY

As was mentioned in the problem statement of this chapter, the main objective of this study was to investigate the specific service level expectations that automotive manufacturing firms have of 3PL service providers. The study focuses on identifying the required characteristics of competent 3PL service providers. The information will provide a guideline to automotive manufacturing firms on improving contract agreements when engaging with 3PL service providers. The findings of the study will make an original contribution in the Eastern Cape Province as it will indicate whether or not automotive manufacturing firms' expectations are being met. It will also indicate the appropriate levels of corrective action that can be used as a guideline for 3PL service providers to meet the expectations of their clients.

The investigation will highlight problem areas associated with 3PL service providers and suggest possible corrective action, thereby allowing automotive manufacturing firms to become more efficient and effective. The research output could also act as an important information source to business enterprises outside the borders of the Eastern Cape Province wanting to set up manufacturing facilities in the region. The study will also create awareness for automotive manufacturing firms about the different types of services offered by 3PL service providers in the Province. Therefore, the

result of this study will equip automotive manufacturing firms to create better ways of selecting 3PL service providers.

1.5 DEFINITION OF KEY CONCEPTS

In the context of the study, the following meanings are ascribed to the concepts embodied in the title and the problem statement:

- Third party logistics (3PL) service providers: Are defined as external suppliers that perform all or part of an organisation's logistics functions (Langley, Coyle, Gibson, Novack and Bardi 2009:119).
- Logistics: May be described as the science of the efficient flow of materials from point of origin to the point of consumption. It is a generic term for all the activities which together ensure that materials and products are at the right place at the right time, that is, create place and time utility (Jonsson 2008:3).
- Supply chain: Refers to a sequence of organisations - their facilities, functions, and activities - that are involved in producing and delivering a product or service. This sequence begins with basic suppliers and extends all the way to the final customer (Stevenson 2007:26).
- Supply Chain Management (SCM): Stock and Lambert (2006:54) define SCM as the integration of key business processes from the end user through to the original suppliers that provide products, services and information that add value for customers and other stakeholders.
- Just in time (JIT) system: Refers to a system that emphasises low inventory levels and a reliance upon transportation to deliver goods as and when customers and logistics nodes need them (Langley, Coyle, Gibson, Novack & Bardi 2009:310).
- Core competency: Facwcett, Ellram and Ogden (2007:43) define a core competency as something that an organisation does so well that it provides the organisation with a competitive advantage.

- Demurrage charges: These refer to costs incurred by shippers or receivers of merchandise, as a daily penalty charge for a rail car or truck that is tied up beyond the normal time for loading and off-loading (Leenders, Johnson, Flynn & Fearon 2006:188).

1.6 CHAPTER OUTLINE

The study is made up of 7 chapters. Chapter 1 is the introductory chapter and explains the background and rationale for the study, the objectives and sub-objectives, the demarcation of the study, as well as its significance.

Chapter 2 outlines Supply Chain Management as a business management methodology. This chapter covers topics such as Total Quality Management (TQM), Six Sigma and lean operating principles. The chapter concludes with a discussion on Just-In-Time (JIT) manufacturing systems.

Chapter 3 explains the evaluation and selection of 3PL service providers, with purpose of giving the reader a clearer understanding of the 3PL industry. This chapter focuses on the services and activities offered by 3PL service providers, different categories of 3PL service providers, as well as third party reverse logistics. The chapter ends off by highlighting possible methods of selecting 3PL service providers.

The automotive industry and 3PL outsourcing in developing countries is discussed Chapter 4. Chapter 5 outlines the research design and methodology of the study.

The findings of the empirical study is presented to the reader in Chapter 6. These findings are integrated with the literature study, while responses to the questionnaire are discussed in relation to the research objectives.

In Chapter 7 the researcher concludes on the findings of the research study. Recommendations regarding possible improvements with regard to the selection of 3PL service providers are made, and the researcher highlights some areas for future research that relate to the topic researched in the study.

1.7 CONCLUDING REMARKS

Having outlined the research problem and study objectives to be achieved in the study in this introductory chapter, Supply Chain Management as a business management methodology, is discussed in the next chapter.

CHAPTER 2

SUPPLY CHAIN MANAGEMENT AS A BUSINESS MANAGEMENT PHILOSOPHY

2.1 INTRODUCTION

Having outlined the background, rationale and objectives of this study in the first chapter, the aim of this second chapter is to give the reader a clearer understanding of the supply chain management philosophy. The chapter begins by defining a number of interrelated concepts such as supply chain, supply chain management, supply management, as well as logistics. Following this, the factors that contribute to the growth of supply chain management and the need to manage supply chains, are discussed.

Finally, the modern business strategies, also referred to as international trends that can be used to make supply chains more efficient and effective, are outlined. To this end, focus will be placed on topics such as Total Quality Management (TQM), Six-Sigma, lean operating principles, as well as Just-In-Time (JIT) manufacturing systems.

2.2 CONCEPTS RELATED TO THE SUPPLY CHAIN MANAGEMENT (SCM) PHILOSOPHY

The Supply Chain Management (SCM) philosophy can be very confusing for those who do not have sound knowledge of the Logistics field. Therefore, the following section explains in more detail concepts such as supply chain, supply chain management, supply management, as well as logistics. The evolution, principles, characteristics, growth and the need to manage supply chains are also highlighted in this chapter in order for the reader to gain a better understanding of the broader concept of SCM.

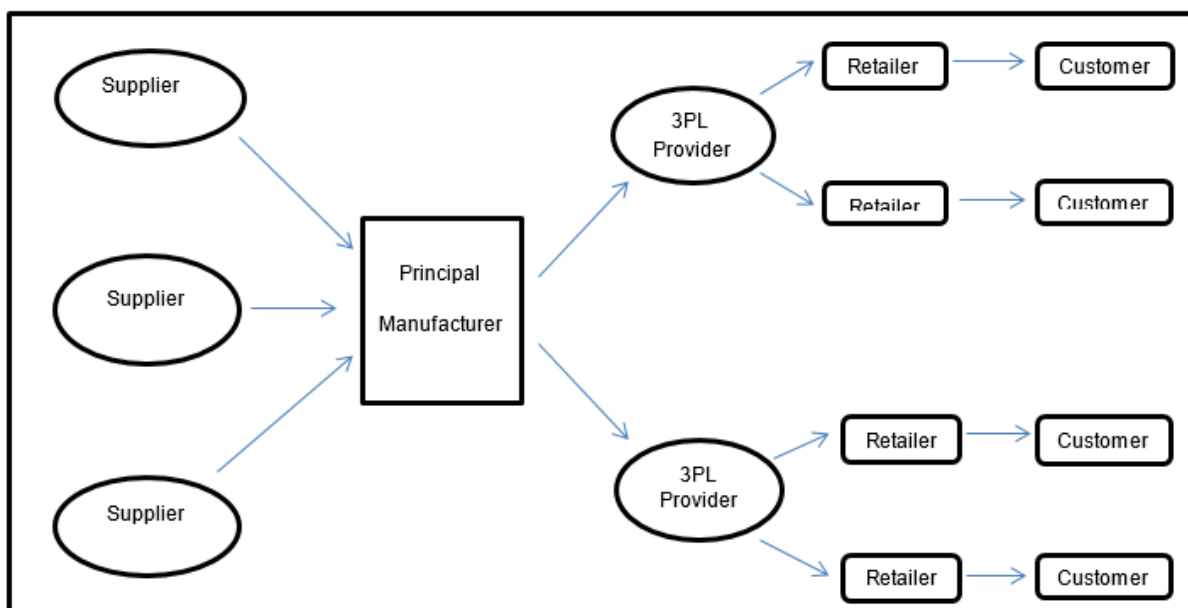
2.2.1 A supply chain

According to Mentzer and Sharma (2010: 4), a supply chain consists of three or more organisations that are connected by one or more of the upstream and downstream flows of goods, services, related information and finances from a supplier to a consumer or producer and eventually to the final customer. The connected organisations form a partnership, meaning that a supply chain consists of various

partners or organisations that work together for the benefit of each member. The authors further assert that the supply chain usually starts with business organisations that extract raw materials from nature and ends with the final customer receiving the final product or service he or she ordered. Pienaar and Vogt (2012: 9) state that the term 'supply chain' is a generic name for process integration between different business activities in order to transform raw materials into finished goods and move them to the final customer.

Referring to Figure 2.1 below, a supply chain typically consists of a number of different supply chain partners such as suppliers, manufacturing or principal organisations, third party logistics (3PL) service providers, retailers and customers. A supply chain partner is defined by Van Weele (2008: 3) as any intermediary that forms part of a supply chain. All the supply chain partners need to work together as a coordinated and integrated unit to ensure supply chain success.

Figure 2.1: The supply chain partners within a supply chain



Source: Researcher's own construction

Sharma, Agarwal and Garg (2013: 296) have further identified the following three categories of supply chains:

- The first is a basic supply chain which generally consists of three supply chain partners such as a principal business organisation, an immediate supplier as

well as an immediate customer. Within the basic supply chain, all partners are directly linked to one or more of the upstream and downstream flows of goods, services, related information and finances.

- The second is an extended supply chain which normally consists of suppliers of the immediate supplier and customers of the immediate customer which are both linked by one or more of the upstream and downstream flows of products, services, related information and finances.
- The third is an ultimate supply chain which usually consists of all the business organisations involved in all the upstream and downstream flows of products, services, related information and finances. Therefore, it typically includes initial suppliers, manufacturers, third party logistics service providers, retailers, as well as final customers.

A supply chain, although consisting of separate intermediaries (supply chain partners) with specialised operations, is regarded as a complete unit. According to the above-mentioned authors, collaboration among these supply chain partners will result in lower cost structures, improved competitiveness and higher profitability for all partners involved. Horn, Cook and Howell (2012: 3) further state that a supply chain is only as strong as its weakest supply chain partner. Therefore, a willingness to co-operate and integrate must exist amongst all supply chain partners to make the entire chain successful.

2.2.2 Supply management

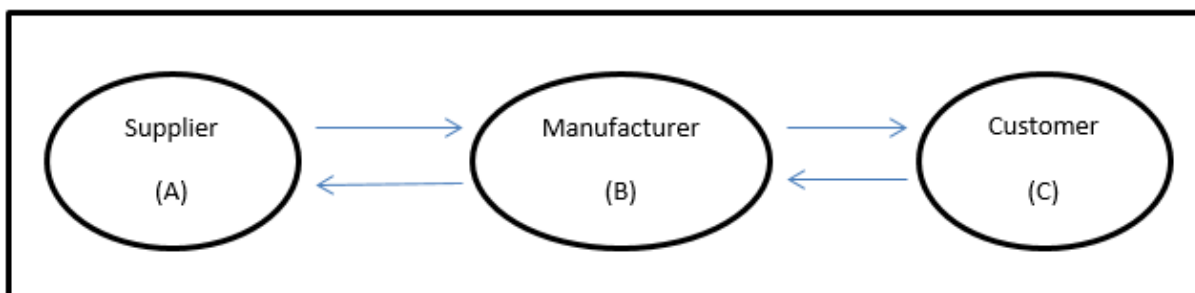
Supply management is a broad term used to describe the various activities of acquiring and managing products, services and resources needed to operate a business organisation. Hugo and Bardenhorst-Weiss (2009: 87) define supply management as the process of identifying, evaluating, selecting, managing and developing suppliers to realise supply chain performance that is superior to that of its competitors. The main goals of supply management are to control costs, efficiently allocate resources and gather information to be used in strategic business decisions.

2.2.3 Supply Chain Management (SCM) defined

The Supply Chain Management (SCM) concept has its origin in the subject Logistics (Bidgoli: 2). However, these two concepts are often mistakenly used interchangeably. In order for the reader to gain a clearer understanding of the difference between SCM and logistics, the researcher defines these two concepts separately.

On the one hand, SCM includes the planning, co-ordinating and management of all activities involved in logistics management, conversion and procurement across a network of upstream and downstream organisations (Pienaar & Vogt 2012: 8). The authors further state that SCM includes co-ordination with supply chain partners such as suppliers, 3PL service providers, retailers and customers. Referring to Figure 2.2 below, SCM occurs from A to C as an entire chain.

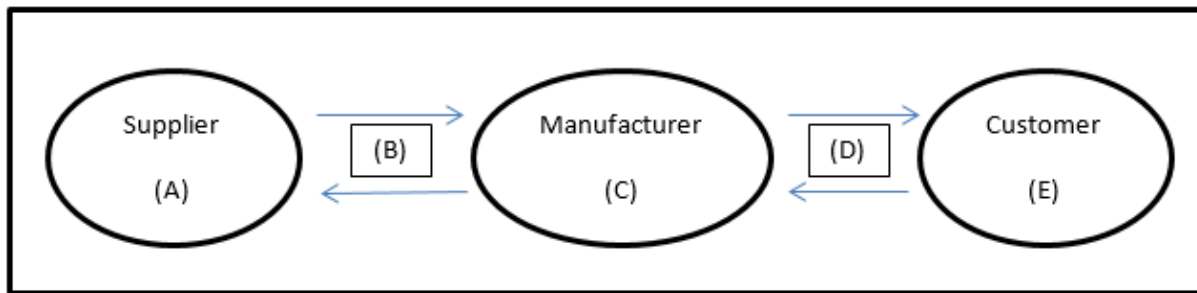
Figure 2.2: Supply chain management



Source: Researcher's own construction

Logistics, on the other hand, is a sub-set of SCM. It is that part of SCM that plans, implements and controls the efficient, effective, forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements (Mangan, Lalwani & Butcher 2008: 9). Referring to Figure 2.3 below, logistics management occurs at B and D, thereby enabling the supply chain partners A, C and E to function as an integrated supply chain unit.

Figure 2.3: Logistics management



Source: Researcher's own construction

2.2.4 The evolution of SCM

Referring to Figure 2.4 below, SCM has evolved from the traditional business approach, which primarily focused on functional objectives, to an approach which focuses more on external integration with supply chain partners. Christopher (2005: 22) describes the evolution of SCM as consisting of four stages and these are articulated by the author as follows:

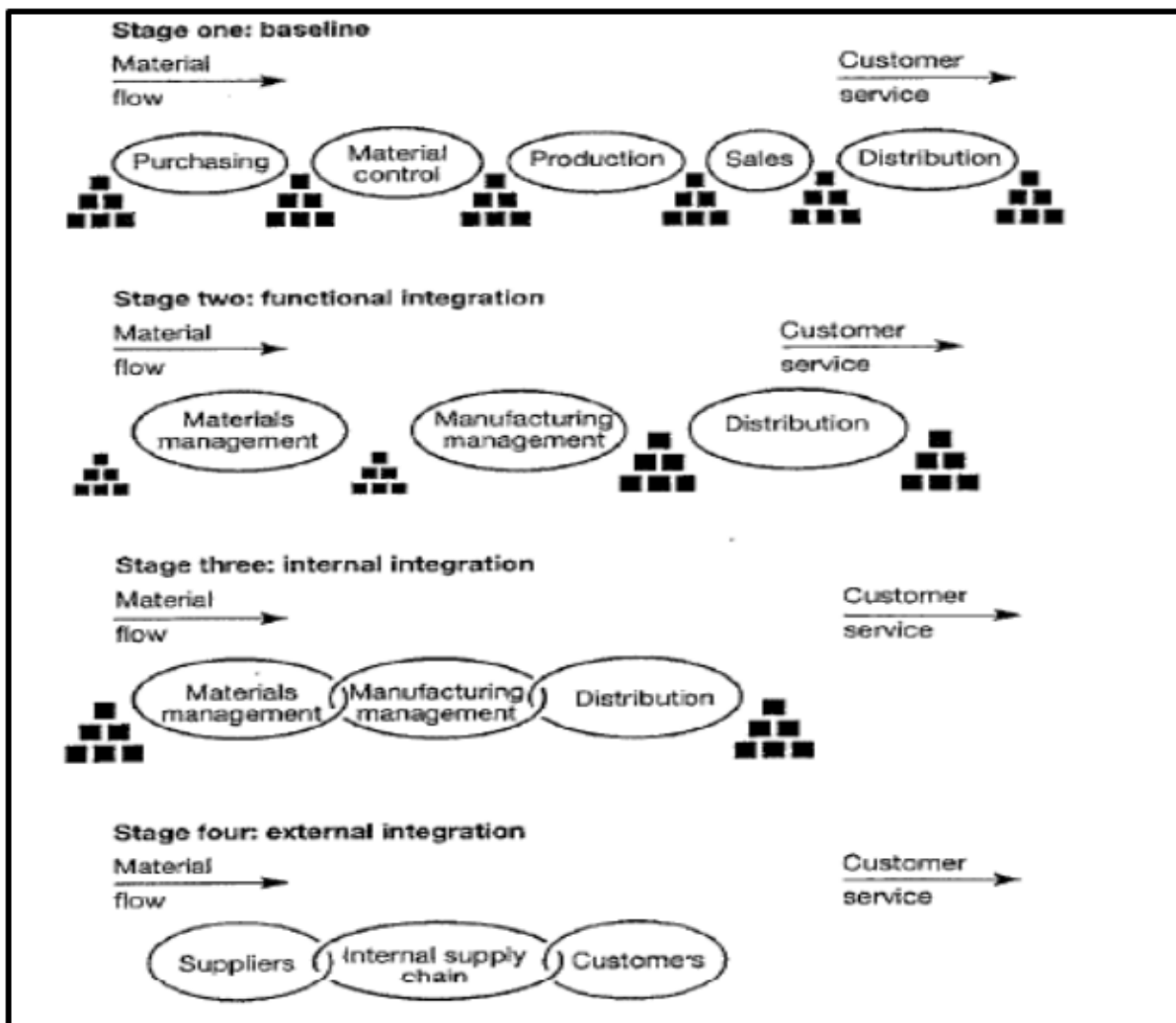
Stage 1: Baseline

In the baseline stage different business functions work in isolation and are driven by functional objectives rather than overall business objectives. During this stage, inter-departmental communication is at a bare minimum or even non-existent between some business functions. For example, warehousing might be pushing for low inventory levels with the goal of decreasing inventory carrying costs, while conversely, manufacturing is calling for high pre-production inventory levels in an attempt to avoid production stoppages.

Stage 2: Functional integration

Within the functional integration stage, limited integration between adjacent functions exists and the responsibilities of some activities are centralised. Functional integration is thus characterised by limited information sharing between functions, while within certain functions information sharing is non-existent.

Figure 2.4: Achieving an integrated supply chain



Source: Christopher (2005: 19)

Stage 3: Internal integration

In the internal integration stage all the business functions within the organisation strive to work together with the common goal of achieving the overall objectives of the business organisation. Within this environment, information is shared freely and open communication systems exist between business functions. For example, the logistics and manufacturing departments will align their departmental objectives in a manner that supports the overall objectives of the business organisation.

Stage 4: External integration

External integration requires total internal functional integration and external integration with supply chain partners such as upstream suppliers, 3PL service

providers and final customers. Therefore, communication and information sharing is inter-organisational between supply chain partners.

2.2.5 Characteristics of SCM

There are numerous characteristics of SCM that have been widely discussed in the literature. In an effort to simplify the large body of knowledge that exists, Hugo, Bardenhorst-Weiss and Van Biljon (2007: 65) present the following summary of the primary characteristics SCM:

- Various business organisations (supply chain partners) work together as a coordinated unit to stream-line the shared supply chain processes with their focus on the strategic objectives and goals of the principal organisation.
- Supply chain partners more often than not belong to more than one supply chain. For example, a 3PL service provider can supply transportation services to more than one automotive vehicle manufacturer, and in this way be part of two separate and competing supply chains.
- Principal organisations' suppliers, 3PL service providers and customer integration share a 'loose' relationship, connected at interfaces and are bound together by mutual advantages. Therefore, it is management's responsibility to ensure that all participating organisations share and work towards the same goal which is value creation for the end customer and wealth creation for the supply chain partners.
- Not all supply chain partners are of equal importance in the supply chain. Their level of importance will depend on the potential impact they have upon the relevant supply chain processes in which they are involved.
- Information and communication are shared across the entire supply chain. Data is made available on an inter-organisational basis. A free will of information sharing should exist between supply chain partners, which is of paramount importance in building a competitive and responsive supply chain.
- The corporate objectives of supply chain partners need to be compatible to ensure supply chain success. It is thus imperative for member organisations'

top management to support the supply chain philosophy and understand the benefits and risks that come with the implementation of this philosophy.

- A shared vision concerning customer value and compatible corporate philosophies is fundamental in achieving the necessary integration in all the aspects of management for all the supply chain partners concerned.

Therefore, SCM can be seen as a business management philosophy that highlights long-term co-operation, based on trust, between supply chain partners. Relationships that are based on trust between supply chain partners often result in the willingness to exchange information freely, have joint planning and share mutual benefits, rewards and risks. In order for this relationship to run as effectively as possible, a set of principles needs to be followed by all supply chain partners.

2.2.6 Supply chain principles

If SCM is to be adopted as top management's 'new religion', then it needs a doctrine. Therefore, Crandall and Chen (2010: 42) developed the much-needed guidance, highlighting what they call the 'seven principles of SCM'. These seven principles as articulated by Crandall and Chen (2010: 42) include the following:

- Segment customers based on service needs

Historically many business organisations grouped their customers based on the type of product, industry or trade channel and simply provided the same level of service to all customers within a market segment. However, efficient and effective SCM groups customers based on individual service requirements irrespective of the industry, and then modifies service offerings to meet the requirements of those particular segments.

- Customise the SCM network

Traditionally, many organisations created monolithic SCM networks for all customer segments, but recently this has been viewed as running counter to successful SCM. When designing SCM networks, organisations should

primarily focus on the specific service requirements and profitability of the individual market segments.

- Pay attention to signals of market demand and plan accordingly

On a regular basis, the sales and operational planning function should span the entire supply chain to identify any changes in customer orders, customer promotions and the like. This demand intensive approach will result in more accurate and reliable forecasts as well as optimum resource allocation.

- Differentiate the product closer to the customer

Modern business organisations can no longer afford to keep high volumes of inventory to compensate for possible errors that might occur as a result of incorrect forecasting. Therefore, product differentiation should be postponed as close as possible to actual customer demand.

- Strategically manage supply chain partners

Through close working relationships with key supply chain partners, in an attempt to decrease the costs associated with owning materials and services, SCM experts improve margins for both principal organisations and supply chain partners.

- Develop a supply chain wide technology strategy

Information technology is one of the key components of SCM and, therefore, it should be set up in such a manner that it creates a platform which supports various levels of decision-making. In addition, it should provide a transparent view of the movement of goods, services and related information from the point of origin to the point of destination.

- Adopt channel spanning performance measures

Traditionally, supply chain measurement systems were used mainly to monitor internal functions. However, these systems can create measures that apply to every link in the supply chain and provide both service and financial metrics.

Crandall and Chen (2010: 43) further maintain that if these seven principles are consistently and comprehensively followed, then the organisation following them will realise a host of competitive advantages

2.2.7 Factors contributing to the growth of SCM

There are many factors that contribute to the growth of SCM. Arnold and Chapman (2006: 7) summarised the following important factors that they contribute towards the growth in prominence of SCM:

- Business organisations are increasingly focusing on their core business functions and outsourcing more of their non-core functions to external suppliers. However, this increases their dependency on suppliers and highlights the need for more trustworthy, reliable and responsive supply chain partners.
- The relaxation of trade barriers has forced existing organisations to find new ways to remain successful and competitive, as local and global competitors are increasingly entering the market.
- The introduction of new technologies makes it possible for organisations to create new products in shorter time intervals. As a result, product life cycles become shorter and organisations are pressured to create new product offerings in quick time successions, which in turn highlight the need for closer relationships with supply chain partners.
- Information sharing between functions and organisations in real time has become evident in modern organisations as a result of the growth and advances in the information technology field. This advancement on its own is one of the most important requirements for proper inter-organisational integration and therefore the need for efficient and effective SCM.

2.2.7 The need to manage supply chains

According to Larsen, Schary, Mikkola and Kotzab (2008:203), many business organisations pay very little attention to the management of their total supply chains and are primarily focused on their own operations. This narrow-minded business approach is still common practice in many organisations and results in an increase in total costs for all supply chain partners, as well as a less competitive and responsive supply chain. In response to this trend, Larsen et al (2008:204) outline the following factors that should be considered when managing the full supply chain:

- Improvement of operations

Competition forces business organisations to implement new innovative practices such as Just-In-Time (JIT) manufacturing systems, Total Quality Management (TQM), Six-Sigma cycles, as well as lean manufacturing to improve their operations and become more competitive. However, the benefits of these practices will not be seen if business organisations operate in isolation. Therefore, all supply chain partners, specifically suppliers and 3PL service providers, should understand and contribute to the achievement of these practices.

- Outsourcing to more external providers

As indicated earlier, business organisations are increasingly focusing on their core functions and outsourcing their non-core functions to external providers. However, this trend leads to a greater dependence on external providers whose actions, if not well managed, could have detrimental consequences for the principal organisation in terms of consistency, reliability, delivery and customer satisfaction.

- Increasing transportation costs

Transportation costs are continuously increasing due to a number of reasons. The three primary reasons for this constant rise in cost in South Africa are because of the volatility of the Rand, the ever-increasing price of fuel and rising

insurance premiums. Consequently, if these issues are not adequately managed, the total costs of the principal organisation and the entire supply chain will increase.

- Pressure from the business organisation's competitors

In order for business organisations to stay competitive they need to keep up with their competitors in the market. As a result, organisations are vigorously competing amongst each other to be the first manufacturer to introduce new products in the market. This allows them to capture a larger part of the available market share and ultimately record higher sales volumes. The introduction of new products requires early supply management and early 3PL service provider involvement to provide the most efficient methods of moving raw materials into the principal organisations' production facility in a timely fashion.

- The influence of globalisation

The removal of trade barriers has lengthened supply chains substantially, and as a result organisations have access to suppliers around the globe. This creates a greater need for proper coordination amongst supply chain partners, particularly 3PL service providers, who are responsible for the movement/transportation of materials globally.

- E-commerce

Most modern organisations are purchasing their supplies and selling their final products or services increasingly more on the Internet. The majority of these transactions are done electronically from the selection of raw material suppliers to the selection of 3PL service providers. Therefore, supply chains have become more controllable as transactions are completed in real time and recorded electronically. As a result less paperwork is required.

- Management of inventories

Supply chain success is partially dependent on how well inventory is managed throughout the entire supply chain. On the one hand, having too much inventory on hand will tie up valuable financial resources that can be used elsewhere. On the other hand though, having too little inventory can result in business failures such as production line stoppages, out-of-stock occurrences and back orders. Therefore, organisations should strive to keep inventory levels as practically low as possible.

The modern business strategies mentioned above that are applied by business organisations in an effort to make their supply chains more effective and efficient, are outlined in the following sub-section.

2.3 TOTAL QUALITY MANAGEMENT (TQM)

TQM is referred to as a management philosophy which underpins the continuous improvement of all activities in a business organisation and recognises the strength of employee involvement and commitment.

2.3.1 TQM defined

According to Bagad (2008: 4), TQM is defined as the total composite product and service characteristics of marketing, engineering, manufacturing and maintenance through which the product or service in use will meet the expectations of the end customer. Oakland (2014) describes TQM as a management approach that focuses on long-term success through customer satisfaction and requires all employees of an organisation to participate in improving processes, products, services and the organisational culture in which they work.

A key study on TQM by Hackman and Wageman as quoted by McInerney and Day (2007: 63), found that TQM processes can be separated into four successive phases, namely, *plan, do, check and act* when solving problems. Many authors in supply chain literature refer to these four successive phases as the PDCA cycle.

The PDCA cycle starts in the planning phase where employees need to identify and define the problem in detail, gather all related information that pertains to the problem, as well as determine the root cause of the problem. Then, in the doing phase, employees need to devise and implement a comprehensive solution to the problem, as well as measure the effectiveness of the solution. Following that, the checking phase requires employees to analyse the results through before-and-after data evaluations. Finally, in the acting phase, employees need to document their results, inform key stakeholders about process changes and make recommendations for the problem to be addressed in the next PDCA cycle. For TQM to be truly effective, it requires the commitment and involvement of all employees in an organisation.

2.3.2 The seven principals of TQM

Deming, Juran, Taguchi and Ishikawa, cited by Charantinath (2011: 53), insist that organisations do not have to incur higher costs in the pursuit of higher quality if the following key TQM principles are followed:

- Final product screening to assure quality must only be regarded as the last alternative

Screening is expensive, especially when it is done once an entire customer order has been manufactured. In addition, final product screening is subject to the usual statistical errors such as labeling a conforming item as non-conforming or the possibility of missing a non-conforming item.

- In-process control should be carried out on a regular basis

In-process control assures that processes operate in an in-control state, thereby avoiding final product screening. Processes that are in an out-of-control state will produce non-conforming products. Therefore, processes that are in an 'out-of-control' state should be identified as early as possible and restored to an 'in-control' state as quickly as possible.

- Quality assurance calls for complete organisational attention

All employees should take note of quality problems and assume responsibility for their own work. Quality assurance is the responsibility of all employees involved in supplying the final product and should not be left solely to the quality control department.

- Prevention is always the preferred strategy

Business organisations should install systems that prevent non-conforming items from being manufactured. For example, the Poka-Yoke system created by Shigeo Shingo, which involves designing a process in such a manner that if non-conformities occur in the manufacturing process, they can be identified immediately and automatically corrected, thereby preventing the production of non-conforming items.

- Quality should be designed into the product

Business organisations should design products in such a manner that they are less likely to be manufactured with defects. In addition, organisations should design processes in such a manner that process variation is very minimal.

2.3.3 Advantages of implementing TQM

There are many strategic benefits that result from implementing TQM systems. Stevenson (2007: 420) highlights the following primary advantages of TQM:

- Improves reputation

Product defects and problems are identified earlier, thereby allowing them to be resolved quicker. Business organisations with a good reputation have a significant advantage over organisations with a bad reputation as it allows them to capture a larger part of the available market share. For example, a good reputation is fundamentally important in the automotive industry due to the high levels of competition between automotive manufacturing organisations.

- Higher employee morale

Employee involvement, as well as team work in decisions concerning TQM is essential. Having high employee morale allows employees to feel part of a team. Consequently, he or she will show more loyalty, commitment, be more productive, as well as take pride in their work and ultimately the quality standards of the entire organisation will improve.

- Lower costs, decreased waste and fewer defective products

Waste in the form of latent defects caused by defective workmanship results in an unnecessary drain on an organisation's budget to resolve these defects. Therefore, employees should be trained on how to minimise waste and defective workmanship, so that organisations can better utilise funds in areas such as productive improvements.

- Quality control inspectors

TQM affords the opportunity to all employees to become quality control inspectors as all employees assume responsibility and accountability for their own work. In addition, TQM encourages employees to use this autonomy to make needed improvements to their individual processes.

- Provides an invaluable problem-solving tool for supervisors and managers to use

Operational requirements often make it impossible for supervisors and managers to consistently monitor all the work being done by employees. TQM allows supervisors and managers to hold each employee responsible for the quality of their own work. Therefore, supervisors and managers can focus more of their time and attention on strategic tasks.

- Management becomes more aware of problems that affect the employees' working environment

TQM creates the platform for employees to convey problems to management almost instantaneously. Therefore, management is able to resolve problems sooner and create methods that help employees deal with problems more effectively.

- Provides opportunity for personal growth and development

TQM gives employees the opportunity to improve their skills and knowledge through training and skills development. It is important for all employees to feel like they are developing their skills and have room to become quality experts. This in turn will also reduce employee turnover.

2.3.4 Disadvantages of TQM

Although the advantages of TQM significantly outweigh the disadvantages, a number of disadvantages should be noted. According to Stevenson (2007: 423), the following disadvantages could be detrimental to business organisations if not managed accordingly:

- High initial introduction costs

The initial introduction costs of implementing TQM are generally high because employees need to be trained in areas such as the importance of quality and methods to improve quality. Consequently, manufacturing will be disrupted during the training process as well as after the training is complete, as employees will take longer to complete their work in a quality fashion.

- Benefits may not be seen for several years

Employees take time to familiarise themselves with new processes. As such, rewards of TQM will not be realised until employees familiarise themselves with the quality approach. Top management will need to change the organisational

culture of the organisation to adjust to a quality approach, as TQM will shape a new organisational culture in the long term.

- Workers may be resistant to change

Attempts to transform employees' working habits to align with TQM principles will almost always encounter obstacles. More experienced employees in particular do not like to be told how to do their work in a different or new manner. These older employees might also feel intimidated by the implementation of TQM.

According to Charantinath (2011: 46), the quality movement has evolved over the last few years from its initial focus on inspection to a focus on prevention. Prevention places significant emphasis on education, organisational collaboration, design improvement, process variation reduction and accountability of the total organisation. The author argues that many organisations have used the quality movement as a means to direct management and employees' attention to the importance of customer satisfaction, corporate responsibility and ultimately operational excellence. Many organisations have further incorporated a Six-Sigma cycle into their quality management system, which is outlined below.

2.4 SIX-SIGMA DEFINED

According to Pienaar and Vogt (2012:339), Six-Sigma is the use of statistical methods to find causes of inefficiencies and to help eliminate them. The author's further state that the method used is called the Define, Measure, Analyse, Implement and Control (DMAIC) process, which is a method used to approach a problem as a project. The DMAIC process includes five steps that need to be taken in the project to eliminate problems that cause inefficiencies and is described by Rampersad and El-Homsi (2007: 305) as well as Pienaar and Vogt (2012: 339) as follows:

- Step 1: Define

In the first step organisations need to clearly identify and define the potential inefficient processes that need to be brought onto an efficient state.

- Step 2: Measure

The second step involves the implementation of a measurement system that is able to track and monitor the appropriate quality performance of the inefficient processes. The system should also provide easy accessibility to the relevant stakeholders and employees.

- Step 3: Analyse

In step three, organisations need to analyse the inefficient processes and conduct 'what-if' scenarios to determine the root cause of these inefficient processes.

- Step 4: Improve

The fourth step involves responding to the identified inefficient processes by restoring them to an efficient state and communicating the decisions and actions to relevant stakeholders and employees.

- Step 5: Control

In the last step organisations need to eliminate the root cause of the inefficient processes, reduce process variations and make structural changes so that the probability of the inefficient processes occurring again can be minimised.

In order for business organisations to make the most of the strategic advantages of TQM, they need to operate in a lean environment. In what follows, lean operating principles are explored in more detail.

2.5 LEAN OPERATING PRINCIPLES

Lean operating principles are known by a variety of synonyms such as the Toyota Production System, Lean Manufacturing and Lean Production. Most authors agree that lean has its origins in the manufacturing industry and can be described as a system that promotes the manufacturing of products with zero waste.

2.5.1 Lean manufacturing defined

According to Ohno (2012: 7), lean manufacturing is defined as a systematic approach to identifying and eliminating waste through continuous improvement, flowing the product at the pull of the customer in pursuit of perfection. Similar to TQM, lean applies to the entire business organisation. Although individual components or building blocks of lean may be tactical and narrowly focused, maximum effectiveness can only be achieved by using them together and applying them cross-functionally throughout the organisation to reduce wastes.

2.5.2 The eight wastes

The wastes found in manufacturing environments are commonly referred to as non-value-adding activities and are known to lean practitioners as the 'eight wastes'. Ohno (2012: 56) states that these wastes account for up to 95% of all costs in non-lean manufacturing environments. Therefore, according to Ohno (2012: 57), the following eight wastes need to be minimised wherever possible throughout an organisation:

- Overproduction

Overproduction occurs when an organisation manufactures more than what the customer actually demands. Overproduction wastes valuable resources such as raw materials and labour that could be used more efficiently to respond to customer demand. Therefore, organisations need to manufacture based upon a pull system and veer away from make-to-stock (or push) manufacturing systems.

- Waiting

Waiting occurs when departments need to wait for resources such as raw materials, information, equipment, tools and the like to complete their functions. To avoid waiting, all resources should rather be supplied on a Just-In-Time (JIT) basis.

- Transportation

Situations where materials are being moved through a number of different receiving locations before reaching the point of destination should be avoided. Materials should be delivered to the exact point of use, thereby minimising any unnecessary in-transit movement, handling and storage.

- Non-value-added-processing (NVAP)

NVAP should be avoided as much as possible as these processes are costly and time consuming. Examples of NVAP include reworking, deburring and inspecting. Value stream mapping is a principle often used by both manufacturing and service organisations to identify non-value-added processes.

- Excess Inventory

Excess inventory is closely related to overproduction and results when an organisation holds more inventory than what the customer demands. Consequently, it has a negative effect on an organisation's cash flow and occupies valuable floor space. Organisations should therefore try to only hold inventory volumes that exactly match customer demand.

- Defects

Manufacturing defects occur when products undergo the full manufacturing cycle, but do not conform to customer requirements as a result of an error that occurred during the manufacturing process. Defects waste resources in four ways. Firstly, the materials are consumed at a cost, but are now unwanted. Secondly, the labour used to manufacture the product the first time cannot be recovered. Thirdly, labour is needed to rework the product. Fourthly, additional labour is needed to remedy any future customer complaints.

- Excess motion

Excess motion refers to any unnecessary movement created by inconsistent work methods, poor layout designs and incorrect housekeeping. The value stream mapping principle may be used to detect this type of waste.

- Underutilised people

Underutilisation of people occurs when organisations fail to utilise the full potential of employees' mental, physical and creative skills. Some of the more common causes for this waste include ineffective or non-existent training, poor workflow, bad organisational culture, high employee turnover and inadequate recruitment practices.

2.5.3 Lean building blocks

In an attempt to minimise or eliminate the above-mentioned wastes, a number of lean building blocks need to be implemented. According to Ruffer (2008: 182), many business organisations that have successfully implemented lean principles regard lean building blocks as one of the most important areas of lean manufacturing. Ohno and Koichi (2012: 149) highlight the following building blocks of lean manufacturing:

- Pull system

This technique is used when organisations manufacture products based on customer demand. The pull system eliminates the possibility of overproduction. Traditionally, manufacturing organisations manufactured products based on a push system. The push system is based on the manufacture-to-stock principle and does not take customer orders into account.

- Kanban cards

Kanban cards are used to indicate the amount of material that is required, material order points, as well as the destination to where the materials should be delivered. This technique is often used to control mass production.

- Work cells

Work cells allow for the arrangement of employees and operations in a cell-like structure, most commonly in a U-shape. In addition, the cellular model allows for better utilisation of employees and improves communication.

- Total Productive Maintenance (TPM)

TPM capitalises on proactive and progressive maintenance methods and relies on the co-operation and knowledge of operators, equipment suppliers and engineering and support employees to optimise machine performance. TPM results in a host of benefits for manufacturing organisations such as reductions in scheduled and unscheduled downtime, elimination of breakdowns, improved utilisation, increased throughput rates and superior quality products.

- Point-Of-Use-Storage (POUS)

This method is used when material need to be shipped directly to where it will be used, thereby eliminating any unnecessary storage and handling of the materials. Lean manufacturing requires all material to be sent directly from the supplier to the place in the production line where it will be used almost immediately.

- Quick changeover

This technique is employed to reduce the amount of time an organisation takes to change a process from manufacturing one type of item to another. The primary reasons for reducing changeover time is to allow for more frequent changeovers in order to increase production flexibility and to manufacture in smaller batch sizes.

- Batch size reduction

Traditionally, organisations manufactured products in large quantities (batch sizes) in an attempt to maximise machine utilisation. Conversely, lean demands products to be manufactured based on customer orders, making the ideal batch size one. However, a batch size of one is not always profitable, so the aim is to practice continuous improvement to reduce the batch sizes to as low as possible. Batch size reduction offers a number of competitive advantages to manufacturing organisations such as reductions in lead-time, cycle time, inventory-carrying costs and work-in-process inventory (WIP). Therefore, smaller batch sizes shorten the overall manufacturing cycle, enabling organisations to deliver faster and to invoice sooner, resulting in an improved cash flow. Shorter production cycles increase inventory turns and allow the organisation to operate profitably at lower margins, which enables price reductions, which further increases sales and market share.

- 5S or Workplace organisation

5S or Workplace organisation is a systematic tool that is used to organise basic housekeeping activities and standardise machinery, materials, manpower and methodologies used in an organisation (Charron, Harrington, Voehl, & Wiggin 2015: 254). Workplace organisation is one of the easiest lean tools to implement and can be applied to any function within the organisation.

- Concurrent engineering

This technique employs cross-functional teams to develop and bring new products to the market. In many instances implementing concurrent engineering has reduced time-to-market by 50%. The automotive and computer industries are good examples. Time-to-market is one of the most important tools for capturing and maintaining market share.

2.5.4 Advantages of implementing lean manufacturing

The advantages of lean manufacturing can be classified into the following three broad categories:

- Operational improvements

According to Koichi (2012: 122), the operational improvements of lean manufacturing include a significant reduction in lead-time, cycle time, space utilisation and in-process inventory. Consequently, productivity is increased and the quality of the products produced is improved.

- Administrative improvements

The administrative improvements indicated by Koichi (2012: 128) include a significant reduction in order processing errors, paperwork in office areas, employee demands, as well as a reduction in the time that customers are placed on hold in call centres. Lean manufacturing also enforces documenting and streamlining processes, which allow for the outsourcing of non-core functions, thereby allowing the organisation to focus its resources on meeting and exceeding the customers' expectations.

- Strategic improvements

Many organisations that implement lean manufacturing do not fully realise the benefits of the strategic improvements. Ohno (2013: 72) states that organisations should learn how to market these new benefits and use them to gain a bigger market share. For example, when an organisation succeeds in reducing its lead-time, a marketing campaign should be introduced. Lead-time refers to the total time that elapses between the placing of an order and the actual delivery of the order (Horn, Cook & Howell 2012: 9). This campaign should be designed in such a manner that it makes the customer aware of the lead-time reduction, thereby enticing the customer to purchase more of the organisation's products. Consequently, the organisation will record higher sales volumes and in turn, the profit of the organisation will increase. As a result, the

organisation will be able to invoice its customers and collect payments sooner, which would significantly improve its cash flow.

2.5.5 Barriers to the successful implementation of lean

According to Trilogiq (2006: 17), many organisations experience difficulties when implementing lean and do not take advantage of the benefits provided by lean manufacturing for the following reasons:

- Firstly, the organisation only reports the percentage improvements and does not convert this into a monetary value. In addition, many employees within the organisation fail to communicate in the same language as management. This results in management not giving the needed support to the department or function implementing lean.
- Secondly, the organisation fails to implement lean building blocks in the correct order. For example, if batch sizes are reduced before reducing changeover times, equipment utilisation will decrease and the organisation will not adequately satisfy the demands of the customer.
- Thirdly, the business organisation may choose an unimportant project as its first task. If the benefits of lean is not realised in the first project then future support for lean projects will fade away. In addition, many organisations overlook administrative areas which tend to be another barrier to the successful implementation of lean.
- Lastly, the organisation fails to implement lean principles into the entire supply chain. The organisation should ensure that all its external suppliers are able to deliver products on a Just-In-time (JIT) basis, contribute to the minimisation of inventories, as well as provide high quality products and services. The implementation of a lean supply chain is one of the most difficult aspects of lean manufacturing. However, it also provides the most significant financial rewards.

To ensure business organisations operate efficiently and effectively in a lean environment, they need their supplies to be delivered to them on a Just-in-time (JIT) basis.

2.6 JUST-IN-TIME (JIT) MANUFACTURING SYSTEMS

JIT manufacturing refers to a planning system that promotes the delivery of inventory at the moment it is required. The system does not support the storage of any materials as it makes materials available exactly when they are needed.

2.6.1 JIT manufacturing defined

JIT manufacturing is defined by Hirano (2012: 7) as a system that strives to eliminate waste and continuously improve productivity. Pienaar and Vogt (2009:184) further state that JIT means manufacturing only what is needed, in the right amounts that are needed, when they are needed, using minimal materials, labour, space and equipment. The primary objective of JIT is to produce the right product at the right time in the right place with zero waste. Furthermore, the JIT manufacturing system suggests nothing is manufactured until it is required. As a result, Hirano (2012: 18) asserts that organisations should only manufacture finished goods just before they are sold. Consequently, sub-assemblies should be assembled just before the finished goods are manufactured and the component parts need to be supplied just before the sub-assemblies are assembled.

2.6.2 The advantages of JIT

According to Seeram (2008: 7), there are a number of JIT advantages that can add value to the operations of manufacturing business organisations. The author highlights the following important advantages:

- A decrease in stock-holding costs which further results in the release of storage space, better space utilisation, as well as savings on rental payments and insurance premiums.
- The elimination of waste as the JIT system does not take expired products into account.
- The elimination of overproduction as only customer orders enter into the system.

- Less working capital is required to finance procurement as only essential stock is purchased.
- The organisation's returns on investment (ROI) will increase as a result of the low levels of inventory held.
- An increase in the levels of customer satisfaction as JIT is based on the demand-pull manufacturing system which incorporates changes in customer demand with relative ease. This makes it even more effective in the modern business world where market demand is volatile and unpredictable.
- A decrease in rework and inspection costs as the 'right first time' principle is practiced.

In addition to the above-mentioned advantages, Wisner (2011) further states that organisations that follow the JIT manufacturing system will realise benefits such as an increase in the quality of products produced, closer relationships with supply chain partners, and higher levels of employee utilisation.

2.6.3 Disadvantages of JIT manufacturing systems

Even though the advantages outweigh the disadvantages of JIT manufacturing systems, the disadvantages should be reviewed on a continuous basis. Mahdaven (2010:542) stresses the following disadvantages that are prominent in JIT manufacturing systems:

- An increase in re-work costs as it makes re-working very difficult in practice, as inventory is kept to a bare minimum.
- An increased reliance on supply chain partners to deliver on time every time.
- An increase in manufacturing downtime and line-idling costs as the system does not allow for safety of buffer stock to be held.
- An increase in transaction and transportation costs as the system requires frequent deliveries in smaller order quantities.

- Unexpected increases in customer orders cannot be met as zero excess finished products are produced.

2.6.4 Factors to consider for the successful implementation of JIT manufacturing systems

The successful implementation of the JIT manufacturing system requires organisations to transform their current methods of designing products and services as well as to introduce new methods of allocating duties to employees and organising tasks (Hirano 2012: 3 ; Seeram 2008: 1). Mercado and Solis (2011: 287) stress that all organisations need to ensure that the following precautions are in place when implementing a successful JIT manufacturing system:

- Management fully supports and promotes the JIT approach.
- Adequate resources are available to develop a JIT software system.
- Close relationships based on trust are fostered with reputable and time-tested supply chain partners.
- Design flow processes are redesigned to incorporate JIT manufacturing.
- Lot sizes are minimised.
- Workstation capacities are balanced wherever possible.
- Preventive maintenance is performed on a regular basis in an attempt to decrease the likelihood of machine breakdowns.
- Set-up times are reduced wherever possible.
- TQM programmes are practiced and implemented throughout the organisation.

Manufacturing operations can be improved on a continuous basis through the complete involvement of employees and management. For service operations, the process of continuous improvement aims at reducing the number of people involved in providing the service, without affecting the quality and rate of service. JIT manufacturing is a powerful tool for reducing the organisation's inventory and

improving productivity. Support and commitment from the top management and extensive employee training lead to the successful implementation of JIT.

2.7 CONCLUDING REMARKS

The supply chain philosophy discussed in this chapter is clearly an important operation in any manufacturing environment. In order to satisfy the end customer, business organisations need to ensure that all supply chain operations are completed in the most efficient and effective manner.

The modern business strategies also referred to as international trends need to be practiced by principal manufacturing organisations in their quest to be more efficient, effective, competitive and successful in an ever-changing business environment. In order to achieve supply chain success, principal organisations need to ensure that all supply chain partners, particularly 3PL service providers, are aligned with the goals of the principal organisation's supply chain. Consequently, this in turn will ensure that all supply chain partners function as one co-ordinated and integrated unit.

The next chapter reviews the services offered by 3PL service providers to manufacturing organisations and provides methods for selecting 3PL service providers.

CHAPTER 3

THE EVALUATION AND SELECTION OF 3PL SERVICE PROVIDERS

3.1 INTRODUCTION

As is clear from the previous chapter, efficient and effective Supply Chain Management (SCM) depends on how well supply chain partners, particularly third party logistics (3PL) service providers and suppliers, are integrated and coordinated within the supply chain. This chapter presents more insight into the evaluation and selection of 3PL service providers.

The chapter begins by defining 3PL in detail, followed by a discussion regarding the various types of logistics service providers. Following this, the services and activities offered by the respective 3PL service providers, are discussed. Thereafter, the chapter presents an overview of the different categories of 3PL service providers.

Finally, third party reverse logistics, as well as possible methods of successfully selecting the most suitable 3PL service providers are outlined.

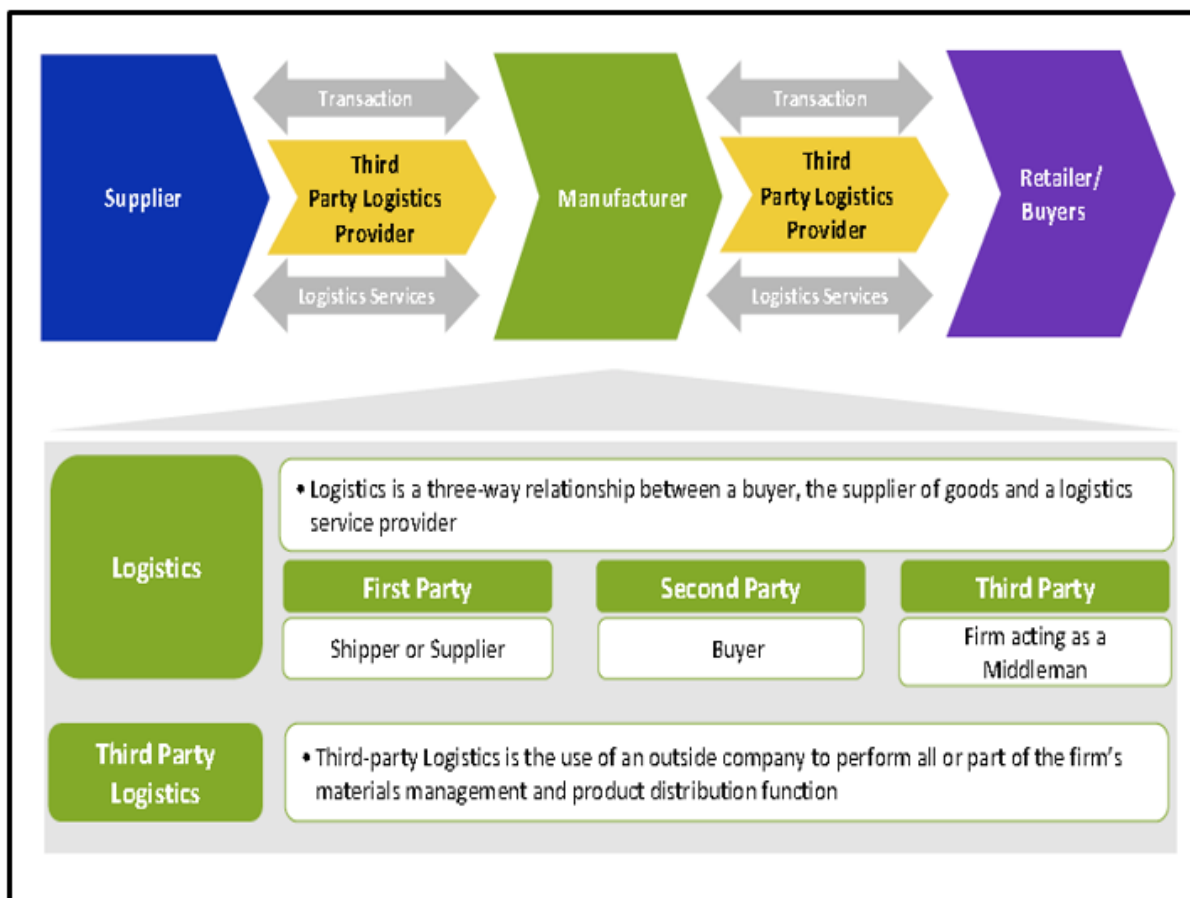
3.2 THIRD PARTY LOGISTICS DEFINED

The term third party logistics (3PL) is known and used especially in the automotive manufacturing industry. According to Aguezzoul (2009), a 3PL service provider is a “private organisation that provides logistics services under a contract to a primary manufacturer, supplier or user of a product or service.” As was explained in Chapter 1, it is termed ‘third party’ because the logistics provider does not own the products involved in the supply chain, but participates in the logistics of the supply chain at various points between the manufacturer and the end user of the product (Charan 2012). Tian (2010) defines 3PL as the “management, control and delivery of logistics activities on behalf of a shipper or manufacturer by an external provider.” 3PL services include functions such as transport, warehousing, order processing, information systems and value-added services.

3PL is thus the outsourcing or contracting of logistics services and is broadly defined as the subcontracting of a professional service provider to manage the distribution and logistics functions within the supply chain of the principal organisation. The main

components of 3PLs are illustrated in Figure 3. below. The figure describes the relationship that exists when a shipper, supplier or manufacturer decides to contract some or all of their logistics functions to a 3PL service provider. The relationship consists of three parties: whereby the shipper, sender or supplier are the first party; the buyer, receiver or customer as the second party; and the 3PL service provider as the third party.

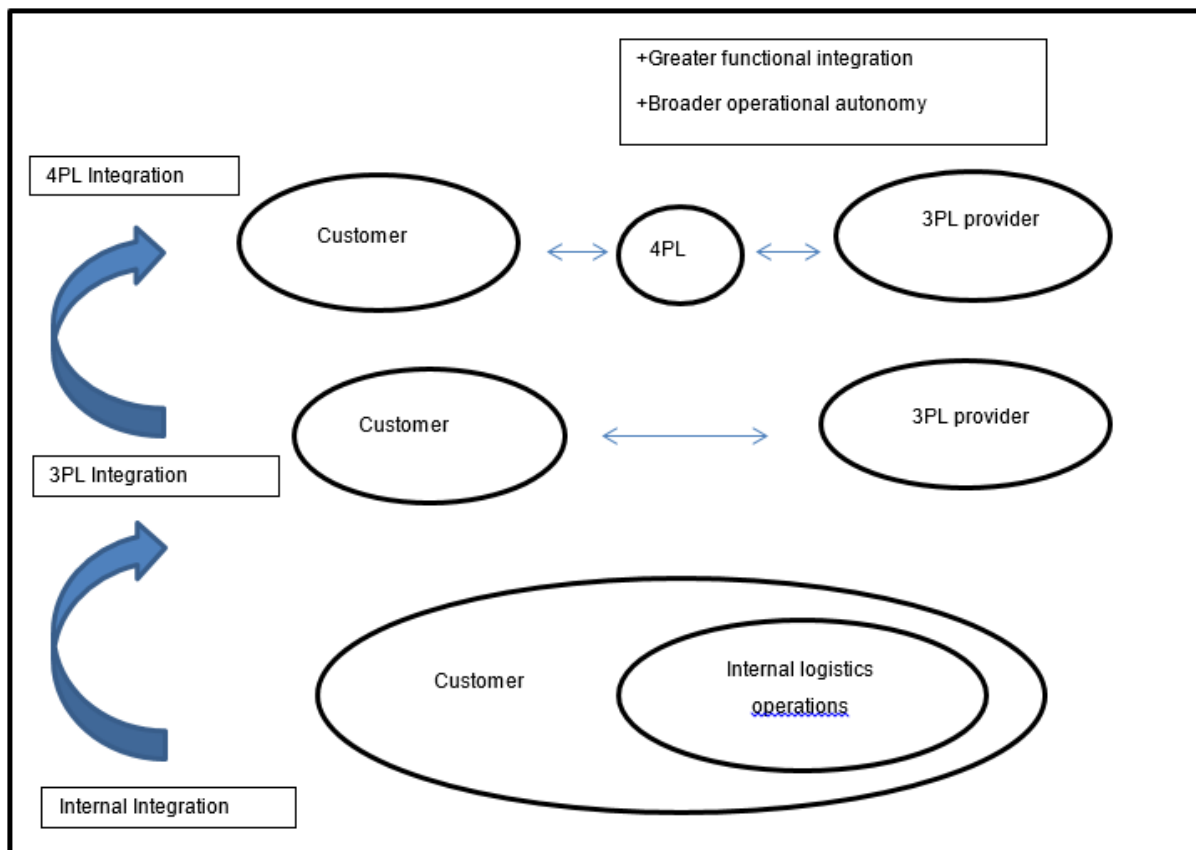
Figure 3.1: The main components of 3PL



Source: Aguezzoul (2009)

Aguezzoul (2009) maintains that many modern business organisations contract to 3PL service providers to perform their logistics functions, either completely or partly, so that they can concentrate on their core functions. Therefore, 3PL service providers have become important supply chain partners in most organisations' supply chains, because they assist in reducing the overall costs of logistics, increasing productivity-based profits and improving the quality of service to their customers.

Figure 3.2: Fourth Party Logistics



Source: Coyle, Langley, Novack and Gibson (2013: 133)

According to Coyle, Langley, Novack and Gibson (2013: 132), a recent addition to logistics providers that is increasingly being accepted by modern business organisations, is fourth party logistics (4PL) service providers. The authors define 4PL as organisations that assemble and co-ordinate the resources, technology and capabilities of its own organisation with those of complementary service providers to provide a complete supply chain solution. Referring to Figure 3.2 above, a 4PL service provider leverages the capabilities of a 3PL logistics provider through a centralised point of contact. The role of 4PL service providers are two-fold. Their first role is to manage and direct activities of multiple 3PL service providers and their second role is to serve as an integrator that brings together the needs of the customer and the resources available through 3PL service providers. Coe (2014: 232) further explains the difference between first, second, third and fourth party logistics providers as follows:

- First party (1PL) is a fully in-house logistics function, handled by a parent business organisation.
- Second party (2PL) involves a customer contracting another business organisation to fulfil individual functions such as warehousing or transportation.
- Third party (3PL) is where a business organisation that is dedicated to the provision of logistics services is outsourced by two or more supply chain participants to perform their integrated logistics requirements. This is the category most referred to when discussing the 'logistics industry' and it has also seen the most growth in recent years.
- Fourth party (4PL) describes logistics integrators who serve as market mediators to create value-adding chains and to unite supply chain partners and 3PL service providers coherently. 4PL involves 'hybrid organisations' and is often established by joint ventures or partnerships as is the case with freight forwarders and freight brokers.

According to the above-mentioned authors, this is a functional typology, whereby individual business organisations may overlap into several of these categories, with the largest of the multinational corporations providing several different services to their customers as 3PL service providers. The services and activities offered by 3PL service providers are discussed in the next section.

3.3 SERVICES AND ACTIVITIES OFFERED BY 3PL SERVICE PROVIDERS

Traditionally, 3PL service providers have been primarily contracted as storage business organisations, carriers, or forwarding agents. However, in recent times they have expanded to offer a host of other services and activities as well (Diabat, Khreishah, Kannan, Panikar & Gunasekaran 2013: 806). In today's business world, 3PL service providers are able to perform as specialists for various logistics services and are no longer considered simply as transportation and warehousing organisations. As was mentioned earlier, services offered by 3PL service providers include inventory management, warehousing operations, the physical distribution of the goods, shipment consolidation and any information systems that are required. Most 3PL service providers have specialised their services through differentiation, with the scope

of services incorporating a variety of activities across the supply chain (Aguzzoul 2009). Many 3PL service providers now offer all of the primary services, as well as various value-adding services, as summarised and explained in Table: 3.1 below.

Table 3.1: Services and activities offered by 3PL service providers

Service	Activity
Transportation	Shipping, forwarding, consolidation, bulk-breaking, contract delivery, freight bill payment and auditing, cross-docking, household goods relocation, load tendering and brokering.
Warehousing	Storage, receiving, assembly and re-assembly, picking, cross-docking and kitting.
Inventory management	Forecasting, location analysis, network consulting and slotting or layout design.
Order processing	Order entry and fulfilment, consignee management and call centre controlling.
Information systems	EDI/VANS, routing/scheduling, artificial intelligence, expert systems, bar-coding, RFID, web-based connectivity, tracking and tracing.
Value-added services	Design and recycling of packaging, repackaging, marking, labelling and billing.

Source: Aguezzoul (2009)

3.3.1 Transportation

Transportation entails the transfer of inventory and finished goods from one point to another in the supply chain. According to Pienaar and Vogt (2012: 333), transportation is a fundamental activity that entails the carriage of goods from the point of origin to the point of destination and is the largest cost component within the logistics process. Finding the correct balance between costs and speed of transportation is often the key to increasing the efficiency of the supply chain. Therefore, 3PL service providers must be able to provide the most appropriate transportation modes to meet the specific needs of manufacturing organisations, at the most efficient cost to the customer (Foulds 2013). Goh and Garg (2008), as well as Wu (2009), highlight the following mandatory transportation services that should be offered by all 3PL service providers:

- Shipping in general

- Forwarding
- Contract delivery

The authors further assert that the following distribution and consolidation activities should be standard under transportation services:

- Physical distributions in general

Physical distribution refers to the outbound distribution of the organisation's final products to its customers (Horn, et al 2012: 12).

- Milk-runs

Milk-runs refer to the routing of a supply to make multiple, repeating pick-ups or drop-offs at different locations. Milk-runs are used by suppliers who make small frequent deliveries to customers who maintain low levels of inventory (Joseph, Merlino, Omi & Bowen 2014: 5).

- Cross-docking

Cross-docking is defined by Blanchard (2010: 94) as the process of re-handling freight from inbound transportation modes and loading it into outbound transportation modes within 48 hours or less.

- Direct deliveries

Direct deliveries refers to situations where products and services are sold directly to the customer (Horn et al 2012: 23). In other words, there are no warehouses or distribution centres involved.

There are different modes of transportation covering road, rail, water, air, pipeline, as well as a combination of two or more modes, more commonly referred to as intermodal transportation. The various modes of transportation used by manufacturing organisations are briefly discussed in the following paragraphs.

3.3.1.1 Road transportation, using Less-Than Truckload shipments

Less-Than Truckload (LTL) shipments describe the transportation of relatively small loads of goods that do not constitute large enough volumes to fill entire trucks on their own (Gaffney 2013). Freight from various business organisations would then occupy the space on any given truck and this would reduce the costs of shipping for each of the business organisations utilising the 3PL service provider. Lower costs to the organisations would be possible because the 3PL service provider would distribute the costs among them all and customers would only pay for the volumes they have used. According to Coe (2014: 233), in LTL shipments, the goods are packaged onto pallets and loaded onto trucks. As a result, according to Gaffney (2013), there is less handling of shipments because forklifts, loading docks, power tailgates and pallet jacks may be used.

Foulds (2013) states that when transitioning from courier shipments to larger heavier shipments, this would usually be the most cost effective method of transportation.

3.3.1.2 Road transportation, using Full Truckload shipments

Full Truckload (FT) shipments involve the movement of large amounts of homogenous cargo. The 3PL service provider contracts entire trailers to a single customer and the cargo usually remains on a single truck or trailer from the point of origin to the final point of destination (Robinson 2013). A primary advantage of this method of transportation is that there is a considerably lower risk of accidentally mixing cargos, or swapping one business organisation's cargo with another's. Goods are also handled far more carefully than shipments using the LTL method. However, according to Foulds (2013), the main disadvantage of this transportation type involves the risk of damage to the goods since they are often concentrated and carried in large amounts. This problem is further compounded if the shipments are not packaged properly in preparation for what is usually a lengthy, tedious trip on the road, lasting up to several days or more.

3.3.1.3 Railway transportation

Railway transportation involves all freight that is carried via railway networks and consists of either Single Wagon Loads (SWL) or full or block train loads. According to

Stolze, Lieb and Lampe (2012: 217), SWL describes the case where a customer makes use of one or several wagons at a time, because the quantities of goods are insufficient to fill an entire train. This system is most commonly used for the transfer of chemicals, vehicles and machinery and involves multiple 3PL and 4PL service providers.

On the other hand, Stolze et al (2012: 218) describe a full, or block train system as the situation where an entire train is chartered to haul the goods of a single shipper between two locations. This form of rail transportation is less complex and faster than SWL, as the train does not need to be stopped for 'shunting' procedures. The primary drawback of this mode of transport is that the customer must pay for an entire train, regardless of whether any carriages or spaces remain empty (Unselde & Kotzab 2011). Wagons may either be owned by a 3PL service provider or may be hired from the railway operator. This mode is most commonly used to transport large volumes of steel, coal and construction materials.

3.3.1.4 Air transportation

Air transportation involves all freight that is carried via air carriers. It is mostly viewed as a premium, emergency service because it is the most expensive mode of transport. Air transportation is more suitable than road or rail when goods have to be transported globally. According to Horn et al (2012: 36), air transportation is popular when customers demand higher service levels, especially when items need to be delivered to a distant location quickly. One of the primary disadvantages of air transportation is low accessibility as airports are mostly only situated in large cities which are often far from manufacturing organisations (Horn et al 2012: 37).

3.3.1.5 Water transportation

Water transportation involves all freight carried via container carriers and barges over water. This form of transport is well suited for intermodal use. The containers are easily transferred from ships at ports into trains or trucks for inland distribution. Water transportation competes mainly with rail transportation and is sub-divided into international deep sea transport, inland waterways such as rivers, lakes and canals, as well as coastal and inter-coastal waterways. According to Horn et al (2012: 37), in northern and central Europe, water carriage is important because of the vast system

of navigable waterways such as rivers and lakes. Barges are used as carriers of freight on these rivers and lakes. Water transportation is one of the most cost effective modes of transport and it holds significant benefits for organisations transporting large volumes over long distances. The primary disadvantage of water transportation includes the possibility of goods getting damaged or rusted at sea, especially if not properly packaged or secured on board during high seas (Horn et al 2012: 37).

3.3.1.6 *Intermodal transportation*

Intermodal transportation involves the transportation of goods via the use of more than one mode of transport during a single journey. The goods are usually placed into a container that can be transported by a variety of methods and these containers are designed specifically for intermodal transportation and adhere to the dimension guidelines of the Intermodal Organisation for Standardisation (IOS) (Coe 2014: 233). The IOS has set the standard in terms of the sizes and dimensions for these containers so that goods may remain in the containers when transferred between the different modes of transport, instead of having to be unpacked and repacked with each change in transport (Coe 2014: 233). The IOS also allows goods to travel faster at a reduced cost. The variations of the different modes that may be combined depend on factors such as the nature and amount of goods, the time of delivery, as well as pricing. Intermodal transportation typically increases the revenue of each separate mode of transport, whereby the combination of two different modes of transport would usually be more economical and efficient than any one mode alone (Nemoto & Rothengatter 2012: 331-332).

Most international or long distance cargo movements involve intermodal transportation systems. For example, rail freight would be combined with other modes of transportation and containers would be transported by ship to a port where they are moved from the ships onto rail wagons, or transported via truck to rail terminals. The containers would then be transported to the nearest distribution hubs by rail and from there the cargos would be transported to the final destinations via road transportation (Nemoto & Rothengatter 2012: 331-332). An example can also be made of Volkswagen South Africa in Uitenhage, which imports parts from their mother company in Germany. The parts can be sent by ship to Port Elizabeth and from there it is transported by truck to the plant in Uitenhage

When considering rail transportation, there are two categories of intermodal transportation used by rail operators, termed accompanied and unaccompanied transportation. Accompanied transportation involves the case where an entire truck is loaded onto a rail wagon, while unaccompanied transportation involves the transportation of loose units such as containers or trailers alone (Nemoto & Rothengatter 2012: 331-332).

The selection of the correct mode of transportation as well as the most suitable intermodal combination is of paramount importance to manufacturing organisations, as this may result in an increase in the total logistics costs, should the incorrect mode of transportation be selected.

3.3.2 Warehousing

Warehousing may be described as the storage of products or goods at points along a supply chain. According to Hughes (2011), warehousing does not just involve the storing of products, but also the receiving, identification, assembly and preparation of the goods according to their demand. Depending on the nature of the goods received, the customer's needs, the distribution requirements and other variables, there are many different roles that may be fulfilled by a warehouse (Bisenieks & Ozols 2010: 206-213; Sachan & Datta 2005: 664-669). According to the above-mentioned authors, the services that are generally offered by warehouses include the following:

- Receiving

A warehouse receives the goods from the supplier and so assumes full responsibility for the products until they are collected for transportation to the next destination in the supply chain.

- Inspection

The items of each shipment are counted, checked and recorded, to note the state of the goods and their time of delivery. This acts as a verification to the warehouse manager as well as the owner of the goods about the condition of the goods received.

- Repackaging and handling

The goods may need to be repacked into pallets for storage. This may be done, for example, when non-standard items are being stored, or when the storage quantities differ from those received.

- Sortation

This allows the goods arriving at the warehouse to be sorted into specific customer orders, immediately upon their arrival, so that they may be easily rerouted, or directed to the appropriate storage location. In the case of cross-docking, products are transferred straight from the receiving dock to the shipping dock, without entering into storage. In this case the warehouse would act as a relocation depot, rather than a storage facility (Abbasi 2011: 182).

- Labelling and tracking.

The goods are marked separately or tagged for identification purposes. This may be done with a barcoding or Radio Frequency Identification (RFID) system, to identify which company the items belong to and to enable ease of access for efficient Last-in-First-out (LIFO) / First-in-First-out (FIFO) handling processes.

- Storage

The goods may be packed and stored for later retrieval according to the specifications of the warehouse.

- Packing and shipping

The stored goods may need to be repacked, or consolidated and prepared as per the outgoing order requirements, especially if stored in bulk volumes. They are then relocated within the warehouse and placed into transport containers, overland vehicles or other transport mechanisms.

- Reporting

Periodic reports are issued to the owners of the goods, to inform them of stock

levels, stock rotations, the time lengths of goods in storage and other such pertinent information.

In line with the above-mentioned authors, Goh and Garg (2008) and Wu (2009) suggest that the following standard warehousing services should be provided by 3PL service providers:

- Cross-docking
- Assembly and kitting
- Picking
- Packing
- Receiving

3.3.3 Inventory Management

Inventory management plays an important role in the control of materials and goods that have to be stored for later use in the case of manufacturing, or later exchange activities as with the provision of services. According to Hugos (2011), the main goal of inventory management is to maintain an optimum balance of inventory, thereby avoiding situations where manufacturing organisations carry too much or too little inventory. Having too much inventory on hand ties up the organisation's capital as well as increases costs such as storage, spoilage, pilferage and obsolescence. However, having too little inventory causes business failures such as production stoppages which, in turn, lead to customer dissatisfaction.

Goh and Garg (2008) and Wu (2009) maintain that the following are inventory management delivery systems that should be actively managed by 3PL service providers in order to maintain optimum levels of inventory:

- Just-In-time (JIT) delivery

As was indicated earlier in section 2.6 JIT delivery refers to the process of delivering products, raw-materials, component parts or sub-assemblies at the exact time when it is needed by the user (Lai & Cheng 2009: 13).

- Just in sequence (JIS) delivery

According to Omatu, Rocha, Bravo, Corchado, and Bustillo (2009: 354), JIS delivery refers to a warehouse-free process which is characterised by the delivery of products, raw materials, component parts or sub-assemblies in line with the assembly sequence of an Original Equipment Manufacturer (OEM) in the automotive industry.

- Vendor managed inventory (VMI)

VMI is an inventory management system where the supplier makes inventory replenishment decisions for the customer (Ray 2010: 125).

3.3.4 Order Processing

Order processing refers to a set of activities that a business organisation needs to perform to deliver the goods that a customer has ordered. Jaganeth (2012) describes order processing as all the activities performed by the manufacturing organisation and the 3PL service provider after a customer has placed an order. The author further asserts that these activities should include the following:

- Order entry
- Order fulfilment
- Consignee management
- Call centre management

3.3.5 Information Systems

Togar (2011) describes information systems as the use of information technology as a critical enabler of the supply chain networks that business organisations use to acquire, produce and deliver goods and services all over the world. Goh and Garg (2008) and Wu (2009) state that the following information systems should be offered by all 3PL service providers:

- Barcoding and scanning

Barcoding refers to a process where products receive a Uniform Product Code (UPC) which is a unique code assigned to all products, while scanning refers to the process of retrieving information about the product from the UPC (Plant and Murrell 2007: 29).

- Tracking and tracing

Tracking is the constant monitoring of a truck transporting freight, while tracing refers to determining the whereabouts of a truck (Horn et al 2012: 44).

- Satellite technology

Satellite technology allows communication across a wide geographic area, and provides a fast high-volume channel for information exchange around the world (Gopalakrishnan, Haleem & Abid 2015: 428).

- Radio frequency identification (RFID)

Sharma (2010:158) defines RFID as a means of identifying a person or an object using a radio frequency transmission of 125 KHz, 13.56MHz or 800–500 MHz.

- Electronic data interchange (EDI)

EDI refers to the computer-to-computer exchange of documents in standard formats to facilitate high-volume transactions (Gopalakrishnan et al 2015: 427).

3.3.6 Value-added services

Soinio, Juho Tanskanen and Finne (2012: 31) define value-added services as any services provided by 3PL service providers that are additional to basic services such as transportation, warehousing, order management, inventory management and information systems management. According to Lin, Zhou, Shi and Ma (2009) as well as Wu (2009), the following standard value-added services should be included in all 3PL service provider portfolios:

- Import and export services of parts and finished vehicles

- Sub-assembly preparation
- Design and recycling of packaging
- Marking and labelling
- Billing

Given the variety of services and activities offered by 3PL service providers, it is fundamental that 3PL service providers tailor their service offerings to suit the specific needs of their customers. The next section discusses the various categories of 3PL service providers.

3.4 DIFFERENT CATEGORIES OF 3PL SERVICE PROVIDERS

Zowada (2013: 112) conducted a study on the perceptions of customers towards 3PL service providers. The author found that customers categorise service providers by their size and function. The size of a business organisation, considered as small, medium or large, is based on its financial turnover, range of services offered, staff capacity and national coverage. The author further explains that the function of the business organisation is perceived relative to its specialisation, or the service it provides in the supply chain. Coe (2014: 232) presents a distinction between the functions of 3PL service providers. The author notes that 3PL services providers may be either 'asset-based', or 'non-asset-based'. Those that are asset-based, include business organisations that directly deal with the products, such as warehousing and transportation services over land, air or water. Non-asset-based 3PL service providers specialise more in value added services such as supply chain management consulting, software development, the sale of space on ocean carriers, consolidating shipments, freight forwarding, customs handling and insurance brokerage.

Selviaridis and Spring (2007) describe three different categories of 3PL service providers which have arisen due to globalisation and the international expansion of business organisations in the modern world. The first is a wholly-owned venture, which either occurs by self-founding or through the acquisition of existing logistics organisations (Selviaridis & Spring 2007). The second is a joint venture or other form of alliance that is partnered with business organisations across the target market.

These joint ventures are discussed by Coe (2014: 227) as being oriented in one of two directions: horizontal or vertical. Horizontal alliances refer to collaboration between different 3PL service providers that offer different overlapping services, while vertical alliances refer to the cooperation between consecutive 3PL service providers in a supply chain (Coe 2014: 227). The primary goal of horizontal alliances is to reach other geographical markets, while vertical alliances rather aim at accessing certain niche markets.

The third type of 3PL service provider covers the spectrum of all industries, whereby a business organisation establishes a subsidiary branch or department with the purpose of conducting the principal organisation's logistics functions (Selviaridis & Spring 2007).

All of the above-mentioned services and functions provided by 3PL service providers refers to the forward downstream movement of products towards the eventual customer. However, logistics management includes the reverse upstream movement of products as well. Therefore, the next section reviews third party reverse logistics.

3.5 THIRD PARTY REVERSE LOGISTICS

According to Senthil, Srirangacharyulu and Ramesh (2014: 51), as well as Ordoobadi (2009: 831), a recent addition to the 3PL service industry has been the introduction of business organisations who offer reverse logistics (RL) facilities. Otherwise termed Reverse Supply Chain Management (RSCM), the concept is defined as the "effective and efficient management of the series of activities required to retrieve a product from a customer to return it to the supplier, dispose of it or recover value from it (Erol, Velioglu, Buyukozkan, Aras, Cakar & Korugan 2010: 43). Pienaar and Vogt (2009: 102) highlight the following primary reasons for product returns:

- Excess or wrongly delivered items
- Damaged, malfunctioning or defective items
- Unwanted items due to customer dissatisfaction
- Product recalls

- Warranty returns

In the modern business world, where energy consumption, pollution creation, the effect on climate change and the effects on the environment have gained importance, there has been a significant move by local governments and business organisations to promote the facilities of recycling used commodities and the return and reuse of end-of-life products (Senthil et al 2014: 51; Ordoobadi 2009: 831-833). While the recycling of glass, paper and plastics is not a new practice, the returns of goods have expanded to incorporate a wide spectrum of products in the market today including Waste Electrical and Electronic Equipment (WEEE), End-of-Life Vehicles (ELV), as well as furniture and household appliances (Erol et al 2010: 44).

According to Senthil et al (2014: 51-56), as well as Ordoobadi (2009: 834), the management and implementation of RL services are usually carried out by 3PL service providers who possess RL facilities and should offer the following services:

- Specialised product arrangement management
- Customer relationship management
- Data tracking
- Repackaging
- Relabeling

While the drive for RL includes factors such as marketing motives, competition, direct economic benefits, legislation and concern for the environment, it has also been shown that including a return policy in the reverse flow of products, results in increased customer service levels and improved consumer approval (Rogers & Tibben-Lembke 2011).

Given the variety of services and activities offered by 3PL service providers, as well as the different categories of 3PL service providers, the task of selecting a suitable 3PL service provider could be challenging. Therefore, the following section highlights possible methods of selecting 3PL service providers.

3.6 SELECTING THE MOST SUITABLE 3PL SERVICE PROVIDERS

As was stated earlier in section 3.2, the purpose of using 3PL service providers is to reduce the costs incurred in a business organisation's operations and to reduce the number of separate points of contact for an organisation while improving the efficiency and effectiveness of its supply chain. 3PL service providers have been shown to be generally more efficient at providing logistics services than business organisations that handle the logistics functions internally (themselves). A study by Gotzamani, Longinidis and Vouzas (2010), for example, found that 3PL service providers were more successful than manufacturing business organisations that operated their logistics departments internally, when assessed in terms of the quality implementation and financial performance of their dealings.

3.6.1 Factors of consideration when selecting 3PL service providers

Once an organisation has decided to contract a 3PL service provider, the next step is to determine which provider to select (Zowada 2013: 115). Gotzamani et al (2010: 438) stress that this is a crucial decision, which must consider several criteria such as the quality and performance of the provider, with the quality of service being a central criterion that must be weighed against the financial performance of the provider. Zowada (2013: 115) states that the selection criteria for 3PL service providers should include the following factors:

- The range of the services provided
- The approach towards the customer
- The field of specialisation of the business organisation
- The price of the services provided
- The provider's references or portfolio
- The provider's technological capabilities.
- The cooperation initiative of the provider
- The reputation of the provider in the market

- The provider's location

Zhao and Lv (2009) assert that pricing is the most crucial factor when selecting a 3PL service provider, while Tian et al. (2010) view the industry rather as a service-based industry and veer away from the idea of basing a 3PL service provider decision solely on price. The authors assert that 3PL service providers' profit margins are very low and the expenses associated with logistics operations are continuing to rise. Therefore, 3PL service providers need to broaden their scope of services and concentrate more on services that add the most value. Hua et al (2009) also imply that the deciding factors should rather be focused on the quality of service provided.

A study done by the International Warehouse Logistics Association (IWLA) found that the selection criteria for 3PL service providers have changed between 1994 and 1999, and that the most important selection criteria to customers included service quality, reliability and on-time performance. By 2003, however, the most important criteria had again changed to focus primarily on the price, followed by the reliability of the provider and the quality of the service. A study conducted by Rahman (2011: 342) on the logistics services available in Australia, suggests that the most commonly used logistics functions are warehouse management, order fulfilment and transportation management, while the primary three criteria that motivated business organisations to outsource these services are reductions in cost and capital investment, as well as an increase in operational flexibility.

Aguezzoul (2009) views the decision process differently to Tian et al (2010) and Hua (2009), and states that this migration in opinion towards price is due to the increased trend for quality of services offered by 3PL service providers as well as the widening service offerings of 3PL service providers. The author suggests that this has resulted in the deciding factor settling upon the price, especially in the event where service offerings are often equal.

In recent times, with the additional requirements of extra value-added services being included in 3PL service providers' portfolios, as well as many industries being required to guarantee the transportation and shipping conditions of shipments, there are numerous factors that must be considered in the decision-making process of selecting 3PL service providers (Vijayvargiya & Dey 2010).

According to Vijayvargiya and Dey (2010), as well as Gotzamani et al (2010: 438), a service quality approach should be used to select a suitable 3PL service provider, based on a variety of service quality attributes. This approach attempts to consider customer perceptions relative to the customer services and therefore discern overall customer satisfaction. Therefore, dimensions of reliability, responsiveness, assurance, empathy, tangibility and the cost of the service quality are all factors that may be considered for provider selections. McGinnis, Kochunny and Ackerman (2009) concur with the above-mentioned authors and highlight the following selection criteria for 3PL service providers in order of importance:

- Superior error rates
- Financial stability
- Creative management
- The ability to deliver as promised
- Shipments and deliveries arriving on time
- The availability of top management
- The business organisation's responsiveness to unforeseen occurrences
- Pricing of services

In a key study by Moberg and Speh (2004, cited in Vijayvargiya & Dey 2010) which investigates the process of selection of a 3PL service provider in order to provide warehousing services, the results of the study indicate that the primary factors for choosing a 3PL service provider involve responding to service requests, management quality and their proven track record of ethical performance. Conversely, the least important criteria for 3PL service provider selection in warehousing, included the risk affinity of the 3PL service provider, its information technology, organisation size and nationwide cover (Vijayvargiya & Dey 2010).

3.6.2 Methods of selecting 3PL service providers

Various methods are available for business organisations to select suitable 3PL service providers. According Vijayvargiya and Dey (2010), one of the most common methods includes the ELECTRE method, which describes the process of “elimination and choice expressing reality”. This process uses several outranking relations to compare which of the two actions are the more favourable (Vijayvargiya & Dey 2010).

Similarly, a five-step model has been proposed by Aghazadeh in Vijayvargiya and Dey (2010) to assist with the decision-making process for 3PL service providers, highlighted by the author as the steps of decision-making, developing criteria, the weeding out process, the determination of the top project and, finally, the beginning of the new partnership. Aguezzoul (2009) classifies six important categories of selection methods for 3PL service providers, and these are articulated by the author as follows:

3.6.2.1 *The statistical or probabilistic approach*

The statistical or probabilistic approach refers to the statistical modelling tools, which may be applied to decipher the most advantageous 3PL service providers available. Using data gathered from empirical studies, either binary logic models or confirmatory factor analysis (CFA) could be used to examine the inter-relationships among variables. The author refers to studies that have used such approaches and describes two types of variables that are appropriate for statistical approaches. These are, firstly, generic variables, which include service cost, performance, value-added and perceived capability, and, secondly, alternative specific variables, which represent the size and scale of a business organisation, the product status and the size and destination of the shipments.

Such approaches are advantageous, as they analyse the behaviour of 3PL service providers. However, the implications are that they are difficult to analyse and it is not possible to introduce mathematical constraints into the calculations.

3.6.2.2 *The artificial intelligence approach*

The artificial intelligence approach integrates certain qualitative factors, such as human expertise, into the selection process, with two main systems being “expert systems and case-based reasoning (CBR)”. An e-commerce based 3PL service

provider selection system proposed by Ying and Dayong (2009), which represents an expert system, proposes five intelligence agents. These include order management, logistics process re-engineering, resource scheduling, dynamic union management, as well as simulating and evaluating.

Artificial intelligence offers a flexible base of knowledge, while taking into account the qualitative factors of the provider, but it requires the collection of knowledge of the 3PL services and there is typically less access to the necessary expertise.

3.6.2.3 *The mathematical programming model*

This model involves the use of calculation systems, whereby a function objective is optimised against a set of constraints presented to the decision-makers. These techniques are often used for modelling, evaluating and planning 3PL service provider networks. Similar to mathematical programming models, a multi-objective programming model has been used by Kumar, Vrat and Shankar (2006) for allocating a 3PL service provider under a set of “conflicting multi-objective criteria”. The authors argue that in a multi-objective approach, criteria do not have a common dimension and several solutions are proposed. There is also the choice for adding constraints into the model. Conversely, the method does not propose an optimal solution and the results of the method are difficult to analyse.

3.6.2.4 *The linear weighting model*

The linear weighting model places a score on each selection criterion, by a process of weighted averages. Then, by adding these scores together, the criteria are each awarded a total combined rating. The most appropriate criterion for an organisation is thus signified by the highest value, as determined by these weighted averages. The linear weighting model is based on the Analytic Hierarchy Process (AHP), which assesses five generic dimensions, covering the reliability, responsiveness, tangibles, assurance and empathy of the provider (Bhatti, Kumar & Kumar 2010: 277).

Vijayvargiya and Dey (2010) make reference to a more generic form of the linear weighting model system, termed the Analytic Network Process (ANP). This is classified as a three-levelled selection criteria tool, with the compatibility, cost, quality and reputation of the provider rated at the first level. Within the second level, the

supporting characteristics of the providers are devised and are supportive of the first level determinants. These generally include the long term relationship, operational performance, financial performance and risk management of the business organisations. The third and final level's determinants are termed the enablers and these cover additional dimensions to support the attributes of the upper two levels.

The benefits of the linear weighting model is that it is rapid and simple to use. They take into account the subjective criteria and are inexpensive to implement. Conversely, the main disadvantage of this model is that it depends on human judgment and no mathematical constraints can be introduced.

3.6.2.5 The fuzzy logic approach

Fuzzy logic has been proposed as a method for determining the optimum 3PL service providers in various studies (Senthil et al 2014: 54; Datta, Samantra, Mahapatra, Mandal & Majumdar 2013: 537-540; Liu & Wang 2009). Developed as a method by Zadeh (1965, cited in Senthil et al 2014: 54), the fuzzy set theory is intended to "deal with the abstraction of the main viable effect from an array of information that is expressed in vague and imprecise terms." A fuzzy number is therefore a value which is assigned to an imprecise element, between zero and one, where zero denotes completely false and one denotes completely true (Senthil et al 2014:54).

Datta et al (2013) suggest that the fuzzy-based technique is very useful for quantifying circumstances that are "too multifaceted or undefined to be reasonably described in typical quantitative terms" and where the best suited alternative must be chosen from several selection criteria. Liu and Wang (2009) agree that an integrated fuzzy approach enables analysts to evaluate the full process of 3PL service provider selection and provides a more accurate, effective and systematic decision support tool for 3PL service provider selection.

Through a modified form of fuzzy logic, that uses Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), or fuzzy TOPSIS, Senthil et al (2014: 55) suggest that the system of 3PL service provider selection may be achieved through the following steps:

- Model the problem as a hierarchy

- Evaluate the weights of the criteria
- Assess the consistency by evaluating the Eigen sectors
- Decide on the final ranking using fuzzy TOPSIS, with a fuzzy evaluation matrix and a weighed fuzzy evaluation matrix

3.6.2.6 *The Public Warehouse Selection Support (PWSS) tool*

A software tool termed Public Warehouse Selection Support (PWSS) has been devised by Colson and Dorigo (2004, cited in Vijayvargiya & Dey 2010) for the selection of warehousing 3PL service providers. Vijayvargiya and Dey (2010) outline the following extensive list of criteria that are factored into this software tool:

- The possibility for temperature control
- The storage volumes
- Dangerous items
- The separation of storage areas
- Ventilation
- Offices on site
- Control for humidity
- Geographical distances to highways
- Waterways
- Opening hours
- Assistance with customs
- Use of technologies such as RFID and barcoding
- Internet connections

- Equipment handling such as fork lifts
- The characteristics of the docks

This mono-objective approach is advantageous, as it proposes an optimal solution, with the choice to introduce constraints into the model. However, it does not assess the subjective criteria of 3PL service providers.

Given the various tools and methods mentioned above that can be used in the selection process of 3PL service providers, it is clear that there are certain limitations inherent in each of them. Therefore, most of the above-mentioned authors promote the integration of two or more of the selection methods in order to present a more comprehensive analysis of the possible services offered by 3PL service providers.

3.7 CONCLUDING REMARKS

From the above discussion it is clear that selecting the right 3PL service providers is a precarious operation in any business organisation, due to the high level of risk and low level of certainty involved. Business organisations need to review their selection methods for 3PL service providers on a continuous basis and only select providers that can tailor their service offerings according to the principal organisation's needs.

In order for automotive manufactures to realise more potential from their 3PL service providers in the future, issues such as early 3PL service provider involvement, cost saving initiatives from 3PL service providers and 3PL service provider development, will therefore become more crucial. It could thus be concluded that the success of these strategies is dependent on how well the 3PL service providers respond to meeting the needs of the business organisation and the value an organisation attaches to 3PL service provider relations.

The next chapter focuses on the automotive manufacturing industry and 3PL service provider outsourcing. The link between 3PL service providers and the automotive manufacturing industry in developing countries is also discussed.

CHAPTER 4

3PL SERVICE PROVIDER OUTSOURCING IN THE AUTOMOTIVE MANUFACTURING INDUSTRY IN DEVELOPING COUNTRIES

4.1 INTRODUCTION

The previous chapter provided an evaluation of 3PL service providers and outlined possible methods of successfully selecting 3PL service providers. This chapter outlines the role of 3PL service providers in the automotive manufacturing industry, more specifically in a developing country such as South Africa. The chapter begins with the defining concepts such as *automotive industry*, *automotive supply chains* and *automotive logistics*, followed by an explanation of the linkage between automotive manufacturing organisations and 3PL service providers. Next, a discussion on the modular logistics processes which are practiced by automotive manufacturing organisations, is provided.

Thereafter, the chapter continues with a discussion on 3PL service provider outsourcing, with an overview of the advantages and disadvantages of logistics outsourcing. Steps to follow when outsourcing to 3PL service providers are also discussed, before the problems associated with outsourcing are deliberated.

Following this, a review of the logistics environment in South Africa, and some of the obstacles faced by organisations operating in the South African environment, are outlined. The chapter concludes with a discussion on some of the strategies that have been proposed for solving, or overcoming, the problems faced by organisations operating in the South African automotive industry.

4.2 THE AUTOMOTIVE INDUSTRY DEFINED

The automotive industry is defined by Binder and Rae (2011) as the conglomeration of all of the business organisations involved in the production of motor vehicles and their components. This includes the fixtures for these vehicles, such as the engines and bodies, tyres, batteries and all other components required to make these vehicles operative. The principal products of the industry are passenger automobiles, light trucks, heavy duty trucks, vans, pickups and sports utility vehicles.

The automotive industry is viewed as a key driver for economic growth in many developing countries. According to the National Association of Automobile Manufacturers of South Africa (NAAMSA: 2012), the industry contributes around 6.0% to South Africa's GDP and accounts for almost 12.0% of the country's manufactured exports, making it a crucial cog in the economy. The Automotive Industry Export Council of South Africa (AIECSA: 2010) reports that more than 28 000 people are directly employed in the industry, while 65 000 people are employed in the component manufacturing industry. The Council further states that about 200 000 people are employed in retail and after-market activities with 6 600 employed in the tyre manufacturing industry alone.

4.2.1 Automotive supply chains

Chandra, Srivastava and Agarwal (2013: 206) describe the automotive industry's supply chain as broadly consisting of two parts. The first they suggest includes inbound automotive logistics, which involves the supply of raw materials and components from suppliers to the principal manufacturer, up until the final assembly stage. The second they note involves the delivery of finished vehicles from the principal manufacturer to the distributors, customers, or final points of sale, which they refer to as outbound automotive logistics. Referring to Figure 4.1 below, inbound automotive logistics occurs between stages A and B, while outbound logistics occurs between stages B, C and D.

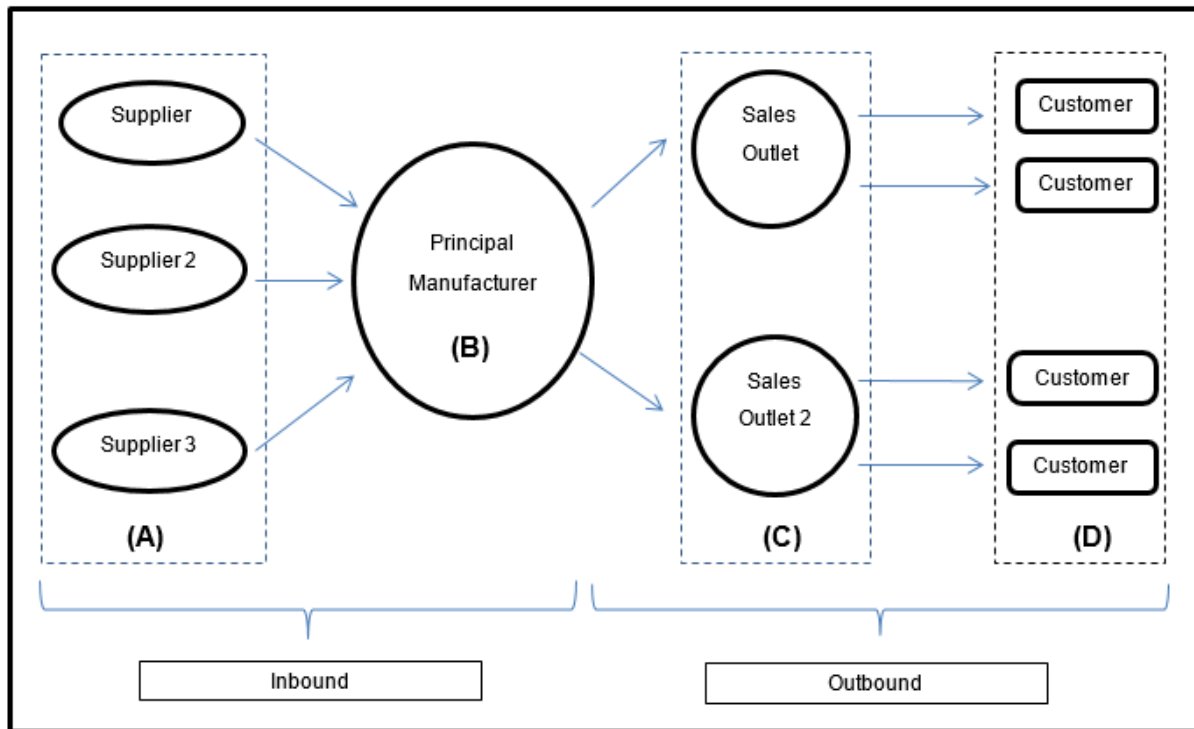
While some parts of the logistics supply chain may require simple bulk shipments to vendor-managed inventories (Reeves, Caliskan & Ozcan 2010: 467), other parts may require complicated sequencing where JIT shipments are transferred from a single manufacturing location to multiple, geographically dispersed assembly locations. As a result, Chandra et al (2013: 207) assert that classifications of logistics providers in the automotive industry are typically made according to the product or commodity type, rather than the distribution and logistics services that are supplied.

4.2.2 Automotive logistics

Liu, Huang and Zhang (2010) define automotive logistics as the flow of an automotive producer's raw materials, components, vehicles and spare parts throughout the stages of the automotive production and sales cycle. Automotive logistics covers activities

across each aspect of the business operation and includes the inbound handling of raw materials and components, the garage logistics during manufacturing, the sales logistics of vehicles, and the distribution of spare parts.

Figure 4.1: Outbound and inbound flows



Source: Researcher's own construction

One of the most important roles of 3PL service providers in the automotive industry is the management of cargos of goods within the supply chain. As noted by Ford (1926) "it is a waste to carry so small a stock of materials that an accident will tie up production. The balance has to be found and that balance largely depends on the ease of transportation."

Liu et al (2010) argue that automotive logistics is a highly complex field, which demands considerable capital resources and is both technology and knowledge intensive when compared with other industries. According to Reeves, Caliskan and Ozcan (2010: 460), the scope of the distribution and logistics services required in the automotive industry is far-reaching. The industry supply chain handles not only "mundane parts such as screws and fasteners", but also large and valuable items such as "cockpit modules, door assemblies and transmissions" that must arrive in prescribed production sequences. The automotive industry is also a leading

practitioner of the system of 'lean principles' including JIT shipments, small batch sizes and low inventories (Reeves et al 2010: 460). These systems were detailed in Chapter 2.

In developing countries such as South Africa, manufacturing costs are high due to a lack of integrated logistics services offered by automotive 3PL service providers. Liu et al (2010) argue that automotive organisations require professional logistics solutions to help reduce their costs. This is problematic for developing countries because current logistics services are not suitably meeting the demands of the automotive business organisations in terms of quality and scope of services. Domestic 3PL service providers are generally only able to provide single specialised logistics services, such as either warehousing or transportation. Automotive business organisations must therefore often directly manage large numbers of specialised logistics business organisations who only offer single services. A broader range of integrated logistics services and network planning is thus required to better meet the needs of the automotive sector (Zhao & Lv 2009).

Foreign automotive business organisations, for example, require emergency transportation and tracking services, because they need to be able to monitor many different elements within the automotive supply chain to ensure that deliveries are on time and within budget. Foreign business organisations also place a significant emphasis on suitable packaging and reinforcements, product identification systems and pick-up and delivery reliability (Wu 2009). Ketels (2011) claims that local and foreign automotive business organisations highly value the efficient management of inventory and return goods. Goh and Garg (2008) emphasise that collaboration with 3PL service providers is crucial for successful supply chain operations. Therefore, 3PL service providers in developing countries must strive to improve their service capabilities to meet the standards of 3PL services providers in the developed world.

In order to compare different 3PL service providers in the automotive manufacturing industry, it is important to know which specific services are required. While the automotive logistics market, as in any other logistics market, should be highly flexible to meet the needs and demands of its customers and thereby tailor solutions to satisfy the demands of its customers, there are to some extent, standard services that are universally available across the industry (Wu 2009). Some of these services are

specific to the automotive market, having risen from needs within the industry, while others are collectively available across all markets. There are six service-specific services that play a significant role in the automotive industry, as categorised by Wu (2009), which include *Transportation Services, Warehouse Services, Inventory Management, Order Processing and Value-added Services*. These services were discussed in Chapter 3.

The next section discusses modular logistics processes, explaining what modular logistics processes entail, as well as their functions and benefits for the automotive supply chain.

4.2.3 Modular logistics processes

The automotive industry, according to Lin, Zhou, Shi and Ma (2009: 323), is becoming more based on a system of modularity. As one of the most prevalent means of supporting product variety and achieving mass production, the authors note that the automotive industry has been changing rather to a system of modular production. Modularity is described by Baldwin and Clarke (1997, cited in Lin et al 2009: 323) as the building of “a complex product or process from smaller subsystems that can be designed independently, yet function together as a whole.” According to Lin et al (2009: 323), modularity has been in practice since 1996, when it was implemented in the Volkswagen and Mercedes-Benz factories in Brazil and France. Studies suggest that automotive industries in many other countries, including the United Kingdom, have also moved towards a system of modularity, as it leads to cost reductions, improved distribution speeds, greater flexibility and the sharing of risks (Lin et al 2009: 323).

An example of modularity is the case of the Smart car, which was launched as a joint venture between Mercedes-Benz and the Swatch Swiss watchmakers (SMH) (Takeishi & Fujimoto 2003, cited in Lin et al 2009: 324). The authors describe that, while a typical auto-manufacturer would expect to interact with between 200 and 300 suppliers, only 25 module suppliers, or system partners, are involved in the case of the Smart car. These system partners are suppliers that provide the completed body structures, entire dashboard systems, seating modules and full braking control systems.

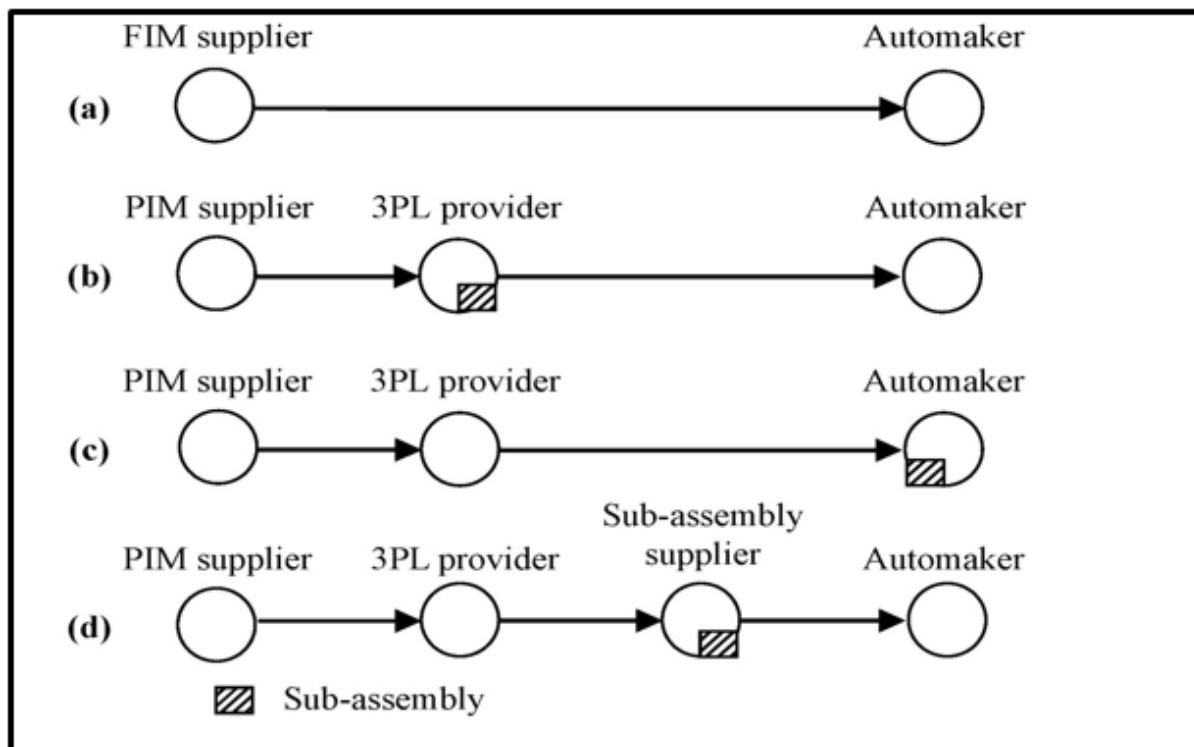
While various other automotive manufacturers are following the trend towards modular supply chains, including Audi and Hyundai, there are complex product structures and supplier networks which make it challenging to apply modular principles in the upstream supply chains of many car manufacturers (Lin et al 2009: 324). The authors note the case of General Motors, for example, which must interact with 30 000 suppliers and over 9 000 members in its supply chain, making it difficult for the manufacturer to change its structures.

Lin et al (2009) conducted a study of the supply networks of fully integrated (FIM) and partly integrated parts modules (PIM) based on a seat module, instrument panel, air conditioning module and tyre module. In their study, the authors found that in a FIM supply network, such as a seat module, where the module does not require any further sub-assembly before being fed onto the final assembly line, the module supplier requires efficient upstream supply network integration and modularity. In a partly integrated module (PIM) supply network, however, the authors argue that the 3PL service providers play an important role in the production capability and propose a variety of network structures as shown in Figure 4.1 below.

Figure 4.1 below indicates the case of FIM, where no sub-assembly is required. The supply network may be more direct along line (a). For PIM, however, the sub-assembly can be finished by the 3PL service providers (b), automaker (c) or sub-assembly supplier (d). The authors assert that there is a varying level of modularity available in each case, with option (a) involving the most modularity and option (d) involving the least.

The next section discusses outsourcing logistics services to 3PL service providers, with an overview of the advantages and disadvantages of outsourcing, the problems that may arise from outsourcing, as well as the barriers faced by 3PL service providers.

Figure 4.2: Patterns of modular supply networks



Source: Lin et al (2009: 336)

4.3 3PL SERVICE PROVIDER OUTSOURCING

Generally, outsourcing can be defined as the practice of acquiring goods or services from an external contractor that were originally completed or produced internally by an organisation (Hugo & Badenhorst-Weiss 2011: 62). Thus, outsourcing comprises the transfer of single functions, or the functions of an entire organisation, to an external supplier or service provider. Partial outsourcing is also possible when an organisation only sub-contracts some of its services or activities, while the rest are handled internally (Hugo & Badenhorst-Weiss 2011: 2).

The term 'logistics outsourcing' can be defined as the process of outsourcing an organisation's logistics demands to an external organisation that provides logistics services (Dolgui & Proth 2013: 676). The outsourcing of logistics services involves the contracting of 3PL service providers, which are third party organisations that possess the necessary expertise for consistently performing logistics activities that would otherwise have been performed in-house. Logistics outsourcing tends to operate over long-term periods and with expanded service offerings that provide interdependent

and mutually beneficial relationships between the co-operating organisations (Vahdani, Jolai, Tavakkoli-Moghaddam & Mousavi 2012: 802).

4.3.1 Advantages of outsourcing to 3PL service providers

The competitive manufacturing environment is changing swiftly around the world. This change is driven by technology forces and globalising organisations that are constantly seeking new methods for improvement in each of the aspects of their businesses, such as through knowledge gain, increased flexibility and improved performance (Coe 2014: 224). Logistics is therefore receiving increased attention, since it is a sector in which productivity and efficiency improvements are possible in order to lower operating costs, while improving customer services.

For most manufacturing organisations, however, logistics is not an area of primary competence and in order to successfully satisfy their manufacturing process requirements and improve organisational efficiency, many organisations are beginning to focus rather on their own areas of expertise and competence, while leaving 3PL service providers to handle their logistics requirements (Vahdani et al 2012: 802). This is because, when logistics is outsourced and properly managed by a 3PL service provider, many advantages can be generated for an organisation.

The advantages of outsourcing to 3PL service providers are well documented. Research indicates that organisations that have advanced experience in outsourcing practices are able to manage logistics procedures efficiently, to achieve optimum business outcomes that are well-defined and which bring about a high level of satisfaction for their customers (Rajesh, Puhazhendhi, Ganesh, Ducq Yves, Lenny Koh & Muralidharan 2011: 223; Vahdani et al 2012: 802). Rajesh et al (2011: 223) and Vahdani et al (2012: 802) further highlight the following additional advantages:

- Cost savings
- Improved quality of services
- Access to additional facilities and external expertise
- Higher value creation and/or greater service integration

- Strategic sourcing
- Strategic repositioning
- Achieving higher efficiency for the organisation and increasing its areas of specialisation
- Better, faster and cheaper support functions
- Solving problems that may arise from business restructuring and reorganisation
- Reaching global markets and suppliers
- Overcoming global competition
- Generating contracts with fewer suppliers
- Forming closer, longer-term relationships with suppliers and distributors
- Receiving higher levels of service from the suppliers

Therefore, 3PL service providers add value to organisations at varying levels, depending on the degree to which they are employed and integrated into the supply chain of that organisation (Rajesh et al 2013: 223). They are able to provide value to organisations at the most basic levels, for example, by defining and organising what the most effective method of transporting a shipment of goods for an organisation would be. 3PL service providers are also able to add value to organisations at the most sophisticated level, for example, when they are fully integrated into the entire supply chain of an organisation that is heavily dependent on supplier and distributor interactions (Vahdani et al 2012: 802). In such cases, the 3PL service provider is involved in many of the organisation's processes, including designing; co-ordinating and executing supply chain strategies; providing organisations with value-added information for improving and better managing their supply chains; and feedback information that allows the organisation to better manage its core competencies (Van Weele 2011:62, cited in Hugo & Badenhorst-Weiss 2011: 64).

Reasons for outsourcing logistics services can be differentiated between strategic and tactical reasons. Strategic reasons include those that assist with the improvement and

focus of an organisation, such as to access resources that would otherwise not have been available internally; to receive important financial infusions; to access world-class capabilities and facilities for the organisation; to improve the satisfaction of customers; to accelerate the benefits of re-engineering; to share the risks of operation; and to increase the strategic flexibility of the organisation (Anand, Chandrashekar & Narayanamurthy 2014: 123).

Tactical reasons include those that are implemented in order to reduce the costs of operation and control, such as to reduce the load on internal resources; to improve the performance of the organisation; and to be able to handle circumstances that have spun out of control (Anand et al 2014: 123). The relative importance given by an organisation to outsource its logistics functions also changes over time and fluctuates according to both internal and external circumstances (Hsieh, Chang & Wu 2014: 154). For example, after 11 September 2001, organisations became acutely more focused on making decisions for security reasons.

Outsourcing to 3PL service providers with large scopes of facilities, such as large distribution networks and access to various modes of transportation, allows organisations to more easily adjust to their changing environments, as, for example, supply chain demands increase (Lu, Meng & Goh 2014:32). This can be, for example, in response to the increased output of a process that becomes automated. Those 3PL service providers with wide ranging facilities can also offer access to wider networks of 'field-stocking' facilities, so that technicians can be supported with faster service of automated equipment or maintenance services (Hsieh et al 2014: 154).

Most of the reasons that are cited in the literature for outsourcing to 3PL service providers relate to decreasing costs or increasing customer services, which are ultimately related to improved financial turnover. Improved financial turnover is often generated by improving the focus of managers, as well as enhancing the speed and efficiency of delivering products to the market, which ultimately increase the revenue of the organisation (Lu et al 2014: 33).

While there is hesitance among organisations to transfer the responsibility for their connectivity processes to other organisations, many organisations that outsource their logistics activities are performing exactly that. Therefore, as noted by various authors,

few organisations deny that the advantages of outsourcing their logistics activities considerably outweigh the potential difficulties or problems that may occur from the process (Rajesh et al 2011: 223). However, even though 'savvy companies' depend heavily on outsourced 3PL service providers to increase their productivity, expand their flexibility of operations, improve their product and service quality, save money and increase their financial bottom lines, outsourcing is not without its disadvantages (Vahdani et al 2012: 802). The next section provides an overview of the disadvantages that may be associated with outsourcing logistics activities to 3PL service providers.

4.3.2 Disadvantages of outsourcing to 3PL service providers

In spite of the clear advantages of outsourcing, there are also various potential disadvantages that may be experienced from outsourcing (Bhattacharya, Singh & Bhakoo 2013: 399). The authors mention the following disadvantages:

- Reduced control systems for observing how products are delivered, when compared to the execution of these functions in-house
- Hidden risks and costs that can arise due to the operations of external organisations
- Poor interaction or support from high level management
- Cross-functional politics between organisations
- Low or no communication across organisations
- Unclear expectations between the organisations, such as the scope of work
- Uncertainty and instability among different organisations
- Problems with confidentiality and other security issues
- Problems with co-ordination and the timing of independently operating organisations

It has also been found that organisations may be anxious to hand over some, or many of the functions of their business to an external third party organisation. Hugo and

Badenhorst-Weiss (2011: 63) summarise all of the major disadvantages that relate to outsourcing as the “loss of control and skills”, which occur because of the dependence of an organisation on outside parties. Other concerns may include issues with safety, security and trust; the price of the service; the depth and capability of the 3PL service provider’s management; and the transition process when changing from an internally controlled, to an outsourced operations system (Fu, Lai & Liang 2014).

Bhattacharya et al (2013: 399) maintain that the disadvantages that may potentially exist with outsourcing can be categorised into three groups: technology, processes and people (human resources). Of these three groups, the people aspect is an especially critical aspect for management and decision-makers. This is because as the corporate culture of an organisation changes, the corresponding disruptions that occur to staff can play a significant role in the success of the outsourcing partnership. In various studies, for example, the cultural compatibility has been found to be a major contributing factor to the failure of a logistics outsourcing partnership, especially when cultures are incompatible and poor inter-organisational communication results (Fu et al 2014).

4.3.2.1 Steps to follow when outsourcing to 3PL service providers

In order to reduce the potential disadvantages associated with an outsourcing initiative, organisations should identify the areas that pose the greatest risks or concerns and plan methods for overcoming these (Creazza, Dallari & Rossi 2012: 2925; Fu et al 2014). Therefore, certain steps should be followed in the outsourcing process (Hugo & Badenhorst-Weiss, 2011: 64) which include:

- Conducting a thorough analysis of the 3PL service provider
- Identifying the core competencies of the 3PL service provider
- Clearly understanding what should be achieved by the outsourcing arrangement
- Generating a comprehensive plan for ensuring that the outsourcing arrangement enhances the performance of the business organisation
- Carefully choosing the correct 3PL service provider

- Treating the 3PL service provider as a partner of the business organisation
- Maintaining communication channels, with honesty and trust
- Providing suitable training to staff on the skills necessary for coping with the change that occurs with integration

In the event of organisations making poor decisions about the outsourcing of their logistics processes, there is a risk that they could compromise the quality of their services, which in turn increases the risks of compromising their market share, customer loyalty and financial bottom line. Logistics outsourcing should therefore be treated as an important business concept, with major strategic and potentially far-reaching repercussions for any organisation. In spite of this, many organisations still neglect the important issues of the logistics processes when they outsource their logistics processes (Creazza et al 2012: 2925).

Various authors have stated that as service providers undertake an organisation's logistics functions, the service provider must continually attempt to improve its performance in order to maintain effective cost and efficiency performance targets (Lu et al 2014: 33). It is therefore important for organisations to implement effective measurement processes for gauging the cost efficiency of their service providers, because failure to do so can reduce the success of the outsourcing arrangement (Lu et al 2014: 33; Vahdani et al 2012: 802).

4.3.3 Problems associated with outsourcing to 3PL service providers in developing countries

Shen (2000, cited in Hong et al 2004) claims that throughout the developing world, more than three quarters of business organisations do not outsource their logistics activities. This figure varies significantly from market to market, through and between the developing and developed worlds. This ranges from China in which only 2.0% of organisations outsourced their logistics activities, to the UK, which outsourced 40.0% of logistics activities in the mid-2000s (Coe 2014: 228). Coe (2014: 228) further notes that France, Germany, the US and Europe outsourced 22.0%, 28.0%, 19.0% and 25.0% of their logistics activities respectively over the same period and the growth of the outsourced market in China was recently estimated at approximately 30% per

annum. As much as 45.0% of logistics activities are outsourced to 3PL service providers in Australia. Rahman (2011: 342-343) argues that this is likely to increase as 3PL services providers improve their efficiency and productivity by implementing information technology (IT) systems and through the integration of multiple services.

The total logistics costs in the developed world follow a trend of between 10.0% and 15.0% of the costs of any particular industry (Coe 2014: 225), while the comparable figures in the developing world are between 15.0% and 25.0%. Waters (2007, cited in Zhang & Figliozzi 2010) claims that this figure might often be considerably higher, at between 40.0% and 60.0%.

According to authors such as Wu and Wong (2009), the main negative experiences that automotive manufacturers have in developing countries can be summarised as follows:

- Loss of control of the supply chain
- Logistics providers are perceived as undependable and unresponsive
- Communication problems arise between customers and the 3PL service providers
- There is a slow response time to customer requests
- There is a high rate of loss, theft and damage of goods
- Logistics providers have poor lead time performance
- There is not enough variety of services
- Problems have arisen with service providers failing to keep confidential information secret
- High costs have proven inhibitory to business operations

As discussed by Zhao and Lv (2009) and Waters (2007, cited in Zhang & Figliozzi 2010), poor infrastructures in developing countries have created generally higher costs for 3PL service providers. This means that for the automotive business organisations,

their high logistics costs decrease their competitiveness, while increasing the prices of their products. In addition, their lead times are much higher than they would be in developed countries and damage risks during transportation are present as well. In an attempt to overcome this, automotive manufacturers must keep high volumes of parts in stock, causing high warehousing and storage costs. Costs also escalate due to the need to strengthen the packaging of delicate products in preparation for the rougher transport services and road networks (Zhao & Lv 2009; Coia 2011) in developing countries.

Relationships between people and organisations are crucial in business (Lee 2011). The departmentalism style of management of automotive groups has led to a considerable fragmentation of the logistical services market (Zhao & Lv 2009), meaning that it is difficult for 3PL service providers to acquire new contracts at automotive business organisations who have already established their 3PL service provider networks. Although this is not a phenomenon specific to developing countries, this can be attributed to the personal relationships that exist between the decision-makers at both logistics and automotive business organisations (Coe 2014: 225).

According to Coe (2014:247), the quality of domestic logistics provisions in the emerging economies of Brazil, Russia, India, China and South Africa (BRICS) are becoming a major strategic issue with respect to the growth of the global economy. The author notes that there are widespread issues in each of these countries in areas such as the basic access to infrastructure, the lack of integration between transport types, and the over-dependence on road transport systems. Solutions for many such challenges will require co-ordinated governmental action at a national level (Coe 2014:248).

Many South Africans perceive supply chain logistics as a term to describe simply the facilities of warehousing and transportation, or as “a service input to client industries”, rather than a dedicated business sector (Coe 2014:225). This is because most local 3PL service providers do not offer the higher-level logistics services observed in developed countries. Many of the influences of the South African logistics environment have historical roots, which have kept the outsourcing of logistics services in South Africa relatively underdeveloped.

4.3.3.1 Barriers faced by 3PL service providers in developing countries

Wu (2009) suggests that the scope of services by logistics organisations in developing countries typically includes warehouse-related operations such as receiving, processing, assembly, packaging and storage, or transport-related services such as order picking, shipping and goods returns, while value-adding services do not play a significant role in developing countries so far.

The 3PL service provider market of developing countries is “a booming phenomenon”, note Mothilal, Angappa Gunasekaran, Nachiappan and Jayanth Jayaram (2012: 2408) and as a result, it is presenting a considerable opportunity for business development. Nonetheless, certain aspects of the 3PL service provider industries of developing countries are still creating barriers for service development and after reviewing the literature, it is apparent that these barriers may be categorised into the following three groups:

- Legal issues
- The infrastructure and equipment required by 3PL services providers
- The staff and manpower required for efficient operation

These barriers are discussed in more detail in the following paragraphs.

4.3.3.2 Legal issues

Legislation in developing countries has created various obstacles for logistics operations and this has prevented the automotive industry from running as smoothly as in developed countries. For shipping agents crossing borders into developing countries, for example, different licenses are required that prove difficult to source and process, especially for smaller transportation companies (Coia 2011). According to Coe (2014: 245), developing countries are also hampered by time-consuming customs and import and export procedures for materials or finished goods, while outbound logistics are also seen to be an issue when suppliers fail to meet delivery deadlines set by the buyers.

Barriers may also be observed by public authorities and in many developing countries, each mode of transport is managed by its own ministry, though these ministries do not always interact well. This results in poor efficiency and the overlapping of the roles of the different authorities (Zhang & Figliozzi 2010). Taxation systems in developing countries have also proven to be inhibitory to 3PL service providers, whereby tax benefits for companies who purchase locally produced equipment have created uneven circumstances for competitors, since state of the art equipment that is demanded by customers, may not be available from local manufacturers, while those that are available may be of inferior quality (Mothilal et al 2012).

4.3.3.3 *Infrastructure and equipment*

Often, poor transportation infrastructure, which are still under development, hinder the efficient shipment across developing countries (Zhao & Lv 2009; Wu 2009; Ketels 2011). Despite extensive investments into the transportation infrastructures of some countries such as China, the transportation infrastructure of developing countries in general cannot cope with the increasing demand (Wu 2009). These circumstances have led to extensive congestion and traffic problems, resulting in service delays (Zhang & Figliozzi 2010). Coe (2014: 249) alludes to the example of Nigeria's busiest container terminal in Apapa, operated by Denmark's A.P. Møller Group, which faces considerable road haulage issues that are created by poor roads, congestion, low levels of investment and limited IT capabilities.

In many developing countries, the transportation costs are in the upper range of the most expensive in the world. Zhao and Lv (2009) state that transportation costs in developing countries are on average, between 40.0% and 50.0% higher than those in the developed world, while Waters (2007, cited in Zhang & Figliozzi 2010) has estimated the costs to be far higher, at around double the cost of the developed world.

Rail networks in developing countries have been shown to be much faster than roads as a means of transportation. However, using the rail networks has also proven to be more risky for shipments because of the theft which occurs on trains (Coia 2011). Zhang and Figliozzi (2010) add that the railway networks of most developing countries do not have the capacity to relieve the load significantly on road transportation systems and thus far, most of the railway network facilities have only been used for bulk

transportation. Conversely, finished goods and industrial products are transported via road.

Business organisations in developing countries must often rely on smaller logistics providers, who sub-contract their trucking services to private service providers and for some routes, it can be difficult to source the necessary facilities (Coia 2011). Most logistics providers in developing countries also have poor transportation equipment and IT technology capabilities, such as inferior or non-existent tracking and tracing systems (Ketels 2011; Zhang & Figliozzi 2010). The lack of high-quality cold chain facilities, for example, for handling fragile organic products, has a negative impact on product quality, thereby reducing export opportunities (Coe 2014: 244).

Warehousing in developing countries has also been plagued by various shortcomings. Many warehouse facilities are either poorly equipped, based on outdated designs, or are fitted with poor lighting, insufficient fire and safety equipment, inefficient temperature control and bad docking facilities that all affect the competence and reliability of these facilities and the services provided (Mothilal et al 2012). In addition, warehouses are seldom automated due to the relatively low costs of labour in third world countries, compared to the costs of expensive state-of-the-art automation equipment. This often results in higher fault rates, damages and human errors such as picking mistakes (Zhang & Figliozzi 2010). Furthermore, Warehouses are often located away from the optimum locations for logistics supply chains, which hinders the design and operation of supply chains (Bisenieks & Ozols 2010). Power outages and load shedding due to electricity shortages and outdated communication infrastructures in some locations have also been shown to hinder productivity (Zhang & Figliozzi 2010; Liu et al 2010).

4.3.3.4 Staff requirements

Many authors (Wu 2009; Liu et al 2010; Ketels 2011) agree that the 3PL service provider industry is facing a major shortage of suitably qualified logistics staff. Most of the employees in developing countries lack the training on logistics concepts and international business to match their developed world counterparts (Wu 2009). The authors argue that only trained and experienced logistics managers are able to cope with the complexities involved with logistics procedures and the difficulties that arise

from integrating these facilities. Inadequacies in logistics knowledge and management capabilities cause costly operational errors to arise from losses due to mismanaged supply chains.

This section has provided an overview of the core functions of 3PL service providers and their role within the logistics processes of developing countries. The next section discusses logistics outsourcing in South Africa, specifically, with a discussion on the country's limitations and strategies that can be applied to overcome these limitations by the manufacturing sector.

4.4 THE LOGISTICS ENVIRONMENT FOR AUTOMOTIVE MANUFACTURING ORGANISATIONS IN SOUTH AFRICA

Since many manufacturing organisations in South Africa are competing in an ever-increasingly competitive global market, they are being forced to acquire the services of 3PL service providers (Coe 2014: 224). As is the case with other global organisations, South African manufacturing organisations have been pressured to increase their services to customers at lower costs, while at the same time maximising their market share and returns for their shareholders.

In South Africa in the 1970s, the market share of the railway's manufacturing clientele flattened, which Havenga and Pienaar (2012: 103) argue was because of rate problems. The two authors explain that the railways assumed that "high-value rail cargos" of mostly manufactured goods were "price inelastic" and attempted to cross-subsidise the transportation of agricultural goods with higher charges on manufactured goods.

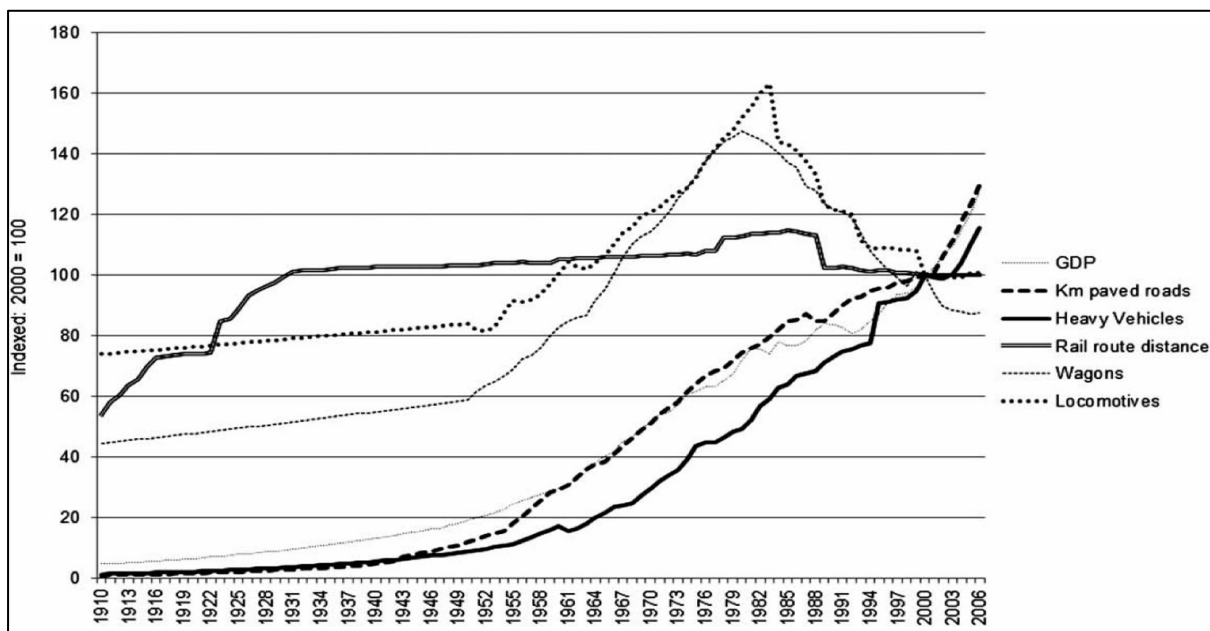
As a result, as Figure 4.2 below shows, shippers of manufactured commodities pursued alternative arrangements for their transporting needs. In response, the usage of heavy vehicles has increased exponentially in the country to satisfy the country's logistics needs.

Due to the geographical positioning of South Africa, organisations in the country are logistically positioned at a disadvantage, as they are far removed from the majority of their international markets and suppliers (Scholvin & Draper 2012: 381). This makes the logistics processes for South African manufacturing organisations more costly and

complex. Therefore, South African manufacturing organisations are forced to discover innovative means of improving their profitability and increasing their competitive advantage.

Scholvin and Draper (2012: 381) argue that while being located at the edge of the continent limits South Africa’s potential role as a gateway for the continent, there are various other factors that make South Africa a potentially suitable gateway for manufacturing organisations to Africa and the world. For example, Johannesburg and to a lesser extent Cape Town, are the primary locations for international organisations that have established headquarters for their Sub-Saharan business organisations. These organisations benefit from the excellent corporate services that are available in the country, as well as South Africa’s business environment that is “highly suitable for international business” (Scholvin & Draper 2012: 382). This includes the Johannesburg Stock Exchange (JSE), which provides a conduit for the flow of financial transactions between the entire African continent and the rest of the world.

Figure 4.3: Usage of transportation modes for freight in South Africa from 1910 to 2006, relative to their infrastructure index



Source: Havenga & Pienaar (2012: 94)

Although numerous 3PL service providers exist in South Africa and many of the country’s automotive manufacturers employ 3PL services providers for their logistics functions, in South Africa, political constituents have attempted to influence the

logistics sector (Havenga & Pienaar 2012: 93). They have done so by influencing infrastructure spending of the country in a manner that benefits certain societies in the short term, while opposing projects where the funds could otherwise have been better spent. Havenga and Pienaar (2012: 93) suggest that this trend has had a negative effect on logistics developments in the country.

In South Africa, it is a concern for manufacturers that most of the key importers and exporters are not situated closer to the peripheral zones of urban areas (Joubert & Axhausen 2013: 744). The authors further argue that to maintain the economically beneficial importing and exporting of goods for manufacturing in South Africa, the challenge remains in transport planning, where flow on the main freeways and especially in the urban centres must be improved.

While South Africa regularly interacts with the other major maritime powers in the Indian Ocean and South Africa's network of maritime ports is considered to be the most efficient and best equipped on the continent, South Africa is still not a maritime power (Potgieter 2011: 52). According to Potgieter (2011: 52), the country does not use its maritime facilities to its full potential. In terms of the freighting needs of the logistics supply chain, Scholvin and Draper (2012:381) maintain that the Ngqura deep-water port near Port Elizabeth offers the potential to function as a regional hub for international 'transhipments'.

Following this overview of the logistics environment in South Africa, the following section provides a review of the main suggestions that automotive manufacturing organisations can use to overcome some of the above-mentioned challenges.

4.4.1 Strategies for manufacturing organisations to overcome logistical challenges in South Africa

Joubert and Axhausen (2013: 744) suggest that to overcome the challenge with transport planning, where flow on the main freeways and especially in the urban centres needs to be improved, omni-directional through-traffic in Johannesburg is a good option to be used as a hub for connecting the two main ports in the country that is, from Durban in the South-East, to Cape Town in the South-West. In addition, to overcome the challenges with traffic in the country, Joubert and Axhausen (2013: 744) recommend using commercial vehicle activities, along with the "associated network

analysis approach.” They state that this technique is very helpful for determining the key import and export facilities and should be applied more by local and provincial governments and transport planners to determine specific and directed policy measures for transport infrastructure improvements.

Havenga and Pienaar (2012: 93) believe that it is possible to overcome the influence that political constituents have placed on infrastructure spending. The authors state that this can be achieved if the state co-operates with emerging entrepreneurial elements and 3PL service providers in the society to provide mutually beneficial strategies.

4.5 CONCLUDING REMARKS

This chapter presented an overview of the automotive manufacturing industry and 3PL service provider outsourcing, with the focus on developing countries. Additionally, the modular logistics process was highlighted before a detailed explanation of 3PL service provider outsourcing was provided. Finally, the logistics environment in South Africa was outlined in an effort to underscore both the challenges faced by organisations and some potential solutions to these obstacles.

It can be concluded that the automotive industry plays a key role in developing countries as it is a significant contributor to GDP and provides a source of employment, which is much needed in South Africa. However, automotive logistics is a highly complex field, demanding considerable capital resources. One of the most important roles of 3PL service providers in the automotive industry is the management of cargos of goods within the supply chain. As a result, the automotive industry is becoming more based on a system of modularity, through a system of modular production.

- Logistics outsourcing is receiving increased attention, since it is a sector in which productivity and efficiency improvements are possible in order to lower operating costs, while improving customer services. However, 3PL service providers face significant barriers in developing countries such as stringent legal regulations, poor infrastructure and equipment, as well as a lack of competent manpower for efficient operations. Therefore, business organisations operating in the developing world are forced to create new innovative methods to remain successful and competitive.

The next chapter outlines the research design and methodology used, followed by the empirical study and findings of the study in later chapters.

CHAPTER 5

RESEARCH DESIGN AND METHODOLOGY

5.1 INTRODUCTION

The preceding chapter provided a short overview of the automotive manufacturing industry, and how the practice of 3PL outsourcing functions in developing countries. The chapter also concluded the literature review for this study. The purpose of this fifth chapter is to outline the research design and methodology used for this study. The chapter starts off by defining the concept of research, and, following this, a description of qualitative research and the characteristics of qualitative research are provided. The next section defines quantitative research as this was the method primarily used for this study. In addition, this section highlights the various types of quantitative research methodologies together with the characteristics thereof.

Next, the research design, the definitions of research design, along with the sampling techniques, research instruments, data collection procedures, and the data analysis techniques that were used in this study, are outlined. Finally, considerations regarding the reliability and validity of the study, as well as the ethical considerations, are presented.

5.2 THE RESEARCH PHILOSOPHY

Research is generally defined as the methodical and logical way of searching for information on a particular subject. According to Leedy and Ormrod (2014:2), research can be defined as the systematic process of collecting, analysing and interpreting data in order to increase one's understanding of a phenomenon that one is interested in. Rajasekar, Philominathan and Chinnathambi (2006:2) argue that the most important objectives of research are:

- To discover new facts for a particular subject or topic.
- To authenticate and confirm new information.
- To analyse a method or occurrence in order to ascertain any 'cause and effect relationship'.

- To create new systematic methods and concepts to help solve problems of both a scientific and non-scientific nature.
- To find solutions to a variety of problems, regardless of the nature of the problem.
- To overcome the problems that may occur in peoples' daily lives.

There are two primary epistemological approaches to research, which are contained within the research philosophies of positivism and interpretivism (Saunders, Lewis & Thornhill 2009). The philosophy of positivism holds that there is one single reality, which can be precisely measured and documented using experimentation and objective research. According to Neuman (2016), positivism is a research paradigm (or framework) that combines a deductive approach, with a precise measurement of quantitative data, so that researchers are able to identify the causal laws to help predict human behaviour. Neo-positivism, also referred to as post-positivism, came about as a response to some of the criticisms against positivism. Neo-positivism argues that it is not possible to understand reality perfectly, that research findings are not necessarily true, and that it is acceptable to use qualitative research methods in conjunction with quantitative methods (Neuman 2016). Typically, however, the principles of positivism are closely aligned with the concepts of quantitative research, and quantitative techniques are generally applied when approaching a study from a positivist perspective.

Conversely, the interpretivist philosophy holds that reality is subjective, and open to multiple interpretations by different observers. Interpretivist researchers therefore, apply principles of qualitative research when attempting to understand a phenomenon. An explanation of both quantitative and qualitative research is presented below in more detail, for better understanding.

5.2.1 Qualitative Research

Struwig and Stead (2013:11-13) argue that qualitative research cannot be easily defined or described by the use of one particular research method, as there are a variety of qualitative methods available. There is a wide range of subjects that make use of qualitative research. Some of these include management sciences, sociology,

psychology and education. According to Tesch (1990), qualitative research can be regarded as any research in which qualitative data is used and includes words, pictures, drawings, photographs, films and music - therefore, any information that is not expressed in numbers. According to Bryman (2015), qualitative research is usually used in studies that require participant observation, interviews, archival analysis and/or focus groups. Some of the subjects that utilise these methods are ecology, ethnography, symbolic interactionism and post modernism. Struwig and Stead (2013:11) further articulate various characteristics of qualitative research, which are outlined next.

5.2.1.1 *The participants' and researchers' perspective*

Qualitative researchers strive to comprehend the topic being researched from the research participants' point of view. Qualitative researchers do not refer to their participants as 'subjects', as this would imply that their role in the research process is inferior, which is quite the opposite. Some researchers merely report the views of the participants, but this may depreciate into a research report that is anecdotal (Collis & Hussey 2013:154-155). Anecdotal reports are subjective in nature, and mainly reflect the participants' views with the researcher providing little commentary on, or in-depth analyses of these views. It is the researcher's responsibility to scrutinise and construe the research data in relation to the participants' original perspective (Collis & Hussey 2013:154-155).

5.2.1.2 *Contextualism*

Generally, people behave in a certain way for a reason. Therefore, it is essential to portray an inclusive description and breakdown of the situation, or the social circumstances of the research participants. Often, the behaviour of individuals is inextricably linked to their experiences, as well as their surroundings (Atwood & Stolorow 2014). Contextualism emphasises the various macro and micro contexts of an individual, in conjunction with how these contexts dynamically interact with one another. The historical context of the individual may also be crucial to the researcher. In addition, Bohman (1991:47) asserts that contextualism is closely aligned to holism, which examines social environments in their entirety.

5.2.1.3 Process research

Process research explores interconnected events over a period of time as they develop. Therefore, it is vital to recognise how one's past can affect the individual's thoughts or behaviours. Social events are not static; therefore, it is necessary to understand change and process. For example, it may be more prolific to understand how people try to make career decisions over time (developmental processes), opposed to finding out whether they are currently decided on a career or not (static processes) (Struwig & Stead 2013:11).

5.2.1.4 Flexibility and the use of theories

Qualitative researchers prefer to conduct research in a fairly relaxed, unstructured manner, and are often hesitant to rely exclusively on theory to provide the answers they require.

5.2.1.5 Discourse analysis and ethnography of communication

Discourse analysis examines the impact of certain discourses (ways of talking and behaving) on specific contexts. The focus may be on identifying the discourses being used, the effects of discourses in the text, or explaining the broader context in which the text functions (Gee 2010). Both discourse analysis and ethnography are closely linked to linguistics. These methods aim to establish patterns of communication that are both relevant and functional for people.

5.2.1.6 Ethnoscience and structural ethnography

Ethnoscience place great importance on *reduction* as an analysis principle, while structural ethnographers pay more attention to the meaning behind language, and see their work as the discovery of cultural themes as larger patterns within the world. Ethnoscience and structural ethnographers consider language as the most important mode for transmitting culture between successive generations (Tesch 1990).

5.2.1.7 Symbolic interaction and ethno-methodology

Symbolic interactionists believe that people are constantly reinterpreting and redefining meaning as they transcend from one situation to another. They look for the most important features happening in an event. By contrast, ethno-methodologists try

to produce confusion, anxiety, bewilderment and disorganised interaction in an attempt to discover what is otherwise hidden.

5.2.1.8 Observational studies

According to Leedy and Ormrod (2014:180), observational studies require extensive planning, attention to detail, good support from research assistants, and plenty of time. These studies are based on a particular aspect of behaviour, which is then recorded by the observer. The behavioural patterns are then measured in order to determine their intensity, accuracy, regularity and maturity.

In addition to the above-mentioned characteristics of qualitative research, Struwig and Stead (2013:13) further outline three conditions that concern the discovery of regularities in qualitative research (see tables 5.1 to 5.3 below):

Table 5.1: Research in which connections among identified and categorised elements are sought

Grounded theory	This method allows the researcher to construct theory by developing concepts from data. Therefore, the theory is grounded in the data from the study.
Ethnographic content analysis	This applies grounded theory to documents.
Event structure analysis	In this method, the researcher tries to find an underlying logical structure according to what events have happened.

Source: Struwig & Stead (2013:13)

Table 5.2: Research where the interest is in the comprehension of the meaning of the action

Phenomenology	The most important goal is to find a common theme, to illustrate the range of meanings of a phenomenon.
Hermeneutics, case studies and life histories	These all call for interpretation of one piece of data. Hermeneutics refers to the interpretation of meanings from texts.

Source: Struwig & Stead (2013:14)

Table 5.3: Research in which the identification of regularities is sought in the form of patterns

Phenomenography	Interviews are mostly used, and quotations are primary sorted on the basis of their similarity. This identifies and maps out the different ways in which people experience, conceptualise, perceive or understand aspects of the world.
Naturalist inquiry, holistic ethnography and educational ethnography	These all follow an inductive analysis that begins with empirical observations, and then results in the development of theoretical categories. Therefore, this type of research aims to discover constructs and propositions.
Action research	This is outcome-orientated research, in which the participants and the researcher are both involved in decisions regarding the research process. Such research is often conducted to empower disadvantaged communities, and relies on social justice as an important guiding principle.

Source: Struwig & Stead (2013:14)

The next section provides a discussion on quantitative research.

5.2.2 Quantitative research

According to Struwig and Stead (2013:4-6), quantitative research is perceived as conclusive research involving a substantial representative sample, with structured data collection procedures. Struwig and Stead (2013:4) and Bryman (2015) articulate the following characteristics of quantitative research:

5.2.2.1 Constructs and their measurement

Quantitative research examines constructs, which are the key research features upon which a hypothesis may be based. An example of a construct might be people, events or ideas. Therefore, constructs are the key elements in quantitative research. Quantitative research usually measures the constructs studied by means of a questionnaire and/or some other form of structured observation (Bryman 2015).

5.2.2.2 Causality

Quantitative researchers aim to determine the causal relationships (cause and effect relationships) between constructs and variables, by using independent and dependent variables. This affiliation tries to illustrate the current status of a specific situation and

its causes. A causal relationship between constructs provides insight as to why things are the way they are, by identifying their causes. Causality is vital to quantitative researchers as they tend to take a natural scientific approach to research; and as such, the quantitative approach is usually positivist or neo-positivist.

5.2.2.3 Generalisation

A quantitative researcher should be able to generalise their results beyond the limits of their research sample. It is therefore imperative that results can be legitimately generalised to a wider population.

5.2.2.4 Replication

Unlike qualitative research, which is often criticised for being difficult to replicate, the findings of a quantitative research study should be easily replicable. A study must be replicable in order to make certain that the findings can be applied in other contexts. It is therefore essential to limit any potential biases of the researcher, and to make sure that the content of the study is clearly described in order to ensure accurate results.

5.2.2.5 Individuals as the focus

The most important contribution of an experimental study in quantitative research is the responses from the participants who make up the research sample. The respondents' individual responses are combined to form an aggregate, which is then used collectively to form a measurement of the sample.

5.2.3 Choice of research for this study

This research was performed mainly within the positivist research paradigm of causality, since it was held by the researcher that there should be a clear causal relationship evident between the expectations that automotive manufacturing firms have of third party logistics (3PL) service providers in the Eastern Cape Province, and why automotive manufacturing firms in the Eastern Cape Province find it important to trade with 3PL service providers; as well as what the current levels of performance offered by 3PL service providers to automotive manufacturing firms are in the province. It was therefore concluded that a quantitative methodology would be the best

mode of determining these causal relationships, as well as what the major problems currently associated with 3PL service providers are; the consequences of unacceptable performance levels provided by 3PL service providers; and the action plans that automotive manufacturing firms may use to bring 3PL service providers in line with their expectations.

The research design that was formulated within the quantitative research paradigm of this study, is outlined in the next section.

5.3 RESEARCH DESIGN

A research design is the plan that is devised in order to conduct a research project, implement the research methodology, and examine any ensuing data (Bryman & Bell 2007:74). Cheek (2008), for instance, defines the research design of a project as the systematic techniques that are devised to convert a research concept into a research plan that can be executed. This includes the sampling techniques that are to be used, the research instruments, data collection, and data analysis. Fraser, Johnson, Leenders and Flynn (2015:358-360) confer that research linked to supply chain management, which is the case in this particular study, can be defined as “the systematic collection, classification and analysis of data as the basis for better supply decisions”.

5.3.1 Sampling

A research population is a large group of people, animals or objects that form the main focus of a scientific query, and research is usually for the benefit of the entire population (Rajasekar et al. 2006:12). A population under research should typically have similar characteristics, or a common binding characteristic that makes all the participants equal. The research population for this study included the combined population of automotive manufacturing firms in the Eastern Cape Province of South Africa, and the binding characteristic of this population as automotive manufacturing firms was their potential need for efficient and effective 3PL suppliers.

According to Collis and Hussey (2013:230), due to the enormity of population sizes, the researcher is usually unable to test every individual due to such efforts being too time-consuming and costly. Consequently, the researcher must make use of a sample

of that research population instead, which needs to be representative of the population from which it was drawn (Bless, Higson-Smith & Kagee 2006:162). Flick (2015:166) also argues that the core purpose of a research sample is to enable the researcher to conduct a study to test individuals from the research population, so that the results can allow the researcher to deduce a conclusion that is relevant to the whole population.

There are two major sampling methods available to researchers, namely non-probability sampling and probability sampling. In the case of non-probability sampling, the likelihood of any particular member of the research population being selected is unknown; and the sample is arbitrary, as the researcher relies on personal judgment and convenience (Lancaster 2005:149; Leedy & Ormrod 2014:199; Zikmund 2003:397). Such methods of non-probability sampling are appropriate for qualitative research, and Struwig and Stead (2013:120-121) state that there are various non-probability sampling techniques available, such as convenience, judgement, quota, and snowball sampling. Since qualitative research was not the focus of this study, these sampling techniques are not discussed in further detail here.

Collis and Hussey (2013:144) concur that, in the case of quantitative studies, an appropriate sample should be large enough to satisfy the needs of the research study; chosen at random; and unbiased. Therefore, it is essential for the size of the sample to be appropriate to permit statistical analysis. Probability sampling techniques are therefore more appropriate for quantitative studies. In the case of probability sampling, the likelihood of any particular member of the population being selected is known (non-zero). In other words, every member of the population stands an equal chance of being selected as part of the sample. Struwig and Stead (2013:120-121) state that there are various probability sampling techniques available, as outlined in Table 5.4 below.

Table 5.4: Comparison of probability sampling techniques

Description	Cost and extent of use	Advantages	Disadvantages
<p>Simple random: Participants are selected via random selection from the overall research population.</p>	<p>The cost is high. It is not often used (except for random digit-dialling)</p>	<p>Minimal prior knowledge of the population is needed. It is easy to analyse data and record errors.</p>	<p>It requires a sample frame from which to work. It disregards any prior knowledge of the population that the researcher may already have. There tend to be larger errors for between-group, same-sample size than stratified sampling. The respondents may not be in close proximity to one another.</p>
<p>Systematic: The researcher selects units at pre-selected intervals.</p>	<p>The costs are moderate. It is used moderately.</p>	<p>It is easy to gather and check the sample.</p>	<p>There may be an increased variability if sampling follows a periodic ordering of the population.</p>
<p>Stratified: Sub-samples are randomly selected from each group of the population.</p>	<p>The costs are high. It is used moderately.</p>	<p>Representation of all groups in the sample is assured. Sample size variability is reduced.</p>	<p>Accurate information on each stratum is required. Costs may rise if no prior stratified lists are available.</p>
<p>Cluster: A random group or cluster of individuals is chosen.</p>	<p>Costs are low. It is used frequently.</p>	<p>The researcher can estimate the characteristics of the cluster, as well as the population as a whole.</p>	<p>There is a larger error of comparable characteristics between group sizes. The researcher must allocate population members to a unique cluster to prevent duplication or omission of results.</p>

Description	Cost and extent of use	Advantages	Disadvantages
Multi-stage: Smaller groups are selected progressively, linking the first four sampling techniques.	Costs are high. It is used often, such as in nationwide surveys.	Advantages depend on the combined techniques.	Disadvantages depend on the combined techniques.

Source: Adapted from Struwig & Stead (2013:120-121)

For the purpose of this study, a simple random sampling technique of probability sampling was used to gather a random sample of participants from the research population of automotive manufacturing firms in the Eastern Cape Province. According to Davies (2007:58), the technique of simple random sampling lies at the heart of all scientific research, and fulfils the requirements of an appropriate sample. In addition, Flick (2015:105) states that simple random sampling is a very basic form of sampling and should involve selecting a sample using a completely random selection. Lancaster (2005:149) and Davies (2007:57) further highlight that simple random sampling is ideal when the population under investigation is relatively small, and all the members are known, as was the case in this study.

5.3.2 Research instruments

There are four primary research instruments applied in research when gathering information from human participants: surveys, face-to-face interviews, telephonic interviews, and structured questionnaires (Jackson 2008:96-97). Each of these is delineated, next.

5.3.2.1 Survey research

To effectively implement survey research, a sample from a large research population needs to be studied. Thereafter, the results may be generalised and applied to a larger population. The types of questions asked are usually determined by the sample group's individuality, attitudes and past experiences. Their responses are then summarised in terms of percentages, frequency counts or alternate statistical indices

that allow the researcher to make a particular assumption on the population (Jackson 2008:96-97).

5.3.2.2 *Face-to-face interviews*

Face-to-face interviews require the researcher to make personal contact with the study sample. According to Jackson (2008:96-97), personal contact between the researcher and the respondent(s) has the advantage of giving a researcher insight into the respondents' true opinions and beliefs, as both verbal and body language can be recorded. The author further argues that it has a reasonably high response rate due to participants being able to dedicate more time to answering questions, opposed to answering them via telephonic surveys. However, this method lacks participant confidentiality, is costly, and is time consuming (Bryman, 2015).

5.3.2.3 *Telephone interviews*

Leedy and Ormrod (2014:185) perceive telephonic interviews to be less time consuming and cheaper than face-to-face interviews, as it enables a researcher to have access to anyone that has a phone. The response rate is generally higher than that of mailed questionnaires due to the fact that it requires immediate attention. On the other hand, this kind of survey method could be viewed as biased, as people without telephones are automatically disqualified; while participants could feel compelled to answer in a particular way (Collis & Hussey 2013:213). According to Struwig and Stead (2013:91), a distinct advantage of telephonic and face-to-face methods is that the researcher has the opportunity to follow up on information to gain clarity, should there be a lapse in understanding.

5.3.2.4 *Structured questionnaires*

Structured questionnaires are popular methods used by researchers to collect data from human participants. The most common method of distribution is email. Researchers utilise this method when they know that their respondents have fixed email addresses and facilities, due to it being much faster and more cost-effective to conduct (Struwig & Stead 2013:92). Bless et al. (2006) argue that it is vital that self-administered questionnaires are clear and free of any ambiguity that may cause confusion and possible misinterpretation of a question. The disadvantage of this

method is that the researcher is not on hand to clarify a matter should there be any lapses in understanding of any part of the questionnaire.

According to Leedy and Ormrod (2014:186), this method creates less sampling and interviewer bias, due to the fact that most people have mailing addresses. Researchers have found the data gathered from these research instruments to be more comprehensive, as participants do not feel pressurised by the researcher, and are able to answer at their leisure. Further advantages relate to confidentiality, and issues with releasing sensitive information. Respondents may feel more comfortable divulging personal information on a written survey, as it places some distance between the researcher and the participant - as opposed to face-to-face interviews (Bless et al. 2006).

The main objective for using quantitative research in this study was to ascertain the service-level expectations that automotive manufacturing firms have of 3PL service providers. Due to the fact that most of the targeted participants of this study had mailing addresses, and in light of the advantages discussed above, it was decided that a structured questionnaire should be used to gather the necessary information to achieve this objective. Face-to-face interviews were considered inappropriate due to the fact that face-to-face interview methods lack participant confidentiality, are costly, and are time consuming. The researcher also decided not to use telephonic surveys as they are both expensive and time consuming.

5.3.2.5 Questionnaire design

The proper design of a questionnaire is crucial to its success in yielding the desired results. Jackson (2008:91) confirms that the careful planning of a questionnaire is a prerequisite to ensuring that the data is both reliable and valid. The method chosen to administer the questionnaire determines the manner in which the questions should be asked. The following guidelines for the designing, wording and phrasing of questions, as proposed by Struwig and Stead (2013:89-91), Bless et al. (2006), as well as Collis and Hussey (2013:212-216), were taken into account by the researcher when preparing the questionnaire for this study:

- The questionnaire should be divided into logical segments.

- Questions must be concise in order to avoid confusion.
- Only questions requiring definite answers should be posed.
- Questions should constitute open-ended, multiple-choice, dichotomous, scaled-response, and/or ranking types of question structures.

The questions posed in the questionnaire of this study were structured in such a manner that each group of questions focused on assembling data on specific topics. For the purpose of this study, the researcher decided to use both Likert-scale and open-ended questions as the structure for the questionnaire questions. The dominant style of questioning, however, was based on a scaled-response type of question, as recommended by Collis and Hussey (2013:212-216), whereby respondents were asked to rate their level of agreement on the given question on a five-point scale between strongly disagree and strongly agree. The researcher included a neutral option as well to eliminate potential biases. Some open-ended questions were also included to allow for greater clarity on certain responses. Once the questionnaire was completed, it was then pre-tested.

5.3.2.6 Questionnaire pre-testing

It is vital for a questionnaire to be pre-tested before sending it to the whole sample (Sekaran 2003:248). Pre-testing assists in eliminating any ambiguity in the questions, and ensures that there are no problems with how the questions are phrased, which could possibly lead to misunderstandings. A questionnaire should also be pre-tested to establish its appropriateness for the sample participants (Sekaran 2003:248). Struwig and Stead (2013:89) agree that pre-testing should highlight any problems that may occur in the understanding of the questions.

For the purpose of this study the completed questionnaire was pre-tested on 15 fourth-year part-time students who were studying towards a Bachelor's of Technology (B Tech) degree in the field of Logistics and Supply Chain Management at the Nelson Mandela University (NMU). All 15 students were employed on a full-time basis in the automotive industry in the Eastern Cape. Once the researcher received feedback from the pre-testing phase, the following minor changes were made to the initial questionnaire:

- Some of the questions were rephrased to make the understanding of the questions easier.
- Questions were grouped into three main categories namely: transportation warehousing; value-added services; and 3PL consequences. Value-added services include order processing, labelling, bulk-breaking, barcoding, information systems, and pricing.
- The length of the overall questionnaire was reduced from 83 questions, to 63.

The final questionnaire used for the data collection phase of the study is presented in Appendix A.

5.3.3 Data collection

To start the data collection process off, contact in the form of telephone calls were made to Purchasing, Logistics, Warehousing and Supply Chain managers at automotive manufacturing firms in the Eastern Cape Province, who were responsible for dealing with 3PL service providers. The goal of the telephonic calls was firstly to introduce and explain the purpose and benefit of the research project; secondly, to request participation before sending out the questionnaire; and thirdly, to obtain the correct email addresses of the respondents. The final questionnaire, together with a cover letter (see Appendix A) that outlined the objectives and purpose of this study, was then emailed to the respective respondents.

In addition to the emailed questionnaires that were sent out, the researcher also hand-delivered some questionnaires to personal contacts in the automotive manufacturing industry of the Eastern Cape. These questionnaires were then collected by the researcher at a later stage that suited the respondents, and the data was recorded on Microsoft Excel for the purposes of data analysis.

5.3.4 Data analysis

In order to analyse the data gathered from the sample of respondents, two popular quantitative data analysis techniques were employed: descriptive statistical analysis, and inferential statistical analysis. As explained by Adams, Khan, Raeside and White (2007), descriptive statistics provides a means of observing the features of the data,

and the frequencies in which the data are presented, both numerically through the use of percentage tables, and visually through the use of frequency graphs. Conversely, inferential statistics offers a means of observing whether any cause-and-effect type relationships exist between the variables, so that it can be conferred whether any associations exist between the variables with any statistical significance (Agresti 2007).

5.3.4.1 Descriptive statistics

In observing the descriptive statistics of the data, the researcher sought to determine aspects such as the mean, median and modal values, as a measure of the overall tendency of the respondents to answer positively or negatively on any particular subject; as well as the skewness, kurtosis and standard deviations of the data, as measures of the grouping of the respondents' attitudes towards more-positive or more-negative answers on any particular subject.

5.3.4.2 Inferential statistics

When performing the inferential statistical analysis of the data, a bivariate correlation analysis was performed to observe whether the answers of any two ranked or numerical variables were linearly related to each other. As explained by Adams et al. (2007), Pearson's Product Moment Correlation Coefficient (r) is presented as a value between -1 and +1 in order to observe how closely two variables are linearly associated; whereby, a value of -1 indicates a strong negative correlation, and a value of +1 suggests a strong positive correlation. The significance value (p) is presented as an indication of whether the correlation is statistically significant at below an alpha (α) of 0.05; which would suggest that the responses were so consistently observed across all the respondents that the chances of concluding that an association existed when in fact there was none (a type I error), was less than 5% (Lieberman & Cunningham 2009; Corder & Foreman 2014).

Performing the correlation analysis allowed the researcher to determine, with statistical reliability, whether correlations existed between the different variables, such as allowing observations on whether aspects of transportation, warehousing, value-added services or their consequences were found to be causing issues among the respondents.

While statistical reliability is observed through the significance value (p), further testing is usually performed to determine reliability within the data, as well as to determine whether the data is normally distributed (Field 2013; McCrum-Gardner 2008). For the purpose of this study, Cronbach's alpha was performed in order to measure the internal consistency between the respondents' answers. This test is frequently performed as a first-line measure of the reliability of the data (Ritter 2010; Tavakol & Dennick 2011; Heale & Twycross 2015). A Cronbach's alpha statistic of above 0.7 is typically thought, among many social science observers, to infer reliable internal consistency (Tavakol & Dennick 2011; Ritter 2010). Measuring whether to use non-parametric tests or parametric tests is also performed using the Shapiro-Wilks' test for normality.

The results of these analyses are presented in Chapter 6. Other considerations that were made to maximise the reliability of the results, are outlined in the next section.

5.4 RELIABILITY AND VALIDITY

5.4.1 Reliability

According to Thyer (2010:335), reliability is the extent to which an experiment, test, or any measuring procedure yields the same result on repeated trials. Without the agreement of independent observers able to replicate research procedures, or the ability to use research tools and procedures that yield consistent measurements, researchers would be unable to satisfactorily draw conclusions, formulate theories, or make claims about the generalisability of their research (Howell, Miller, Park, Sattler, Schack, Sperry, Widhalm & Palmquist 2012). According to Howell et al. (2012), the four key types of reliability are as follows:

- **Equivalency reliability:** is the extent to which two items measure identical concepts at an identical level of difficulty. Equivalency reliability is determined by relating two sets of test scores to one another to highlight the degree of relationship or association. In quantitative studies, and particularly in experimental studies, a correlation coefficient, statistically referred to as ' r ', is used to show the strength of the correlation between a dependent variable (the

subject under study), and one or more independent variables, which are manipulated to determine the effects on the dependent variable.

- **Stability reliability (sometimes called test, re-test reliability):** is the agreement of measuring instruments over time. To determine stability, a measure or test is repeated on the same subjects at a future date. Results are compared and correlated with the initial test to give a measure of stability.
- **Internal consistency:** is the extent to which tests or procedures assess the same characteristic, skill or quality. It is a measure of the precision between the observers or measuring instruments used in the study. This type of reliability often helps researchers to interpret data, and predict the value of the scores or the limits of the relationships among the variables.
- **Interrater reliability:** is the extent to which two or more individuals (coders or raters) agree. Interrater reliability addresses the consistency of the implementation of a rating system.

This study used equivalency reliability and internal consistency in the configuration of built-in checks, which were written into the questionnaire to ensure maximum reliability, and calculated through tests for Cronbach's alpha, and correlation analysis, as outlined earlier in the chapter. Interrater reliability was also ensured by introducing external statistical data analysts to analyse the data, thereby minimising the chances of researcher bias.

5.4.2 Validity

Validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. While reliability is concerned with the accuracy of the actual measuring instruments or procedures, validity is concerned with the study's success at measuring what the researcher sets out to measure (Howell et al. 2012).

According to Howell et al. (2012), the four key types of validity are as follows:

- **Face validity:** is concerned with how a measure or procedure appears. The following questions apply: Does it seem like a reasonable way to gain the

information the researchers are attempting to obtain? Does it seem well designed? Does it seem as though it will work reliably?

- Criterion related validity (also referred to as instrumental validity): is used to demonstrate the accuracy of a measure or procedure, by comparing it with another measure or procedure that has been demonstrated to be valid.
- Construct validity: seeks agreement between a theoretical concept and a specific measuring device or procedure. Construct validity can be broken down into two sub-categories: Convergent validity and discriminate validity. Convergent validity is the actual general agreement among ratings that are gathered independently of one another, where measures should be theoretically related. Discriminate validity is the lack of a relationship among measures that theoretically should not be related.
- Content validity: is based on the extent to which a measurement reflects the specific intended domain of content. Unlike face validity, content validity depends on established theories for support.

This study maximised face validity through the use of Likert-scale and open-ended questions in the questionnaire, as these were seen as reasonable ways to gain information from the respondents. The questionnaire was also designed in such a manner that it extracted the exact information that the researcher required. Content validity was also tested by performing a pilot survey.

5.5 ETHICAL CONSIDERATIONS

All research should be performed within ethical parameters that ensure that the research incurs minimal negative impact on the environment, the participants, or the organisations that may be involved (Bellamy 2011). This research was performed with strict adherence to the ethical requirements of research, by ensuring that the respondents participated with full information on the purpose and use of their information for this study; anonymity of both themselves and their employing organisations in participating in this research; and their right to withdraw or otherwise refrain from participating in this study if they so decided. Steps were also taken to minimise the potential negative effect(s) on the environment, such as by emailing the

questionnaires wherever possible rather than printing them; and by phoning or communicating, via email, wherever possible instead of using road or air transport.

5.6 CONCLUDING REMARKS

This chapter provided the research design and methodology of the study. This research was performed mainly within the positivist research paradigm of causality, since it was held by the researcher that there should be a clear causal relationship between the variables that may be observed to answer the research questions of this study. A simple random probability sample of participants from the research population of automotive manufacturing firms in the Eastern Cape Province was gathered, and the questions posed in the questionnaire of this study were structured using both Likert-scale and open-ended questions. Following pre-testing on 15 fourth-year B Tech students, the questionnaire was distributed via email and in hard-copy, along with a cover letter outlining the objectives and purpose of this study.

In order to analyse the data, two popular quantitative data analysis techniques of descriptive statistical analysis and inferential statistical analysis were employed, with particular techniques of Correlation Analysis, Cronbach's alpha, and tests for normality being performed. The next chapter provides a report on the empirical results that were collected during this investigation.

CHAPTER 6

EMPIRICAL FINDINGS OF THE STUDY

6.1 INTRODUCTION

The previous chapter explained the research design and methodology that was used to complete this study. This chapter outlines the empirical findings of the study by analysing the questionnaire that was distributed to the respondents to gather information to answer the study's objectives. In this chapter, firstly, a discussion of the descriptive statistics is provided, which includes a description of the sample, followed by a presentation of the findings from the different sections of the questionnaire.

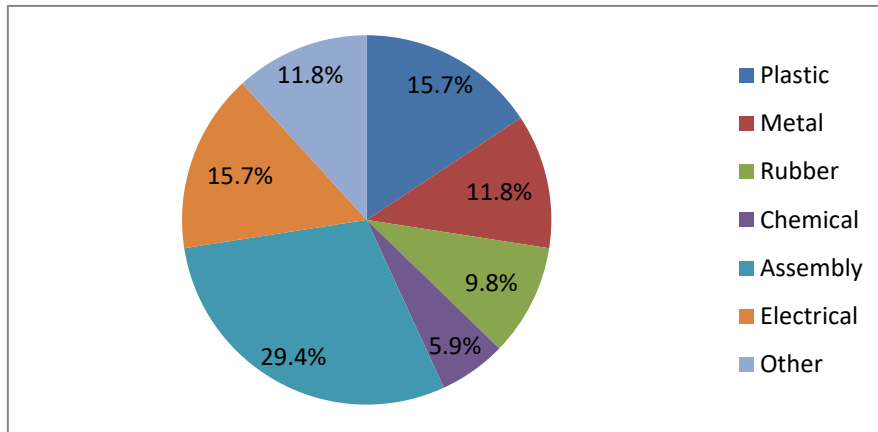
Thereafter, the chapter also presents the results from the inferential statistical analysis that was performed, particularly outlining the findings that were determined from the correlation analysis. Finally, the Cronbach alpha results are provided at the end of the chapter, forming the basis upon which the reliability of the results can be based.

6.2 DESCRIPTIVE STATISTICS

Descriptive statistics aim to describe, summarise and organise data; and such statistics also have the ability to make a data set more understandable to readers and researchers (Aron, Aron & Coups 2008:3; Salkind 2010:8). According to Hardy and Bryman (2009:7), descriptive statistics provides information that reveals three characteristics about a data set — namely, its central tendencies (the most likely observations); its dispersion (the degree to which the observations vary); and its shape (the concentrations of the data relative to the most likely observations).

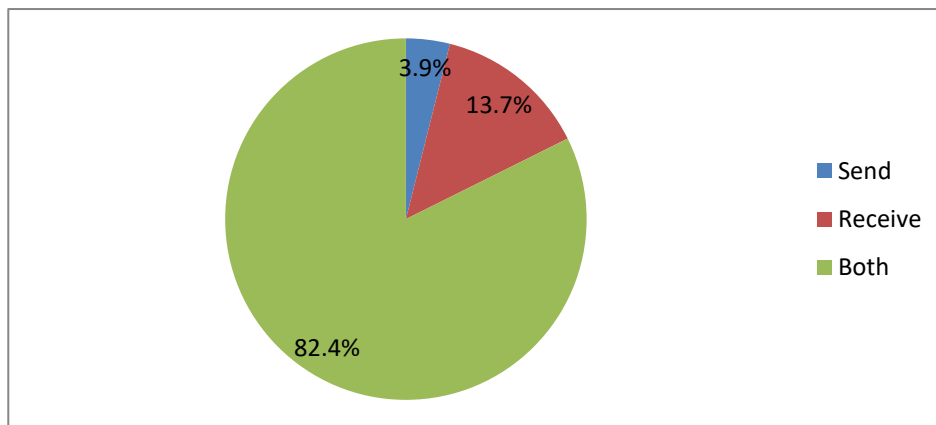
As shown in Figure 6.1 below, a total of 51 respondents from the automotive sector participated in this study, wherein it was determined that the largest group of respondents was employed in the assembly sector (29.4%, $n = 15$), followed by plastics (15.7%, $n = 8$), electrical (15.7%, $n = 8$), metal (11.8%, $n = 6$), other sectors (11.8%, $n = 6$), rubber (9.8%, $n = 5$), and the chemical sectors (5.9%, $n = 3$).

Figure 6.1: The automotive sector in which the respondents worked (Q2)



When asked whether the respondents' departments made use of 3PL service providers to send or receive components and parts, or both (Q1), it was observed that the vast majority of the respondents (82.4%, n = 42) made use of 3PL service providers for both sending and receiving components and parts; while 13.7% (n = 7) used 3PL service providers for receiving only, and just two respondents (3.9%) used 3PL service providers only for sending goods (see Figure 6.2 below).

Figure 6.2: Whether the respondents' departments made use of 3PL service providers to send or receive components and parts, or both (Q1).



The following findings are presented in terms of the sub-objectives of the study:

Sub-objective 1: To source the reasons why automotive manufacturing firms in the Eastern Cape Province find it important to trade with 3PL service providers.

Question 3 of the questionnaire was an open-ended question and required the respondents to indicate reasons for making use of 3PL service providers. The main reasons as indicated by the respondents in order of importance are as follows:

- Outsourcing logistics-related functions to 3PL service providers allows manufacturing firms to realise a greater cost saving than performing the functions in-house.
- By engaging with 3PL service providers, it allows manufacturing organisations to focus more on their core function, which is the manufacturing of products.
- Many manufacturing firms do not own the logistical infrastructure and resources to perform transportation, warehousing and value-added services internally. Therefore, they find it easier, and more cost efficient, to allow 3PL service providers to perform these services for them.
- The respondents indicated that many 3PL service providers offer a one-stop logistics solution to their organisation, which is an advantage in the current highly competitive business environment.

It was apparent that almost all of the respondents (96.1%, n = 49) outsourced transportation services to 3PL service providers, while only around two thirds (64.7%, n = 33) outsourced warehousing and inventory management; and around half (45.1%, n = 23) outsourced value-added services (VAS), such as order processing, labelling, bulk-breaking, barcoding, information systems, and pricing (Question 4, see *Table 6.1* below).

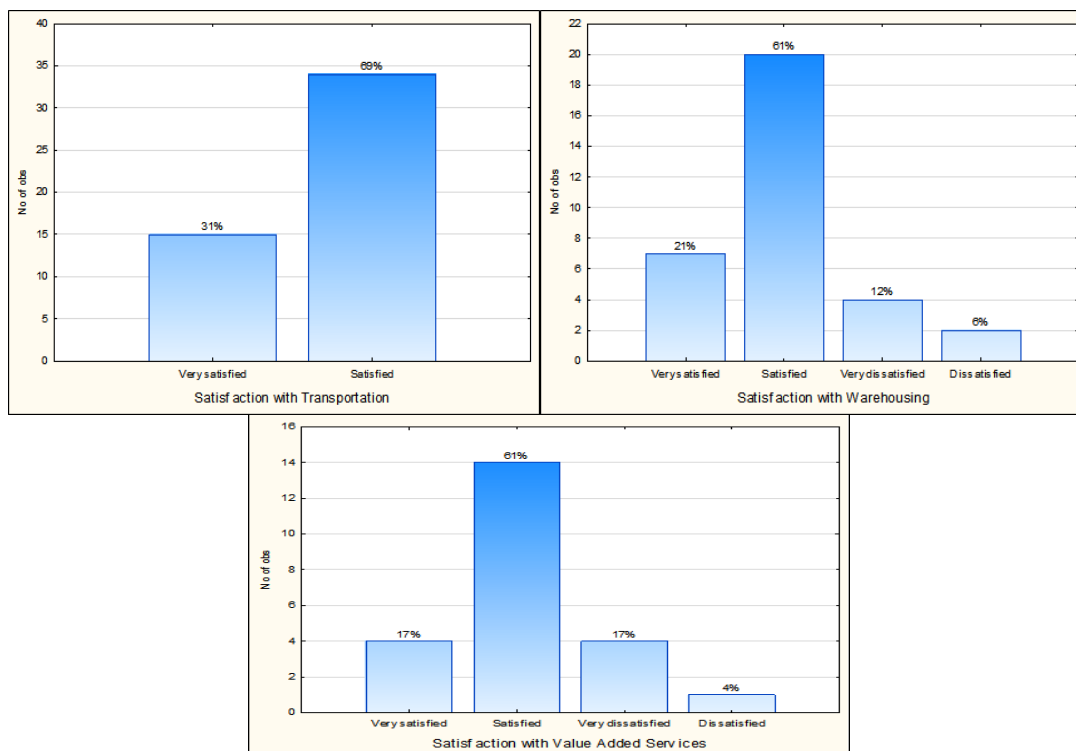
Table 6.1: 3PL services outsourced by the department/section (Q4)

Services outsourced by the department	Number of responses	Percent of cases
Transportation services	49	96.1%
Warehousing and inventory management	33	64.7%
Value-added services such as order processing, labelling, bulk-breaking, barcoding, information systems, and pricing	23	45.1%

Question 6 (Q6) of the questionnaire asked the respondents to rate their level of satisfaction with transportation 3PL service providers (Q6.1), warehouse 3PL service providers (Q6.2), and value added 3PL service providers (Q6.3). As shown in figure 6.3 below, the 49 respondents who said they outsourced transportation services to 3PL service providers earlier in the questionnaire, all noted that they were either satisfied (69.4%, n = 34), or very satisfied (30.6%, n = 15) with their 3PL service providers; while the 33 respondents (64.7%) who stated that they outsourced warehousing and inventory services to 3PL service providers, showed a wider distribution of their level of satisfaction. In this regard, seven respondents (21.2%) were very satisfied, 20 respondents (60.6%) were satisfied, two respondents were dissatisfied (6.1%), and four respondents (12.1%) were very dissatisfied with their warehousing 3PL service providers.

Similarly, in the case of the 23 respondents who outsourced value-added services (VAS) to 3PL service providers, only four respondents (17.4%) were very satisfied, fourteen respondents (60.9%) were satisfied, one respondent (4.3%) was dissatisfied, and as many as four respondents (17.4%) were very dissatisfied. This indicates that while transportation services were generally being performed well by the respondents' transportation 3PL service providers, in the case of warehousing and VAS, respondents were generally only moderately satisfied with their 3PL service providers, suggesting that improvements in these areas would be required.

Figure 6.3: Satisfaction with transportation 3PL service providers (Q6.1) (left), warehouse 3PL service providers (Q6.2) (right), and VAS 3PL service providers (Q6.3) (bottom)



Sub-objective 2: To determine whether or not 3PL service providers are meeting the expectations of automotive manufacturing firms in the Province

The goal of this sub-objective was to determine whether 3PL service providers are meeting the expectations of automotive manufacturing firms. To determine this, the respondents were given a wide range of expectations of which they had to indicate whether they agree, strongly agree, are neutral, disagree or strongly disagree with their 3PL service providers' ability to meet their expectations.

The structure of the questionnaire was such that similar questions were posed to the respondents in each of the sections of the questionnaire; however, respondents were asked to rate their answers in each section in relation to either transportation, warehousing or VAS (see the Questionnaire structure in Appendix A). This, therefore, allowed the researcher to understand which areas were important or unimportant under each of the topics of transportation, warehousing and VAS.

6.2.1 Questions targeting transportation expectations (Q8-Q24)

Questions Q8 to Q24 of the questionnaire were dedicated to topics relating to transportation, and asked questions such as how strongly the respondents agreed, disagreed, or were neutral towards the ability of their 3PL service providers to provide different transportation-related services. The descriptive statistical analysis of the data presented the central tendencies of the data, such as whether the respondents generally agreed, disagreed, or were neutral towards certain expectations; whereby, mean values that were close to 1.0 indicated more 'agreement', while mean values closer to 5.0 indicated more 'disagreement'. Furthermore, since the scale was from 1.0 = strongly agree to 5.0 = strongly disagree, and the middle of the scale was 3.0, it allowed the researcher to discern which expectations were generally more important to the respondents (average values less than 3.0), and which expectations were generally less important to the respondents (average values greater than 3.0). Thus, average values closer to 1.0 indicated that the respondents were generally in agreement that such matters were more important for the 3PL service providers to perform well, and values closer to 5.0 were less important.

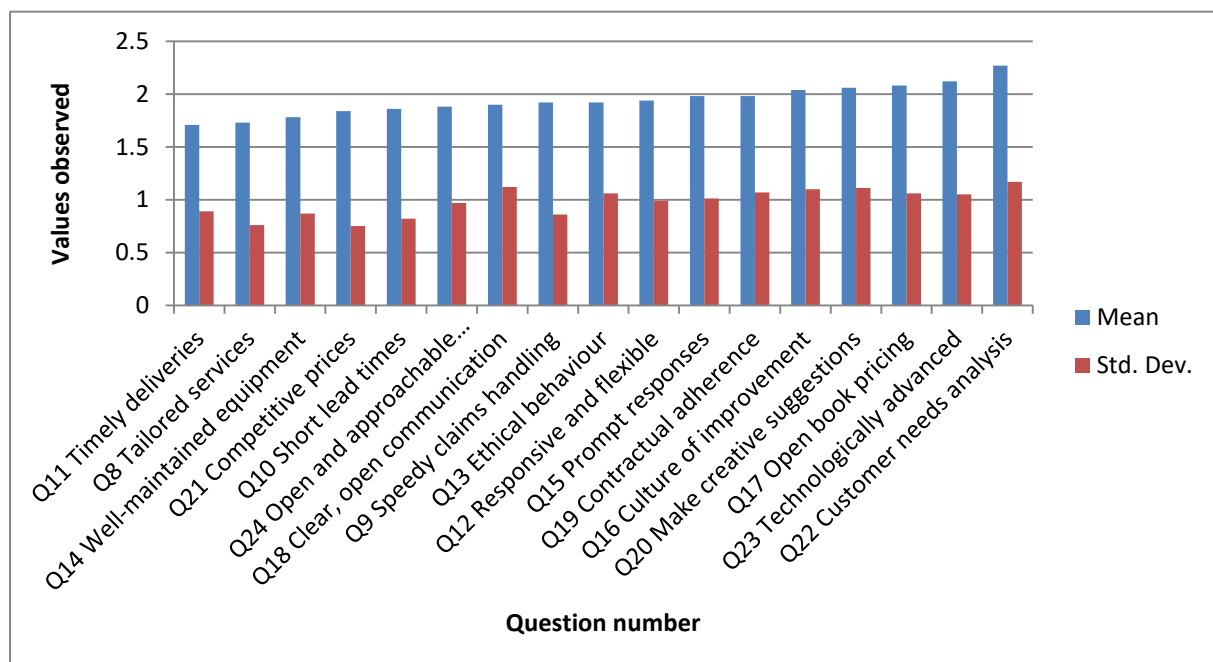
As shown in Table 6.2 below, the respondents all generally agreed or strongly agreed that each of the expectations listed were important to successful transportation outsourcing. This is because all of the mean values were between 1.71 and 2.27 — above the 3.0 mid-scale cut-off, and in the range of 'generally more important'. The topics where respondents were in closest agreement of high importance were the need for 3PL service providers to provide logistics services tailored to customer needs (Q8; mean = 1.73; SD = 0.76), the ability for 3PL service providers to ensure that shipments and deliveries arrived on time (Q11; mean = 0.71; SD = 0.89), and for the 3PL service providers to have well-maintained transport and material handling equipment (Q14; mean = 1.78; SD = 0.87).

Table 6.2: Central tendencies on questions targeting the expectations that should be met by transportation 3PL service providers (Q8-Q24)

	Valid N	Mean	Med	Std. Dev.
Q8: Provide logistics services tailored to customer needs	49	1.73	2	0.76
Q9: Speedy handling of claims and returns	49	1.92	2	0.86
Q10: Short lead-times	49	1.86	2	0.82
Q11: Ability to ensure shipments and deliveries arrive on time	49	1.71	1	0.89
Q12: Responsive and flexible to unforeseen circumstances	49	1.94	2	0.99
Q13: Display of ethical behaviour	49	1.92	2	1.06
Q14: Well-maintained transport and material handling equipment	49	1.78	2	0.87
Q15: Prompt response to customer demand	49	1.98	2	1.01
Q16: Culture of continuous improvement	49	2.04	2	1.10
Q17: Open book pricing policy for services offered	49	2.08	2	1.06
Q18: Clear, open communication	49	1.90	2	1.12
Q19: Strict adherence to contractual commitments	49	1.98	2	1.07
Q20: Putting forward creative suggestions to assist customers	49	2.06	2	1.11
Q21: Competitive prices in relation to other 3PL service providers	49	1.84	2	0.75
Q22: Use of customer needs analysis	49	2.27	2	1.17
Q23: Staying abreast with technological advances	49	2.12	2	1.05
Q24: Open and approachable 3PL staff	49	1.88	2	0.97

Figure 6.4 below presents a visual representation of the mean and standard deviations of the expectations that should be met by 3PL service providers performing transportation services (Q8-Q24), and their relative importance to the respondents, ordered from lowest mean (left) to highest mean (right). This provides a means of demonstrating graphically, which issues were closest to 1.0, indicating more ‘agreement’ among the respondents of their importance. Similarly, it also provides a means of demonstrating which issues had the lowest standard deviations, indicating less variability in the answers, and overall greater consensus among the respondents on those issues.

Figure 6.4: Means and standard deviations of expectations relating to transportation 3PL service providers (Q8-Q24)



Individual results of the actual respondent answers from Question 11 (Q11) are shown in Table 6.3 below; whereby for instance, 26 respondents (53.1%) strongly agreed and 13 respondents (26.5%) agreed that 3PL service providers should have the ability to ensure that shipments and deliveries arrive on time (Q11), while only eight respondents (16.3%) were neutral, and two respondents (4.1%) did not agree, respectively, generating a mean of 1.71, and standard deviation of 0.89. Indeed, Q11 had not only the lowest mean, but also the lowest median value (see Table 6.2 above); and in combination with a relatively small standard deviation, it indicates that the

respondents were closely in agreement that transportation 3PL service providers should have the ability to ensure that shipments and deliveries arrive on time.

Conversely, in the case of Q8, 42.9% of the respondents (21 respondents each) agreed and strongly agreed, respectively, that 3PL service providers should offer logistics services tailored to customer needs, while 12.2% and 2.0% (six respondents and one respondent, respectively) were either neutral or disagreeing with this requirement (see Table 6.4). In Q14, 21 respondents (42.9%) also strongly agreed, and 22 respondents (44.9%) agreed that 3PL service providers should have well-maintained transport and material handling equipment; while 2 respondents (4.1%) and 4 respondents (8.2%) were neutral or did not agree (see Table 6.5).

Table 6.3: Respondents' answers to whether 3PL service providers should have the ability to ensure that shipments and deliveries arrive on time (Q11)

		Frequency	Percent	Valid Percent
Valid	Strongly agree	26	51.0	53.1
	Agree	13	25.5	26.5
	Neutral	8	15.7	16.3
	Disagree	2	3.9	4.1
	Total	49	96.1	100.0
Missing	System	2	3.9	
Total		51	100.0	

Table 6.4: Respondents' answers to whether 3PL service providers should provide logistics services tailored to customer needs (Q8)

		Frequency	Percent	Valid Percent
Valid	Strongly agree	21	41.2	42.9
	Agree	21	41.2	42.9
	Neutral	6	11.8	12.2
	Disagree	1	2.0	2.0
	Total	49	96.1	100.0
Missing	System	2	3.9	
Total		51	100.0	

Table 6.5: Respondents' answers to whether 3PL service providers should have well-maintained transport and material handling equipment (Q14)

		Frequency	Percent	Valid Percent
Valid	Strongly agree	21	41.2	42.9
	Agree	22	43.1	44.9
	Neutral	2	3.9	4.1
	Disagree	4	7.8	8.2
	Total	49	96.1	100.0
Missing	System	2	3.9	
Total		51	100.0	

As discussed earlier, issues with the highest standard deviations indicated the greatest variability in answers between the respondents, or less general consensus over whether or not those traits were important. In the case of the topics covered in Q13, Q16, Q17, Q18, Q19, Q20, Q22 and Q23, for instance, each had standard deviations of 1.06, 1.10, 1.06, 1.12, 1.07, 1.11, 1.17, and 1.05, respectively. This means that the respondents were less consistent in their answers for these attributes than for the other attributes, and there was a certain amount of variability and disagreement

between the respondents over the importance of these issues when outsourcing transportation to 3PL service providers. The mean values of almost all of these variables were also over 2, indicating that there was some degree of discrepancy between the respondents over whether or not such expectations were important for transportation 3PL service providers.

In Q16, for instance, there was low consistency among the respondents over whether 3PL service providers should have a culture of continuous improvement (mean = 2.04; SD = 1.10), since approximately one third (38.8%, n = 19) of the respondents strongly agreed, one third of the respondents (32.7%, n = 16) agreed, and the remaining approximately one third of the respondents (28.6%, n = 14) were either neutral, in disagreement, or in strong disagreement (see Table 6.6). Stated differently, as many as 14 of the 49 respondents (28.6%) felt that a culture of continuous improvement was less vital than other characteristics for 3PL service providers to successfully perform their transportation expectations. The mean agreement for Q16 (mean = 2.04), though, still placed Q16 in the middle of the range in relation to all of the other potential expectations (see Figure 6.4 above).

Similarly, respondents thought less highly of having an open-book pricing policy for services offered (Q17; mean = 2.08; SD = 1.06); putting forward creative suggestions to assist customers (Q20; mean = 2.06; SD = 1.11); using a customer needs analysis (Q22; mean = 2.27; SD = 1.17); and staying abreast with technological advances (Q23; mean = 2.12; SD = 1.05); since these four expectations were listed with least importance out of all the potential expectations. For instance, 19 respondents (37.3%) strongly agreed, 12 respondents (23.5%) agreed, 14 respondents (27.5%) were neutral, three respondents (5.9%) disagreed, and one respondent strongly disagreed (2.0%) that having an open-book pricing policy for services offered was important for 3PL service providers (Q17), as shown in Table 6.7.

Table 6.6: Respondents' answers to whether 3PL service providers should have a culture of continuous improvement (Q16)

		Frequency	Percent	Valid Percent
Valid	Strongly agree	19	37.3	38.8
	Agree	16	31.4	32.7
	Neutral	9	17.6	18.4
	Disagree	3	5.9	6.1
	Strongly disagree	2	3.9	4.1
	Total	49	96.1	100.0
Missing	System	2	3.9	
Total		51	100.0	

Table 6.7: Respondents' answers to whether 3PL service providers should have an open-book pricing policy for services offered (Q17)

		Frequency	Percent	Valid Percent
Valid	Strongly agree	19	37.3	38.8
	Agree	12	23.5	24.5
	Neutral	14	27.5	28.6
	Disagree	3	5.9	6.1
	Strongly disagree	1	2.0	2.0
	Total	49	96.1	100.0
Missing	System	2	3.9	
Total		51	100.0	

In relation to the need for transportation 3PL service providers to use a customer needs analysis (Q22), 15 respondents (30.6%) strongly agreed, 16 respondents (32.7%) agreed, and more than one third of respondents (22.4%) were either neutral, disagreed (8.2%) or strongly disagreed (6.1%). Three respondents (6.1%) even

strongly disagreed with the need for transportation 3PL service providers to use a customer needs analysis, as shown in Table 6.8 below.

Table 6.8: Respondents’ answers to whether 3PL service providers should use a customer needs analysis (Q22)

		Frequency	Percent	Valid Percent
Valid	Strongly agree	15	29.4	30.6
	Agree	16	31.4	32.7
	Neutral	11	21.6	22.4
	Disagree	4	7.8	8.2
	Strongly disagree	3	5.9	6.1
	Total	49	96.1	100.0
Missing	System	2	3.9	
Total		51	100.0	

Almost no respondents disagreed that transportation 3PL service providers should have short lead-times (Q10), provide logistics services tailored to customer needs (Q8), or have competitive prices in relation to other 3PL service providers (Q21), though surprisingly, seven respondents did not think that 3PL service providers should show a display of ethical behaviour (Q13) (To see a full list of all results tabled, please refer to Appendix II). Five or more respondents also disagreed that 3PL service providers should show a prompt response to customer demands (Q15); have a culture of continuous improvement (Q16); provide clear, open communication (Q18); show strict adherence to contractual commitments (Q19); put forward creative suggestions to assist customers (Q20); offer competitive prices in relation to other 3PL service providers (Q21); use a customer needs analysis (Q22); and/or stay abreast with technological advances (Q23).

6.2.2 Questions targeting warehousing expectations (Q26-Q39)

In the case of questions targeting expectations of warehousing 3PL service providers (Q26-Q39), central tendencies on the respondents’ answers are shown in Table 6.9 below. While providing logistics services tailored to customer needs (Q8) and the

ability to ensure that shipments and deliveries arrive on time (Q11), had the lowest means and standard deviations when applied to transportation, respectively, when considered in relation to warehousing, the respondents were more consistently concerned with whether 3PL service providers had well-maintained material handling equipment (Q30; mean = 1.88; SD = 0.99); and for the 3PL service providers to be responsive and flexible to unforeseen circumstances (Q28; mean = 1.91; SD = 1.01). Similarly to Q8, though, providing logistics services tailored to customer needs (Q26) was observed to have the third lowest mean and the lowest standard deviation (mean = 0.97; SD = 0.88), indicating that the respondents were also in agreement that — as in the case of transportation 3PL service providers — tailoring services to customer demands was important when undertaking warehousing duties as well.

Table 6.9: Central tendencies on questions targeting the expectations of warehousing 3PL service providers (Q26-Q39)

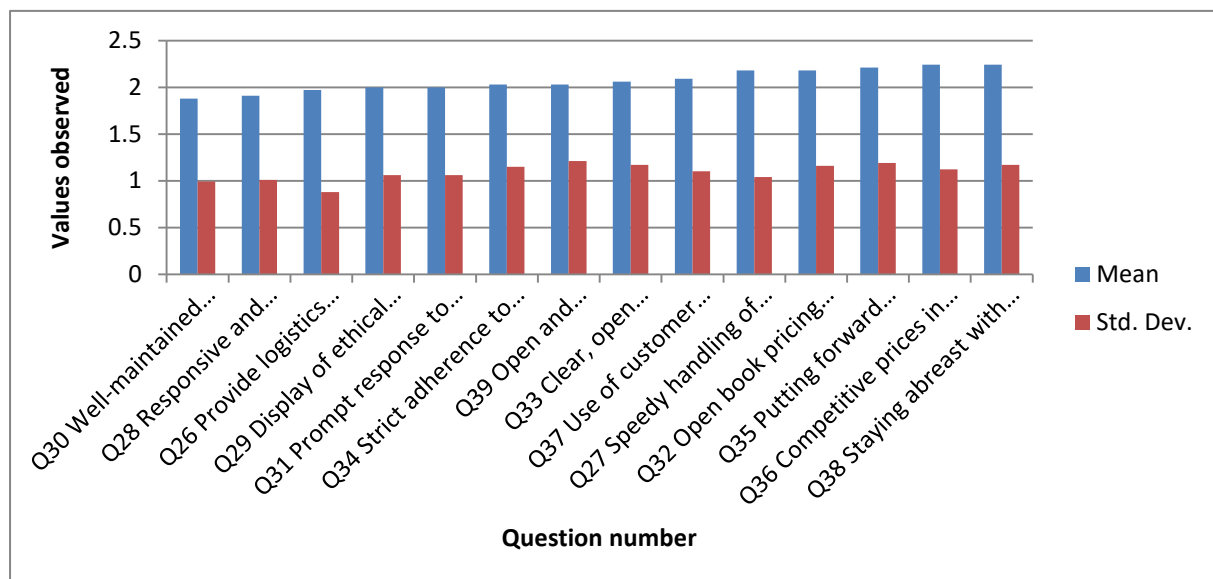
	Valid N	Mean	Med	Std. Dev.
Q26: Provide logistics services tailored to customer needs	33	1.97	2	0.88
Q27: Speedy handling of claims and returns	33	2.18	2	1.04
Q28: Responsive and flexible to unforeseen circumstances	33	1.91	2	1.01
Q29: Display of ethical behaviour	33	2.00	2	1.06
Q30: Well-maintained material handling equipment	33	1.88	2	0.99
Q31: Prompt response to customer demand	33	2.00	2	1.06
Q32: Open book pricing policy for services offered	33	2.18	2	1.16
Q33: Clear, open communication	33	2.06	2	1.17
Q34: Strict adherence to contractual commitments	32	2.03	2	1.15
Q35: Putting forward creative suggestions to assist customers	33	2.21	2	1.19

	Valid N	Mean	Med	Std. Dev.
Q36: Competitive prices in relation to other 3PL service providers	33	2.24	2	1.12
Q37: Use of customer needs analysis	33	2.09	2	1.10
Q38: Staying abreast with technological advances	33	2.24	2	1.17
Q39: Open and approachable 3PL staff	33	2.03	2	1.21

Figure 6.5 below presents a graphical representation of the means and standard deviations of the expectations that 3PL service providers should achieve while performing warehousing services (Q26-Q39), ordered from lowest mean (highest importance) on the left, to highest mean (lowest importance) on the right. Topics covered in questions Q35, Q36 and Q38 were observed to have the highest mean values (mean = 2.21, SD = 1.19; mean = 2.24, SD = 1.12; and mean = 2.24, SD = 1.17), respectively, indicating that putting forward creative suggestions to assist customers (Q35), having competitive prices in relation to other 3PL service providers (Q36), and staying abreast with technological advances (Q38), were the least important expectations for 3PL service providers when undertaking warehousing services.

Interestingly, as in the case of transportation, the topics of staying abreast with technological advances (Q38) and putting forward creative suggestions to assist customers (Q35) did not appear to be important for warehousing either. However, the aspect of having competitive prices in relation to other 3PL service providers (Q36) was rated far more highly when considered as a property of transportation 3PL service providers than when considered among warehousing 3PL service providers. For instance, in the case of transportation 3PL service providers, having competitive prices was rated fourth, while for warehousing 3PL service providers, competitive pricing was rated least important (along with the need to stay abreast with technological advances (Q38)).

Figure 6.5: Means and standard deviations of warehousing topics (Q26-Q39)



It should be noted that the number of respondents that answered the questions Q26-Q39 was lower than in the questions pertaining to transportation ($n = 33$ down from $n = 49$ in transportation-related questions). It is possible that this may have had a slight reduction effect on the statistical reliability of the results that were observed in the warehousing-related questions. However, the results of the tests for reliability (Cronbach’s alpha) discussed later in the chapter, help to dispel any uncertainties in this regard.

6.2.3 Questions targeting value-added services (VAS) expectations (Q41-Q52)

In the case of questions targeting value-added services (VAS) (Q41-Q52), central tendencies on the respondents’ answers are shown in Table 6.10 below; and Figure 6.6 below presents a graphical representation of the means and standard deviations of these issues, ordered from lowest mean (left) to highest mean (right).

Table 6.10: Central tendencies on questions targeting expectations of value-added services 3PL service providers (Q41-Q52)

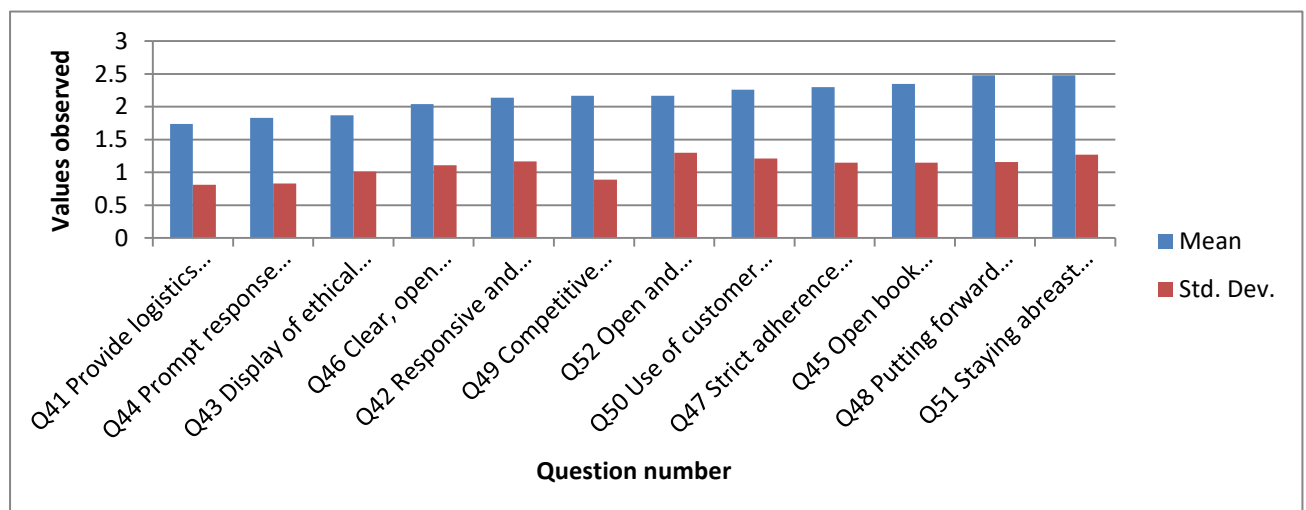
	Valid N	Mean	Med	Std. Dev.
Q41: Provide logistics services tailored to customer needs	23	1.74	2	0.81
Q42: Responsive and flexible to unforeseen circumstances	22	2.14	2	1.17
Q43: Display of ethical behaviour	23	1.87	2	1.01
Q44: Prompt response to customer demands	23	1.83	2	0.83
Q45: Open book pricing policy for services offered	23	2.35	2	1.15
Q46: Clear, open communication	23	2.04	2	1.11
Q47: Strict adherence to contractual commitments	23	2.30	2	1.15
Q48: Putting forward creative suggestions to assist customers	23	2.48	3	1.16
Q49: Competitive prices in relation to other 3PL service providers	23	2.17	2	0.89
Q50: Use of customer needs analysis	23	2.26	2	1.21
Q51: Staying abreast with technological advances	23	2.48	2	1.27
Q52: Open and approachable 3PL staff	23	2.17	2	1.30

Once again, as in the case of transportation and warehousing 3PL service providers, providing logistics services tailored to customer needs had the lowest mean among VAS 3PL service providers, and it also had the lowest standard deviation (Q41; mean = 1.74; SD = 0.81), indicating that the respondents were in relatively unanimous agreement that tailoring services to customer needs was the most important aspect of a 3PL providing value-added services. This was followed by having a prompt response to customer demands (Q44; mean = 1.83; SD = 0.83), and displaying ethical behaviour (Q43; mean = 1.87; SD = 1.01). Interestingly, ethical behaviour was also considered

relatively more important in warehousing activities, but less important for 3PL service providers undertaking transportation activities.

The trend in the low necessity for 3PL service providers to stay abreast with technological advances (Q51; mean = 2.48; SD = 1.27), and for 3PL service providers to put forward creative suggestions to assist customers (Q48; mean = 2.48; SD = 1.16) continued when in relation to 3PL service providers offering VAS, as was the case for 3PL service providers providing transportation and warehousing services. Unlike transportation and warehousing 3PL service providers, though, the expectation of having competitive prices in relation to other 3PL service providers (Q49; mean = 2.17; SD = 0.89) was considered to be of only moderate importance relative to the other potential expectations; while the low standard deviation of this result showed that the respondents were universally accepting of this attitude.

Figure 6.6: Means and standard deviations of VAS 3PL properties (Q41-Q52)



The trend continued among the respondents to answer fewer of the VAS questions compared to the transportation questions, since as explained at the beginning of the chapter, only 23 respondents had outsourced VAS services. Thus, the number of respondents that answered the questions Q41-Q52 was lower (n = 23) than in the questions pertaining to either transportation (n = 49) or warehousing (n = 33); indicating that only around half of the respondents answered the VAS-related questions. Once again, it is possible that this may have had a slight weakening effect on the overall statistical reliability of the results that were observed. However, the

results of the tests for reliability (Cronbach's alpha) discussed later in the chapter, help to dispel any uncertainties in this regard.

Sub-objective 3: To highlight the major problems currently associated with 3PL service providers.

Question 25 was an open-ended question and asked respondents to list the major problems they currently experience with transportation 3PL service providers. Even though most of the respondents were satisfied with their transportation 3PL service providers, some respondents still highlighted a few problem areas. A summary of the major problem areas in order of importance is as follows:

- Late deliveries or missing lead-time deadlines, is the biggest problem cited by the respondents.
- Lack of qualified personnel or trained personnel is the second biggest problem experienced by the respondents.
- Wrong, short or damaged deliveries is the third biggest problem experienced by the respondents when dealing with their transportation 3PL service providers.

It should also be noted that a small amount of the respondents indicated that they do not experience any problems with their transportation 3PL service providers.

Question 40 was also an open-ended question and asked respondents to list the major problems they currently experience with warehouse 3PL service providers. A summary of the major responses in order of importance is as follows:

- Demotivated personnel working for warehouse 3PL service providers is cited as the biggest problem by the respondents.
- Lack of transparent information flow from warehouse 3PL service providers to automotive manufacturing firms is noted as the second biggest problem experienced by the respondents.

- Slow handling of product returns is the third biggest problem as indicated by the respondents.
- Poor stock rotation and slow reaction to customer demand is cited as the fourth biggest problem by the respondents.
- A lack of specialised or qualified warehousing personnel employed by warehouse 3PL service provider companies is mentioned as the fifth biggest problem by the respondents.

Question 53 was another open-ended question and asked respondents to list the major problems they currently experience with VAS 3PL service providers. A summary of the major responses in order of importance is as follows:

- Late deliveries or missing lead-time deadlines, is the biggest problem cited by the respondents.
- The costs associated in engaging with VAS 3PL service providers are high, and therefore noted as the second biggest problem by the respondents.
- Lack of innovation by VAS 3PL service providers is stated as the third biggest problem by the respondents.

Sub-objective 4: To determine the consequences of unacceptable performance levels by 3PL service providers.

6.2.4 Questions targeting the consequences of unacceptable performance levels provided by 3PL service providers (Q54-Q61)

Unlike the questions targeting the expectations that 3PL service providers performing transportation, warehousing or value-added services should meet, the structure of the questionnaire was different in the final section of the study, as it instead enquired about the negative consequences that the respondents had experienced as a result of inferior performance by their 3PL service providers.

Central tendencies on the respondents' answers are shown in Table 6.11 below, while Figure 6.7 below presents a graphical representation of the means and standard deviations of these results, ordered from lowest mean (left) to highest mean (right).

Figure 6.7: Negative consequences caused by inferior 3PL performance (Q54-Q61)

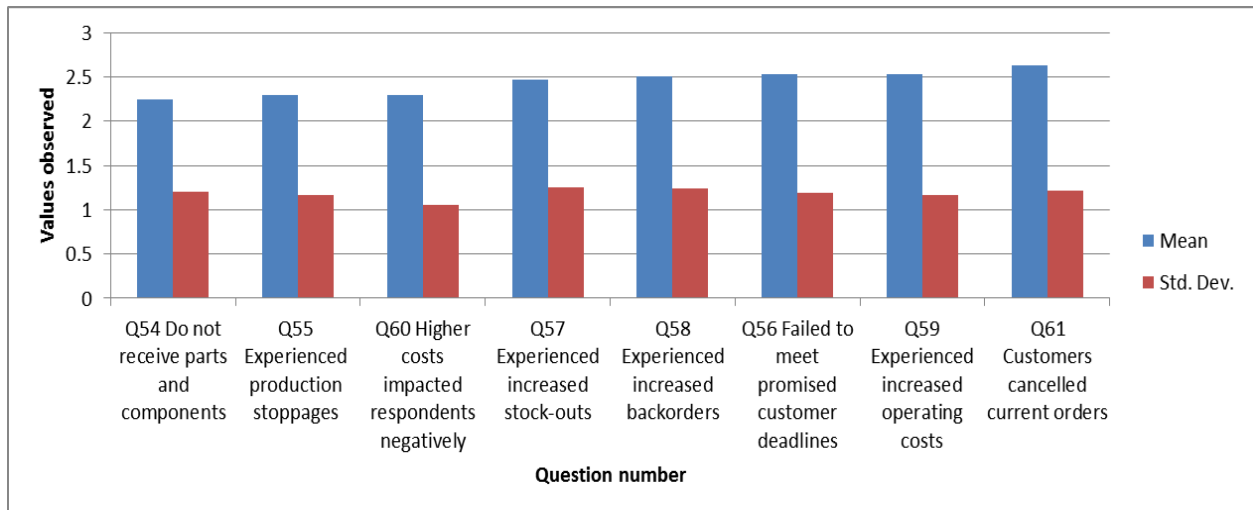


Table 6.11: Central tendencies on questions targeting consequences of poor 3PL performance (Q54-Q61)

	Valid N	Mean	Med	Std. Dev.
Q54: Respondents do not receive parts and components as required because of any late delivery, or incorrect shipments, packaging, or barcoding	51	2.25	2	1.20
Q55: Respondents experienced production stoppages from the unavailability of supplies	51	2.29	2	1.17
Q56: Respondents failed to meet promised customer deadlines	51	2.53	2	1.19
Q57: Respondents experienced increased stock-outs	51	2.47	2	1.25
Q58 Respondents experienced increased backorders	51	2.51	3	1.24
Q59: Respondents experienced increased operating costs	51	2.53	3	1.16

	Valid N	Mean	Med	Std. Dev.
Q60: The higher costs impacted negatively on respondents' costs, new business and profits	51	2.29	2	1.06
Q61: Respondents' customers cancelled their current orders and they lost future sales	51	2.63	3	1.22

The topics that were noted to have the highest average negative consequences caused by inferior 3PL performance, as indicated by lowest mean values across the respondents' answers, were that it resulted in them not receiving parts and components on time (Q54; mean = 2.25; SD = 1.20); that they had experienced production stoppages (Q55; mean = 2.29; SD = 1.17); and that higher costs had impacted their organisations' profit margins (Q60; mean = 2.29; SD = 1.06).

It was observed less consistently that customers had been forced to cancel current orders due to inferior 3PL performance (Q61; mean = 2.63; SD = 1.22); that respondents had experienced increased operating costs (Q59; mean = 2.53; SD = 1.16); and/or that they had failed to meet promised customer deadlines (Q56; mean = 2.53; SD = 1.19). This presented somewhat of a contradiction in the results, though, since as mentioned above, the mean value of the respondents appeared to indicate that higher costs had impacted their organisations (Q60). Yet, the respondents noted less frequently that they had experienced increased operating costs (Q59). There was also a difference in the median values between Q60 and Q59, where the median in Q60 was 2, while for Q59 it was 3.

It should be highlighted, though, that the range of mean values across all of the 'consequences' topics was concisely grouped between 2.25 and 2.63, indicating that there was not much variability in the mean values describing the negative consequences that had been caused by 3PL service providers; and no single issue stood out as being far more or less of a problem than other variables. Thus, all of the issues were positioned within a predominantly moderate range, and the standard deviations were also low enough to indicate that there was consistency and unity among the respondents on their sentiments. It should be highlighted that all 51 of the

respondents presented answers to these final questions on the consequences of inferior 3PL performance, thereby increasing the overall reliability of these results.

Sub-objective 5: To identify action plans that automotive manufacturing firms have to bring 3PL service providers in line with their expectations.

Question 63 was an open-ended question and asked the respondents to suggest corrective measures to be taken should 3PL service providers fail to perform as promised. A summary of the major responses in order of importance is as follows:

- The majority of respondents indicated that they would first communicate with the 3PL service provider and impose a penalty on them as per the terms and conditions of the contract signed between the automotive manufacturing firm and the 3PL service provider.
- A smaller number of respondents noted that they would cancel the contract and look for an alternative 3PL service provider if they do not have a back-up supplier.
- The minority of respondents indicated that they keep safety stock in key locations, to buffer against situations where 3PL service providers fail to deliver as promised.

6.2.5 Tests for normality

An assumption on all parametric tests is that the data should be normally distributed (Saunders et al. 2009). In the event that data is not normally distributed, non-parametric tests should instead be performed. Common tests that are performed to observe normality include Kolmogorov-Smirnov (K-S), and the Shapiro-Wilkes' (S-W) tests (Field 2013). A K-S test was performed in this study, and as shown in Table 6.12 below. The p-values for the K-S on each of the transportation, warehousing, value-added services, and consequences variables (when combined), were above an alpha of 0.05, allowing a conclusion to be made that the data was normally distributed.

However, upon scrutiny of the skewness and kurtosis of the combined variables, which are measures of the asymmetry and sharpness of the frequency distributions, respectively, it was clear that the data in the transportation and warehousing sections

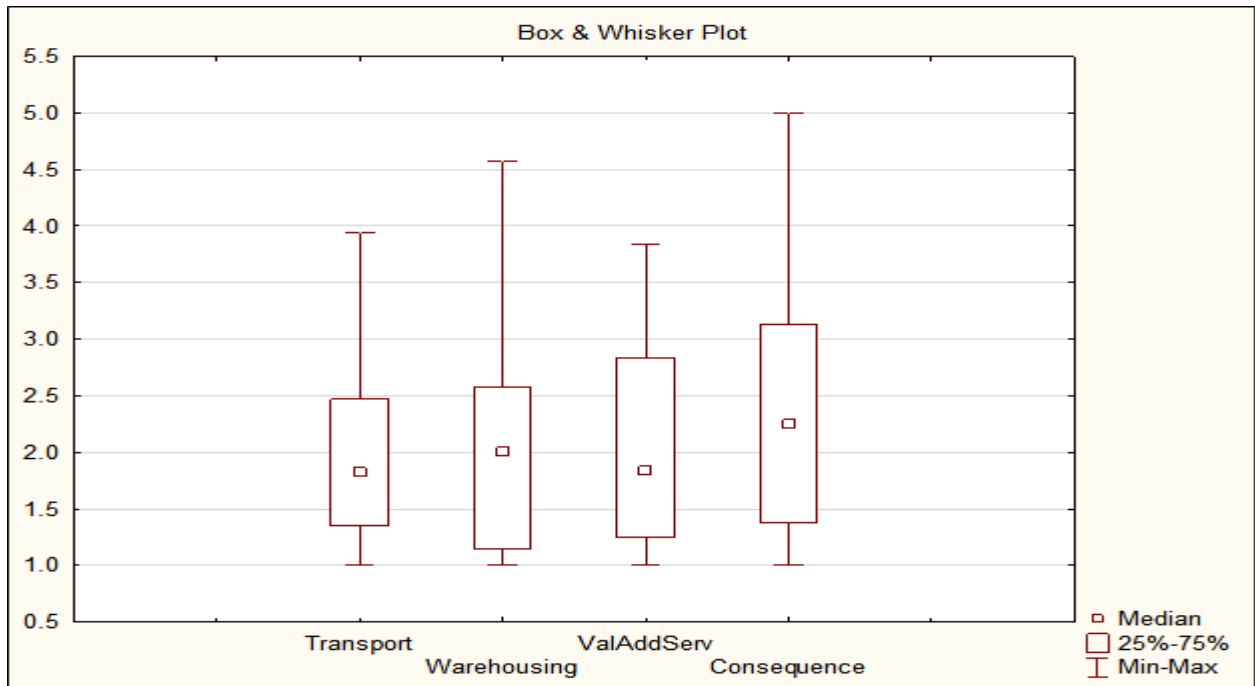
was moderately positively skewed (transport skewness = 0.77; warehousing skewness = 0.90). VAS and consequence data, however, was below a skewness of 0.5, indicating that the data on those combined variables was not skewed.

From the kurtosis data, it was apparent that the combined transportation data was approximately normally distributed, since it had a kurtosis of almost zero (transport kurtosis = -0.01). Warehousing data had sharper peaks since its kurtosis was above zero (warehousing kurtosis = 0.77), and the VAS and consequence data had flatter distributions since their kurtoses were below zero (VAS kurtosis = -1.02; consequence kurtosis = -0.86, respectively). Visual depictions of these results are shown in the box and whisker plots in Figure 6.8 below. These results conclude that although the K-S test suggested otherwise, the data sets did not strictly follow normal distributions, and non-parametric tests would instead be the most appropriate tests to perform on these data sets.

Table 6.12: Results for the K-W test, skewness and kurtosis for transportation, warehousing, VAS, and consequences variables (combined)

Descriptive Statistics							Test for normality	
	Valid N	Mean	Median	Std. Dev.	Skewness	Kurtosis	K-S	p
Transport	49	1.94	1.82	0.78	0.77	-0.01	d=0.13	> 0.20
Warehousing	33	2.07	2.00	0.91	0.90	0.77	d=0.12	> 0.20
VAS	23	2.15	1.83	0.90	0.33	-1.02	d=0.16	> 0.20
Consequences	51	2.44	2.25	1.06	0.23	-0.86	d=0.10	> 0.20

Figure 6.8: Box and whisker plots of the transportation, warehousing, VAS, and consequences variables (combined)



6.3 INFERENCE STATISTICS

6.3.1 Correlation analysis

A correlation analysis was performed on the combined transportation, warehousing, VAS and consequences data to observe, with statistical reliability, whether any correlations existed between the different variables; thereby allowing conclusions to be drawn on whether the aspects of transport, warehousing, value-added services or their consequences were correlated. This was valuable for observing, for instance, whether respondents who had listed an average agreement in the transportation segment of the questionnaire, also listed an average agreement in the warehousing and VAS segments of the questionnaire, and vice versa.

As shown in Table 6.13 below, there was a very strong positive correlation between the mean values of respondents in the transportation section of the questionnaire and their mean values in the warehousing section of the questionnaire, which was statistically significant at below an alpha of 0.05 ($r = 0.93$, $p = 0.000$). This meant that respondents with low average means in the questions relating to transportation also presented low average mean values in the questions targeting warehousing; while

respondents who noted disagreement to the topics in the transportation section also presented low average disagreement to the topics in the warehousing section.

Stated differently, people who noted a higher average importance for the ability of their 3PL service providers to provide different transportation-related services also noted a higher average importance for the ability of their 3PL service providers to provide different warehousing-related services. Conversely, those who noted a lower average importance for the ability of their 3PL service providers to provide different transportation-related services also noted a lower average importance for the ability of their 3PL service providers to provide different warehousing-related services. Scatter graphs of these results are shown in Figure 6.9 below.

Table 6.13: Correlations observed between the factors of transportation, warehousing, VAS and the consequences of inferior 3PL service providers

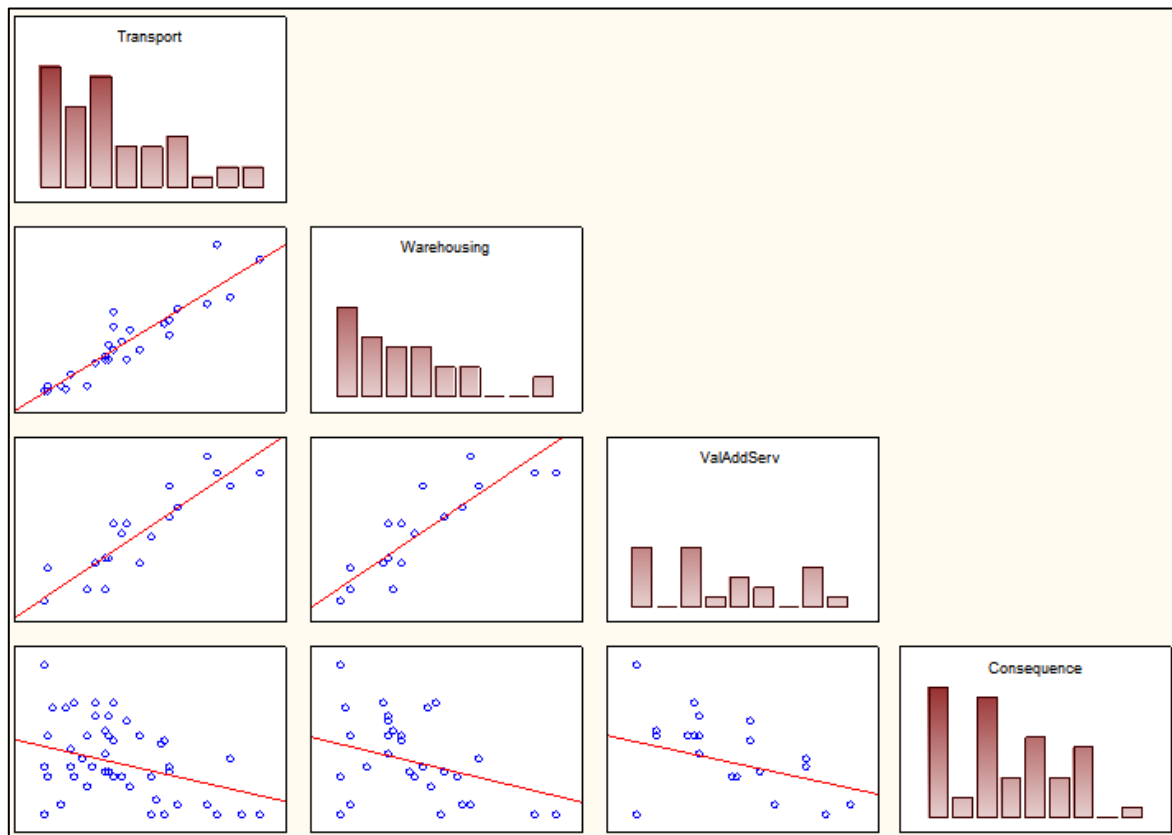
		Transport	Warehousing	VAS	Consequence
Transport	Coefficient	1.00			
	No. correlations	N=49			
	Significance	p= ---			
Warehousing	Coefficient	0.93	1.00		
	No. correlations	N=31	N=33		
	Significance	p=0.000	p= ---		
VAS	Coefficient	0.92	0.88	1.00	
	No. correlations	N=23	N=21	N=23	
	Significance	p=0.000	p=.000	p= ---	
Consequences	Coefficient	-0.33	-0.32	-0.35	1.00
	No. correlations	N=49	N=33	N=23	N=51
	Significance	p=0.020	p=0.069	p=0.103	p= ---
Marked correlations (in red) are significant at $p < 0.05$					

Other sections of the questionnaire that also showed strong positive statistically reliable correlations between the respondents' answers, were between transportation and VAS ($r = 0.92$, $p = 0.000$), and between warehousing and VAS ($r = 0.88$, $p = 0.000$).

There was a weak negative correlation between the respondents' mean answers to transportation 3PL service providers and consequences of inferior 3PL service providers, indicating that those with higher average agreement to the topics in the transportation section of the questionnaire tended to provide more general disagreement to the negative consequences that they had observed from inferior 3PL services.

Stated differently, respondents that had noted higher average importance on the transportation topics tended to have had less negative consequences from any inferior services from their 3PL service providers ($r = -0.33$; $p = 0.020$). Although this was a weak negative correlation, it was still statistically significant at below an alpha of 0.05. Furthermore, this correlation was between almost all of the respondents ($n = 49$), indicating that this conclusion was representative of the entire sample group — thereby increasing the reliability of the data gathered.

Figure 6.9: Scatter plots of the correlations between the factors of transportation, warehousing, VAS, and the consequences of inferior 3PL service providers



6.4 RELIABILITY

While the reliability of the results has been discussed continuously throughout the chapter, tests for reliability were also performed through the calculation of Cronbach alpha for each of the variables. As described in Chapter 5, Cronbach alpha is performed in order to measure the internal consistency between the respondents' answers, and a Cronbach alpha statistic of above 0.7 is typically thought, among many social science observers, to infer reliable internal consistency (Tavakol & Dennick 2011; Ritter 2010; Heale & Twycross 2015).

The Cronbach alpha of all variables in the transportation section of the questionnaire was 0.96, as was the Cronbach alpha of all variables in the warehousing and consequences sections of the questionnaire, as shown in Table 6.14 below. The Cronbach alpha of variables in the VAS section of the questionnaire was only marginally lower, at 0.95, indicating that all of the variables consisted of data with a high internal consistency. The inter-item correlations between the variables were also

calculated, which is a measure of the extent to which the scores of different items on a scale are related; thereby providing an assessment of item redundancy, and the degree to which items on a scale are measuring the same content (Cohen & Swerdlik 2010). The inter-item correlations were typically between 0.65 and 0.91 across the different variables.

According to Piedmont (2014), average inter-item correlations for a set of items should be between 0.20 and 0.40; wherein values below 0.20 could indicate that the items may not be representative of the same content domain, while values above 0.40 may indicate that only a small bandwidth of the construct has been captured. The higher average values of the inter-rater correlations in Table 6.14 below therefore indicate that while the items in this study were representative of the same content domain, they may only have been capturing limited segments of the constructs. This highlights the fact that opportunities exist for future research to be performed to examine each of these topics in further detail.

Furthermore, in the case of inter-item correlations above 0.8, this could indicate multi-collinearity (Lin & Wang 2010). However, multi-collinearity would only have been a problem in the event of performing advanced inferential statistical analyses, such as multiple regression or structural equation modelling (SEM) (Grewal, Cote & Baumgartner 2004). The average inter-item correlation for transportation was 0.60; while for warehousing it was 0.67; for VAS it was 0.66; and for consequences it was 0.78.

Table 6.14: Cronbach alpha and inter-item correlation values between the test questions

Transportation			Warehousing			VAS			Consequences		
Cronbach alpha: 0.96			Cronbach alpha: 0.96			Cronbach alpha: 0.95			Cronbach alpha: 0.96		
Average inter-item correlation: 0.60			Average inter-item correlation: 0.67			Average inter-item correlation: 0.66			Average inter-item correlation: 0.78		
	Item-Total Corr.	Alpha if deleted		Item-Total Corr.	Alpha if deleted		Item-Total Corr.	Alpha if deleted		Item-Total Corr.	Alpha if deleted
A8	0.72	0.96	A26	0.77	0.96	A41	0.73	0.95	A54	0.76	0.97
A9	0.71	0.96	A27	0.75	0.96	A42	0.79	0.95	A55	0.85	0.96
A10	0.72	0.96	A28	0.75	0.96	A43	0.88	0.95	A56	0.92	0.96
A11	0.70	0.96	A29	0.84	0.96	A44	0.72	0.95	A57	0.91	0.96
A12	0.80	0.96	A30	0.73	0.96	A45	0.79	0.95	A58	0.90	0.96
A13	0.82	0.96	A31	0.83	0.96	A46	0.80	0.95	A59	0.88	0.96
A14	0.78	0.96	A32	0.80	0.96	A47	0.79	0.95	A60	0.79	0.96
A15	0.76	0.96	A33	0.87	0.96	A48	0.71	0.95	A61	0.88	0.96
A16	0.87	0.96	A34	0.82	0.96	A49	0.65	0.95			
A17	0.81	0.96	A35	0.80	0.96	A50	0.83	0.95			
A18	0.85	0.96	A36	0.84	0.96	A51	0.88	0.95			
A19	0.85	0.96	A37	0.84	0.96	A52	0.83	0.95			
A20	0.77	0.96	A38	0.81	0.96						
A21	0.39	0.96	A39	0.74	0.96						
A22	0.79	0.96									
A23	0.75	0.96									
A24	0.72	0.96									

6.5 CONCLUDING REMARKS

A total of 51 respondents participated in this study, wherein the largest group was employed in the assembly sector, followed by plastics, electrical, metal, rubber, chemical and other sectors. The vast majority of the respondents made use of 3PL service providers for both sending and receiving components and parts. Almost all of

the respondents outsourced transportation services to 3PL service providers, while only around two thirds outsourced warehousing and inventory management; and half outsourced VAS. Most respondents were satisfied or very satisfied with their transportation 3PL service providers; but fewer were satisfied, and some were dissatisfied or very dissatisfied, with warehousing and VAS 3PL service providers.

Aspects most important for transport, warehousing and VAS 3PL service providers were for the 3PL service providers to provide logistics services tailored to customer needs, though in the case of transportation 3PL service providers, it was noted that they should also ensure that shipments and deliveries arrived on time, and to have well-maintained transport and material handling equipment. Least important for transport 3PL service providers was having an open-book pricing policy for services, putting forward creative suggestions to assist customers, using a customer needs analysis, and staying abreast with technological advances.

For warehousing, the respondents wanted 3PL service providers to have well-maintained material handling equipment and to be responsive and flexible to unforeseen circumstances; though putting forward creative suggestions to assist customers, having competitive prices in relation to other 3PL service providers, and staying abreast with technological advances were less important. In addition to providing logistics services tailored to customer needs, VAS 3PL service providers were also expected to respond promptly to customer demands, and to display ethical behaviour; though staying abreast with technological advances, putting forward creative suggestions to assist customers and having an open-book pricing policy were considered least important.

The range of mean values across all of the 'consequences' that had been caused due to inferior 3PL performance was concisely grouped, indicating that no single issue stood out as far more or less of a problem than the others; though three common problems noted were that respondents had not received parts and components, experienced production stoppages; and higher costs had impacted their organisations.

Respondents who noted a higher average importance for the ability of their 3PL service providers to provide different transportation-related services also noted a higher average importance for the ability of their 3PL service providers to provide

different warehousing-related services, with statistically reliably consistency. Other sections of the questionnaire that also showed strong positive statistically reliable correlations were between transportation and VAS, and between warehousing and VAS. Respondents that noted higher average importance on the transportation topics also tended to have less negative consequences from any inferior services from their 3PL service providers.

The Cronbach alphas of each of the transportation, warehousing, VAS and consequences data sets, combined, indicated that the data was reliable, and had suitable internal consistencies.

The next chapter presents the study's main conclusions, recommendations and prospects for further research.

CHAPTER 7

FINAL CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

7.1 INTRODUCTION

The previous chapter provided a report on the empirical findings of the study. This chapter provides the final conclusions as well as recommendations for future study. In this chapter, firstly a short summary of the content covered in the previous chapters is provided. Thereafter, recommendations for future research are explained. Lastly, the shortcomings of the study are outlined.

7.2 SHORT SUMMARY OF THE CONTENT OF THE DIFFERENT CHAPTERS

The main objective of this study was to investigate the expectations that automotive manufacturing firms have of Third Party Logistics (3PL) service providers in the Eastern Cape Province. In support of the main objective, the study focused on achieving the following five sub-objectives:

- To source the reasons why automotive manufacturing firms in the Eastern Cape Province find it important to trade with 3PL service providers.
- To determine whether or not 3PL service providers are meeting the expectations of automotive manufacturing firms in the Province.
- To highlight the major problems currently associated with 3PL service providers.
- To determine the consequences of unacceptable performance levels provided by 3PL service providers.
- To identify the action plans that automotive manufacturing firms have to bring 3PL service providers in line with their expectations.

In order to achieve the above-mentioned sub-objectives relating to the topic of this study, seven chapters were delineated in this dissertation.

The first chapter provided a structured outline of the research problem, the study objectives, an overview of the literature topics the study covered, as well as the research design and methodology that was applied in this study. The second chapter outlined supply chain management as a business management philosophy. In addition, the chapter highlighted the modern business strategies, also referred to as international trends, that need to be practiced by principal manufacturing organisations in their quest to be more efficient, effective, competitive and successful in an ever-changing and challenging business environment. In order to achieve supply chain success, principal organisations need to ensure that all supply chain partners, particularly 3PL service providers, are aligned with the goals of the principal organisation's supply chain. Consequently, this in turn will ensure that all supply chain partners function as one co-ordinated and integrated unit.

The third chapter gave an explanation of the evaluation and selection of 3PL service providers. Additionally, the chapter suggested that in order for automotive manufactures to realise more potential from their 3PL service providers in the future, issues such as early 3PL service provider involvement, cost saving initiatives from 3PL service providers, and 3PL service provider development, will therefore become more crucial.

The fourth chapter presented an overview of the automotive manufacturing industry and 3PL service provider outsourcing, with the focus on developing countries. Additionally, the modular logistics process was highlighted before a detailed explanation of 3PL service provider outsourcing was provided. The logistics environment in South Africa was outlined in an effort to underscore both the challenges faced by organisations and some potential solutions to these obstacles.

The chapter concluded that the automotive industry plays a key role in developing countries as it is a significant contributor to GDP and provides a source of employment, which is much needed in South Africa. Automotive logistics is a highly complex field, demanding considerable capital resources. One of the most important roles of 3PL service providers in the automotive industry is the management of cargos of goods within the supply chain. As a result, the automotive industry is becoming more based on a system of modularity, through a system of modular production.

Logistics outsourcing is receiving increased attention, since it is a sector in which productivity and efficiency improvements are possible in order to lower operating costs, while improving customer services. However, 3PL service providers face significant barriers in developing countries such as stringent legal regulations, poor infrastructure and equipment, as well as a lack of competent manpower for efficient operations.

The fifth chapter provided the research design and methodology that was used in this study. This research was performed mainly within the positivist research paradigm of causality, since it was held by the researcher that there should be a clear causal relationship between the variables that may be observed to answer the research questions of this study. A simple random probability sample of participants from the research population of automotive manufacturing firms in the Eastern Cape Province was gathered, and the questions posed in the questionnaire of this study were structured using both Likert-scale and open-ended questions. Following pre-testing on 15 part-time fourth-year B Tech: Logistics students who are employed in the automotive industry, the questionnaire was distributed via email and in hard-copy, along with a cover letter outlining the objectives and purpose of this study.

In order to analyse the data, two popular quantitative data analysis techniques of descriptive statistical analysis and inferential statistical analysis were employed, with particular techniques of Correlation Analysis, Cronbach's alpha, and tests for normality were performed.

The sixth chapter provided the results of the empirical study. A total of 51 respondents participated in this study, wherein the largest group was employed in the assembly sector, followed by plastics, electrical, metal, rubber, chemical and other sectors. The vast majority of the respondents made use of 3PL service providers for both sending and receiving components and parts. Almost all of the respondents outsourced transportation services to 3PL service providers, while only around two thirds outsourced warehousing and inventory management; and half outsourced value-added services such as order processing, labelling, bulk-breaking, barcoding, information systems, and pricing. Most respondents were satisfied or very satisfied with their transportation 3PL service providers; but fewer were satisfied, and some

were dissatisfied or very dissatisfied with warehousing and value added services (VAS) 3PL service providers.

Aspects most important for transport, warehousing and value-added services (VAS) 3PL service providers were for the 3PL service providers to provide logistics services tailored to customer needs; though in the case of transportation 3PL service providers, it was noted that they should also ensure that shipments and deliveries arrived on time, and to have well-maintained transport and material handling equipment. Least important for transport 3PL service providers was having an open-book pricing policy for services, putting forward creative suggestions to assist customers, using a customer needs analysis, and staying abreast with technological advances.

For warehousing, respondents wanted 3PL service providers to have well-maintained material handling equipment and to be responsive and flexible to unforeseen circumstances. However, putting forward creative suggestions to assist customers, having competitive prices in relation to other 3PL service providers, and staying abreast with technological advances, were less important. In addition to providing logistics services tailored to customer needs, VAS 3PL service providers were also expected to respond promptly to customer demands, and to display ethical behavior. However, staying abreast with technological advances, putting forward creative suggestions to assist customers and having an open-book pricing policy were considered least important.

The range of mean values across all of the 'consequences' that had been caused due to inferior 3PL performance was concisely grouped, indicating that no single issue stood out as far more or less of a problem than the others. However, three common problems noted were that respondents had not received parts and components on time, some experienced production stoppages and higher costs had impacted their organisations negatively.

Respondents who noted a higher average importance for the ability of their 3PL service providers to provide different transportation-related services also noted a higher average importance for the ability of their 3PL service providers to provide different warehousing-related services, with statistically reliable consistency. Other sections of the questionnaire that also showed strong positive statistically reliable

correlations were between transportation and VAS, and between warehousing and VAS. Respondents that noted higher average importance on the transportation topics also tended to have less negative consequences from any inferior services from their 3PL service providers.

The Cronbach alphas of each of the transportation, warehousing, VAS and consequences data sets, combined, indicated that the data was reliable, and had suitable internal consistencies.

7.3 RECOMMENDATIONS FOR FUTURE RESEARCH

With reference to the conclusions drawn on the study's primary and sub-objectives, the expectations that manufacturing firms have of 3PL service providers in the Eastern Cape Province can be perceived as a very important prerequisite for firms in the automotive industry to operate successfully. To share in the benefits of meeting the expectations of manufacturing firms and avoid the negative consequences of inferior 3PL service provider performance, it is recommended that 3PL service providers strive to adhere to all the expectations identified in Tables 6.2, 6.9 and 6.10 of Chapter 6.

Other topics recommended for future research that blend in with the outcomes of this study, include a model to successfully select 3PL service providers, a certification process for 3PL service providers, the development of instruments to measure 3PL service provider performance, as well as the importance of using qualified personnel in the 3PL service provider industry. Lastly, it is further recommended that research be done on the expectations that 3PL service providers have of manufacturing firms in order for them to operate successfully as the literature indicates they face significant barriers in developing countries.

7.4 SHORTCOMINGS OF THE STUDY

Although it is felt that the study addressed the main and sub-objectives in a satisfactorily manner, shortcomings of the study in hindsight revolves around the limited number of sub-sectors from which the respondents were selected. A further division of some of the sub-sectors could have resulted in a larger range of sub-sectors from which the respondents could have been selected, thereby increasing the response rate of the study.

7.5 CONCLUDING REMARKS

This chapter provided a conclusion for the study as well as recommendations for future research. Despite the above-mentioned shortcoming, it is felt that the main and sub-objectives of the study were fully addressed, and that this study makes a valuable contribution to a more effective and efficient Eastern Cape automotive sector.

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ANNEXURE A: QUESTIONNAIRE

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MASTER'S RESEARCH SURVEY

**TOPIC: THE EXPECTATIONS THAT AUTOMOTIVE MANUFACTURING FIRMS
HAVE OF THIRD PARTY LOGISTICS (3PL) SERVICE PROVIDERS IN THE
EASTERN CAPE PROVINCE.**

The South African automotive industry has undergone significant changes over the past decade. To be more cost effective and competitive, business organisations have increased their level of outsourcing and are relying more heavily on supply chain partners, especially 3PL service providers. Therefore, determining which 3PL service providers to include in their supply chain has become a key strategic consideration for business organisations operating in this dynamic industry. To date, very little research has been done on the expectations that automotive manufacturing firms have of 3PL service providers.

As the actions of an organisation's 3PL service providers generally impact on cost and service quality, the attached questionnaire focuses mainly on cost and service quality issues, and has been structured as such. In addition, the questionnaire has also been designed in such a way that it will only require a maximum of 20 minutes to complete.

As no names or any other form of identification is required, anonymity is guaranteed. All information will be treated as confidential and it will be impossible to identify any individual or specific business organisation on the basis of the results included in the final report.

Your cooperation in completing the attached questionnaire will be highly appreciated as the information obtained will assist in achieving the study objectives of this Master's study.

Thank you for your time and willingness to complete the questionnaire.

Yours faithfully

Shandran Pillay
Researcher: Department of Logistics, NMMU.

General information

1. Please indicate with an "X" whether your department makes use of 3PL service providers to send or receive components and parts, or both.

Send	Receive	Both
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2. Indicate with an "X" the automotive sector which your business organisation operates in.

Plastic	Metal	Rubber	Chemical	Assembly	Electrical	Other (specify)	
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3. Please list reasons for making use of 3PL service providers

a) _____

b) _____

4. Please indicate with an "X" which of the following 3PL service(s) is/are outsourced by your department/section:

4.1	Transportation services	
4.2	Warehousing and inventory management	
4.3	Value-added services such as order processing, labeling, bulk-breaking, barcoding, information systems, pricing, etc.	

5. Please indicate how you select 3PL service providers.

a) _____

b) _____

c) _____

6. Please rate with an "X" your level of satisfaction with the following types of 3PL service provider(s) that you use:

		<i>Very satisfied</i>	<i>satisfied</i>	<i>Very dis-satisfied</i>	<i>Dis-satisfied</i>
6.1	Transportation 3PL service provider(s)				
6.2	Warehouse 3PL service provider(s)				
6.3	Value-added 3PL service provider(s)				

7. Please list reasons for your answer to question 6 above.

a) _____

b) _____

c) _____

Questions related to **TRANSPORTATION** only

My literature research thus far shows the following expectations which should be met by **transportation** 3PL service providers. Please indicate with an "X" whether you strongly agree, agree, are neutral, disagree or strongly disagree with the following **expectations**:

		<i>Strongly agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly disagree</i>
8	Provide logistics services tailored to customer needs					
9	Speedy handling of claims and returns					
10	Short lead times					
11	The ability to ensure that shipments and deliveries arrive on time					
12	Responsive and flexible to unforeseen circumstances					
13	Display of ethical behaviour					
14	Well-maintained transport and material handling equipment					
15	Prompt response to customer demand					
16	Culture of continuous improvement					
17	Open book pricing policy for services offered					
18	Clear, open communication					
19	Strict adherence to contractual commitments					
20	Putting forward creative suggestions to assist customers					
21	Competitive prices in relation to other 3PL service providers					
22	Use of customer needs analysis					
23	Staying abreast with technological advances					
24	Open and approachable 3PL staff					

25. Please list the major problems you experience with your **transportation** 3PL service providers

a) _____

b) _____

c) _____

Questions related to **WAREHOUSING** only

My literature research thus far shows the following expectations which should be met by **warehouse** 3PL service providers. Please indicate with an "X" whether you strongly agree, agree, are neutral, disagree or strongly disagree with the following **expectations**:

		<i>Strongly agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly disagree</i>
26	Provide logistics services tailored to customer needs					
27	Speedy handling of claims and returns					
28	Responsive and flexible to unforeseen circumstances					
29	Display of ethical behaviour					
30	Well-maintained material handling equipment					
31	Prompt response to customer demand					
32	Open book pricing policy for services offered					
33	Clear, open communication					
34	Strict adherence to contractual commitments					
35	Putting forward creative suggestions to assist customers					
36	Competitive prices in relation to other 3PL service providers					
37	Use of customer needs analysis					
38	Staying abreast with technological advances					
39	Open and approachable 3PL staff					

40. Please list the major problems you experience with your **warehouse** 3PL service providers

a) _____

b) _____

c) _____

Questions related to **VALUE ADDED SERVICES** only

My literature research thus far shows the following expectations which should be met by **value added** 3PL service providers. Please indicate with an "X" whether you strongly agree, agree, are neutral, disagree or strongly disagree with the following **expectations**:

		<i>Strongly agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly disagree</i>
41	Provide logistics services tailored to customer needs					
42	Responsive and flexible to unforeseen circumstances					
43	Display of ethical behaviour					
44	Prompt response to customer demand					
45	Open book pricing policy for services offered					
46	Clear, open communication					
47	Strict adherence to contractual commitments					
48	Putting forward creative suggestions to assist customers					
49	Competitive prices in relation to other 3PL service providers					
50	Use of customer needs analysis					
51	Staying abreast with technological advances					
52	Open and approachable 3PL staff					

53. Please list the major problems you experience with your **value added** 3PL service providers

a) _____

b) _____

c) _____

CONSEQUENCES of inferior 3PL performance

My literature research thus far highlights the following general consequences caused by inferior 3PL performance. Please indicate with an "X" whether you strongly agree, agree, are neutral, disagree or strongly disagree with the following general **consequences** caused by inferior 3PI performance:

		<i>Strongly agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
54	We do not receive parts and components as required because of any of the following: late delivery, incorrect shipments, incorrect packaging, incorrect barcoding, etc.					
55	We experience production stoppages because of the unavailability of supplies					
56	We fail to meet promised customer deadlines					
57	We experience increased stock-outs					
58	We experience increased backorders					
59	We experience increased operating costs					
60	The higher costs impact negatively on our costs, new business and profits					
61	Our customers cancel their current orders and we lose future sales					

62. Except for the above-listed consequences, list any other consequences that you experience as a result of inferior 3PL performance.

- a) _____
- b) _____
- c) _____

63. Please suggest corrective measures to take, should your 3PL service providers fail to perform as promised.

- a) _____

- b) _____

- c) _____
